



انجمن کامپیوتر ایران

# بیستمین سمپوزیوم بین المللی

## هوش مصنوعی و پردازش سیگنال



۳ و ۲ اسفند ماه ۱۴۰۲ دانشگاه علوم و فنون مازندران، بابل، ایران

### فراخوان ارسال مقالات:

دانشگاه علوم و فنون مازندران با همکاری انجمن کامپیوتر ایران بیستمین سمپوزیوم بین المللی هوش مصنوعی و پردازش سیگنال را در اسفندماه ۱۴۰۲ برگزار می نماید. هدف این سمپوزیوم ارتقای دانش و فناوری در حوزه هوش مصنوعی و پردازش سیگنال است. از کلیه اساتید، دانشجویان و پژوهشگران دعوت به عمل می آید تا با ارسال مقالات تخصصی خود حول محورهای زیر در این رویداد علمی و فناورانه مشارکت نمایند و به اعتلای این سمپوزیوم بپردازند.

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# بیستمین سمپوزیوم بین المللی هوش مصنوعی و پردازش سیگنال

۲ و ۳ اسفند ماه سال ۱۴۰۲

مجلس شورای اسلامی

سازمان های مرتبط



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- یادگیری ماشین
- یادگیری عمیق
- پردازش زبان طبیعی
- بینایی ماشین
- تحلیل و واکاوی داده
- سیستم های هوشمند
- پردازش و پالایش سیگنال
- ریاتیک و اتوماسیون
- تعامل انسان و ماشین
- علوم شناختی محاسباتی
- کاربردهای هوش مصنوعی و پردازش سیگنال

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**Title:** Multimodal learning for dementia assessment

**Abstract**

Alzheimer's disease is a major health concern, especially for the elderly. While there have been advancements in diagnostic methods and potential treatments, clinical assessment and traditional tests still play a significant role in diagnosis, even though other forms of dementia can have similar symptoms. As the demand for expertise in this area grows, machine learning is gaining attention as a potential aid in neurologic diagnosis. In this talk, we will discuss our attempts to develop and validate deep learning systems that can process multimodal data and accurately classify individuals with different cognitive statuses, including normal aging, mild cognitive impairment, Alzheimer's disease, and other forms of dementia.



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**Title: Neural Information Retrieval: A Doubtful Advantage**

### **Abstract**

There are >5 billion users on the Internet, 98% of whom collectively submit >10 billion queries per day to search engines – powered by Information Retrieval (IR) methods. As such, IR methods adopted by search engines play a major role in how people think, perceive and act, and as a result have the potential to shape each individual's personal beliefs and consequently impact the social fabric. The development of robust and effective IR methods is likely to have immediate impact on individuals and broader populations with important socioeconomic outcomes. As Large Language Models (LLMs) grow in complexity, many IR tasks, which were considered stubborn problems, have now become increasingly softer to address. The tangible evidence of the impact of LLMs can be observed on the standard MSMARCO passage retrieval benchmark, which consists of over 10M queries, passages, and relevance labels where the mean reciprocal rank measure has, as a result, increased from  $\sim 0.19$  to  $>0.45$  – a 2.3x increase in performance. However, the substantial increase in performance is due to a strong positive impact on a subset of the query space, where such queries receive a near perfect treatment (i.e., reciprocal rank of  $\sim 1$ ), but a notable subset of the query space remains completely unsatisfied. For example, on the MSMARCO development set, at least 30% of queries receive a reciprocal rank of 0 by state-of-the-art rankers (completely unaddressed) and the reciprocal rank of one of the best available rankers, namely TCT-ColBERT, is only 0.04 on 50% of the queries in this set. These observations can be explained by the preferential bias of LLMs towards certain subspaces. The objective of this talk will be to explore how LLM-based retrieval methods can potentially break-

free from already encoded preferential biases in order to allow them to show robust and effective retrieval performance across the whole spectrum of user queries.



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**Title: Trustworthy Machine Learning: Exploring Reliability in AI**

### **Abstract**

While AI models often achieve remarkable success, their reliability is frequently overshadowed. In this presentation, we will discuss the main paradigms in machine learning concerns, encompassing topics like memorization, knowledge leakage, privacy, copyright protection, resilience against a wide array of attacks, and fairness, all under the AI trustworthiness umbrella. Join us as we unveil the hidden challenges and shed light on the critical aspects that define the trustworthiness of AI models, highlighting the need for a more comprehensive understanding in our ever-evolving AI landscape

## زمانبندی کارگاه‌ها و لینک برگزاری

- تمامی کارگاه‌ها روز سه شنبه ۱ اسفند ماه برگزار خواهند شد.  
- کارگاه‌های که لینک آنها در جدول زیر قرار دارد به صورت عمومی برگزار خواهند شد و نیازی به ثبت نام نیست. البته به شرکت کنندگانی که در کارگاه‌های مذکور ثبت نام کرده باشند گواهی اعطا خواهد شد ولی برای سایر شرکت کنندگان گواهی صادر نخواهد شد.

شماره کارگاه	عنوان	ساعت برگزاری	لینک برگزاری
۱	رویکرد MLOPS در طراحی و توسعه سامانه‌های هوشمند تحلیل کلان‌داده (به همراه ارائه نمونه عملیاتی کاربردی سامانه ذکاوت- ذائقه‌سنجی هوشمند کاربران در تحلیل شبکه‌های اجتماعی)	۱۱:۰۰ تا ۱۳:۰۰	<a href="http://87.236.39.98/workshop1/">http://87.236.39.98/workshop1/</a>
۲	پردازش سیگنال‌های قلبی با الگوریتم‌های یادگیری عمیق	۱۷:۰۰ تا ۱۸:۳۰	<a href="http://87.236.39.98/workshop2/">http://87.236.39.98/workshop2/</a>
۳	<b>Building Modern Enterprise Data Platforms</b>	۹:۰۰ تا ۱۱:۰۰	<a href="http://87.236.39.98/workshop3/">http://87.236.39.98/workshop3/</a>
۴	<b>Deep Learning Perspective on Robotic Grasping</b>	۱۳:۰۰ تا ۱۶:۰۰	<a href="http://87.236.39.98/workshop4/">http://87.236.39.98/workshop4/</a>



# برنامه بیست و هفتمین کنفرانس بین‌المللی کامپیوتر

## انجمن کامپیوتر ایران

چهارشنبه ۲ اسفند ۱۴۰۲				آغاز	پایان
جزئیات برنامه				آغاز	پایان
<p>تلاوت قرآن سرود ملی معرفی دانشگاه علوم و فنون مازندران سخنرانی رئیس دانشگاه علوم و فنون مازندران، دکتر سید خلاق میرنیا پخش آگهی تبلیغاتی شرکت نگار خودرو - شرکت ماشین‌سازی شمال پیروز سخنرانی رئیس سمپوزیوم، دکتر ایرج مهدوی پخش آگهی تبلیغاتی شرکت فومن شیمی - شرکت اندیشه بابلسر سخنرانی رئیس انجمن، دکتر جعفر حبیبی تیزر دانشگاه</p>				۱۰:۳۰	۹:۰۰
<p>سخنران کلیدی اول: <b>Dr. Vijaya Kolachalama</b> <b>Title: Multimodal learning for dementia assessment</b></p>				۱۱:۰۰	۱۰:۳۰
پنل ۱: بخش اول یادگیری ماشین - پردازش سیگنال	پنل ۲: بخش دوم یادگیری ماشین - پردازش سیگنال	پنل ۳: بخش سوم یادگیری ماشین - پردازش سیگنال	پنل ۴: بخش چهارم یادگیری ماشین - پردازش سیگنال	۱۲:۴۵	۱۱:۰۰
نهار و نماز				۱۳:۴۵	۱۲:۴۵
<p>سخنران کلیدی دوم: <b>Dr. Ebrahim Bagheri</b> <b>Title: Neural Information Retrieval: A Doubtful Advantage</b></p>				۱۴:۳۰	۱۴:۰۰
پنل ۵: بخش پنجم یادگیری ماشین - پردازش و پالایش سیگنال	پنل ۶: بخش اول یادگیری عمیق	پنل ۷: بخش دوم یادگیری عمیق		۱۶:۱۵	۱۴:۳۰
پنل ۸: بخش سوم یادگیری عمیق	پنل ۹: بخش چهارم یادگیری عمیق	پنل ۱۰: بخش اول پردازش زبان طبیعی - بینایی ماشین	پنل ۱۱: بخش دوم پردازش زبان طبیعی - بینایی ماشین	۱۸:۰۰	۱۶:۱۵

پنج‌شنبه ۳ اسفند ۱۴۰۲

جزئیات برنامه				پایان	آغاز
<u>نشست ۱۵: بخش دوم</u> <u>سیستم‌های هوشمند</u>	<u>نشست ۱۴: بخش اول</u> <u>سیستم‌های هوشمند</u>	<u>نشست ۱۳: بخش دوم</u> <u>تحلیل و واکاوی داده -</u> <u>رباتیک و اتوماسیون</u>	<u>نشست ۱۲: بخش اول</u> <u>تحلیل و واکاوی داده -</u> <u>رباتیک و اتوماسیون</u>	۱۰:۴۵	۹:۰۰
<p><u>سخنران کلیدی سوم:</u>  <b>Dr. Mohammad Sabokrou</b>  <b>Title: Trustworthy Machine Learning: Exploring Reliability in AI</b></p>				۱۱:۳۰	۱۱:۰۰
<u>نشست ۱۹: بخش سوم</u> <u>علوم‌شناختی - کاربرد</u> <u>هوش مصنوعی</u>	<u>نشست ۱۸: بخش دوم</u> <u>علوم‌شناختی - کاربرد هوش</u> <u>مصنوعی</u>	<u>نشست ۱۷: بخش اول</u> <u>علوم‌شناختی - کاربرد</u> <u>هوش مصنوعی</u>	<u>نشست ۱۶: بخش سوم</u> <u>سیستم‌های هوشمند</u>	۱۳:۱۵	۱۱:۳۰
نهار و نماز				۱۴:۱۵	۱۳:۱۵
<p><u>بخش آگهی تبلیغاتی حامیان سمپوزیوم:</u>                      بخش آگهی تبلیغاتی شرکت لاوین                      بخش آگهی تبلیغاتی شرکت نگار خودرو- شرکت ماشین‌سازی شمال پیروز                      بخش آگهی تبلیغاتی شرکت فومن شیمی- شرکت پلاستیک طبرستان                      بخش آگهی تبلیغاتی شرکت مازی نور- شرکت فراصنعت طبرستان                      تیزر دانشگاه</p>				۱۵:۰۰	۱۴:۳۰
<p><u>نشست ۲۰: بخش چهارم</u>  <u>علوم‌شناختی - کاربرد هوش مصنوعی</u></p>				۱۶:۴۵	۱۵:۰۰
<p>سخنرانی عضو هیئت مدیره انجمن کامپیوتر ایران، دکتر الهام فراهانی                      سخنرانی دبیر علمی سمپوزیوم، دکتر اکرم نخعی                      سخنرانی دبیر اجرایی سمپوزیوم، دکتر علی قاسمی</p>				اختتامیه ۱۷:۴۵	۱۶:۴۵

برنامه افتتاحیه بیستمین سمپوزیوم هوش مصنوعی و پردازش سیگنال

روز: چهارشنبه ۲ اسفند ماه ۱۴۰۲

ساعت: ۹:۰۰ تا ۱۰:۳۰

محل: مجازی/اتاق اصلی کنفرانس

تلاوت قرآن کریم، سرود جمهوری اسلامی ایران، معرفی دانشگاه علوم و فنون مازندران، سخنرانی رئیس دانشگاه علوم و فنون مازندران (دکتر سید خلاق میرنیا)، پخش آگهی تبلیغاتی شرکت نگارخودرو- شرکت ماشین سازی شمال پیروز، سخنرانی رئیس سمپوزیوم (دکتر ایرج مهدوی)، پخش آگهی تبلیغاتی شرکت فومن شیمی- شرکت اندیشه بابلسر، سخنرانی رئیس انجمن (دکتر جعفر حبیبی)، تیزردانشگاه

۹:۰۰-۱۰:۳۰

برنامه اختتامیه بیستمین سمپوزیوم هوش مصنوعی و پردازش سیگنال

روز: پنجشنبه ۳ اسفند ماه ۱۴۰۲

ساعت: ۱۶:۴۵ تا ۱۷:۴۵

محل: مجازی/اتاق اصلی کنفرانس

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سخنرانی دبیر اجرایی سمپوزیوم ( دکتر علی قاسمی)

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## Wiener Method-Based Fault Detection in Rotating Machines: A Comparative Analysis

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### Abstract

Accurate fault detection in rotating machines ensures optimal performance and prevents costly downtime in industrial applications. This research utilizes the power of machine learning to assess the identification of faults, in rotary machines. A specialized fault setup collected the vibration data that ranged from healthy to faulty conditions. The data include a total of 96 recorded data, of which 24 data are for the healthy condition and 72 data for the faulty condition. After collecting data, our analysis with machine learning involved using features and classification techniques such as Support Vector Machines (SVM) k Nearest Neighbors (KNN) and Multi-Layer Perceptron (MLP). Furthermore, we employed correlation analysis (CA) and the Wiener method to enhance fault detection accuracy. The results show that the best performance is achieved using features extracted by the Wiener method which improved the accuracy of test data for all classifiers, reaching up to 96.42% for SVM, and 93.33% for both MLP and KNN models. These findings highlight the potential of machine learning, in improving fault detection and categorization in rotary machines, particularly through the effectiveness of Wiener methods.

**Keywords:** Rotary machinery•Wiener method•Signal processing•Fault detection•Machine learning



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## Data science and machine learning application in technology and energy management

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### Abstract

This manuscript presents an overview of the application of data science and machine learning techniques in the domains of technology and energy management. With the increasing availability of data and advancements in computing capabilities, organizations and industries are leveraging these technologies to extract valuable insights, optimize processes, and enhance decision-making in the context of technology and energy management. The manuscript highlights various applications, challenges, and future directions of data science and machine learning in these domains.

**Keywords:** Data science·Machine learning·Application·Technology·Energy management



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## LDA-GWO: Utilizing LDA and Gray Wolf Optimizer in Diabetes Diseases Diagnosis

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### Abstract

By utilizing the Artificial intelligence, knowledge can be derived from a vast amount of disease and medical records. This information can lead to the discovery of rules governing disease creation, growth, and acceleration, and provide valuable insights for identifying the causes of disease occurrence. Furthermore, it can aid in the diagnosis, prediction, and treatment of diseases based on the prevailing environmental factors available to healthcare professionals. The objective of this research is to diagnose diabetes by employing a combination of LDA and the gray wolf algorithm. This approach was applied to the PIDD dataset. The superiority of the gray wolf algorithm is demonstrated by the measurement of recognition accuracy, which shows a notable improvement.

**Keywords:** gray wolf optimizer, GWO, LDA, Diabetes, Machine learning, Artificial intelligence



## Distracted AI: Integrating Neuroscience-Inspired Attention and Distraction Learning in ANN

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### Abstract

This paper introduces an advanced approach in artificial intelligence (AI) that incorporates neuroscience-inspired attention mechanisms and distractor learning into artificial neural networks (ANNs). This novel method significantly reduces model size and RAM consumption during training, offering a more efficient and resource-effective solution for AI development. By emulating the human brain's ability to process information and manage distractions, our approach not only addresses common AI challenges such as model collapse and bias amplification but also contributes to a reduction in computational resource requirements. This is particularly beneficial in scenarios where computing power and memory are limited, making AI more accessible and sustainable. Furthermore, the smaller model footprint and lower resource demand pave the way for broader applications of AI in various fields, including those with restricted hardware capabilities. This paper details the theoretical framework of this approach, its practical implementation, and the potential implications for future AI developments, emphasizing the balance between advanced AI capabilities and resource efficiency.

**Keywords:** Neuroscience-Inspired AI•Attention Mechanisms•Distractor Learning•Model Efficiency•Computational Resource Reduction•Artificial Neural Networks



## Enhancing Farsi Text Recognition via Iteratively Using a Language Model

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### Abstract

In the present era, there is a growing demand for a reliable Farsi text recognition system, that addresses the needs of both industrial and individual users. The process of text recognition is typically accompanied by a subsequent post-processing step, which aims to tailor the text to specific language constraints. However, the iterative use of post-correction offers valuable insights to enhance the quality of the recognized text. Meanwhile, building upon the recent successes of Transformer-based approaches in computer vision and natural language processing, this paper proposes a Farsi text recognition model. This model seamlessly integrates a decoupled convolutional Transformer-based vision model for initial predictions and a Transformer-based language model for refining the results obtained. Evaluation of well-known Farsi OCR datasets, including Iranshahr, Sadri, and Shotor, demonstrates the model's superior performance, surpassing existing literature with recognition accuracies of 97.59%, 99.25%, and 99.97% on Iranshahr, Sadri, and Shotor datasets, respectively.

**Keywords:** Optical Character Recognition ·Farsi Text Recognition ·Transformers ·Language model ·Deep learning



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## Optimizing Complex Ensembles: Automatic Bias-Variance Tuning with SVM-Based Learners

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### • Abstract

Ensembling is an extremely powerful and popular method for increasing the strength of a machine learning predictor by combining it with other predictors in order to obtain more accurate results. However, it is difficult for ensembles to strike a balance between bias and variance, and between performance and diversity among candidate models during ensemble constructions. To help alleviate this problem, a novel ensemble construction method and a dynamic weighting strategy is proposed. During the ensemble construction, candidate models are selected by a mixture of their individual performances and their agreement with the preexisting ensemble model. When obtaining final predictions, base learners in the ensemble are assigned weights that are dependent on their individual performance and how similar the test data is to the data that the model has performed uniquely well on.

Experiments on real-world datasets show that this method performs extremely well across a wide variety of domains.

**Keywords:** Ensemble •Stacking •Support Vector Machines •Optimization •Bias-Variance





## Community Detection to Improve Machine Learning Based Heart Disease Prediction

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### Abstract

This research article introduces a novel approach to enhance the accuracy of heart disease classification through the integration of graph-based techniques and community detection with machine learning. The paper explores the potential of capturing complex relationships within heart disease datasets using community detection and encode the membership of a node as a feature set, using on hot encoding, in order to enrich the current available features as the input of machine learning classifiers. The study utilizes a comprehensive dataset amalgamated from multiple sources and employs graph conversion, community detection, and machine learning algorithms to analyze the data. Results indicate that the proposed approach surpasses traditional machine learning models, achieving an accuracy of 94%. The research underscores the potential of graph-based techniques in enhancing heart disease classification and offers insights into opportunities, limitations, and future research directions in this domain. Despite certain limitations in sample size and deployment challenges, the study presents compelling evidence for the efficacy of community detection approaches in the context of heart disease classification, with implications for diagnosis and treatment.

**Keywords:** Machine Learning•Community Detection•Graph-Based•Heart Disease



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## Assessing Classical and Evolutionary Preprocessing Approaches for Breast Cancer Diagnosis

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### Abstract

The utilization of evolutionary machine learning has demonstrated efficacy in addressing challenges related to medical data mining. Medical data mining is an important branch of data mining that plays a big role in the healthcare industry. The present article introduces novel methodologies for predicting the malignancy of breast masses. The Wisconsin Breast Cancer Dataset (WBCD) and Wisconsin Diagnosis Breast Cancer (WDBC) are utilized as experimental datasets for the proposed approaches. The proposed methodology entails three primary phases, beginning with pre-processing and outliers detection, followed by feature selection, and concluding with modeling through machine learning. Notably, the study employs the interquartile range (IQR), Cook's distance, Z-Score, and K-means methods to detect and remove outliers. Additionally, the Whale Optimization Algorithm (WOA) is utilized as a feature selection technique to identify the most relevant features for modeling. Following feature selection, the Support Vector Machine (SVM) and Gaussian Naive Bayes (GNB) algorithms are employed to develop predictive models based on the selected features. The trained models underwent testing, and the results indicate that the optimal accuracies achieved for each dataset were as follows: an accuracy of 98.25% for the WDBC dataset and a perfect accuracy of 100% for the WBCD dataset.

**Keywords:** Machine Learning, Evolutionary Feature Selection, Outliers detection, Whale Optimization Algorithm



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## Advances in Gamma Level Measurement by Optimal Autoregressive Kalman Filter

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### Abstract

Level measurement in industrial processes plays a major role in process control and monitoring. In hazardous, corrosive and turbulent environments, conventional methods do not have proper efficiency and accuracy and cause measurement errors and disruption in the production process. Due to the level of measurement conditions that the devices must withstand to achieve their goal of accuracy, linearity and reliability, some advanced methods such as gamma-ray measurement are suitable. Kalman filters are a suitable process for non-stationary data and noise reduction. The adaptive filter is presented with an autoregressive prediction model, and the Akaika criterion is studied in this paper for the estimation and smoothing of gamma-level measurement data. Due to the receiver's uncertainty and distortion of gamma radiation, an improved adaptive Kalman filter with autoregressive and Akaika criterion is proposed to smooth and improve the measurement. Also, the endorsement of the advanced technique has been authenticated by implementation and testing in the industry.

**Keywords:** Level Measurement; Data mining, Estimation; Adaptive Signal Processing; Gamma Radiation.



## Implementation of an improved parallel code phase search algorithm for GPS signal acquisition on Zynq SoC

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### Abstract

In the field of Global Positioning System (GPS), signal acquisition stands as the initial and crucial step in the signal processing chain. Numerous algorithms have been proposed for acquisition, and this paper introduces enhancements to the Parallel Code-phase Search (PCS) algorithm utilized for acquiring GPS satellite signals. Our approach involves the generation of carrier replica and PRN code, as well as the calculation of the FFT conjugate of the PRN code using MATLAB, with subsequent storage in an SD-Card. A key improvement lies in utilizing a single FFT IPCore for both FFT and IFFT computations, eliminating the need for two FFT IPCores and one IFFT IPCore as seen in the original PCS algorithm. This optimization results in reduced consumption of DSP blocks and memory resources. Furthermore, we compared different architectures, namely Radix-4, Radix-2, and Radix-2lite, in terms of clock cycles, resource utilization, and power consumption. The Radix-4 architecture was chosen due to its efficiency. This enhancement not only lowers power consumption by at least 8.8% but also increases the algorithm execution time while reducing overall costs.

**Keywords:** GNSS, GPS, Acquisition, Parallel Code-phase Search, Zynq



## تجزیه و تحلیل سیستم هوشمند فروش آنلاین با استفاده از مدل ماشین بردار پشتیبان

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### چکیده

– با توجه به رشد گسترده جهانی شبکه های وب و قرار گرفتن در فضای مجازی و توسعه کسب و کار بصورت اینترنتی، تجارت الکترونیک، راه جدیدی برای کسب و کار ایجاد کرده است. در این تحقیق می خواهیم با استفاده از مدل ماشین بردار پشتیبان در خرید اینترنتی بر اساس علایق و درخواست مشتریان نیاز مشتریان را تشخیص داده و محصول مورد نظر را در اختیار آنها قرار دهیم. از این رو نیازمند ابزارهایی هستیم که بتوانند الگوهای مختلف را تشخیص دهند. مدل ماشین بردار پشتیبان دارای مزایای خاصی در تشخیص الگو و تشخیص ناحیه است. هدف از این مدل به دست آوردن بهترین راه حل برای اطلاعات کنونی است.

### کلیدواژه

– ماشین بردار پشتیبان، تجارت الکترونیک، فروش آنلاین



## روشهای یادگیری ماشین در تشخیص حملات سایبری

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### چکیده

– پیشرفت سریع فناوری های شبکه و میزان و دامنه داده های انتقال یافته در شبکه، روزبه روز در حال افزایش است. به همین دلیل، تراکم و پیچیدگی حملات سایبری هم در حال گسترش است. معرفی اهداف روش های یادگیری ماشین در تشخیص، طبقه بندی و تجزیه و تحلیل حملات سایبری موضوع این ارائه می باشد. یادگیری ماشین، ابزارها و فنون مختلفی را برای خودکارسازی مواجهه با حملات سایبری و پیش بینی سریع آنها ارائه می کند و لذا از روش های کاهش ابعاد آماری یا الگوریتم های انتخاب ویژگی استفاده و داده های آموزشی ابتدا از یکسری عملیات پیش پردازشی شامل تبدیل داده ها و نرمال سازی عبور می کنند. به این ترتیب آموزش مدل ها بطور مداوم به روز شده و تشخیص نفوذ بصورت خودکار انجام می شود. بر این اساس یک طبقه بندی اساسی برای حملات سایبری پیشنهاد و نشان داده شده است که افزایش رویکردهای ترکیبی به جای طبقه بندی کننده های یکسان برای تهدیدهای مختلف، این فناوری را بیشتر توسعه می دهد. روش های کاهش ابعاد و انتخاب ویژگی برای کارایی سیستم تشخیص نفوذ حیاتی بوده و اثربخشی تکنیک های موجود یادگیری ماشین برای امنیت سایبری به ویژگی های دیتاست ها و بروز شدن



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مداوم آنها بستگی دارد. همچنین باید اذعان داشت که اگرچه تشخیص با فناوری های هوش مصنوعی صورت گرفته است اما به نظر نمی رسد بدون نظارت انسانی، تضمین کامل امنیت امکان پذیر باشد.  
کلیدواژه

- امنیت سایبری، حملات سایبری، روش های یادگیری ماشین.



## تشخیص گره سرطانی ریه در تصاویر سی تی اسکن با استفاده از یک شبکه عصبی کانولوشنال سه بعدی (CNN ۳D)

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### چکیده

سرطان ریه دومین سرطان شایع در مردان و زنان در سراسر جهان است. تشخیص گره‌های ریوی در تصاویر توموگرافی کامپیوتری (CT) یکی از حیاتی‌ترین فناوری در تشخیص و درمان زود هنگام سرطان ریه است. رویکردهایی مبتنی بر شبکه عصبی کانولوشنال عمیق برای این منظور اختصاص داده شده است، اما مدل‌ها حداقل تا حدی بر اجزای ۲ بعدی یا ۲.۵ بعدی متکی هستند، به ویژه قطر گره‌های ریه باعث می‌شود که نتایج با مثبت کاذب بالا باشد و به طور قابل توجهی بر عملکرد تشخیص گره‌های ریه تأثیر بگذارد. در این مقاله، یک شبکه عصبی کانولوشنال سه بعدی تطبیقی برای تشخیص گره‌های ریوی پیشنهاد شده است که شامل دو بخش تشخیص گره کاندید و کاهش مثبت کاذب است. در مرحله اول، اطلاعات ذره‌های ریزدانه گره‌های کانونی توسط ماژول توجه با وضوح بالا ترکیب شده و در روش پیشنهادی شناسایی می‌شوند. در مرحله دوم، یک ساختار ۳ بعدی شبکه عصبی کانولوشنال تطبیقی (CNN 3D) برای کاهش بیشتر موارد مثبت کاذب طراحی شده است که اطلاعات متنی چندسطحی را از طریق یک هسته پیچشی ۳ بعدی تطبیقی استخراج می‌کند. نتایج نشان می‌دهد که روش پیشنهادی می‌تواند حساسیت را افزایش داده و نرخ مثبت کاذب را برای تشخیص خودکار گره‌های ریوی کاهش دهد.

### کلید واژه

– شبکه کانولوشنال، گره ریه، یادگیری عمیق، سرطان





## تخمین آهنگ تنفس با استفاده از اطلاعات حالت کانال وای فای

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### چکیده

با توجه به اهمیت علائم حیاتی، آهنگ تنفس بطور گسترده‌ای در پایش سلامتی مورد استفاده قرار گرفته است. در سال‌های گذشته، سیستم‌های مختلفی برای تشخیص و نظارت بر تنفس پیشنهاد شده است. در پژوهش حاضر، نشان داده شده است که سیگنال‌های *Wi-Fi* می‌توانند برای تشخیص و شمارش تنفس استفاده شوند. فعالیت‌های انسانی، تأثیرات متفاوتی بر داده‌های اطلاعات حالت کانال (*CSI*) دارد. این تأثیرها می‌تواند برای شناسایی فعالیت‌های کلان و خرد انسان مورد استفاده قرار گیرد. در این پژوهش با استفاده از *CSI*، اطلاعات مربوط به تنفس استخراج شده است و همچنین با کمک روش‌های یادگیری ماشین، آهنگ تنفس تخمین زده شده است و وضعیت سلامتی بطور مداوم مورد پایش قرار گرفته است. با استفاده از معیارهای ارزیابی، کارایی مدل بررسی شده است. در این پژوهش از فیلترهای همپل، میانه و باترورث به منظور حذف فرکانس‌هایی که ناشی از تنفس نیستند استفاده شده است و آهنگ تنفس بدست آمده از *CSI* با آهنگ تنفس اصلی مقایسه شده است. نتایج نشان می‌دهد دقت سیستم با بکارگیری طبقه‌بندی کننده‌های *KNN* و *RF* به ترتیب به  $95/95\%$  و  $91/34\%$  رسیده است، همچنین میانه و میانگین خطای سیستم به ترتیب به  $58 \text{ bpm}$  تا  $22 \text{ bpm}$  و از  $17 \text{ bpm}$  تا  $45 \text{ bpm}$  بدست آمده است.

### کلیدواژه

اطلاعات حالت کانال، تخمین آهنگ تنفس، پایش سلامتی، وای فای



## مدل سازی ، تحلیل و طراحی آنتن پلازما در ماموریت های فضایی

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### چکیده

– آنتن های پلازمایی، آنتن های خاصی هستند که از پلازما به عنوان منبع انرژی برای انتشار موج رادیویی استفاده می کنند. این نوع آنتن ها برای ماموریت های فضایی به دلیل ویژگی های خاصشان بسیار مناسب هستند. در این آنتن ها، پلازما جایگزین فلز شده و از این رو تغییر عناصر سازه در آن، موضوع جدید و جذابی است. در این مقاله ابتدا آنتن پلازما معرفی و ویژگی ها و چالش های آن در صنعت فضایی بررسی می شود. سپس تحلیل استفاده از لامپ فلورسنت به عنوان پلازما و بررسی بهترین طراحی با استفاده از آن صورت می پذیرد. در ادامه روش های کوبل سیگنال اطلاعات با استفاده از نرم افزار *CST STUDIO SUITE* جهت شبیه سازی آنتن ارزیابی می شود. شبیه سازی ها نشان می دهد که بهترین نتایج در بازه فرکانسی  $1\text{ GHz}$  تا  $1/5\text{ GHz}$  برای لامپ فلورسنت با استفاده از کوبل آستینی و طول  $12\text{ cm}$  در فرکانس  $1/163\text{ GHz}$  حاصل شده است. بررسی های انجام شده و ویژگی های ذکر شده از آنتن پلازما، امید به استفاده تجاری از آن را در صنایع مختلف و از جمله صنعت فضایی مضاعف می کند.

### کلید واژه

آنتن پلازما ، ماموریت فضایی ، کوپلینگ آنتن، نرم افزار CST



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## Using Ensemble Learning, A Cosine Similarity-Based Model for Detecting Security Anomalies in Software Defined Networks

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### Abstract

Currently, Software-Defined Network (SDN) is as one of the most commonly used network architectures. It requires using a software-based, centralized controller to communicate with the underlying network hardware to control the flow of the traffic through the network. This helps achieve easy, flexible, and integrated control and management of the entire network. In SDNs, the controller is the sole entity that monitors the entire network and is accountable for traffic management based on its comprehensive understanding of the network. Software-Defined Networks (SDNs) rely on a centralized controller for network management, yet this centralized control exposes vulnerabilities, leaving networks susceptible to disruptive attacks. To fortify SDN security, this article presents an innovative approach that merges machine learning and deep learning techniques through ensemble learning. Our method introduces several key innovations. Firstly, it employs ensemble learning, combining multiple models to enhance predictive capability. Secondly, the utilization of cosine similarity-based classification enables the grouping of attacks with varying degrees of similarity, refining the distinction between attack types. Thirdly, the approach includes customized classifiers, trained specifically for distinct attack classes, optimizing detection accuracy for each type. Finally, the K-Nearest Neighbor (KNN) algorithm is applied for final classification of new data samples, improving precision in identifying attack types. With an exceptional accuracy rate of 99.91%, our method



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surpasses the performance of analogous studies. By amalgamating these innovations, our approach establishes a robust framework for detecting security anomalies in SDNs, reinforcing network integrity and reliability.

**Keywords:** Software-defined networks, intrusion detection system, deep learning, machine learning, security anomaly



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## Transfer Learning-based Emotion Detection System in Cultivating Workplace Harmony

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### Abstract

The technological advancements made the organizations achieve more business profits and attain new horizons that significantly impact on employee stress and mental-well well-being. Moreover, due to the advent of Artificial intelligence (AI), which offers automotive tasks and efficiency gains, the employee get fear of losing their jobs. Due to this, the employee suffers from excessive stress and mental health issues. Therefore, emotion detection is imperative in such a stressful workplace environment. Inspired by this, we proposed a transfer learning-based emotion detection system to improve the workplace environment. For that, a facial emotion dataset is utilized, which comprises grayscale images of employee faces having emotions such as fear, neutral, anger, sadness, happiness, surprise, and disgust. Then, we used transfer learning-based pre-trained models with the intention of reducing the computational overhead of AI training. We employed ResNet, Inception, MobileNet, and EfficientNet which offer an effective accuracy while detecting the emotions of the employee. This strategic use of pre-existing models not only optimizes efficiency but also enhances the overall effectiveness of our facial emotion analysis system, ensuring a robust and accurate representation of diverse emotional states in employees. From the result analysis, we found that the ResNet outperforms other existing pre-trained models in terms of training accuracy (95.23%), training loss (0.41), and training time (2803 sec).

**Keywords:** Artificial Intelligence, V2X, Blockchain, Garlic Routing, IoT, 5G.



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## Enhancing Service Quality in Healthcare Systems Through Deep Learning

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### Abstract

In recent years, there has been a growing need for effective system health management in various industries, including aerospace, manufacturing, and healthcare. The use of deep learning for the analysis and diagnosis of biomedical and healthcare problems has received unprecedented attention in the last decade. This technique has so far produced several achievements that have made it difficult to discover meaningful features by other methods and human experts as a promising approach to deal with these challenges. DL is a type of machine learning algorithm with multiple layers of similar functions stacked in the network and has the capability to create meaning from medical big data. These algorithms can learn to identify patterns indicative of diseases, helping physicians make more accurate diagnoses and potentially reducing errors. deep learning models can extract and classify relevant information from Electronic Health Records.

**Keywords:** Healthcare, Deep Learning, Machine Learning, Big Data, Medical Imaging, Electronic Health Records (EHRs), Biomedical, ECG, EEG, Artificial Intelligence Systems, Neural Network



## Sentiment analysis on drug reviews using ensemble learning method

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### Abstract

Sentiment analysis, a branch of natural language processing, has gained considerable attention recently. This analytical approach is now widely used across multiple sectors, such as healthcare, finance, and customer service. Sentiment analysis in the healthcare domain can contribute to advancements in this field and help doctors to gain a deeper understanding of patient sentiments, enabling them to make more informed prescriptions. In our research, we concentrated on sentiment analysis of drug reviews. We applied ensemble learning methods, including the stacking learning method, using three base models and one meta-model. We also employed three feature extraction methods: TF-IDF, Bag of Words (BOW), and Continuous Bag of Words (CBOW). Among these methods, the stacking learning model with TF-IDF achieved the highest accuracy, reaching 89.8%.

**Keywords:** Natural language processing, Sentiment analysis, Ensemble learning, drug reviews





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## A Data-Driven based Robust Multilayer Perceptron Approach for Fault Diagnosis of Power Transformers

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### Abstract

Power transformers are one of the most important and costly components in electricity distribution and transmission systems. The timely diagnosis of power transformer faults in power distribution and transmission networks is a crucial and decisive issue. One of the most important tools in the diagnosis and detection of internal faults in transformers is dissolved gas analysis (DGA). In this paper, the Duval Pentagon Method (DPM) method is employed for fault diagnosis. The challenges associated with using classic DGA methods and, on the other hand, the advantages of artificial intelligence (AI) methods have prompted researchers to use AI-driven approaches. In the study, a robust multi-layer perceptron (RMLP) neural network and an ensemble model are proposed, demonstrating satisfactory performance against outliers. The results of the analysis of data and the simulation in Python indicate the superiority of the RMLP method over the ensemble method. The proposed model is implemented using Python with version 3.12.1.

**Keywords:** RMLP, Power transformers, DGA, DPM, Fault diagnosis



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## Optimal Adaptive Control of Constrained-Input Continuous-Time Systems Based on Synchronous Policy Iteration Method

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### Abstract

In this paper, an online constrained optimal adaptive control method based on the reinforcement learning for partially-unknown nonlinear continuous-time systems with affine equations is presented. A distinctive feature of this paper is the proposal of a method to solve an algebraic Riccati equation online designed for constrained-input systems, all without requiring prior knowledge of the system's complete internal dynamics model. The algorithm used is the Synchronous Policy Iteration Method Without requiring an initial stabilization control signal. Unlike the existing methods, actor and critic networks update each other simultaneously and instead of minimizing the Bellman error, a direct adaptive law for updating the weights is presented. The stability and convergence of the proposed method are proved by the Lyapunov theorem and the simulation results show the correctness and effectiveness of the controller performance.

**Keywords:** Reinforcement Learning, Constrained Optimal Adaptive Control, Continuous-Time System, Synchronous Policy Iteration Method



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## A New Initialization Method for $K$ -means Clustering

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### Abstract

Clustering techniques are widely used for data analysis and knowledge discovery in various fields. Among them, the  $K$ -means algorithm is a popular and efficient method for categorization of data into clusters based on similarity. However, the effectiveness of the  $K$ -means algorithm heavily depends on the initial selection of cluster centroids. In traditional  $K$ -means, the initial centroids are randomly chosen from the input data. This random initialization can lead to suboptimal clustering results, as the algorithm is sensitive to the initial configuration. The resulting clusters may not accurately represent the underlying structure of the data and may vary for different runs of the algorithm. In the proposed improved  $K$ -means for the initial centroids, we first find the largest and smallest value based on top-two important features of the data set and perform clustering in this space. Then we take the data close to the average of each cluster as the center of that cluster. The experimental results on three well-known datasets, TIMIT, Iris and Immunotherapy shows that the proposed initialization method outperforms other ones in terms of clustering validity and accuracy measures.

**Keywords:** clustering,  $K$ -means algorithm, centroid initialization.



## Improving the Performance of the K-Nearest Neighbors Algorithm with Parallelization in Dask

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### Abstract

In this study, the K-Nearest Neighbors (K-NN) algorithm is implemented in both serial and parallel modes using the Python programming language for classification tasks. The execution times are measured and compared between the serial and parallel implementations, demonstrating a performance improvement in the parallel execution. The research aims to emphasize the significance of parallelization and computational efficiency enhancement in machine learning algorithms, specifically focusing on K-NN, using Python and tools such as DASK. Such studies are valuable for enhancing the performance of tasks related to data scientists and data analysts, benefiting from the accessibility and ease of parallelization offered by Python and related frameworks.

**Keywords:** Performance Improvement, K-Nearest Neighbors Algorithm, Parallel Programming, Machine Learning, Big Data.



## Utilizing a New Approach in a Multiple Linear Regression Model to Predict Insurance Charges

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### Abstract

Insurance industries primarily rely on premiums as a source of income. Consequently, developing an accurate algorithm for predicting insurance charges is essential for these industries. The development of artificial intelligence and machine learning techniques has given rise to generating algorithms to predict insurance charges. This research presents a methodology to enhance the performance of the regression model, providing better outcomes than previous examinations. The performance of the regression model is analogous to the Random Forest and XG-boost algorithms. Although the regression method may not have better results in a mean absolute error, it performed better in the median absolute error value. Despite the simplicity of the regression models, they have demonstrated exemplary performance compared to previous studies and other models.

**Keywords:** Insurance, Cost prediction, Health Care, Data Mining, Regression, Random Forest, XGBoost



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## Single-Tone Continuous-Wave Interference Detection and Estimation Using Matrix Features

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### Abstract

Radio-frequency communication system performance can be affected by interference signal. Although spread spectrum techniques can provide a level of robustness for secure communication, but they can be still affected by strong interferences. Therefore, early detection and estimation of interference signal presence can enable the user or system to make preemptive actions. In this paper, a new detection and estimation strategy based on flipped Toeplitz-covariance-matrix Frobenius-norm is proposed for single-tone continuous-wave interference. By bordering the autocorrelation matrix, the Frobenius norm is calculated in each step. Then the derivation is obtained and the Fourier transform of the result, provides the input signal frequency. This method can be used as early warning stage in secure-communication direct-sequence system. The performance of the proposed method is investigated through real dataset simulation and comparison with some other methods which shows good performance.

**Keywords:** Detection, Estimation, Interference, Flipped Toeplitz Matrix, Frobenius Norm.



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## Leveraging Lanczos Algorithm for Computation of Eigenbasis in Type I Discrete Sine Transform

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### Abstract

The main contribution lies in presenting an application of the Lanczos algorithm to provide an eigenbasis for a specific type of discrete Sine transform, referred to the signal processing literature as DST of type one. This method, suggesting a new approach, opens up new possibilities for finding the eigenbasis of other discrete trigonometric transforms, which serve as the key tool in image and video compression.

**Keywords:** eigenvalue, eigenvector, discrete trigonometric transform, Lanczos algorithm



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## Detection of Hand Movements Using EMG Signals for Human-Computer Interface and convolution neural network

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### Abstract

This article presents a study on the effectiveness of a Convolutional Neural Network -based approach for hand movement detection using electromyography (EMG) signals. The study involved 40 participants and used Myo armbands to record EMG signals. The CNN model consisted of three convolutional layers, three max-pooling layers, and two fully connected layers. The model achieved an F1-score of 0.981, precision of 0.981, and recall of 0.981, outperforming two other machine learning algorithms, SVM and RF. The study's results demonstrate the potential of using CNNs for detecting hand movements using EMG signals, which can be applied in prosthetics and robotics for controlling prosthetic limbs and robotic arms. The study's findings suggest that CNN-based approaches have great potential for future research in the field of EMG-based hand movement detection.

**Keywords:** Hand Movement Detection, CNN, Pattern Recognition, Machine Learning





## تشخیص بیماری های تخریب کننده عصبی براساس ویژگی های زمانی و فرکانسی با کمک یادگیری ماشین

رها میرزائی یقین<sup>۱</sup>، محبوبه شمسی<sup>۲</sup> و مجید آقائی<sup>۳</sup>

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### چکیده

این مقاله درباره بیماری های تخریب کننده عصبی مانند پارکینسون، هانتینگتون و بیماری اسکروز جانبی آمیوتروفیک صحبت می کند. این بیماری ها طی زمان باعث تخریب مغز و سایر اعضای عصبی می شوند و باعث کاهش کیفیت زندگی بیمار می شوند. آن ها اغلب باعث اختلالات حرکتی، شناختی و روانی می شوند که نیازمند مراقبت ویژه برای بیمار و خانواده او است. تحقیقات در این زمینه می تواند به شناخت بهتر از علل شناختی و عصبی این بیماری ها کمک کند و روش های درمانی و پیشگیری نوینی را ارائه دهد. در این تحقیق، الگوریتم چندمرحله ای برای تجزیه و تحلیل راه رفتن برای تشخیص بیماری های تخریب کننده عصبی ارائه شده است. از طریق پیش پردازش سیگنال های راه رفتن با استفاده از فیلتر بانک Transform Wavelet در نرم افزار MATLAB، سیگنال ها بهبود یافته و خصوصیات آماری، زمان، فرکانس و غیر خطی آن ها استخراج و اولویت بندی می شوند. سپس این ویژگی ها به عنوان ورودی به روش های طبقه بندی خطی و غیر خطی مانند LDA، ماشین بردار پشتیبانی خطی، نزدیک ترین همسایه و شبکه های عصبی داده می شوند. نتایج نشان می دهد



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که استفاده از طبقه‌بندی کننده غیرخطی نزدیک‌ترین همسایه می‌تواند بین چهار کلاس مبتلا به بیماری‌های مذکور تفاوت معنی‌داری ایجاد کند و با دقت  $100\%$  بیماری‌ها را تشخیص دهد.

کلید واژه

- بیماری‌های تخریب کننده عصبی، یادگیری ماشین، پردازش سیگنال، تجزیه و تحلیل راه رفتن



**Advancements in Artificial Intelligence Algorithms for Precise Diabetes Prediction and Analysis in the Healthcare Landscape: A Systematic and Analytical Investigation**

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**Abstract**

This manuscript presents a systematic and analytical investigation on advancements in artificial intelligence algorithms for precise diabetes prediction and analysis in the healthcare landscape. Diabetes is a chronic disease affecting millions of individuals worldwide, and accurate prediction and analysis are crucial for effective management and prevention of complications. This study aims to explore various artificial intelligence algorithms that can enhance diabetes prediction and analysis, thereby assisting healthcare professionals in making informed decisions. The manuscript describes the methodology, results, and discussion of the study, highlighting the potential benefits and limitations of the algorithms.

**Keywords:** Artificial Intelligence, Algorithms, Diabetes Prediction, Diabetes Analysis, Healthcare, Precise, Systematic, Analytical Investigation



## Dynamic Prototype Weighting for Multi-label Classification problems

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### Abstract

In multi-label classification, each instance is associated with a predetermined set of labels. One common approach is to use the Binary Relevance (BR) paradigm to learn each label independently using a base classifier. Using Nearest Neighbor (NN) as the base classifier (BRNN) is a simple, descriptive, and powerful approach. However, the NN algorithm has some problems, such as its dependency on the distance criterion. To address this, we propose a method that tunes a parametric distance using a prototype weighting approach, minimizing complete cross-validation (CCV) classification error on training data. This improves the classifier's generalization and reduces randomness. However, it is known that when learning imbalanced data, other performance metrics, such as F-measure, are more appropriate than classification error. The second contribution of this paper is extending this method to improve the F-measure. Due to the imbalanced nature of multi-label data, it is expected to perform better. Our method is compared to state-of-the-art NN-based approaches, demonstrating comparable or superior performance in experiments.

**Keywords:** Multi-label classification, Binary relevance, Nearest neighbor, Dynamic distance measure, Prototype weighting, Complete cross-validation



### Reward shaping in reinforcement learning of multi-objective safety critical systems

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#### Abstract

Reinforcement learning (RL) depends critically on how well the reward function formulates the goal of the application. In safety-critical systems, several safety properties should be met during the RL process in addition to achieving the primary target. In this paper, we utilize the reward shaping technique to guide the RL algorithm in a way that satisfies the target and safety properties and fulfills other properties, such as efficiency, as much as possible. Reward shaping is a technique to improve the performance of RL by including additional information in the reward signal. Reward shaping functions utilize the system's main target for the base reward signal and add some other reward signals based on other system properties. Suppose each property has its own associated reward signal. In that case, the reward is not a scalar value but a vector, and the original reinforcement learning converts to a multi-objective reinforcement learning (MORL) problem. When all system objectives are related, a single scalarized objective can be defined by combining several objectives. This paper proposes an aggregation method based on prioritized aggregation operators for scalarizing multiple reward functions. We demonstrate our technique in two case studies: a cart-pole balancing problem with an obstacle and a lunar-lander problem. The simulation results show that our method guides the RL algorithm to converge to optimal policies faster than existing approaches.

**Keywords:** Reinforcement Learning (RL), Reward shaping, Safety-critical systems, Multi-objective RL (MORL)



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## Transductive Zero-Shot Learning with Reliability-Based Pseudo-Label Integration

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### Abstract

Zero-shot Learning (ZSL) is the task of classifying samples from unseen classes using semantic similarities with seen classes. However, ZSL models tend to be biased toward seen classes, especially in a generalized setting where test samples may belong to either seen or unseen classes. Although sample labels are not available during the training phase, applying transductive learning, which fine-tunes the classifier using unlabeled data, can enhance ZSL model performance in the absence of training labels for unseen classes. The transductive approach can mitigate bias by integrating pseudo-labeled unseen samples during the training phase. Two reliability criteria are proposed in this study for selecting unseen samples to be integrated into the training set with associated pseudo-labels: raw score and margin score. Utilizing a standard ZSL base model, we evaluate both reliability measures across various sample selection strategies, including balanced and unbalanced selections, with differing integration ratios. Our results demonstrate that reliability-based sample selection significantly improves model performance.

**Keywords:** Zero-shot Learning, Transductive Learning, Reliability Score, Integration Ratio



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## Unsupervised Hyperspectral Image Classification: Spatial and Spectral Feature Fusion with Masked Autoencoders

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### Abstract

In this study, we present an innovative unsupervised hyperspectral image classification method using a dual-branch architecture that merges spatial and spectral feature extraction. Our unique approach employs masked autoencoders, significantly outperforming traditional methods with an impressive overall accuracy of 97.1%. The paper details the model's performance evaluation, offers visual insights into its classification capabilities, and compares it with existing techniques, demonstrating its effectiveness and potential for advancing remote sensing applications.

**Keywords:** Hyperspectral Image Classification, Vision Transformers, Unsupervised Learning, Masked Autoencoders Introduction



## Improving Machine Learning based ASD Diagnosis with Effective Feature Selection

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### Abstract

Autism spectrum disorder (ASD) poses major public health challenges due to its increasing prevalence and the critical need for early intervention to improve outcomes. This study investigates machine learning approaches for automated screening and diagnosis of ASD, leveraging questionnaire and demographic data from large cohorts of toddlers (n=1,054) and adults (n=704). After data cleaning and preprocessing, an efficient sequential feature selection technique identifies subsets of the most predictive features. Several classification algorithms, including neural networks, random forests, support vector machines, and logistic regression, are developed using these refined datasets and rigorously evaluated through 10-fold cross-validation. The models demonstrate excellent predictive performance, achieving 100% accuracy in identifying ASD in both toddlers and adults. This signifies that the selected feature sets are highly relevant for capturing autistic traits across age groups, although manifestations vary developmentally. Compared to existing methods, the models show substantially improved accuracy, highlighting machine learning's potential for accessible and scalable assessment of ASD. Additional validation on bigger real-world datasets would further establish generalizability. Overall, this study demonstrates that machine learning can assist evidence-based clinical decision-making for ASD diagnosis. Promising future work should focus on enhancing model interpretability, translating these technologies responsibly to bolster early intervention, and evaluating impact on patient outcomes





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through rigorous trials. Machine learning shows immense promise in aiding the identification and timely treatment of this import yet often underdiagnosed public health issue.

**Keywords:** Autism Spectrum Disorder (ASD), feature selection, Machine learning



# شناسایی چالش‌های توسعه یک سیستم هوش مصنوعی با بهره‌گیری از سوالات کاربران در انجمن‌های توصیف‌پذیر پرسش و پاسخ به وسیله‌ی الگوریتم‌های خوشه‌بندی متون

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## چکیده

– هوش مصنوعی توصیف‌پذیر یک حوزه مهم از تحقیقات است که هدف آن ایجاد مدل‌های هوش مصنوعی با توضیحات قابل درک برای انسان است. در این مطالعه، موضوعاتی را که توسعه‌دهندگان XAI مورد بحث قرار می‌دهند و چالش‌هایی که با آن‌ها روبرو هستند را با تجزیه و تحلیل بحث‌ها در انجمن‌های *Stack Exchange* بررسی می‌کنیم. ما از تکنیک‌های خوشه‌بندی متون برای شناسایی ده موضوع کلیدی که توسعه‌دهندگان مورد بحث قرار می‌دهند، از جمله موانع توسعه مدل استفاده می‌کنیم. تجزیه و تحلیل ما نشان می‌دهد که توسعه‌دهندگان موضوعات مربوط به مفاهیم بنیادی، عیب‌یابی ابزارها، و تفسیر شبکه‌های عصبی را مفیدترین موضوعات



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می‌دانند و در روش‌های بهبود مدل و تعیین اهمیت ویژگی‌ها با چالش‌هایی مواجه می‌شوند.

## کلید واژه

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## برگشتی در صنعت سیمان با استفاده از شبکه عصبی پیش‌بینی بار BLSTM

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### چکیده

– بار برگشتی در صنعت سیمان، کیفیت محصول و راندمان تولید را کاهش می‌دهد. نظارت و کنترل بر بار برگشتی و پارامترهای موثر در عملکرد جداکننده هوایی مدار خردایش می‌تواند راندمان تولید و کیفیت محصول را بهتر کند. شناسایی پارامترهای موثر در عملکرد جداکننده هوایی، به ویژه در مدیریت بار برگشتی، برای بهینه سازی مدار آسیا به صورت هوشمند بسیار مهم است. داده‌های جمع‌آوری شده از حسگرها به دلیل نوسانات و نویز زیاد، چالش‌هایی را در پردازش داده‌ها ایجاد می‌کند و علاوه بر آن رفتارهای غیرخطی و وابستگی‌های زمانی پیچیده بین داده‌ها شرایط را سخت می‌کند. این مقاله ابتدا بر آماده‌سازی داده‌ها برای کاهش نویز، مدیریت نقاط پرت و مقادیر گمشده تمرکز می‌کند. سپس یک مدل شبکه عصبی حافظه طولانی-کوتاه مدت دو طرفه (*BLSTM*) برای مدل‌سازی وابستگی‌های زمانی و پیش‌بینی بار برگشتی ارائه می‌دهد. روش پیشنهادی با سه معیار میانگین خطای مطلق، ریشه میانگین مربعات خطا و میانگین مربعات خطا در مقابل روش‌های موجود مورد ارزیابی قرار گرفته و موفق به کسب نتایج بهتری شده است.



## کلید واژه

– مدار خردایش، جداکننده هوایی، سری های زمانی، پیش بینی، پیش پردازش داده‌ها، شبکه عصبی حافظه طولانی کوتاه مدت دو طرفه (BLSTM)

## کنترل وزن محصول خط تولید پیوسته ایزوگام با روش یادگیری تقویتی

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## چکیده

– ایزوگام دارای خط تولید پیوسته با جریان تولید بدون توقف است. چنانچه بتوان در تولید ایزوگام وزن هر رول را تحت کنترل نگه داشت از کم یا زیاد شدن میزان قیر مصرفی در هر رول جلوگیری به عمل می‌آید که این امر باعث کاهش هزینه و افزایش کیفیت در تولید می‌شود. در این مقاله با فرض شرایط ایده‌آل، یک رویکرد جدید برای حل مشکل تحت کنترل نگه داشتن وزن با استفاده از یادگیری تقویتی توسط یک عامل یادگیرنده خودآموز پیشنهاد می‌شود. با استفاده از مدل ایجاد شده قبل از ثبت وزن، فاصله بین غلتک‌ها، دمای تشت قیر و سرعت خط تخمین زده می‌شود تا وزن رول‌های ایزوگام در محدوده استاندارد ثابت بماند. بدین منظور از الگوریتمهای سارسا و یادگیری کیو که از معروف‌ترین روش‌های یادگیری تقویتی هستند، استفاده شده است. نتایج نشان می‌دهد



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الگوریتم یادگیری کیو به زمان بیشتری جهت یادگیری نسبت به الگوریتم سارسا نیاز دارد اما عملکرد نهایی بهتری نسبت به الگوریتم سارسا دارد. با تغییرات مشخص شده توسط مدل به دست آمده و رسیدن به وزن در محدوده مورد نظر، بهبود کیفیت رولها و کاهش ضایعات کارخانه در هر تولید را به دنبال خواهد داشت.

**کلید واژه**

– الگوریتم سارسا ، الگوریتم یادگیری کیو ، ایزوگام ، کیفیت



## تنظیم مستقیم ماشین بردار پشتیبان برای دسته‌بندی مجموعه داده‌های نامتوازن

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### چکیده

– یکی از چالش‌های مهم در زمینه داده‌کاوی مسئله دسته‌بندی مجموعه داده‌های نامتوازن است. به گونه‌ای که تعداد نمونه‌های یک کلاس از باقی کلاس‌ها کمتر است. همچنین یکی از مدل‌های دسته‌بندی، ماشین‌های بردار پشتیبان است که به دلیل رویکرد بهین‌حاشیه و تعمیم‌پذیری مناسبی که دارد از محبوبیت بالایی برخوردار است. در واقع این الگوریتم صحت عملکرد (*Accuracy*) را در کنار خطای ساختاری مدل بهینه می‌کند که در داده‌های نامتوازن، منجر به تضعیف دسته‌بندی داده‌های اقلیت می‌شود. یکی از شیوه‌های مقابله با عدم توازن بهینه کردن معیاری مانند *F-Measure* است که متناسب با شرایط عدم توازن طراحی شده است. از سوی دیگر خروجی مدل بردار پشتیبان بسیار وابسته به یک ضریب است که وظیفه تنظیم بین خطای تجربی و ساختاری را به عهده دارد. در این مقاله با بررسی مدل در تمام مسیر تنظیم، مقدار این ضریب مستقیماً به گونه‌هایی تعیین می‌شود که عملکرد نهایی از منظر *F-Measure* روی داده‌های اعتبارسنجی بیشینه شود. پیچیدگی محاسباتی مدل نهایی به دست آمده از نتایج مطلوبی در مقایسه با روش‌های پایه



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روی تعدادی از مجموعه داده‌های نامتوازن برخوردار است.

**کلید واژه**

دسته بندی کار، ظریب تنظیم، ماشین بردار پشتیبان، داده های نامتوازن.





## خوشه‌بندی براساس واریانس نمودار تصمیم و تشخیص تعادل

### چگالی

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### چکیده

– در عصر فناوری خوشه‌بندی و استخراج اطلاعات مفید از میان داده‌ها در حوزه‌های اقتصادی و سیاسی به یکی از چالش‌های محققان تبدیل شده است. الگوریتم‌های خوشه‌بندی پیک چگالی، نقاط داده با چگالی‌های بالا را به عنوان مراکز خوشه‌ای بالقوه در نظر می‌گیرند و نقاط غیرمرکزی را به خوشه‌هایی با چگالی بالاتر اختصاص می‌دهند. خوشه‌بندی پیک چگالی می‌تواند خوشه‌هایی با اشکال دلخواه را کشف کند، اما محدودیت‌هایی نیز دارد. اندازه‌گیری چگالی در خوشه‌بندی پیک چگالی نمی‌تواند تفاوت چگالی بین خوشه‌های مختلف را از بین ببرد که دقت انتخاب مرکز خوشه را کم می‌کند. از طرفی نزدیکترین نقطه با چگالی بالاتر بدون در نظر گرفتن اتصال تعیین می‌شود که منجر به خطاهای خوشه‌بندی است. الگوریتم خوشه‌بندی تشخیص تعادل چگالی براساس واریانس همسایگان و پیک‌های چگالی برای از بین بردن تفاوت چگالی در میان خوشه‌های مختلف و تشخیص دقیق مراکز خوشه‌ای در داده‌های پیچیده ارائه شده است. روش پیشنهادی دارای دو رویکرد است: (۱) تشخیص واریانس تراکم بین خوشه‌های مختلف را به خوبی انجام می‌دهد. (۲) شباهت دلتاها برای تخمین شباهت تراکم نقاط داده با تفاوت بین سرخوشه‌ها بررسی می‌گردد. نتایج بدست آمده از مقایسه روش پیشنهادی و جدیدترین روش‌های بهبود یافته پیک چگالی بر روی داده‌های واقعی و مصنوعی برتریت روش را نشان می‌دهد.



## کلید واژه

جستجوی سریع، خوشه بندی متقابل، نزدیکترین همسایه.

## تحلیل تکنیکال و تخمین ارزش سهام با استفاده از پیش‌بینی

### ارزش تجمیعی زیرگروه‌ها

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## چکیده

بازار سهام و سرمایه، به‌عنوان یکی از بزرگ‌ترین بازارهای مالی در جهان امروزی، است. این امکان که بتوان زودتر از نتایج حاصل از تغییرات روند بازار تصمیم‌گیری کرد، نکته‌ای است که می‌تواند موفقیت سرمایه‌گذار را تضمین کند. برای این منظور می‌توان با استفاده از الگوریتم‌های هوش مصنوعی و الگوریتم‌های حوزه یادگیری ماشین به آن دست پیدا کرد. تخمین ارزش سهام از روی دادگان تاریخی، یکی از فعالیت‌هایی است که با استفاده از تحلیل تکنیکالی بازار سهام بسیار انجام می‌گردد. یکی از رایج‌ترین فعالیت‌ها در تحلیل تکنیکال، استفاده از دادگان تاریخی مربوط به قیمت سهام و پیش‌بینی ارزش سهام در آینده است. آنچه به‌عنوان هدف در این فعالیت قصد انجام آن را داریم، تخمین ارزش سهام تجمیعی بخشی از زیرسهام‌های برندهای دس آلمان و همچنین داوجونز آمریکا است. بدین منظور با به‌کارگیری الگوریتم‌های رگرسیونی یادگیری ماشین با رویکرد ترکیبی استکینگ به تخمین قیمت سهام هریک از زیرگروه‌های سهام اقدام کردیم. سپس با تجمیع قیمت تخمینی هریک از زیرگروه‌های موجود به پیش‌بینی ارزش کلی سهام تجمیعی پرداختیم. نتایج حاصل از اجرای روش پیشنهادی نشان از مقادیر ۹۹.۷۴ و ۹۷.۳۴ درصد معیار ضریب تعیین رگرسیونی در آزمایشات با رویکردهای مدنظر بر روی دادگان می‌دهد که بیانگر کارایی بالای روش پیشنهادی در تخمین قیمت سهام است.



## کلیدواژه

الگوریتم‌های رگرسیونی، پیش‌بینی سهام، تحلیل تکنیکال، یادگیری ترکیبی

## ارایه راهکار مبتنی بر یادگیری ماشین برای پیش‌بینی بدافزار فایل‌های PDF به کمک الگوریتم‌های درخت تصمیم

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## چکیده

– فایل‌های PDF به دلیل استفاده گسترده و محبوبیت بین کاربران، مورد مناسبی برای مهاجمان هستند که کدهای مخرب خود را در آنها جاسازی کنند. با توجه به ساختار پیچیده PDF و پیچیدگی حملات، بخش بزرگی از سیستم‌های تشخیص خودکار فعلی قادر به شناسایی مؤثر فایل‌های PDF با محتوای مخرب پنهان نیستند. همچنین بسیاری از کارهای پیشنهادی از صحت و دقت لازم در شناسایی بدافزارها برخوردار نیستند. برای حل این مساله، مقاله پیش رو سعی دارد با بهره‌گیری از راهکارهای یادگیری ماشین، راه حلی را برای پیش‌بینی بدافزارهای PDF با تحلیل بخش‌های مختلف یک سند PDF ارائه نماید. در راهکار پیشنهادی، ابتدا از روش CHAID برای رشد درخت تصمیم استفاده خواهیم نمود و در گام بعدی از الگوریتم درخت تصمیم CART استفاده خواهد شد. ارزیابی نتایج نشان دهنده دقت الگوریتم CHAID در پیش‌بینی بدافزار به میزان ۹۴٫۶۹٪ می‌باشد و همچنین دقت روش CART در تشخیص و پیش‌بینی بدافزار ۹۵٫۹۲٪ است.



کلیدواژه

– بدافزار *PDF*، تشخیص بدافزار، تشخیص *PDF* مخرب، یادگیری ماشین، درخت تصمیم

## Convolutional Neural Networks Towards Facial Skin Lesions Detection

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### Abstract

Facial analysis has emerged as a prominent area of research with diverse applications, including cosmetic surgery programs, the beauty industry, photography, and entertainment. Manipulating patient images often necessitates professional image processing software. This study contributes by providing a model that facilitates the detection of blemishes and skin lesions on facial images through a convolutional neural network and machine learning approach. The proposed method offers advantages such as simple architecture, speed and suitability for image processing while avoiding the complexities associated with traditional methods. The model comprises four main steps: area selection, scanning the chosen region, lesion diagnosis, and marking the identified lesion. Raw data for this research were collected from a reputable clinic in Tehran specializing in skincare and beauty services. The dataset includes administrative information, clinical data, and facial and profile images. A total of 2300 patient images were extracted from this raw data. A software tool was developed to crop and label lesions, with input from two treatment experts. In the lesion preparation phase, the selected area was standardized to 50×50 pixels. Subsequently, a convolutional neural network model was employed for lesion labeling. The classification model demonstrated high accuracy, with a measure of 0.98 for healthy skin and 0.97 for lesioned skin specificity. Internal validation involved performance indicators and cross-validation, while external validation compared the model's performance indicators with those of the transfer learning method using the Vgg16 deep network model. Compared to existing studies,



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the results of this research showcase the efficacy and desirability of the proposed model and methodology.

**Keywords:** Deep Learning, Convolutional Neural Networks, Skin Lesions, Image Processing



## Identifying Spam Tweets in Social Networks with Combined Approaches of Feature Selection and Deep Learning

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### Abstract

Spam detection in social media is difficult due to unique linguistic features. Spammers can bypass filtering systems by changing their posting behavior and following real accounts. The practical method for detecting spam is to classify posts based on their textual content using a text classification technique based on deep learning. This manuscript aims to identify spam in social networks based on content. This paper presents a three-step method for detecting spam in social networks. The convolutional neural network(CNN) is used for feature extraction in the first step. Several feature selection methods are used in the second stage, with the majority voting for feature selection. In the third stage, the combined learning and classification methods are used. In the proposed method, the combined feature selection is made using the chi-square method, random trees, and recursive elimination method. Examinations on the Twitter dataset show that the proposed method in spam detection has accuracy, sensitivity, and precision of 99.46%, 99.36%, and 99.32%, The proposed method is more accurate in CNN+SVM, and CNN+SVM+LSTM.

**Keywords:** Spam, Social networks, Deep learning, Convolutional neural network(CNN).



## تشخیص چهره‌ی با ماسک و بدون ماسک به کمک شبکه عصبی

## پیشگی

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## چکیده

-کشف و تشخیص چهره یکی از روش‌های متداول احراز هویت بیومتریک است. دلایل استفاده از این روش، امکان‌پذیری و در عین حال استفاده راحت از آن است. در چند سال گذشته همه‌گیری بیماری کرونا یا کووید-۱۹ در سراسر جهان اتفاق افتاد و به طور جدی منجر به تأثیرات منفی بر سلامت و اقتصاد مردم شد. از زمان شیوع کووید-۱۹، پوشیدن ماسک صورت، بعنوان بهترین راه برای محافظت از افراد در برابر ویروس کرونا و جلوگیری از انتشار یا آلوده شدن به این بیماری، بطور وسیعی رایج شد. ولی پوشیدن ماسک باعث می‌شود که قسمت عمده صورت افراد پوشیده شده و تشخیص چهره ماسک‌دار یک کار چالش‌برانگیز شود. در این تحقیق، دو روش: اولی مبتنی بر ترکیب شبکه کانولوشنی عمیق و دومی مبتنی بر ویژگی‌های الگوی باینری محلی برای تشخیص چهره ماسک‌دار استفاده شده است. الگوریتم پیشنهادی نخست در ابتدا چهره افراد را به کمک *RetinaFace* که یک شبکه عصبی برای تشخیص چهره است، تشخیص داده، سپس ویژگی‌های مربوط به ناحیه بالای ماسک یعنی چشم، ابرو و پیشانی را از چهره افراد به کمک شبکه کانولوشنی *ArcFace* می‌آموزد. الگوریتم پیشنهادی دوم به جای استخراج ویژگی‌های مربوط به ناحیه بالای ماسک، تنها ویژگی‌های مربوط به ناحیه چشم را به کمک شبکه *ArcFace* می‌آموزد. سپس هر دو الگوریتم، ویژگی‌های آموخته شده از *RetinaFace* را با ویژگی‌های الگوی باینری محلی استخراج شده از ناحیه ابرو در چهره‌ی ماسک‌دار در چارچوبی یکپارچه ترکیب کرده و به تشخیص چهره ماسک‌دار می‌پردازند.



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الگوریتم‌های پیشنهادی روی مجموعه داده COMASK20 آزمایش شدند و به ترتیب به نتایج  $f1$ - $score=93.47\%$  و  $f1$ - $score=93.58\%$  دست یافتند. این پژوهش در مقایسه با پژوهش‌های پیشین پیاده‌شده بر روی این مجموعه داده، به بهبود ۱۳ درصدی دست یافت.

## کلید واژه

تشخیص چهره، تشخیص چهره ماسکدار، الگوی باینری محلی





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## بدست آوردن همترازی زمانی بین متن و صوت با استفاده از ترکیب الگوریتم CTC و MarbelNetVAD

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### چکیده

- در این مقاله روشی جدید با استفاده از ترکیب الگوریتمهای طبقه بندی زمانی ارتباطگرا (CTC) و *MarbelNetVAD* به منظور برچسب زنی داده‌های صوتی در حالتی که علاوه بر کم بودن داده‌ها، صوت متناظر با متن هم حالت استاندارد نداشته پیشنهاد شده است. از جمله این نوع داده‌ها می‌توان به متن و صوت ادعیه مفاتیح‌الجنان اشاره کرد که تعداد محدودی دعا توسط چند مداح/گوینده با لحنی خاص خوانده شده است. در این روش با استفاده از الگوریتم CTC تخمین اولیه‌ای همترازی‌های زمانی، مبتنی بر توزیع احتمالی بدست آمده از یک مدل بازشناسی گفتار *wav2vec2* بدست می‌آید. مشکل تخمین اولیه با توجه به نوع داده‌ها این است که ممکن است صوت یک عبارت کوتاه از یک جمله در جمله دیگر تشخیص داده شود. از این رو، در ادامه با ترکیب خروجی CTC و زمانهای بدست آمده از *MarbelNetVAD* تخمین دقیقی از همترازی زمانی هر عبارت و صوت متناظر با آن در دنباله صوتی بدست می‌آید. نتایج حاصل از شبیه‌سازی‌ها نشان می‌دهد میانگین و واریانس اختلاف همترازی‌های زمانی تخمین زده شده توسط روش پیشنهادی در حدود  $0.64s$  و  $0.37$  است، در عین حال که روش CTC به عنوان روش پایه به میانگین و واریانس در حدود  $0.47s$  و  $0.87s$  رسیده است.

کلید واژه

-همترازی زمانی، الگوریتم CTC، *MarbelNetVAD*.



## قطعه‌بندی معنایی تصاویر هوایی و محاسبات لبه در اینترنت اشیا

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### چکیده

– رایانش ابری یکی از بزرگترین فرآیندهای محاسباتی عصر دیجیتال است که شامل ارائه منابع محاسباتی از طریق اینترنت می‌شود. امروزه به طور فزاینده‌ای، دستگاه‌هایی که به خدمات ابری دسترسی دارند، اعم از تجهیزات اینترنت اشیا که داده‌ها را برای تجزیه و تحلیل آنلاین انتقال می‌دهند، افزایش پیدا کرده است. از طرفی زیرساخت ابری سنتی برای مدیریت چنین حجم عظیمی از داده‌ها طراحی نشده است و حجم زیادی از داده‌های تولید شده از تجهیزات سیار و حسگرها، ظرفیت شبکه موجود را بیش از حد اشغال کرده و منجر به تاخیر در پاسخ‌دهی و چالش‌های امنیتی خواهند شد. محاسبات لبه یک مدل محاسباتی مبتنی بر قرار گرفتن منابع پردازشی و ذخیره‌سازی نزدیک به محل تولید داده برای بهبود زمان پاسخ‌دهی، صرفه‌جویی در پهنای باند و حفظ حریم خصوصی است. در این مقاله از دو مدل شبکه عصبی عمیق *PSPNet* و *U-Net* برای استخراج ویژگی از تصاویر هوایی نواحی سیل‌زده و نیز دو شبکه رمزگذار *ResNet50* و *MobileNet* استفاده شده تا با پیاده‌سازی ترکیبی آنها بر روی یک سیستم تعبیه‌شده کم مصرف، بررسی میزان حافظه مصرفی و زمان اجرای فرآیند استنتاج از طریق محاسبات لبه مبتنی بر *GPU* انجام شود. معیار *MIoU* برای ارزیابی هر ترکیبی از مدل شبکه عصبی و رمزگذار بکار گرفته شده است.

### کلید واژه

هوش مصنوعی، یادگیری عمیق، محاسبات لبه، قطعه‌بندی تصاویر.



## بهبود تشخیص سرطان سینه با استفاده از شبکه عصبی پیچشی کوانتومی

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چکیده - طبق گزارش سازمان بهداشت جهانی<sup>۱</sup> (*WHO*)، سرطان سینه، هر ساله، ۲/۱ میلیون زن را تحت تاثیر قرار می‌دهد. تشخیص زودهنگام این بیماری می‌تواند خطر مرگ ناشی از سرطان سینه را کاهش دهد. علاوه بر این، از خدمات تحت وب می‌توان برای نظارت بر بیماران، افراد مسن، و افراد دارای معلولیت در روستاهای دورافتاده در بسیاری از کشورها استفاده کرد، در این مناطق، زنان مبتلا به سرطان سینه یا تشخیص داده نمی‌شوند، و یا دیر تشخیص داده می‌شوند. ایده این مطالعه بهبود تشخیص سریع و دقیق این بیماری بر اساس روش‌های یادگیری عمیق با استفاده از پیکسل‌های خام تصاویر ماموگرافی سینه می‌باشد. طبقه‌بندی تصاویر پزشکی هم برای وظایف بینایی کامپیوتر و هم برای مراقبت‌های بالینی بسیار مهم است. شبکه‌های عصبی عمیق<sup>۲</sup> (*DNN*) و شبکه‌های عصبی پیچشی کوانتومی<sup>۳</sup> (*QCNN*) تکنیک‌های در حال ظهور در یادگیری ماشین هستند که کارایی خود را برای کاربردهای طبقه‌بندی مختلف نشان داده‌اند. ایده ارائه شده این مقاله، طراحی یک سیستم تشخیص سرطان با استفاده از یک معماری مبتنی بر شبکه‌های عصبی پیچشی کوانتومی بر اساس مدل شبکه عصبی پیچشی<sup>۴</sup> (*CNN*) و مدل از پیش‌آموزش‌دیده<sup>۵</sup> (*ResNet*۱۰۱)



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برای تقویت طبقه‌بندی تصاویر ماموگرافی سینه جهت تشخیص توده سرطانی در مجموعه داده پزشکی<sup>۱</sup> (CBIS-DDSM) تحت وب است.

## کلید واژه

تشخیص توده‌های سرطانی، شبکه‌های عصبی پیچشی، شبکه‌های عصبی پیچشی کوانتومی، ResNet<sup>۱۰۱</sup>



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## A Robust Framework for Epileptic Seizure Diagnosis: Utilizing GRU-CNN Architectures in EEG Signal Analysis

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### Abstract

Seizures that take place repeatedly and without provocation are referred to as epilepsy. Epilepsy can be diagnosed with electroencephalography (EEG). One of the most influential challenges of the past few years has been the use of deep learning algorithms to replace manual inspection of medical signals by specialists, such as epilepsy signal classification. This paper presents a multi-label classification approach for epileptic seizures using deep learning. UCI machine learning repository's epileptic seizure dataset has been used to classify epileptic seizure patients. 178 features are present in each of the 11500 samples in the dataset. Based on a variety of criteria, the proposed method may have a positive impact on epilepsy diagnosis, in most cases by approximately 6% compared with existing methods utilizing long short-term memory (LSTM) and autoencoder. It is possible thus to develop and apply gated recurrent unit-based methods with good potential for categorizing EEG signals for epilepsy diagnosis based on gated recurrent unit (GRU)-CNN based methods.

**Keywords:** Electroencephalogram (EEG), signals, Epilepsy seizure, Deep Learning, Gated Recurrent Unit (GRU), GRU-CNN, Classification.



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## Beyond Words: A Heterogeneous Graph Representation of Text via Graph Neural Networks For Classification

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### Abstract

In this research, a method employing Graph Neural Networks (GNNs) for text classification is introduced. Our approach transforms unprocessed raw text into structured heterogeneous graphs, a format known for its remarkable propensity to understand complex data relations. The conversion process enables the GNN, a model distinguished for its effectiveness in multiple domains, to comprehensively interpret and deliver a textured representation of the original text. By creating a graph per document and capturing both overt and covert contextual details within the texts, the text classification task is converted to a graph classification task. This approach can convert texts into graphs regardless of their length which eliminates the need to set a maximum length or add padding to texts that are shorter than the maximum length when inputting them into neural networks. To show the versatility and robustness of the method, experimental evaluations are conducted on two datasets – the Yelp Polarity for sentiment analysis binary classification and AG news for multi-class text classification. These experiments also serve to illustrate the efficacy of using dependencies and tags to trace and map relationships within word sequences such that the model’s context perception will be enhanced. In comparison with established baselines, the advanced GNN-based procedure manifests superior capacity in text representation. Hence, this study paves the way toward a new avenue in text classification specially sentiment analysis meanwhile underscores the eminent role of graph neural networks in reinforcing context understanding and text representation.

**Keywords:** Index Terms—Graph Neural Network, Heterogeneous Graph, Sentiment Analysis, Text Classification



## A study on hybrid deep learning approaches for “Monero” cryptocurrency price prediction

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### Abstract

Traders and investors are always looking for a way to predict the price of cryptocurrencies to increase their returns and reduce their risks. However, due to unpredictability, instability, and movement, cryptocurrency price prediction is a challenging task. Researchers have proposed different architectures for prediction based on statistical approaches, machine learning (ML), and deep learning (DL) techniques. In this article, we aim to evaluate some of these approaches by implementing their proposed architectures on historical data of Monero (XMR) cryptocurrency from the beginning of 2016 to the end of November 2023 and compare the results. According to the obtained results, the CNN-LSTM-Dense architecture performs better based on the Mean Squared Error (MSE) evaluation metric by achieving a value of 0.00472.

**Keywords:** Cryptocurrency Price Prediction, Hybrid Deep Learning, Convolutional Neural Networks, Bidirectional Long Short-Term Memory, Monero



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## Early diagnosis of Alzheimer's disease from MRI images with deep learning model

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### Abstract

Alzheimer's disease (AD) is recognized as the primary cause of memory impairment globally. This condition progresses in severity from mild to severe and interferes with people's everyday routines. Early diagnosis plays a critical role in patient care and clinical trials. Convolutional neural networks (CNN) are used to create a framework for identifying specific disease features from MRI scans. Classification of dementia involves approaches such as medical history review, neuropsychological tests, and magnetic resonance imaging (MRI). However, the image dataset obtained from Kaggle faces a significant issue of class imbalance, which requires equal distribution of samples from each class to address. In this article, to address this imbalance, the Synthetic Minority Oversampling Technique (SMOTE) is utilized. Furthermore, a pre-trained convolutional neural network has been applied to the DEMNET dementia network to extract key features from AD images. The suggested model's impressive 98.67% accuracy was obtained.

**Keywords:** Alzheimer's Disease, Deep learning, convolutional neural networks, MRI image.





## A CNN-LSTM deep neural network with technical indicators and sentiment analysis for stock price predictions

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### Abstract

The utilization of social media platforms, such as Twitter, has experienced a notable surge. Consequently, the sentiments expressed by both influential figures and the general public have come to exert a significant influence on public opinion. This influence extends to various domains, including the stock market, where traders are swayed by the ideas and posts disseminated through these channels. Hence, the present study seeks to improving accuracy in stock price predictions with sentiment analysis and utilization of technical indicators, thus an CNN-LSTM framework is introduced to predict stock market with sentiment analysis and technical indicators. Three deep learning models along with technical indicators and sentiment analysis are used to predict stock prices. The impact of time windows of different sizes; 1, 7, 14, 21, 30, 45 and 60 was compared on the performance of the model, and the best time window was selected to predict stock prices. 4 error-based evaluation criteria have calculated. The best model to predict the stock price was the CNN-LSTM model. The MSE of the model was 0.0011.

**Keywords:** long short-term memory; convolutional neural networks; deep learning; gated recurrent unit; technical indicators; sentiment analysis.



## شناسایی ارزشهای دیجیتال هم رفتار و پیش بینی قیمت ارزهای دیجیتال با استفاده از یک مدل مبتنی بر شبکه عصبی عمیق

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### چکیده

امروزه با معرفی فناوری بلاک چین، ارزشهای دیجیتال به سرعت محبوبیت پیدا کرده است و یک روش سرمایه گذاری و تجارت امن در میان مردم مورد استفاده قرار می گیرد. یکی از نیازمندی های اساسی معامله گره های حرفه ای در این بازار داشتن توانایی پیش بینی قیمت است که در صورت دقیق بودن، می تواند سودهای چشمگیری را نتیجه دهد. از اینرو، ارائه یک مدل کارآمد برای پیش بینی قیمت ارزشهای دیجیتال، به دلایل نوسان بالای قیمت ارز دیجیتال و پویایی آن، بعنوان یک چالش تحقیقاتی مورد توجه قرار گرفته است. در این مقاله، ابتدا با استفاده از یک الگوریتم خوشه بندی توسعه یافته، ارزشهای دیجیتال هم رفتار از نظر قیمت شناسایی می شود. سپس، برای پیش بینی قیمت هر یک از ارزشهای دیجیتال هر خوشه، یک مدل مبتنی بر یادگیری عمیق مبتنی بر شبکه های *LSTM* و *GRU* و مکانیزم توجه ارائه شده است. کارایی سیستم بر روی داده های واقعی مطالعه شده است. نتایج به دست آمده، موفقیت روش پیشنهادی را در حل چالش های مذکور تأیید می کنند.

### کلید واژه

پیش بینی قیمت ارز دیجیتال، خوشه بندی سری زمانی، شبکه *LSTM* و شبکه *GRU*، مکانیزم توجه.



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## SNRGAN: The Semi Noise Reduction GAN for Image Denoising Mehrshad Momen

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### Abstract

Conventional noise reduction methods often fail to effectively handle high levels of noise, leading to artifacts and distortions. This paper proposes a Generative Adversarial Network (GAN) approach for noise reduction with low complexity. The proposed Semi Noise Reduction GAN (SNRGAN) effectively learns the underlying patterns of noise and generates denoised versions of noisy images, even with different noise levels. Training our model on three diverse datasets yielded admissible results, as evidenced by superior PSNR and NMSE scores. Furthermore, our model excelled in both subjective evaluations and objective metrics and its efficacy in handling elevated noise levels positions it as a promising solution for real-world applications.



**Keywords:** Generative Adversarial Networks, Noise Reduction, Convolutional Neural Networks

## Two-step registration of rigid and non-rigid MR-iUS for brain shift compensation using transfer learning

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### Abstract

Accurate removal of brain tumors is always one of the most important challenges for surgeons, as the continuous change of the brain state after opening the skull and releasing the resulting pressure causes the tumor state to change. By registration of preoperative MR images on intraoperative ultrasound images, the extent of this change is estimated and a new image of the brain is created. The result shows the changes and shifts in the brain, and the surgeon removes the tumor based on this image. Image registration using new deep learning methods has attracted the attention of many researchers due to its high efficiency and accuracy. In this paper, the images of 22 male and female patients with grade 2 glioma tumors were used to evaluate the proposed method. MR images of the patients were taken before surgery, while ultrasound images were taken during surgery and after cranial incision. The deep network used in this paper to compensate for non-rigid changes is voxel morph. All images were fed to the pre-trained network in pairs, and the results are reported for each individual. The average error of all images for the proposed method is  $3.56 \pm 1.72$ . This shows the improvement in performance compared to the previous methods since in this work the landmarks were not used in training phase.

**Keywords:** medical image registration, digital image processing, transfer learning, neural networks.



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## Autoencoder-based Anomaly Detection in Microservices using Distributed Tracing

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### Abstract

In the fast-evolving realm of software development, microservice architecture has become a pivotal strategy for managing modern business tasks. While offering benefits like scalability and independence, ensuring the reliability of microservice systems is crucial for sustained customer satisfaction and business success. This paper introduces AnoTraceAE, an unsupervised anomaly detection framework tailored for microservice applications. Using distributed tracing, AnoTraceAE employs span and trace embeddings with a Convolutional Autoencoder to identify deviations from normal behavior in microservice systems. The model's efficacy is demonstrated through experiments on the TrainTicket dataset, showcasing superior performance across precision, recall, F1-Score, specificity, and Matthews Correlation Coefficient (MCC) compared to existing models. AnoTraceAE proves versatile, robustly addressing the challenges of anomaly detection in microservice architectures, highlighting its effectiveness in accurately identifying anomalies and minimizing false positives.

**Keywords:** Trace, Anomaly Detection, Microservice, Deep Learning, Autoencoder



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## A Deep Ensemble model to Recognize Human Activities using inertial sensors on smartphones

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### Abstract

Human Activity Recognition (HAR) is a crucial area of research in the fields of health and human-machine interaction. Smartphones have emerged as a popular choice for HAR due to their ubiquitous nature in daily life. Most available HAR datasets are collected in laboratory settings, which do not accurately represent real-world scenarios. To address this limitation, we collect a real-world dataset using smartphone inertial sensors from 62 individuals. Our collected dataset is small, noisy, and has variable frequency, which add complexity to the activity recognition process. In this paper, we propose a novel ensemble of hybrid deep models for HAR using smartphone sensors, which improves generalization performance and outperforms current methods with an accuracy of 93.9. The implications of these findings are significant for the development of reliable and accurate HAR systems that can operate effectively in real-world scenarios characterized by high intra-class diversity and inter-class similarity.

**Keywords:** Human Activity Recognition; Ensemble learning; Hybrid Deep Models; time series classification; real-world dataset; smartphone inertial sensors.



### EfficientNet-based vehicle damage insurance verification

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#### Abstract

The purpose of this study is to develop a new approach to expedite the vehicle insurance claims process by utilizing the power of EfficientNet, a state-of-the-art deep learning model. Vehicle damage assessments have traditionally been hampered by manual inspections, which result in delays and increased administrative costs. The proposed system, which utilizes EfficientNet as part of its deep learning model, shows unparalleled accuracy when analyzing and verifying vehicle damage in real time using advanced deep learning models trained on extensive datasets. Using a combination of computer vision and image recognition technology, our solution significantly reduces claims assessment time and resources. According to our experimental results, EfficientNet consistently outperformed other algorithms in accurately analyzing and verifying vehicle damage. Its superior accuracy and efficiency make it the ideal choice for expediting the vehicle insurance claims process and reducing administrative costs.

**Keywords:** deep learning, insurance verification, EfficientNet, vehicle, computer vision



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## Imbalanced Data Classification with Fuzzy Logic and Universal Image Fusion for Gearbox Defect Detection

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### Abstract

Finding data with different appearance defects and imaging them on a large scale is a time-consuming and expensive matter. In this paper, an image-based model for detecting and classifying defects on various surfaces such as metal, wood, carbon fiber, concrete and fabric structures is provided. The model is designed to work with limited and class-imbalanced data. In this model, the Universal Image Fusion (UIF) block is embedded. This block gives a comprehensive view of the distribution of defects, their dimensions, and their location on the surfaces. To make fake defective images, the defects are cropped from the defective images and fused according to the distribution map, with gradient masks on the defect-free surfaces. Next, extracting texture features from images was improved with the help of Fuzzy Inference Systems (FIS) with Gaussian membership function and Sobel operator. Images were classified into two classes, defective and non-defective, with the participation of three networks, VGG-16, InceptionV3, and Resnet-50. The presented model was implemented on a dataset of gearbox components with imbalance data and was able to achieve 97.87% accuracy, 98.59% precision, 98.55% specificity, 97.90% F1 score, 97.22% sensitivity, and 0.9577 informedness (Youden's J statistic).

**Keywords:** gearbox, defect detection, image fusion, Fuzzy Inference Systems (FIS), Sobel operator.





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## Text to fashion image synthesis Via CW-ControlGAN

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### Abstract

Text-to-image synthesis is called the computational method that translates human textual descriptions in the form of keywords or sentences into images with the same semantic content as text. The generated image in this field should match the meaning and content of the text and also have an acceptable quality. In the last few years, the use of Generative adversarial networks has made significant progress in increasing the visual realism, diversity, and semantic harmony of the generated images with their corresponding texts. Nevertheless, this research field is still facing many challenges. The research done is an attempt to develop a new technique and architecture to compete with the recent state-of-the-art models. The research about text-to-image Synthesis is done using two approaches: defining a loss function and then changing architecture. In the first approach, to extract more detailed features from the desired text and the generated image by the model, multi-mode transformer models that are trained on both the image and the text are used, and specifically, in this research, the text and image encoders of the CLIP model are used. The second approach deals with adding a wavelet loss function to the objective function to better train and improve the performance of the generator network in generating generated images. The obtained results show that a combination of two approaches produces good-quality images and better-attended text descriptions. The datasets used in this research are FashionGen and CUB Birds.

**Keywords:** Text-to-Image Synthesis, Generative Adversarial Network, Transformer, Fashion AI, Wavelet transform, Deep Learning



## Comparison of Deep Learning Algorithms for “Bitcoin Cash” Price Prediction

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### Abstract

Price prediction of cryptocurrencies is of great importance for investors and researchers. However, due to the nonlinear nature of the cryptocurrencies, evaluating distinct features of time series data for accurate price prediction is challenging. There are numerous studies on predicting cryptocurrency prices using deep learning algorithms. This article compares some popular deep learning algorithms, including Multilayer Perceptron (MLP), Unidirectional and Bidirectional Recurrent Neural Networks (RNN), Unidirectional and Bidirectional Long Short-Term Memory (LSTM), Unidirectional and Bidirectional Gated Recurrent Unit (GRU), and Convolutional Neural Networks (CNN) for Bitcoin Cash prediction. The results obtained using Mean Absolute Error (MAE) and Mean Squared Error (MSE) indicate that Unidirectional LSTM and Bidirectional LSTM outperform other algorithms in terms of prediction. Therefore, they can be considered as the best algorithms. In addition, according to the comparison made with other papers, the importance of data and hyperparameters is shown in terms of how much they affect the results.

**Keywords:** Cryptocurrency Price Prediction, Artificial Intelligence, Deep Learning, Comparison, Bitcoin Cash



## Driver Assistance System for Stress Recognition by Handcrafted Feature Extraction and Convolutional Neural Network

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### Abstract

Stress is one of the emotional states that cause disruption in decision-making, that's why stress while driving can be dangerous. Identification of stress in drivers by smart algorithms and timely warning can prevent traffic accidents. In the proposed method to provide a stress detection driver assistance system, the feature vector is used as convolutional neural network input, which makes the training of the network stable in repeated repetitions, improves the weight update, and increases the classification accuracy. The drivedb database contains biosignals such as the ECG of drivers in city driving and in our proposed method, the ECG of this database is used. By using the proposed method, three stress states were identified with 93.6% accuracy, which has increased classification accuracy compared to similar methods

**Keywords:**CNN, Driver Stress, ECG, handcraft features



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## Multi-Period High Dimensional Data Modeling Using Hybrid Zero-Convolution CNN-LSTM for Improved Crude-Oil Price Prediction

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### Abstract

The prediction of crude oil prices poses a difficult yet pertinent task across various domains. Therefore, there are dozens of studies in this field to predict its price as accurately as possible. In the majority of these studies, the input signal is univariate. However, when the input signal becomes multivariate and the number of channels (dimension) increases, the error is more likely to rise for many reasons, e.g., overfitting. Moreover, when the available data spans multiple periods (e.g., daily, weekly, and monthly), utilizing these diverse time spans for enhanced forecasting accuracy presents a notable challenge. Addressing these complexities, the present study proposes a hybrid zero-convolutional CNN-LSTM model. This model first involves training a CNN-LSTM network for each distinct period, where the CNN component serves to compress the multivariate signal into a univariate format, effectively mitigating overfitting. Subsequently, the CNN outputs are fed into the LSTM for the final forecasting stage. Furthermore, to leverage the entirety of the available periods for enhanced prediction, the weekly and monthly models are integrated with the daily model using zero convolutional layers to protect the daily model against the initial noise while enhancing its performance utilizing different periods' data. The model was trained on a dataset in which the input signal has 39 channels (dimensions) in different periods (i.e., daily, weekly, and monthly), and the target was the West Texas Intermediate (WTI) crude oil price changes. Ultimately, it was compared to some famous financial time series prediction models and the benchmark using several metrics, which showed the superiority of the introduced model.

**Keywords:** West Texas Intermediate; Deep Learning; CNN; LSTM; Crude-oil Price Prediction; Zero Convolution Layer



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## Image-based virtual try-on systems with wavelet transform

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### Abstract

Virtual try-on is a clothing technology that allows users to try on clothes virtually without physically wearing them. This is done by digitally overlaying clothing on the user's body using various methods such as augmented reality, virtual reality and 3D scanning. Virtual try-on has the potential to revolutionize the fashion industry by reducing returns, improving customer experience and increasing sales. There are several major challenges in the field of image-based clothing virtual try on, including: the variety of human poses and the misalignment between clothes and poses, the existence of suitable datasets, and the existence of images with different resolutions for virtual try-on; It is also important to note that the data must be of high quality and represent the real world. In this research, to overcome the challenge of images with different resolutions, we presented an architecture named Appearance Flow with Wavelet(AFW), which is an extension of the Appearance Flow network; In this architecture, a wavelet transform function and the definition of the loss function in its objective function are used to effectively manage the differences in resolution and make the network more resistant to input images with different resolutions and appropriate warping of clothing, according to the person. The experimental results show that these changes lead to improvement in the way the clothes are warped and determine the shape and size of the clothes that are suitable for the desired person's body, and also cause the network to be resistant to the difference in resolution in the input images.

**Keywords:** Image-based clothing virtual try-on, Wavelet transform function, Virtual try-on



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## Deep Learning: A Overview of Theory and Architectures

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### Abstract

Deep learning (DL) , a dynamic subset of machine learning inspired by the human brain, has evolved into a transformative force, showcasing remarkable capabilities across diverse domains. Often referred to as the "Artificial Neural Network," DL involves neural networks with three or more layers. The integration of DL with the progression of Big Data has facilitated the deployment of intricate neural networks, enabling autonomous analysis of features and correlations within extensive datasets, whether structured or unstructured. Noteworthy is the heightened performance exhibited by DL algorithms when confronted with substantial volumes of data. This paper offers a comprehensive exploration of DL from multifaceted viewpoints, incorporating recent advancements in the field. Beyond elucidating the conceptual and theoretical foundations, the paper systematically addresses challenges, highlights advantages, and proposes solutions intrinsic to DL. Furthermore, it delves into future works in DL, identifying evolving trends and promising areas of exploration such as medical diagnostics, sports training, and energy-efficient approaches. The overarching goal of this paper is to contribute to the continued evolution and widespread application of DL across diverse sectors. By encapsulating the holistic landscape of DL, the research presented herein strives to provide a comprehensive resource for researchers, practitioners, and enthusiasts seeking insights into the current state and future directions of this transformative field.

**Keywords:** Deep learning, Neural networks, Artificial intelligence, Machine learning, Supervised learning, Intelligent systems, Pattern recognition, Computer architecture, Object detection, Computer vision.



## Multi-Level Speaker-Independent Emotion Recognition Using Complex-MFCC and Swin Transformer

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### Abstract

Speech is a crucial tool for communication and expressing emotions. Analyzing emotions from speech signals has been a focus of signal processing research for decades. However, designing emotion recognition models presents challenges due to their reliance on speaker-specific characteristics like language, accent, culture, age, and gender. Hence, it's advantageous to create speaker-independent models. Here, we propose a speaker-independent emotion recognition model using novel multi-level audio features and a co-attention module. The model combines Complex MFCCs, spectrograms, and the original speech signal as inputs to three networks: Bi-LSTM, Swin Transformer, and Wav2vec2.0. The representations out of these networks are combined with a proposed feature embedding optimization mechanism for Wav2vec2.0. The fused features are employed for emotion prediction, and a non-linear SVM kernel classifier handles emotion classification. Experiments on the IEMOCAP dataset demonstrate promising results, achieving up to a 2.28% improvement over prior work in emotion recognition accuracy.

**Keywords:** Speech emotion recognition, speaker independence, complex MFCCs, Swin Transformer, co-attention mechanism



## تشخیص سرطان پستان در تصاویر هیستوپاتولوژیک با رویکرد CNN+LSTM یادگیری عمیق با استفاده از روش

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### چکیده

سرطان پستان دومین سرطان شایع در جهان است. با استفاده از سیستم های تشخیص خودکار می توان در زمان کوتاه تر و با دقت بالاتری آن را تشخیص داد و شانس درمان را افزایش داد. پژوهش های بسیاری از روش های مبتنی بر هوش مصنوعی به ویژه روش های یادگیری ماشین و یادگیری عمیق برای تشخیص سرطان پستان با استفاده از تصاویر هیستوپاتولوژیک استفاده کرده اند. این مقاله مروری، به بررسی پژوهش هایی می پردازد که از مدل CNN+LSTM برای تشخیص سرطان پستان با استفاده از تصاویر هیستوپاتولوژیک استفاده نمودند. در پژوهش های مشابه، مدل CNN+LSTM در استخراج ویژگی های پنهان و همبستگی بین متغیرهای فیزیولوژیکی عملکرد خوبی داشته است. از این رو می توان انتظار داشت این روش برای تشخیص سرطان پستان نیز عملکرد خوبی داشته باشد. یکی از چالش های مدل CNN+LSTM، همانند دیگر معماری های شبکه عصبی عمیق، آموزش مجموعه داده های بزرگ می باشد. از یک طرف آموزش مجموعه داده های بزرگ زمان بر می باشد و از طرفی دیگر استفاده از مجموعه داده های بزرگ می تواند دقت تشخیص را بیشتر کند. در این مدل، از CNN برای استخراج ویژگی و از LSTM برای طبقه بندی استفاده می شود.





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نتایج مطالعات بررسی شده نشان داده است که روش CNN+LSTM در مقایسه با سایر روش‌های یادگیری عمیق عملکرد قابل اعتمادی برای تشخیص سرطان پستان دارد.

**کلید واژه**

سرطان پستان، تصاویر هیستوپاتولوژیک، CNN+LSTM، هوش مصنوعی، یادگیری عمیق.



## شناسایی تغییر رفتار ترول مبتنی بر ترکیب

### LSTM و GAN

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## چکیده

ترولینگ اصطلاح گسترده‌ای است که شامل اشکال مختلف فعالیت‌های نادرست آنلاین از فریب دادن و اظهارنظرهای گمراه‌کننده تا رفتار توهین‌آمیز و تهدیدآمیز است. شناسایی ترول مبتنی بر تغییر رفتار یک از روش‌های جدید تحقیقاتی در این حوزه می‌باشد. در این مقاله از شبکه متخاصم مولد (GAN) به‌عنوان روش جدید نیمه نظارتی از رویکرد یادگیری عمیق، برای شناسایی تغییر رفتار ترول استفاده شده است. روش پیشنهادی از سه جزء مختلف تشکیل شده است: مولد، تشخیص‌دهنده، طبقه‌بندی‌کننده که با هم کار می‌کنند تا نه تنها نظرات ترول‌ها را طبقه‌بندی کنند، بلکه نمونه‌هایی نزدیک به مجموعه آموزش تولید کنند. این روش با آموزش دو شبکه عصبی که یک بازی min-max را انجام می‌دهد عمل می‌کنند. تشخیص‌دهنده سعی می‌کند نمونه‌های آموزشی واقعی را از نمونه‌های تقلبی متمایز کند و تابع مولد سعی می‌کند نمونه‌های آموزشی جعلی تولید کند تا متمایزکننده را فریب دهد که در آن مولد و طبقه‌بندی‌کننده توسط یک‌لایه LSTM به‌عنوان یک کانال مشترک بین آن‌ها متصل می‌شوند. ارزیابی کارایی روش پیشنهادی در حل مسئله تغییر رفتار ترول با استفاده از دو معیار دقت و معیار F1-Score بر روی یک مجموعه داده ۲۰۰۰۰ تایی از ترول اجتماعی توئیتر در مقایسه با جدیدترین روش‌های شناسایی تغییر رفتار (رگرسیون لجستیک) دقت بالاتری را گزارش می‌کند.



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کلید واژه

شناسایی ترول، یادگیری عمیق، یادگیری ماشین، شبکه مولد تخصصی



## HGBiCaps: یک مدل طبقه‌بندی چنددسته‌ای گفتار نفرت با

### استفاده از شبکه Capsule

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#### چکیده

گسترش فعالیت‌ها و محتواهای تولیدشده توسط کاربران در سیستم‌عامل رسانه‌های اجتماعی، چالش‌هایی از جمله محتوای گفتار نفرت<sup>۱</sup> و سوءاستفاده اخلاقی را برای پژوهشگران و جامعه به وجود آورده است. حفظ تعادل بین آزادی بیان و احترام به عزت افراد، یک نگرانی اساسی برای ارائه‌دهندگان بسترهای نرم‌افزاری در حوزه رسانه‌های اجتماعی است. در این مقاله، ما یک مدل تشخیص گفتار نفرت به نام HGBiCaps معرفی کرده‌ایم. این مدل با استفاده از سه لایه BiGRU، Embedding، و Capsule قابلیت بهبود تشخیص گفتار نفرت را با در نظر گرفتن اطلاعات متنی<sup>۲</sup> ارتقاء می‌بخشد. علاوه بر این، ما توانسته‌ایم مدل را در دسته‌های چندگانه و باینری تعمیم<sup>۳</sup> دهیم. دقت حاصل از آزمایش‌ها بر روی یکی از مجموعه‌های داده چند کلاس به برابر با  $0.80+$  است که نشان‌دهنده بهبود قابل توجه نسبت به مقالات مشابه در این زمینه است.

#### کلید واژه

- تشخیص گفتار نفرت، توپیتور، شبکه capsule، طبقه‌بندی چندگانه، یادگیری عمیق

<sup>۱</sup> Hate Speech

<sup>۲</sup> Contextual

<sup>۳</sup> Generalization



## ViT-PMN: A Vision Transformer Approach for Persian Numeral Recognition

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### Abstract

This study focuses on the task of Persian numeral classification within image data, employing the Vision Transformer (ViT) architecture to predict numerals akin to the MNIST dataset, but adapted to the Persian script. Our approach yielded a notable validation accuracy of 0.9920, particularly noteworthy when employing a patch size of 4. Notably, the research introduces an innovative visualization aspect, showcasing the first multi-head attention linear map and its counterpart, the last one. The visualization of these attention maps provides a unique insight into the model's internal processes and highlights its proficiency in capturing intricate patterns within Persian numeral images. This work contributes to the evolving landscape of character recognition, specifically addressing the challenges posed by the Persian script, and underscores the efficacy of employing the ViT architecture for such intricate tasks. The achieved validation accuracy and the detailed visualization of attention maps mark notable milestones in the realm of Persian numeral classification, showcasing the potential of Vision Transformers in the context of script-specific optical character recognition.

**Keywords:** Artificial Intelligence, Deep Learning, Classification, Persian Dataset, Vision Transformer



## Fast Tracking of Players in Volleyball Video Games Using Parallel GMM Algorithm

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### Abstract

Locating, labeling, and tracking players are vitally important in broadcasting sports videos. To this end, a background subtraction algorithm with high accuracy and speed is required to detect the players. Some complex algorithms such as Gaussian Mixture Model (GMM) usually give better results, but they are too slow to be applied on real-time systems. Since GMM analyses each pixel independently, this algorithm is suitable for parallel processing. Speeding up the GMM algorithm, will speed the tracking of volleyball players. The present paper deals with the implementation of parallel GMM algorithm using modern technologies such as GPU and CUDA. Utilizing pinned memory to transfer data between host and device (in order to improve throughput and asynchronous execution) is another part of the objectives stipulated for this paper. After detecting players based on parallel GMM, the Kalman filter algorithm is employed to track players. The obtained results indicate that our implementation running on a low-end GeForce 9600GT GPU provides at least 7x speed up. It can be concluded that the tracking algorithm is faster when parallel GMM is administered.

**Keywords:** Gaussian Mixture Model; Tracking; Volleyball analysis; GPU.



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## Optimizing Monocular 3D Object Detection on KITTI: Harnessing Power of Right Images

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### Abstract

Monocular 3D object detection is an important yet challenging problem in computer vision, with applications such as autonomous driving. A key limitation in advancing this field is the scarcity of annotated training data, an issue exacerbated in benchmarks like KITTI, which provide only around 7,000 labeled images. Prior arts have developed techniques to improve monocular 3D detection but often rely on external sources of data like LiDAR to supplement the limited training images. In this work, we propose a pre-training strategy that addresses the limited data issue by leveraging unlabeled right-camera images available within the KITTI dataset itself. We pre-train a model initialized for 3D detection by using “right” views before fine-tuning on just “left” images. Our experiments validate that, through this strategic pre-training with readily available “right” images, significant improvements can be achieved over models trained from scratch on only “left” images. We observe consistent gains in 3D detection performance when leveraging “right” image pre-training, without requiring any external LiDAR data. Our method provides evidence that mining unlabeled or weakly labeled in-domain data can effectively remedy the pervasive challenge of limited training data for monocular 3D object detection. This offers a plug-and-play practical strategy to use available datasets like KITTI better and reduce overfitting.

**Keywords:** Computer Vision, Deep Learning, Monocular 3D Object Detection, KITTI Dataset



## Multi Step Knowledge Distillation Framework For Action Recognition in Still Images

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### Abstract

Human Action Recognition (HAR) is a challenging computer vision task due to issues like lack of temporal information, significant intra-class variations, cluttered backgrounds, and misleading objects. A straightforward solution to cope with these challenges is to fine-tune complex deep neural networks that have been properly pre-trained on large scale datasets, such as Image-Net. Nevertheless, these models are computationally inefficient, making them unsuitable for real-world applications. One of the most popular approaches to this problem is knowledge distillation. It involves transferring knowledge from large network to computationally efficient model. Typically, these two networks are referred to as student and teacher networks. Furthermore, several studies have shown that despite stronger models providing more robust guiding signals for the training of student model, the substantial computational gap between student and teacher networks can negatively impact knowledge transfer. To deal with these issues, we propose an innovative multi step knowledge distillation framework that takes advantage of a mid-size teacher assistant network to narrow the computational gap between student and teacher networks. Also, self-distillation is used to improve teacher network performance, which in turn increases student network accuracy. Three variants of EfficientNetV2 are used to construct teacher, teacher assistant, and student networks. According to the results, based on Mean Average Precision (MAP) the student model performance on the Stanford-40 dataset improved from 94.75% to 96.30% by employing the proposed knowledge distillation framework, which is better than the results reported by previous studies.

**Keywords:** Still Image Action Recognition; Deep learning; Knowledge Distillation; Self-distillation;





## ConHGNN-SUM: A Contextualized Heterogeneous Graph Neural Network for Extractive Text Summarization

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### Abstract

Text summarization is a valuable method for extracting important details from large volumes of text data, facilitating tasks like text data analysis. Various text summarization techniques have been developed over time, with some focusing on selecting and summarizing short sentences, while others overlook the semantic relationship between sentences. Extractive document summarization involves learning cross-sentence relations, a critical aspect that has been extensively explored using various approaches. One effective method is to employ neural networks based on graphs, which offer an intricate structure capable of obtaining relations among sentences. In this paper, we present a contextualized heterogeneous graph neural network for extractive text summarization (*ConHGNN-SUM*), incorporating semantic nodes that extend beyond individual sentences, and emphasizes the importance of capturing the relationship between selected sentences as a final step in the summarization process. These extra nodes function as intermediaries connecting sentences and enhancing the interrelationships between them. Our model enhances conventional graph-based extractive methods and delivers comparable performance to other advanced systems for extractive summarization.

**Keywords:** Extractive Text Summarization, Graph Neural Networks, Natural Language Processing(NLP)



## A Hybrid Method of Self-Supervised Graph Embedding, Siamese Networks, and Transformers for Sentiment Analysis in Persian Language

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### Abstract

Recently, Graph Representation Learning (GRL) methods such as biased random walks became popular and are under attention in deep learning literature. Recent works using graph-structured data as inputs in deep learning models show great performance and effectiveness of graph representation learning. Therefore some research has been done in this domain to transform other types of data and problems into graph-structured data to use as inputs for neural networks. In this research, we propose a self-supervised approach for Persian sentiment analysis using combined representation learning and siamese network to improve performance. By leveraging a self-supervised approach, the first features of words are extracted in our constructed graph using biased random walks. After that, the extracted feature vectors are improved by training a siamese network in a self-supervised manner while pseudo-labels are provided by graph edges. Eventually, the improved features are fed as inputs to a transformer-based neural network. The obtained results of experiments demonstrate that our model outperforms the state-of-the-art models of sentiment analysis tasks in terms of classification accuracy over two Persian user comment datasets. An ablative study is conducted for justifying the effectiveness of our proposed components and the achieved results confirm the efficiency of our proposed methods.

**Keywords:** Sentiment Analysis, Graph Representation Learning, Transformers, Self-Supervised Learning, Siamese Networks, Persian Language, Natural Language Processing



## RELIANCE: Reliable Ensemble Learning for Information and News Credibility Evaluation

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### Abstract

In the era of information proliferation, discerning the credibility of news content poses an ever-growing challenge. This paper introduces RELIANCE, a pioneering ensemble learning system designed for robust information and fake news credibility evaluation. Comprising five diverse base models, including Support Vector Machine (SVM), naïve Bayes, logistic regression, random forest, and Bidirectional Long Short Term Memory Networks (BiLSTMs), RELIANCE employs an innovative approach to integrate their strengths, harnessing the collective intelligence of the ensemble for enhanced accuracy. Experiments demonstrate the superiority of RELIANCE over individual models, indicating its efficacy in distinguishing between credible and non-credible information sources. RELIANCE, also surpasses baseline models in information and news credibility assessment, establishing itself as an effective solution for evaluating the reliability of information sources.

**Keywords:** news credibility evaluation, fake news detection, ensemble learning.



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## Novel Approach to Image Similarity Estimation and Object Matching: Leveraging ViT Architecture and Euclidean Distance Metric

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### Abstract

In addressing the challenge of image similarity estimation on the MNIST dataset, our research drives from conventional Siamese network methodologies by incorporating Vision Transformer (ViT) architecture. Departing from the standard MNIST dataset, we introduced a novel paired dataset tailored to enhance the capabilities of similarity estimation. The innovation lies in the utilization of ViT as the backbone for feature extraction, followed by the application of Euclidean distance metrics on the dual input. This departure from the traditional approach not only broadens the scope of image similarity assessment but also enhances the model's discriminative power. Notably, the model attains a commendable test accuracy of 97.14% with a patch size of 7, underscoring the efficacy of our proposed methodology. This work not only contributes to the evolving landscape of image similarity estimation but also underscores the importance of leveraging non-conventional architectures to achieve enhanced performance in this domain.

**Keywords:** Similarity Estimation, Vision Transformer, Deep learning, Artificial Intelligence, Euclidean Distance



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## Deep Identification of Plant Diseases

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### Abstract

Plant diseases pose significant challenges to global crop production, impacting the economy. Innovative agricultural solutions that integrate the Internet of Things and machine learning have emerged to address this issue for early discovery of plant pathogens. While convolutional neural networks (CNNs) have been widely used for plant disease detection, recent advancements in deep learning have introduced vision transformers (ViTs) as highly effective models for classification tasks in various vision-based applications. Researchers have started exploring the potential of ViTs for plant pathology applications. This paper proposes a hybrid model combining the strengths of Pyramid ViT (PVT) and the powerful feature extraction capability of VGG-16 for disease identification. The model demonstrates its efficiency in identifying numerous plant diseases across different crops. By comparing eight modern techniques on PlantVillage dataset, the proposed model outperforms all others, achieving an impressive accuracy of 98.51% and a precision of 97%.

**Keywords:** Plant disease detection, Vision Transformer, Convolutional Neural Network, Smart Agriculture



## RGB Image-Based Hand Pose Estimation: A Survey on Deep Learning Perspective

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### Abstract

The pervasive integration of modern artificial intelligence into daily life necessitates robust human-computer interaction, underscored by advancements in computer technology. As the primary human tool, hand position, and orientation are vital for applications like virtual reality, with hand pose estimation playing a pivotal role. While challenges exist in RGB image-based estimation, the convergence of big data, neural networks, and increased computing power has spurred the application of deep learning in vision, leading to significant progress in hand pose estimation. This review focuses exclusively on RGB image-based methods within hand pose estimation. The paper explores recent advancements in this category, providing a comprehensive analysis of outcomes and charting future directions. Organized around discussions on challenges, advancements, and future directions, this review aims to contribute to the ongoing discourse in the dynamic field of RGB image-based hand pose estimation. By addressing unique challenges specific to this method, the paper offers insights that contribute to the development of precise and robust hand pose estimation systems, impacting the broader landscape of computer vision and human-computer interaction.

**Keywords:** Human-Computer Interaction, Hand Pose Estimation, Deep Learning, Computer Vision.



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## Detecting Persian Signatures in Realistic Images using the YOLO Algorithm

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### Abstract

While crucial for document forensics and security, detecting Persian signatures in real-world scenarios poses a considerable challenge due to the distinctive features of Persian signatures—characterized by complex combinations of shapes and letters instead of conventional names—along with issues like noise, cluttered backgrounds, and more. Furthermore, the scarcity of annotated datasets complicates signature detection in natural settings. This paper addresses these challenges by introducing a new dataset for Persian documents, merging publicly available signatures with diverse backgrounds to create semi-realistic images reflecting real-world conditions. Additionally, the proposed method leverages the YOLOv5 architecture for signature detection. Experimental results demonstrate the effectiveness of this approach in accurately detecting Persian signatures amidst various lighting conditions, background complexities, and signature distortions.

**Keywords:** signature detection, realistic, Persian database.



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## A transformer-based framework for visual grounding on 3D point clouds

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### Abstract

The task of 3D visual grounding involves the challenge of accurately locating an object within a 3D scene based on an accompanying textual description. This task marks an emerging frontier at the intersection of 3D vision and language, with diverse real-world applications. Notably, compared to visual grounding on images, visual grounding on point clouds is a more challenging task. In recent 3D visual grounding approaches, a common strategy involves adopting a two-stage grounding-by-detection paradigm, with an emphasis on using robust detectors and employing various language encoding modules. In this work, rather than relying on different detectors, we focus on generating enriched object proposals that can be more effectively fused with distinct features extracted from textual descriptions. To achieve this, we present an attentive fusion module (AFM) for fusing two distinct feature spaces. we employ transformers to model complex relationships between objects in a scene and fuse these representations with text features. The conducted experiments demonstrate that the proposed framework outperforms the previous works on ScanRefer dataset in both Acc@0.25 and Acc@0.5 metrics.

**Keywords:** 3D visual grounding, 3D object localization, vision-language, point clouds, robotics





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## Persian Automatic Speech Recognition by the use of Whisper Model

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### Abstract

Automatic speech recognition (ASR) systems play a pivotal role in modern communication technology by enabling computers to convert human speech into written form. The Whisper model has demonstrated remarkable performance in ASR, leveraging advanced deep learning techniques and training on extensive multilingual datasets. However, applying the Whisper model to Persian ASR presents unique challenges due to the Persian language's complex phonological features and non-Latin Persian script. This paper aims to maximize the performance of the Whisper model in Persian ASR by fine-tuning the model and adjusting parameters. Experimental results demonstrate that the proposed method outperforms other approaches significantly. To advance research in this field, we make all the source code of the proposed method available at GitHub: [https://github.com/mohammadh128/Persian\\_ASR](https://github.com/mohammadh128/Persian_ASR).

**Keywords:** Automatic speech recognition, Transformers, Deep learning, Natural Language Processing, Whisper model



## A CNN-BiLSTM based deep learning model to sentiment analysis

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### Abstract

Sentiment analysis from texts is a critical domain in Natural Language Processing (NLP) and artificial intelligence, given its substantial importance across various social, commercial, and cultural aspects of life. This analysis, viewed collectively by society, facilitates a better understanding of individuals' opinions and extracts valuable information, contributing to enhanced decision-making and diverse policymaking. The capability of sentiment analysis in automated systems allows for more accurate and prompt responses to feedback and user opinions. This powerful tool empowers organizations to improve customer satisfaction, manage feedback trends in social networks, and overall, streamline international communications.

In this study, utilizing the reputable Semeval2017 Task 4 dataset, we delve into sentiment analysis on texts and propose a hybrid model comprising Embedding, CNN, and BiLSTM. Additionally, we manage The imbalanced problem through data augmentation techniques. The performance of the proposed model is evaluated using multiple metrics, achieving an accuracy of 84%, showcasing acceptable improvement compared to similar prior works. This research not only contributes to enhancing model performance in sentiment analysis but also serves as an effective proposition in the field of artificial intelligence for analogous issues.

**Keywords:** sentiment analysis, twitter social network, hybrid model, deep learning, cnn, bilstm, embedding, natural language processing



## Medical Documents Search Engine in the Comprehensive Hospital System Using Ontology-Based Semantic Similarity Measurement

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### Abstract

The structure of comprehensive hospital systems (CHS) shows the way of organizing the links and communications of the pages inside them, its evaluation requires the use of appropriate methods and indicators. The increase in the pages of CHS is so large and complex that navigating through it and finding the desired services or products makes it time-consuming, tiring and even unsuccessful. Considering the expansion of specialized documents in medical records in the CHS and the increase of these documents as possible, access to information in search engines for medical documents in the CHS is becoming more difficult day by day. Therefore, in this research, a new method proposed for medical documents search engine in the CHS using ontology-based semantic similarity to overcome the above problems and provide more concrete and useful results to the treatment staff. In the proposed method, first, an ontology matrix was formed for semantic analysis. Then the searched documents were clustered by semantic similarity criteria. Finally, the documents searched by the user were retrieved by calculating the distance of the nearest documents to the cluster center. The experimental results showed that the proposed method outperformed other baseline methods in terms of precision (with 84.08% on average), recall (with 58.56% on average), and f-measure (with 69.06% on average).

**Keywords:** search engine, medical documents, clustering, ontology, semantic analysis



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## Advanced Automated Tagging for Stack Overflow: A Multi-Stage Approach Using Deep Learning and NLP Techniques

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### Abstract

This paper explores the critical role of systematic question categorization in question-and-answer platforms, with a focus on the vital function of tagging in efficient content organization. The significance of precise tagging for optimal content management is underscored, noting how tag inaccuracies can lead to search inefficiencies and reduced platform effectiveness. The core of this study is the introduction of an innovative automated tagging system designed specifically for Stack Overflow. As a principal case study, Stack Overflow, renowned for its extensive collection of programming-related queries and solutions, provides a fertile ground for testing and refining our system. Our system leverages various elements such as the question's title, description, and embedded code snippets to recommend pertinent tags, thereby aiming to refine and expedite the tagging process. It starts with question preprocessing, followed by a two-step candidate tag extraction. The first step utilizes the YAKE algorithm for initial tag extraction, and the second involves using MPNET for question embedding. This is complemented by methods like multi-label k-nearest neighbor, multi-label Random Forest, and Cosine Similarity for further tag extraction. The process then moves to tag selection and pruning, eliminating overlaps, and concludes with tag sorting.

We assess our system's performance using metrics such as F1-score, Recall, and Precision. Our experimental results show a notable improvement over existing baseline methods, with our approach achieving a substantial 3.4% enhancement in performance compared to the most effective baseline. This indicates the potential of our system to significantly advance tag-based categorization in question-and-answer platforms.

**Keywords:** Automatic Question Tagging, Stack Overflow, Tag, Deep Neural Network



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## Fine-tuning BERT for Persian Patent Classification: A Dataset and Model Exploration Techniques

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### Abstract

Patent documents are esteemed intellectual assets, garnering significant attention in research and development circles. The complex nature of patent classification forms a foundational step for subsequent tasks in patent analysis. Currently, the manual assignment of classification codes, such as IPC and CPC, is a common practice. In Iran, the International Patent Classification (IPC) is utilized for patent categorization. This paper presents a public dataset for Persian patents and explores the efficacy of fine-tuning the pre-trained BERT language model for International Patent Classification (IPC) code classification. Leveraging ParsBERT, a BERT model trained on the Persian corpus, we address the challenge of automating the assignment of IPC codes to patents. Notably, major patent offices like USPTO and WIPO are increasingly employing artificial intelligence models for this purpose.

**Keywords:** patent classification, Persian patent dataset, IPC classificatio



## ارائه روشی مبتنی بر پردازش زبان طبیعی و متن کاوی به منظور تخمین زمان انجام اسپرینت در متدولوژی چابک اسکرام

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### چکیده

– اخیراً استفاده از پردازش زبان طبیعی برای حل چالش های مهندسی نرم افزار بسیار مورد توجه قرار گرفته است. در این مقاله روش خلاقانه و جدیدی به منظور تخمین مدت زمان انجام اسپرینت (دور) در متدولوژی چابک اسکرام پیشنهاد شده است. در روش پیشنهادی از پردازش زبان طبیعی و کاوش متون مربوط به توصیف داستان ها و مسائل مطرح شده در هر دور به منظور تخمین زمان پایان آن دور در فرآیندهای توسعه نرم افزار چابک و به طور خاص اسکرام استفاده شده است. با استفاده از پردازش زبان طبیعی و مدل های پیش بینی کننده روشی طراحی و پیاده سازی شده است که قادر است زمان دور را تخمین بزند. آزمایش های انجام گرفته روی داده های واقعی مربوط به پروژه هایی که بر اساس متدولوژی چابک اسکرام قبلاً توسعه داده شده اند، نشان دهنده کارایی روش پیشنهادی تا درستی ۸۹ درصد است.

### کلیدواژه

اسکرام، اسپرینت، پردازش زبان طبیعی، پیش بینی زمان.



## بررسی کارایی مدل‌های زبانی عمیق مبتنی بر ترنسفورمر

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### چکیده

مدل‌های زبانی عمیق مبتنی بر مبدل‌ها (ترنسفورمرها) در سال‌های اخیر به‌عنوان یکی از پیشرفت‌های بزرگ در حوزه یادگیری عمیق و پردازش زبان طبیعی مطرح شده‌اند. این مدل‌ها بر پایه‌ی معماری مبدل که اولین بار در زمینه ترجمه ماشینی معرفی شد، ساخته شده‌اند. این پژوهش مدل‌های زبانی عمیق مبتنی بر مبدل‌ها را از دو دیدگاه مدل‌های درک زبان طبیعی (NLU) و تولید زبان طبیعی (NLG) بررسی کرده است. همچنین مهم‌ترین مدل‌های زبانی این دو دیدگاه را که در شش سال اخیر مطرح شده‌اند، معرفی کرده و به تشریح معماری مبدل و اجزای آن پرداخته است. از جمله مدل‌های مورد بررسی می‌توان به XLNet، BERT، Megatron و خانواده GPT اشاره کرد. این پژوهش به مزایا و محدودیت‌های هر یک از مدل‌های ذکر شده و روش‌های آموزش و انتقال یادگیری در این مدل‌ها می‌پردازد. نتایج آزمایش‌ها و تحلیل‌های رسمی نشان می‌دهند که به‌کارگیری مبدل‌ها در معماری مدل‌های زبانی بسیار بهتر از مدل‌های مبتنی بر شبکه‌های عصبی بازگشتی (RNN) و حافظه‌ی طولانی کوتاه‌مدت (LSTM) عمل می‌کنند و مدل‌های زبانی مبتنی بر مبدل توانایی بالقوه‌ای برای درک و تولید زبان طبیعی دارند.

### کلید واژه

پردازش زبان طبیعی، ترنسفورمرها، مدل‌های زبانی، یادگیری عمیق



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تحلیل نظرات مردم در توئیتر در موضوع «ازدواج» و ارتباط آن با

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## چکیده

با توجه به استفاده روزافزون از شبکه‌های اجتماعی در دنیای امروز و افزایش تبادل نظر و احساس در این شبکه‌ها، موضوع تحلیل متون گردآمده در این سکوها از اهمیت زیادی برخوردار شده است. یکی از موضوعاتی که در شبکه‌های اجتماعی مورد بحث و تبادل نظر جدی قرار می‌گیرد و از اهمیت زیادی نیز برخوردار است، ازدواج جوانان و مسائلی مانند مسکن، تورم و اشتغال است. ما در این پژوهش به کمک مدل‌های زبانی بزرگ مانند پارس برت و GPT-۳.۵ به پردازش داده‌های شبکه اجتماعی توئیتر در زمینه‌های ذکر شده می‌پردازیم. در این پژوهش از GPT-۳.۵ برای استخراج جنبه‌های مهم موجود در توئیتهای و برجسب زدن داده‌ها استفاده می‌شود. سپس به کمک مدل پارس برت و روش خوشه‌بندی k-means و همچنین بررسی دستی خوشه‌ها، جنبه‌ها گروه‌بندی شده و موارد نامرتبط آنها حذف می‌شوند. پس از آن این جنبه‌ها تحلیل شده و نتایج نهایی ارائه می‌شوند. برای ارزیابی میزان دقت تعیین احساس جنبه‌ها، از یک مجموعه داده آزمایش برجسب زده شده توسط انسان استفاده شد و برای ۶ کلاس دقت مدل ۰.۶۰+ به دست آمد که برای این تعداد کلاس و با توجه به بدون نمونه بودن روش استفاده شده برای تگ زدن، دقت مناسبی است.

## کلمات کلیدی

تحلیل احساسات مبتنی بر جنبه-ازدواج-مسکن-مدل‌های زبانی بزرگ.





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## Autonomous Robot Navigation: Deep Learning Approaches for Line Following and Obstacle Avoidance

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### Abstract

This research presents a navigation robotic system designed for the concurrent tasks of line following and obstacle avoidance in partially-known environments with presence of obstacles. By applying a strategically positioned camera for precise *line following* with a *LSTM* model and distance sensors guided by a *CNN* model for obstacle avoidance, our system exhibits robust performance. The seamless transition between these modes, driven by real-time environmental inputs, underscores the adaptability and autonomusness of the platform. Experimental results indicate a notable enhancement in performance, demonstrating the efficacy of the proposed approach in achieving superior outcomes in challenging robotic navigation scenarios.

**Keywords:** Robot navigation, Line Following, Obstacle Avoidance, Deep learning, LSTM, CNN.



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## Soft Computing Constrained Optimal Control of Wheeled Mobile Robot

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### Abstract

This paper focuses on addressing a nonlinear constrained control system designed for the trajectory tracking of wheeled mobile robots (WMR). The further incorporates a soft computing technique to smoothly handle two input constraints across various trajectories. The proposed control method adopts a predictive approach, utilizing a continuous nonlinear model of WMR. The optimal control law is determined by solving a nonlinear optimization. A fuzzy rule is introduced to intelligently satisfy the input constraints, enabling the effective incorporation of unconstrained control input alongside meeting the specified limits. The efficacy of the proposed control method is assessed through realistic motion models within a virtual robot experimentation platform (V-Rep). The results illustrate that the proposed control method not only reduces trajectory tracking errors with the incorporation of soft input constraints, but also proves to be suitable for online implementation compared to the other constrained optimal controllers.

**Keywords:** Two wheeled Robot, Nonlinear control, Soft Fuzzy Constraints, Trajectory Tracking, Virtual Robot Experimentation Platform.



## Link Prediction in Dynamic Social Networks Using Deep Learning

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### Abstract

Understanding the dynamics of social networks guided by their evolutionary trends poses a complex problem due to the myriad of variable parameters involved. However, a relatively simpler problem is comprehending the relationship between two specific nodes in these types of networks. Typically, time-varying problems exhibit complex structures represented as dynamic networks, where contents and relationships appear and vanish over time. The challenge of effective inference in dynamic connectivity is highly daunting in large dynamic networks, particularly when they possess nonlinear transmission patterns and scattered connections. To address this challenge, in this study, we employed a Deep Belief Network (DBN) as a method for deep feature representation of nodes. Additionally, for link prediction, we utilized Restricted Boltzmann Machine (RBM). The proposed model (RBM-DBN), while leveraging the advantages of dimensionality reduction, provides more accurate predictions. To evaluate the proposed method, we assessed its performance on two real and publicly available datasets from the web, including FaceBook and Epinions. The experimental results demonstrate that the proposed model outperforms baseline models in terms of precision and recall, establishing it as a desirable model for link prediction in social networks.

**Keywords:** Link prediction, Dynamic social networks, Deep learning, Deep Belief Network, Restricted Boltzmann Machine



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## Mining Influential Spreaders in Complex Networks by an Effective Combination of the Degree and K-Shell

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### Abstract

Graph mining is a valuable technique that enables us to predict and understand behaviors and information dissemination within networks. One crucial aspect of graph mining is the identification and ranking of influential nodes, which has applications in various fields including marketing, social communications, and disease control. However, existing models and methods come with high computational complexity and may not accurately distinguish and identify influential nodes. This paper develops a method based on the degree and k-shell of nodes and their neighbors. Comparisons to previous works, such as Degree and Neighborhood information Centrality (DNC) and Neighborhood and Path Information Centrality (NPIC), are conducted. The evaluations, which include the correctness with Kendall's Tau, resolution with monotonicity index, correlation plots, and time complexity, demonstrate its superior results.

**Keywords:** influential nodes, k-shell, degree, ranking, complex networks



## شناسایی رانش مفهوم در جریان داده و افراز فضای داده به

### مفاهیم مجزا

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### چکیده

بخش عظیمی از دنیای تکنولوژی امروز را سیستم های اطلاعاتی تشکیل داده اند که با جریانی پیوسته و سریع از داده کار می کنند (جریان داده). رانش مفهوم یا تغییر توزیع داده در گذر زمان پدیده ای ذاتی در جریان داده است و اصلی ترین دلیل کاهش اثر بخشی سیستم های مبتنی بر استخراج اطلاعات از داده شناخته شده است. در این مقاله با استفاده از یک روش شناسایی رانش مفهوم ابتکاری و مبتنی بر gTest که اساس آن شمارش تکرار ویژگی های موثر در دسته بندی نمونه ها است، بر روی سه پایگاه داده واقعی رانش مفهوم را شناسایی کرده و براساس آن فضای داده به مفاهیم کوچکتر و مجزا تقسیم می شود. سپس با ایجاد مدل دسته بندی انحصاری برای هر مفهوم و افزایش تعداد مدل یادگیری در فضای داده، قادر خواهیم بود دقت پیش بینی و دسته بندی در یادگیری ماشین را بهبود بخشیم.

### کلید واژه

جریان داده، رانش مفهوم، یادگیری ماشین، شناسایی رانش مفهوم، افزایش دقت در یادگیری



## Controlling a 6DOF Serial Manipulator Using Parallel Robot by ANN

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### Abstract

Nowadays, robotic arms have many uses. Among the equations for robotic arms, we can consider direct kinematics and inverse kinematics as the two most important equations. Direct kinematics equation converts the angles of the joints to end effector position and orientation, whereas inverse kinematics converts end effector position and orientation to the angles of the joints. Inverse kinematic equations are very difficult to solve for particular robots and also parallel robots. However, these equations can be easily solved using neural networks. In this research, we intend to control an articular arm via a parallel joystick or robotic arm. In our proposed method, this is achieved by solving both the direct and inverse kinematic equations mathematically, and the neural network is not used to connect these two arms to each other. Even if one arm intends to imitate another arm, the control of a serial arm by a parallel one is very complicated. So, in this paper we investigate the control of the serial arm using neural networks without knowing the final position of the parallel arm. In this investigation, we implement the most difficult scenario, i.e. controlling a serial arm using a parallel control handle and finally check the results.

**Keywords:** Direct Kinematics; Inverse Kinematics; Robotic; Artificial Neural Network



## Real Time Collision free Robot Path planning in Dynamic Space

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### Abstract

Nowadays, robotic arms have many uses. Among the equations for robotic arms, we can consider direct kinematics and inverse kinematics as the two most important equations. Direct kinematics equation converts the angles of the joints to end effector position and orientation, whereas inverse kinematics converts end effector position and orientation to the angles of the joints. Inverse kinematic equations are very difficult to solve for particular robots and also parallel robots. However, these equations can be easily solved using neural networks. In this research, we intend to control an articular arm via a parallel joystick or robotic arm. In our proposed method, this is achieved by solving both the direct and inverse kinematic equations mathematically, and the neural network is not used to connect these two arms to each other. Even if one arm intends to imitate another arm, the control of a serial arm by a parallel one is very complicated. So, in this paper we investigate the control of the serial arm using neural networks without knowing the final position of the parallel arm. In this investigation, we implement the most difficult scenario, i.e. controlling a serial arm using a parallel control handle and finally check the results.

**Keywords:** Direct Kinematics; Inverse Kinematics; Robotic; Artificial Neural Network



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## Enhancing decisions of goalkeeper and kicker players in the RoboCup 2D simulation league through behavioral cloning

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### Abstract

RoboCup is recognized as a landmark project in the robotics and artificial intelligence industry, providing a crucial platform for the advancement of research and innovations in autonomous and multi-agent systems. This study delves into the use of behavioral cloning in the RoboCup 2D Simulation League to imitate the best decisions and improve the performance of the goalkeeper along with the kicker players. To improve the performance of our soccer team in the league, we have developed a new approach that combines behavioral cloning and game log parsing. To achieve this, we played extensively against the champion team Helios and analyzed the actions and decisions of their goalkeeper and kicker players. This data was used to create a large dataset that our team could use to improve their imitation skills. Our innovative log generator tool and game logs parser made the labeling process easier and will also be useful for future research in the league. Novel features are extracted to represent the state of the game considering the limitations of each player including their head direction along with their field of view. Next, a neural structure is trained to imitate the behavior of kicker players and the goalkeeper. Moreover, the time limit for decision-making in each turn is considered. This study showed that using behavioral cloning for imitation learning noticeably improved our team's actions and decisions due to the enhancement of the number of accurate passes, on-target shoots, and saves by the goalkeeper.

**Keywords:** Behavioral Cloning, Soccer 2d Simulation, Robocup, Imitation learning





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## Revolutionizing Waste Management: A Smart Materials Recovery Facility with Robotic and AI Integration

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### Abstract

This study takes on the challenge of growing urban waste and presents a ground-breaking waste management approach. By merging Robotics and Artificial Intelligence (AI) with traditional Dirty Materials Recovery Facilities (MRFs), our project revolutionizes waste separation. Our intelligent MRFs utilize state-of-the-art robotic arms controlled by the advanced YOLOv8x AI model trained with a custom dataset of garbage items, accurately identifying and sorting various materials such as glass, metal, biodegradable, plastic, and cardboard. The innovative combination of these technologies results in unparalleled precision and efficiency in waste disposal. Ultimately, our system streamlines recycling processes, promotes sustainable city living, and significantly reduces environmental harm.

**Keywords:** Robotics Arm, YOLOv8, Object Detection, MRF, Waste Management



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## Community Detection on a Modified Adjacency Matrix: A Novel Network Approach in Drug-Drug Interaction

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### Abstract

In pharmacotherapy and drug discovery, understanding potential interactions between drugs is crucial for providing patient safety and optimizing treatment outcomes. While much research has focused on identifying drug-drug interactions (DDIs), there is a growing need to uncover non-interacting drug pairs. Non-interactions can be as significant as interactions, offering valuable insights into safe co-prescription practices. In this study, we introduce a groundbreaking approach to DDI detection by employing community detection methods: a clustering approach applied to a modified adjacency matrix. We then used the silhouette criteria to determine the optimal number of clusters, ensuring that non-interacting drugs are accurately represented in distinct groups. This method leverages the inherent structure of the modified adjacency matrix to differentiate between interacting and non-interacting drug pairs accurately. We demonstrated the effectiveness of our method through extensive experiments on real-world datasets, achieving an accuracy rate of 95.3% in predicting non-interactions. Our results highlight our proposed technique's reliability and efficiency in identifying safe drug combinations while minimizing the adverse effects of unintended interactions.

**Keywords:** Drug-drug interactions, Network Complex, community detection.



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## OCRR, A Fast Algorithm for Centrality-Based Graph Reduction in Social Networks

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### Abstract

This paper introduces an Optimized Centrality Ranking with Rewiring (OCRR) algorithm, a novel approach for graph reduction in social networks, particularly focusing on Twitter data. The traditional CRR algorithm, while effective in preserving the structural integrity of graphs, suffers from high computational demands, especially in the rewiring phase. Our OCRR algorithm addresses this issue by implementing a degree distribution aware filtering process, which significantly accelerates the graph reduction process without compromising the accuracy and topological fidelity of the reduced graph. We present a comprehensive evaluation of our method against the standard CRR algorithm, demonstrating its superior efficiency and scalability. This research contributes to the field of social network analysis by providing a more practical tool for analyzing large-scale network data, enabling real-time analysis and efficient handling of complex social media networks.

**Keywords:** social network analysis, graph reduction, betweenness centrality, binning sampling, pagerank centrality.



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## Bibliometric Analysis of research trends on Graph Neural Networks

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### Abstract

Graph Neural Networks (GNNs) are a powerful tool for analyzing complex systems and irregular data structures like graphs, revolutionizing tasks like node classification and link prediction. Therefore, regularly assessing scientific outputs to understand the current landscape is crucial. In this regard, scientometric analysis is employed for describing, explaining, and predicting the scientific status of researchers, research centers, journals, and countries on an international scale. Utilizing bibliometric techniques like distribution analysis, co-word networks, and scientific cooperations has proven valuable in unveiling the production trends of researchers in a scientific field, revealing both explicit and concealed dimensions. Despite existing surveys, a significant gap exists in the literature regarding bibliometric studies on the Web of Science (WoS) database in the emerging field of GNNs. This paper uses bibliometric analysis on WoS to explore the evolving GNN research area, covering contributors, collaborations, top journals, and trends identified through keywords and high citations. The research reveals that China, the United States, and Australia lead in publications on neural graph networks. Additionally, the findings underscore a predominant focus on graph neural networks within the realm of computer science.

**Keywords:** graph neural networks, bibliometric analysis, Co-occurrence network, Collaboration network.



## Hemodialysis Arteriovenous Fistula Survival: Analysis of Medication Impact during the Maintenance Phase Using Data Mining

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### Abstract

Arteriovenous fistula is a durable hemodialysis access option, but its survival is a concern due to potential complications. Influencing factors include patient attributes, comorbidities, surgical techniques, and postoperative care. Despite extensive research, the role of medication in arteriovenous fistula survival, especially during the maintenance phase, remains poorly understood. The study explores the relationship between common medications and arteriovenous fistula survival probabilities during maintenance. The study analyzed records of 119 hemodialysis patients with primary arteriovenous fistulas at the Hasheminejad Kidney Center. Survival probabilities during maintenance were calculated using K-Nearest Neighbors and Kaplan-Meier techniques. Random Forest models investigated the connection between medication usage and arteriovenous fistula survival. Medication importance was assessed using Mean Decrease in Accuracy, and Scatter Plots identified direct relationships. Random Forest models demonstrated strong predictive abilities: MAE 0.043, RMSE 0.057, R-squared 0.761. Noteworthy medications affecting arteriovenous fistula survival, identified through Mean Decrease in Accuracy, included Nephro-Vite, Insulin NPH, Aspirin, Erythropoietin, Losartan, and Furosemide. Scatter plots indicated dynamic associations over time, with shifts from positive to negative effects for Nephro-Vite, Losartan, and Erythropoietin. Insulin NPH, Aspirin, and Furosemide showed negative correlations with arteriovenous fistula survival. The study reveals the link between medication usage and arteriovenous fistula survival probability during maintenance, emphasizing the need to consider temporal dynamics in medication strategies. These findings hold promise for enhancing arteriovenous fistula survival and mitigating complications.

**Keywords:** arteriovenous fistula·Kaplan-Meier·medication·survival probability·Random Forest



## بهبود الگوریتمهای فرآیند کاوی با هدف کشف الگوهای پیچیده تر (چندنخی)

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### چکیده

فرآیند کاوی پلی بین داده کاوی، هوش تجاری و مدیریت کسب و کار است که هدف اصلی آن کشف مدل فرآیند از سابقه‌ی رویدادهای ثبت شده در سیستم‌های اطلاعاتی می‌باشد. الگوهای کنترلی بسیاری جهت کنترل فرآیندهای کسب و کار مورد استفاده قرار می‌گیرند. یکی از الگوهای پیچیده که در این فرآیندها مورد استفاده قرار می‌گیرد چندنخی است. وجود چندنخی در یک فرآیند بدین معنی است که یک مورد (درخواست) در طول فرآیند توسط جداکننده‌ی چندنخی به چند بخش تفکیک شده و هریک مسیر فرآیند را جداگانه و مستقل طی نموده و در آخر توسط متصل‌کننده‌ی چندنخی به هم متصل شده و در قالب مورد اولیه ادامه فرآیند را طی می‌نمایند. الگوریتم‌های زیادی جهت کشف فرآیند از سابقه‌ی رویداد تاکنون ارائه شده‌اند که مهم‌ترین آنها الگوریتم آلفا می‌باشد. این الگوریتم با استفاده از پیدا کردن رابطه دوتایی وظایف سعی در کشف مدل فرآیند دارد. یکی از



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چالش‌های این الگوریتم ترسیم رابطه‌های موازی در مدل استخراج شده نهایی می‌باشد. رابطه‌ی وظایف درون الگوی چندنخی نیز در الگوریتم آلفا بصورت رابطه موازی کشف می‌گردند که مدل استخراج شده قادر به نمایش درست الگوی چندنخی نیست. این پژوهش سعی دارد با تمرکز بر رابطه‌های موازی مشخص شده حاصل از الگوریتم آلفا و استفاده از واریانس فاصله تکرار وظایف روشی را برای کشف صحیح الگوی چندنخی در فرآیند در جهت افزایش خوانایی و درک بهتر مدل نهایی ارائه دهد.

## کلید واژه

مدیریت کسب‌وکار، فرآیندکاوی، سابقه‌ی رویداد، کشف فرآیند، چندنخی



## پایگاه داده گراف و مقایسه آن با پایگاه داده رابطه‌ای

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### چکیده

در سال‌های اخیر، پایگاه‌های داده گراف اهمیت بیشتری پیدا کرده‌اند. زیرا آن‌ها برای ذخیره و مدیریت مقادیر زیادی از داده‌های به هم پیوسته مناسب هستند. پایگاه‌های داده گراف از یک مدل داده‌های گراف مبتنی بر نظریه گراف استفاده می‌کنند. در مقایسه با پایگاه‌های داده رابطه‌ای که روابط را در زمان اجرا محاسبه می‌کنند، پایگاه‌های داده گراف روابط را برای جست‌وجوی سریع و بازیابی داده‌ها حفظ می‌کنند. مدل رابطه‌ای از دهه ۱۹۸۰ برای ذخیره و بازیابی داده‌ها استفاده می‌شود. اخیراً پایگاه داده رابطه‌ای اهمیت خود را از دست داده است. از دلایل مهم شکست پایگاه داده رابطه‌ای این است که با افزایش چند برابری داده‌ها، کار با مدل رابطه‌ای دشوار می‌شود. زیرا پیوستن تعداد زیادی جدول به طور کارآمد کار نمی‌کند. یکی از راه‌حل‌های پیشنهادی، تغییر به پایگاه‌های داده‌ای گراف است، زیرا آن‌ها توان غلبه بر چنین مشکلاتی را دارند. در این مقاله، مقایسه‌ای از پایگاه داده گراف Neo4j با رایج‌ترین پایگاه داده رابطه‌ای MySQL و Oracle ارائه خواهیم کرد.

کلید واژه

پایگاه داده رابطه‌ای، پایگاه داده گراف، Neo4j، MySQL





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## Proposing an Advanced Trending-based Grey Wolf Optimizer for Single-objective Optimization Problems

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### Abstract

Optimization algorithms play a crucial role in solving complex problems in various domains. Single-objective optimization algorithms aim to discover the most optimal solution for a particular objective function, commonly distinguished by a single criterion or goal. Grey Wolf Optimizer (GWO) is a swarm-based algorithm that has gained attention due to its simplicity and efficiency in solving optimization problems. In this article, we propose an advanced version of GWO, which is referred to as the Advanced Trending-based Grey Wolf Optimizer (ATGWO), specifically tailored for single-objective optimization problems. The motivation behind this modification stems from the need to improve the performance metrics of the original GWO algorithm and avoid local optimum. By altering the algorithm's coefficients, we aim to enhance its convergence rate, exploration, and exploitation abilities. To evaluate the proposed ATGWO algorithm, we conduct simulations using 7 multimodal single-objective benchmark functions. The results suggest that although the ATGWO excels in accuracy, it has more delay in comparison with GWO. This study paves the way for future research about optimization algorithms.

**Keywords:** Optimization, Metaheuristic algorithms, Heuristic algorithms, Grey Wolf Optimizer (GWO), Advanced Trending-based Grey Wolf Optimizer(ATGWO).



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## Total Experience Lifecycle Model: Based on Smart University Architecture

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### Abstract

A comprehensive and responsive architecture is essential for any smart and integrated system to effectively meet future requirements and conditions. This is especially true for a smart university, which must integrate and consolidate service coverage to support both basic and smart criteria. To ensure the functional accuracy of this architecture, the experience life cycle model should be thoroughly explored and developed from various perspectives. In this article, we will present the "hardware", "software", "business", and "responsiveness & interaction" life cycle categories of our proposed comprehensive smart-university architecture [1]. These categories consider the experiences within the mentioned layers of architecture, providing coverage and support for the total criteria in universities. It is important to note that so as to prioritizing "Quality of Service (QoS)" and "Quality of Experience (QoE)" for smart-university services, both proposed unified software development life cycle and justified methodology are discussed.

**Keywords:** Smart University, Experience Lifecycle, QoS, QoE



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## An Intelligent Caching Approach in Mobile Edge Computing Environment

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### Abstract

Mobile Edge Computing (MEC) is an emerging technology aimed at alleviating network congestion and cloud service delays. Despite its potential, challenges like limited caching resources and unpredictable user behavior persist. To tackle these hurdles, a new intelligent caching approach called Edge Intelligent Context-aware Caching (EICC) is introduced. EICC addresses resource limitations by considering user, video, and environmental contexts. Utilizing these contexts, we have implemented a content rating algorithm designed to evaluate content. Through this algorithm, content is rated, enabling the caching of the most suitable content according to the available capacity at the network's edge. We demonstrate that our proposed approach is more efficient in terms of cache hit rate, prediction accuracy, and overall delay.

**Keywords:** Mobile edge computing, Edge caching, Mobility prediction



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## Designing an Interpretable Credit Scoring System Using Fuzzy Association Rules

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### Abstract

"Credit Scoring (CS)" refers to methods for evaluating the creditworthiness of individuals or legal entities applying for bank loans. The credit rating is typically expressed as a numerical score, with higher scores indicating more creditworthy loan applicants. However, this process carries severe risks in financial management. For this reason, Credit Risk(CR) analysis has become an important topic and, recently, one of the primary goals of the banking and financial sectors. The use of credit risk analysis for personal and business bank credits has become very common. This paper employs fuzzy association rule mining to extract frequent rules for good and bad credit applicants from a dataset. The extracted rules were applied to the CS system and correctly classified 79.9% of the credit requests. A key advantage of this method is that it provides an interpretable model capable of classifying requests with adequate accuracy."

**Keywords:** Credit Scoring, Credit Risk analysis, interpretability, Fuzzy association rules, Fuzzy Inference System.



## Designing an Interpretable Credit Scoring System Using Fuzzy Association Rules

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### Abstract

Cloud computing has many advantages, and this has led to its widespread acceptance, but issues related to security and maintaining private territory are among the most important concerns in the field of this technology. The first step to achieving success in the information technology environment is to create security and privacy. The emergence of security threats from inside and outside in the field of cloud computing is possible, so one of the guarantees that users expect from cloud computing service providers is the protection of their data from internal and external threats. In this article, we intend to investigate the aforementioned challenge by taking inspiration from the colonial competition algorithm and by improving the components related to the reliability of sending and receiving information, to improve the safe availability of data and the amount of lost data for Reduce the issue of security in the cloud computing environment. Improving security and securing data in cloud computing through the provided solution has led to the reduction of operating costs and ultimately increased efficiency, development of storage space, and higher compatibility and flexibility.

**Keywords:** cloud computing, cloud computing security, meta-innovative algorithms, colonial complacency meta-innovative algorithm



## Fuzzy-Scheduled Constrained Control of Active Vehicle Suspension System

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### Abstract

The active suspension system (ASS) is an automated system that isolates the car body from road irregularities while satisfying the physical constraints of the system. In this paper, a fuzzy-scheduled optimal controller is developed for the ASS to intelligently solve the constraints in various road conditions. The proposed control method is formulated using a prediction approach that employs a continuous nonlinear model of the vehicle suspension system. Subsequently, the optimal control law is determined by solving a nonlinear optimization problem. The control weighting factors are adaptively adjusted by fuzzy rules, enabling effective and smooth satisfaction of input and state constraints. Simulation studies are conducted to demonstrate the effectiveness of the proposed control method. The results indicate that the proposed soft-computing controller satisfies the practical constraints intelligently, when reduces the body acceleration below the standard range defined by ISO. Meanwhile, it is fast and suitable for online implementation when compared to other optimal methods, such as conventional nonlinear model predictive control (NMPC) methods.

**Keywords:** Active suspension system, Inputs and state constraints, Soft-Computing, Optimal controller, Intelligent fuzzy weights



## Simulation of Air traffic control system using Petri nets

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### Abstract

An air traffic control system is a system that aims to prevent collisions between aircraft or obstacles during the flight process and to create a suitable and efficient platform for the smooth movement of air traffic and provide the necessary information to maintain flight safety. Delays in flights, if due to the operation of the air traffic control unit, can sometimes cause problems at the airport, and this will naturally affect the landing and take-off times of other aircraft, and more passengers will be in trouble. Given the important application of this system, its simulation is essential. Simulating a traditional, manual air traffic control system is usually a time-consuming process and requires a system to be explored over a long period of time, which is costly. In this paper, we simulate the air traffic control system during the two processes of landing and take-off of the aircraft in the airspace of the airport, using the Stochastic Reward Net, then using that simulation. We implemented the system in the case of increasing the flight plan and compared. The results show that the values obtained from the model are well consistent with the average values obtained from the studied airport (Mehrabad).

**Keywords:** Air Traffic Control System, Flight Control, Petri Networks, Stochastic Reward Net



## ارتقای ایمنی صنایع پتروشیمی با هوشمندسازی واحد بهره‌برداری توسط هوش مصنوعی

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### چکیده

با توجه به حساس بودن و حفظ ایمنی در صنایع پتروشیمی و در نظرگیری صنایع پتروشیمی به عنوان رکن اصلی صنعت نفت و گاز، با بهره‌گیری از دانش و تخصص فنی، راه‌حل‌های نوین برای کنترل، امنیت و افزایش بهره‌وری ارائه می‌شود. ارتقای ایمنی در این صنایع حساس با استفاده از آخرین فناوری‌ها در صنعت نفت و گاز موجب بهبود تولید، کاهش مصرف انرژی، ارتقای امنیت، ایمنی و بهره‌وری با هدف تسلط بر بازارهای جهانی با توجه به نیازهای مشتری و الزامات محیطی را مهیا می‌سازد. همانند شهر هوشمند که امروزه در سرتاسر جهان حائز اهمیت است، هوشمندسازی واحد بهره‌برداری در صنایع پتروشیمی نیز از لحاظ حفظ و امنیت منافع ملی و افزایش ایمنی نیز بسیار مهم می‌باشد. در پایان، نشان داده خواهد شد که چگونه هوش مصنوعی در صنایع پتروشیمی می‌تواند به طور قابل ملاحظه‌ای امنیت و ایمنی آن را افزایش دهد، همچنین، در کاهش مصرفی انرژی نیز موثر است.

کلید واژه

پتروشیمی، هوش مصنوعی، شبکه عصبی مصنوعی.





## تحلیل داده های فروش مجازی مبتنی بر اینترنت اشیا با استفاده از پردازش لبه

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### چکیده

چکیده - در سال های اخیر اینترنت نقش بسزایی در زندگی افراد داشته است. پیشرفت علم و تکنولوژی موجب تغییر سبک زندگی مردم شده است که این تغییرات در زمینه های مختلف قابل مشاهده است. یکی از تغییراتی که با وجود اینترنت و تکنولوژی در زندگی افراد نقش اساسی داشته است فروشگاه های اینترنتی هستند. فروشگاه های اینترنتی با توجه به مزایایی که دارند تمایل افراد را به سمت خرید اینترنتی افزایش داده اند. به دلیل وسعت و تنوع محصولات و خدمات در این نوع فروشگاه ها نیاز به سیستم هوشمندی که کنترل و نظارت تمامی واحد ها و سیستم را داشته باشد زیاد شده است. یکی از تکنولوژی هایی که امروزه می تواند در هوشمند سازی نقش مهمی داشته باشد اینترنت اشیا است. با توجه به حجم بالای داده ها در این نوع فروشگاه ها، تجزیه و تحلیل بررسی محصولات، آمار های فروش، داده ها و ... کار دشواری است. مدل های مختلفی برای تحلیل داده ها وجود دارد که یکی از این مدل ها استفاده از پردازش لبه است که می تواند در استخراج، ذخیره سازی، تحلیل و پردازش داده ها نقش مهمی داشته باشد. در این پژوهش با استفاده از الگوریتمی از پردازش لبه می خواهیم به تجزیه و تحلیل داده های فروش بپردازیم.

### کلید واژه

اینترنت اشیا، پردازش لبه، تحلیل فروش.



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## طراحی ماهواره مکعبی 1U جهت پایش محیط زیست

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### چکیده

امروزه با گسترش علم و در دسترس بودن فناوری‌های نوین فضایی و ماهواره‌ای، راهکارهای موثر و کم هزینه‌تر جهت انجام انواع فعالیت‌های ارتباطی، پایش، حفاظت و کمک‌رسانی فراهم شده است. از جمله ویژگی‌های نانوماهواره‌ها، افزایش سرعت در انواع عملیات و هزینه کمتر می‌باشد. ماهواره‌های مکعبی می‌توانند نقش خوبی در پایش محیط زیست ایفا کنند. جهت طراحی یک ماهواره مکعبی، طراحی مفهومی و سیستمی ماهواره الزامی است که در آن، الزامات، محدودیت‌ها و وظایف تعیین می‌شوند. سپس با توجه به ویژگی‌های کلی سامانه که شامل ویژگی‌های عملگری، جرمی، توانی و ابعادی است طراحی صورت می‌گیرد. در این مقاله هدف، ارائه نتایج طراحی مفهومی ماهواره مکعبی جهت پایش محیط زیست می‌باشد که نتایج به دست آمده حاصل تحقیقات و فعالیت‌های تیم دانشجویی دانشگاه مازندران در مسابقات علمی - صنعتی طراحی ماهواره مکعبی می‌باشد.

### کلید واژه

طراحی مفهومی ماهواره، طراحی سیستمی ماهواره، کیوبست، ماهواره مکعبی



## Addressing Security Challenges in Wireless BodyArea Sensor Networks: A Comprehensive Analysis and Solutions

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### Abstract

Wireless Body Area Sensor Networks (WBASNs) have gained significant attention in recent years due to their potential in providing continuous physiological monitoring in real-time. However, the integration of WBASNs into the healthcare system raises various security challenges that need to be addressed to ensure the integrity, confidentiality, and availability of sensitive personal health data. This article presents a comprehensive survey of the security challenges in WBASNs, including authentication, privacy, data integrity, and secure data transmission. Furthermore, this study analyzes existing security solutions proposed in the literature and provides insights into future research directions for enhancing the security of WBASNs. By understanding and addressing these security challenges, the potential of WBASNs can be maximized while ensuring patient privacy and data integrity.

**Keywords:** Security Challenges, Network Security, BodyArea Networks (BANs), Data Privacy



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## Integrating Neuro-Sliding Mode Control and Spiking Neural Networks for Enhanced Robotic Prosthetics

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### Abstract

This article introduces an innovative approach to enhancing the precision and adaptability of prosthetic arms by fusing Neuro-Sliding Mode Control (NSMC) and Spiking Neural Networks (SNN). To address dynamic limb movement complexities and the need for real-time cognitive adaptability, our research integrates NSMC and SNN within a 3 Degree of Freedom (3-DOF) robotic arm framework. NSMC governs dynamic arm motion, ensuring stability and precision, while SNN introduces cognitive elements for learning and user-specific adaptation. This integrated framework promises a harmonious balance between stability and cognitive flexibility, resulting in smoother and more intuitive prosthetic movements. Building on a comprehensive review of prior studies, we identify challenges in joint design, control algorithms, and adaptability, laying the foundation for our research. The article details design considerations, implementation strategies, and experimental validations, highlighting the efficacy of the NSMC-SNN integration. Experimental results demonstrate the significantly improved performance of the 3-DOF robotic arm, closely resembling natural human motion. This transformative approach offers a trajectory toward more intuitive and user-friendly robotic prosthetics, with broader implications for the advancement of human-machine interaction in the field of robotic prosthetics. The article concludes by discussing potential avenues for future research.

**Keywords:** Neuro-Sliding Mode Control (NSMC), Spiking Neural Networks (SNN), Precision Control, Neuro-Inspired Robotics, 3-DOF Robotic Arm



## Smart Parking Systems: Comprehensive Review Based on Technological Perspective

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### Abstract

With the constant expansion of urban smartification, this article focuses on smart parking. This research has introduced infrastructure in this area, although the use of these parking facilities is increasing. Smart parking is evaluated through the presentation of technologies and control of information management, such as sensors and communication methods. A comprehensive framework design enables the identification of unused or occupied parking areas and the control of entry and exit flows in smart parking systems, using the Internet of Things (IoT). This greatly facilitates management for both administrators and drivers, thereby reducing waste of time. In addition, entry and exit controls can be automated, eliminating the need for human intervention and leading to the development of a self-sufficient smart parking system, with the inclusion of appropriate sensors. In order to ensure the systematic management of smart parking, cloud computing and fog computing are being introduced in order to improve reliability and user satisfaction.

**Keywords:** Smart parking, Internet of Things, sensors, cloud processing



## EGECC-MAES: Lightweight hybrid encryption algorithm in blockchain for smart health care in the Internet of Things platform

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### Abstract

In recent years, health care Internet of things has become one of the most important and vital technologies for human health care needs. But the security challenge in this technology has made it unreliable. Research shows that blockchain with a decentralized approach and high security can improve the problems and limitations of communication devices in combination with the Internet of Things. Blockchain provides security using strong encryption techniques. The encryption technique presented in this article is a combination of symmetric and asymmetric encryption, which is as light as possible and can overcome the limitations of Internet of Things devices while providing high security. It is also effective in reducing energy consumption and time and data transfer calculations. According to the comparison and evaluation of the functional criteria of the obtained results, the presented method shows its high efficiency compared to other methods.

**Keywords:** healthcare internet of things, blockchain, lightweight hybrid cryptography, security



## On the importance of Context and Data Fusion in Advance Passenger Information System

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### Abstract

The Advance Passenger Information System has become an essential component of passenger processing at borders. The traditional APIS often lacks the capability of deploying contextual information and effectively integrating diverse data sources. This paper proposes an innovative approach to rich APIS based on context-awareness and data fusion techniques. We investigate various aspects of context information for APIS improvement. Moreover, by integrating and combining multiple sources of passenger data such as travel history, visa status, and passenger behavior analysis through data fusion techniques, APIS can generate more accurate, comprehensive, and actionable information. The analysis shows that these two added values can enhance the accuracy and reliability of passenger risk assessment while improving operational efficiency.

**Keywords:** Software Engineering, Context, Context-Awaer, Advance Passenger Information System, Data Fution



## تشخیص هرزنامه در شبکه‌های اجتماعی با استفاده از رویکرد شبکه عصبی عمیق

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### چکیده

هرزنامه یکی از چالش‌های مهم اینترنت و کاربران آنلاین است و باعث اتلاف وقت و همچنین باعث انتشار انواع بدافزار در اینترنت می‌شود. هدف از این مقاله بررسی روش ترکیب شبکه عصبی عمیق به منظور شناسایی هرچه بهتر و دقیق‌تر صفحات هرزنامه از غیر هرزنامه می‌باشد. در این پژوهش برای تجزیه و تحلیل از مجموعه داده مرتبط استفاده شده و نتایج آزمایشات نشان می‌دهد متوسط خطای روش پیشنهادی در تشخیص هرزنامه مخزن داده هرزنامه‌ها در پایگاه داده برابر ۰.۱۵۲+ است و همچنین متوسط شاخص حساسیت و صحت روش پیشنهادی در تشخیص هرزنامه برابر ۹۹.۱۲٪ و ۹۹.۶۷٪ است. آزمایشات نشان می‌دهد روش پیشنهادی دارای شاخص حساسیت و صحت بیشتر از روش‌های یادگیری و داده‌کاوی جهت تشخیص هرزنامه است.

### کلید واژه

تشخیص هرزنامه، شبکه‌های اجتماعی، طبقه‌بندی، انتخاب ویژگی، شبکه عصبی عمیق و الگوریتم بهینه‌کفتار خالدار





## Architecture Level Design of Sub-Word Multipliers for Variable-Sized and Variable-Signed Operands

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### Abstract

Variable Latency Speculative (VLS) computing is a method based on arithmetic approximation that allows early completion similar to prediction. The VLS circuit can be designed to speculate a short path with fewer computations from the critical path that wrong speculation is corrected by error detection and correction circuit. This technique can be generalized to applications that support variable operand sizes. This paper presents VLS multiplier based on sub-word multipliers that makes use of dynamic-range detection unit, which allows to have the flexibility of switching between the short and critical paths base on size and sign of the operand. The dynamic-range detection circuits operate in parallel with sub-word multiplier to reduce the overall delay. Experimental results show that applying the VLS multiplier leads to a reduction in delay with only marginal overhead in area, and power consumption.

**Keywords:** Arithmetic Circuits, Variable Latency Speculative Circuits, Karatsuba Algorithm, Sub-Word Multiplier.



## A New Scheme for Image Compression and Encryption Using ECIES, Henon Map, and AEGAN

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### Abstract

Providing security in the transmission of images and other multimedia data has become one of the most important scientific and practical issues. In this paper, a method for compressing and encryption images is proposed, which can safely transmit images in low-bandwidth data transmission channels. At first, using the autoencoding generative adversarial network (AEGAN) model, the images are mapped to a vector in the latent space with low dimensions. In the next step, the obtained vector is encrypted using public key encryption methods. In the proposed method, Henon chaotic map is used for permutation, which makes information transfer more secure. To evaluate the results of the proposed scheme, three criteria SSIM, PSNR, and execution time have been used.

**Keywords:** Image Compression, Image Encryption, ECIES, Henon Map, AEGAN.



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## WCET estimation using support vector regression based on Legendre orthogonal kernel functions

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### Abstract

In computer science, particularly in real-time systems, due to the existence of deadlines for executable tasks, a concept called worst-case execution time (WCET) has played an important role. Determining WCET is essential for effectively scheduling tasks, thus estimating this parameter is highly important. Due to the complexities of software and hardware, there are many factors affecting the execution of a task, so there are many challenges to estimating WCET. Due to these challenges, nowadays machine learning methods such as support vector regression (SVR) are employed to estimate WCET. In addition, orthogonal functions are utilized as an effective way to use as a kernel function due to the existence of minimal data redundancy in the feature space. In this research, the Legendre orthogonal functions have been used as the SVR kernel in order to estimate WCET. To examine the experimental results of this research, Mälardalen University benchmarks were used, and the results of the proposed method improving the accuracy and tightness of WCET in 69% of the benchmarks were obtained. Furthermore, in 69% of the benchmarks, a safeness percentage of over 60% was achieved.

**Keywords:** real-time systems, machine learning, orthogonal functions



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## A two-stage sign language recognition method focusing on the semantic features of label text

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### Abstract

The ability to recognize sign language is an indispensable technology that plays a crucial role in facilitating communication between individuals who are deaf or hard of hearing. It is of utmost importance to comprehensively understand the nonverbal expressions employed by the hearing impaired. In order to enhance the efficacy of sign language recognition technology, it is imperative to focus on language modeling and improve the utilization of linguistic elements. At present, much attention in sign language recognition techniques that integrate language modeling is directed toward the translation of GLOSS to text in research related to Sign Language Translation (SLT). Our paper, however, proposes a creative approach that involves the linguistic modeling of the corresponding text of sign language during the process of converting signs to GLOSS. Specifically, we have implemented a text correction module that uses a front-mounted sign language recognition module to make preliminary predictions. The corrected GLOSS sequence is then used to obtain the final recognition result with higher accuracy. Our framework was tested on the RWTHPHOENIX-Weather-2014-T dataset and CSL dataset to evaluate its effectiveness in recognizing sign language on a large scale. The experimental results demonstrate that the proposed method significantly enhances the accuracy of the sign language recognition model.

**Keywords:** Continuous Sign Language Recognition, Machine Learning, Language Modeling, Image Processing, Time Series Modeling



## Enhancing Power Oscillation Control: Comparative Analysis of Damping Controllers and Hybrid Computational Intelligence Methods for Power System Stabilization

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### Abstract

In this paper, Artificial ecosystem optimization (AEO) and Ant bee colony (ABC) optimization were used to design damping controllers for power oscillation damping and control. The damping controllers designed are power system stabilizer (PSS), proportional integral derivative-PSS (PID-PSS), fractional order (FO) PID-PSS (FOPID-PSS), tilt integral derivative-PSS(TID-PSS), all designed using the AEO optimization and Neurofuzzy controller (NFC) designed using the ABC optimization. The damping controllers were validated on the IEEE New England power test system which is a ten-machine system. A comparison of results obtained was done based on the settling time of the rotor angle and rotor speed control of the synchronous generators (machines) in the ten-machine power test system. PID-PSS, FOPID-PSS and TID-PSS showed improved rotor angle and rotor speed control in comparison to the PSS damping controller only. NFC however, indicates a better control of the rotor angle and rotor speed than all other controllers designed.

**Keywords:** Fractional order PID damping controller, Tilt integral derivative PID damping controller, Neurofuzzy controller, Computational intelligence, Metaheuristic algorithms.



## Review and Comparative Analysis of Deep Learning Techniques for Smart Grid Load Forecasting

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### Abstract

In the last decade, the water and electricity industry has experienced significant investments in smart grid technologies. Within a smart grid framework, information and energy engage in bidirectional transmission, opening up diverse applications for artificial intelligence, including artificial neural networks, machine learning, and deep learning. This comprehensive review investigates the dynamic landscape of deep learning methodologies applied to load forecasting within smart grids, spanning short-term (STLF), medium-term (MILF), and long-term (LTLF) Forecasting horizons. We scrutinize a range of techniques, encompassing Auto-Encoder Method, Recurrent Neural Network (RNN), Long Short-Term Memory (LSTM), Convolutional Neural Network (CNN), Restricted Boltzmann Machine (RBM), Deep Belief Network (DBN), Deep Boltzmann Machine (DBM), Graph Neural Networks (GNNs), Attention Mechanisms, and Hybrid Models. This article introduces and reviews common deep-learning algorithms used in load forecasting for smart grids and power systems. It also offers a comparative assessment based on the reduction percentage in four indicators: accuracy, speed, mean absolute error (MAPE), and root mean square error (RMSE). The research aims to provide valuable



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insights into the strengths and weaknesses of each deep learning method, guiding researchers and practitioners in making informed decisions when selecting the most suitable approach for diverse load forecasting scenarios in smart grid environments.

**Keywords:** Load forecasting, Deep Learning, Machine learning, Smart grids, Short-term load forecasting (STLF), Medium-term load forecasting (MILF), Long-term load forecasting (LTLF), Artificial intelligence, Neural networks.



### Depression Detection on e-Risk 2017 using Long Short-term Memory Models

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#### Abstract

In today’s fast-paced world, individuals are increasingly vulnerable to high levels of stress, which consequently raise the risk of developing depression. Depression may represent itself via various symptoms, ranging from emotional to physical pains. The symptoms appear gradually, deceiving patients to ignore their changes. The reluctance to accept the depression and the social stigma surrounding this mental disorder prevent a remarkable fraction of patients from visiting the specialists and receiving the treatments. Although people feel uncomfortable to reveal themselves in face-to-face connections, they have an opposite attitude towards social networks. People willingly share their opinions, thoughts, and feelings on social networks nowadays. Psychological studies have explored potential differences in the literature used by individuals with depression and those without. Hence, social network data has become a valuable source of information to study the mental health of users. Following this motivation, in this paper, we have examined the power of several deep learning algorithms for automatically detecting depression on eRisk 2017 dataset, obtained from the social network of Reddit. To this aim, we have studied and compared Long Short-Term Memory (LSTM), Bidirectional LSTM (Bi-LSTM), Gated Recurrent Unit (GRU), Bidirectional GRU (Bi-GRU), and hybrid LSTM-GRU models for depression detection. The results have illustrated superiority of LSTMs in terms of accuracy and timing of detecting depression over the rest of the models. These findings contribute to the expanding body of research on using artificial intelligence for detecting mental health issues.

**Keywords:** Depression, mental health, eRisk, deep learning, LSTM, GRU, social network





## Neurosymbolic AI-based Framework For Sports Ball Identification Concerning Toddlers

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### Abstract

In today’s digital world, a vast amount of unstructured data is generated, primarily consisting of images and videos. Extracting meaningful information from these visuals is crucial for effective retrieval. Among the various fields where these images play a role, sports are essential in everyone’s life. This article introduces a system aimed at helping toddlers effortlessly understand sports balls. The proposed framework establishes a classification system for sports images, considering factors such as ball size, color, direction, dimension, and other vital details. Our approach uses object detection and image processing techniques to classify various sports balls, including cricket balls, basketball, volleyball, tennis balls, and football. To determine their positions and provide relevant information, we implemented the neuro-symbolic ai framework (NSAI) to provide symbolic reasoning question-answer capabilities to classify balls.

**Keywords:** Object detection, Neuro-Symbolic AI, Machine Learning, Performance, Inference, OpenCV, Image Processing, Question-Answer



## تخمین با سرآمد پایلوت کم کانال سیستم MIMO انبوه با کمک سطح بازتابی هوشمند بر اساس یادگیری

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### چکیده

یکی از موضوعات رایج در تحقیقات مرتبط با سیستم‌های مخابراتی، تخمین کانال می‌باشد. اخیراً تخمین کانال سیستم *MIMO* انبوه چندکاربره مبتنی بر یادگیری عمیق در حضور سطح بازتابی هوشمند (*IRS*) ارائه شده است که در آن خطای باقیمانده از تخمین گر کلاسیک *LS* با استفاده از مدل‌سازی به روش حذف نویز تصویر و پیاده سازی با یادگیری عمیق کاهش داده شده است. در حالتی که تعداد عناصر *IRS* بیشتر باشد مشکل سرآمد پایلوت در روش فوق بوجود می‌آید. جهت حل مشکل فوق، در این مقاله با فرض وجود تزویج بین عناصر *IRS*، هنگام تخمین کانال، با غیر فعال کردن برخی عناصر *IRS*، تنها پایلوت متناظر با عناصر فعال *IRS* ارسال شده و کانال متناظر با روش *LS* تخمین زده می‌شود. با توجه به وجود اثر تزویج، بین کانال‌های متناظر با عناصر مجاور *IRS* همبستگی وجود دارد. بر این اساس با روش درونیابی خطی، تخمین اولیه کانال متناظر با عناصر غیرفعال را بدست می‌آوریم. ماتریس کانال حاصله تخمین اولیه از ماتریس کانال می‌باشد،



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برای بهبود بیشتر عملکرد تخمین از شبکه یادگیری عمیق *CDRN* استفاده می‌کنیم. نتایج شبیه-سازی‌ها حاکی از بهبود عملکرد روش پیشنهادی نسبت به روش مرجع از دیدگاه کاهش سرآمد پایلوت و خطای تخمین است.

## کلید واژه

سیستم‌های چند ورودی چند خروجی، تخمین کانال، سطح بازتابی هوشمند، یادگیری عمیق، اثر تزویج



## مقایسه کارایی روش‌های یادگیری تقویتی عمیق برای کنترل دوز داروی بیماران مبتلا به لوسمی

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### چکیده

طراحی یک استراتژی کنترل هوشمند برای تعیین رژیم درمانی دارویی برای بیماران مبتلا به لوسمی می‌تواند در درمان این بیماری بسیار مهم باشد. استفاده از الگوریتم‌های هوش مصنوعی می‌تواند به پزشکان کمک کند تا به طور دقیق‌تر و اثربخش‌تر دوز مناسب دارو را تعیین کنند. در این مقاله، از الگوریتم‌های یادگیری تقویتی پیوسته برای بهینه‌سازی دوز داروی بیماران مبتلا به لوسمی استفاده شده است. برای این منظور سه روش DQN، DDPG و PPO مورد بررسی قرار گرفته است و نتایج آنها با هم مقایسه شده اند که این امر می‌تواند به بهبود و بهینه‌سازی در تعیین رژیم درمانی دارویی برای بیماران CML و حتی سایر بیماری‌های مشابه کمک کند.

### کلید واژه

بیماری لوسمی، رژیم درمانی، هوش مصنوعی، بهینه‌سازی دوز دارو



## تشخیص ایراد موتور القایی با استفاده از تابع چگالی احتمال سیگنال لرزش و معیار کولبک لیبلر

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### چکیده

– موتورهای القایی از جمله ماشین‌های الکتریکی هستند که به دلیل کنترل ساده و گستردگی کاربرد، جایگاه ویژه‌ای در صنایع امروزی دارند. تشخیص ایراد به صورت برخط (آنلاین) و بدون باز کردن موتور بسیار ایده آل است چرا که با حداقل هزینه و حین عملکرد خرابی ماشین در ابتدای کار مشخص و به سرعت مورد بررسی قرار می‌گیرد و از این نظر کمترین بار اقتصادی ممکن را به سیستم تحمیل می‌کند. از جمله روش‌های موجود می‌توان به سنسورهای لرزش، دما، صوت، حرارت، شار و یا نمونه برداری از جریان فاز استاتور به منظور آشکارسازی عیوب موتورهای القایی اشاره کرد. با توجه به این توضیحات در این مقاله روشی مبتنی بر تحلیل آماری سیگنال لرزش جهت تشخیص ایرادات مکانیکی موتور القایی پیشنهاد شده است. روش پیشنهادی با مقایسه تابع چگالی احتمال سیگنال لرزش موتور القایی سالم و معیوب و استفاده از معیار کولبک لیبلر می‌تواند با درصد درستی بسیار مناسب ایراد موتور القایی را تشخیص دهد. در انتها روش پیشنهادی بر روی مجموعه‌ای از ایرادات بیرینگ بر روی یک پایگاه داده استاندارد بررسی و درصد درستی و سرعت بسیار بالای آن (هم از نظر یادگیری و هم از نظر محاسبه ویژگی‌ها) با آخرین روش‌های موجود مقایسه و کارایی آن اثبات شد.

### کلید واژه

سیگنال لرزش، موتور القایی، معیار کولبک لیبلر، تشخیص ایراد.



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## A Survey of Deep learning in Advancing Steel Industry Standards

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### Abstract

The global significance of the steel industry as an economic cornerstone cannot be overstated, with its pivotal role in construction, automotive manufacturing, and pipe production. This paper investigates the transformative influence of deep learning, encompassing machine vision and artificial intelligence, on elevating performance standards within the steel industry. The industry's critical contribution to manufacturing building materials, automotive components, and high-value energy and fluid transmission pipes underscores the need for continuous technological evolution. Machine vision and artificial intelligence have emerged as pivotal catalysts in the pursuit of precision data analysis and enhanced industrial performance. This research explores the escalating importance of these technologies, elucidating their substantial impact on refining industrial processes within the steel sector. Recognized as powerful instruments for progression and optimization, machine vision and artificial intelligence contribute significantly to the industry's technological landscape. This study comprehensively reviews pertinent articles to delve into the myriad applications of machine vision and artificial intelligence in the steel industry. By scrutinizing the latest developments and applications, the paper aims to provide a thorough understanding of how these technologies are actively shaping the industry's landscape. The findings underscore the instrumental role of deep learning in augmenting efficiency, fostering innovation, and ultimately advancing the standards of the steel industry on a global scale.

**Keywords:** Artificial Intelligence, Energy and Fluid Transmission, Steel Industry, Machine Vision, Industrial Performance.



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## Systematic Analysis of Effective Segmentation and Classification for Land Use Land Cover in Hyperspectral Image using Deep Learning Methods: A Review of the State of the Art

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This review paper delves into the intricate realm of segmenting and classifying Hyperspectral Images (HSI), complex visuals spanning numerous electromagnetic spectrum bands. HSI, garnering significant research attention, holds pivotal roles in geospatial applications, notably Land Use/Land Cover (LULC) mapping, demanding precise object identification. Addressing challenges posed by imbalanced data and limited labelled examples, the survey scrutinizes how researchers navigate HSI segmentation and classification. Briefly touching upon the foundational background of these techniques, the study navigates through diverse processing methods—thresholding, clustering, watershed, Deep Learning (DL), and others. Systematically exploring literature trends, DL advancements, attention mechanisms, data types, achieved accuracies, and existing weaknesses, it strives to guide future research. Critically evaluating current knowledge, the paper illuminates' gaps in HSI segmentation and classification, culminating in discussions on pertinent issues and prospective projects in this domain. Ultimately, this work aims to propel advancements by addressing knowledge lacunae and charting potential pathways for upcoming research initiatives.

**Keywords:** Deep Learning.



## Forecasting the Number of Infections and Deaths due to Alpha and Delta Variants of COVID-19 using ARIMA and Prophet Models

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### Abstract

COVID-19 is an infectious disease caused by the most recently discovered Coronavirus. Despite four years of study on the characteristics of this virus since its emersion in 2019, lots of questions have been left unsolved. In this study, we extend examining the predictive power of statistical models in capturing dynamics of COVID-19 in Alpha and Delta variants in the three geographical regions of country of Iran, continent of Asia, and the world. We use the models of ARIMA and Prophet to predict the number of infections and deaths due to the aforementioned variants. The results show that ARIMA is superior to Prophet in the majority of predictions. This model is further superior to the newly LSTM models proposed for predictions in the same situation. We also provide a simulation of the spread of COVID-19 pandemic in Alpha and Delta variants in a test environment, to further illustrate the differences in the nature of the two variants.

**Keywords:** COVID-19, Alpha, Delta, Variants, ARIMA, Prophet, Prediction





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## An IoT-based smart biosensor for the measurement of nitrate concentration in liquid samples

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### Abstract

Various enzymatic bioanalytical sensors have been developed for the specific and sensitive detection of nitrate on the basis of enzymatic nitrate to nitrite reduction. Since the enzyme immobilized on the surface of the electrode of the biosensor is a living organism and its activity reduces over time, it needs to be replaced frequently, limiting its application as a portable device. Moreover, embedding a data storage element and processor for decision-making based on machine learning in the structure of the device to consider the enzyme activity during the nitrate estimation increases its costs, undesirable for mass production. In this work, a cost-effective smart nitrate biosensor is introduced that benefits from an IoT platform. The electrochemical characteristics of the samples along with the enzyme's lifespan are transmitted to a server where a support vector machine with hyperparameters optimized by the slime mold algorithm predicts the nitrate concentration in the samples, followed by sharing the results with the clients. The results showed that the machine learning unit is capable of predicting the nitrate concentration with  $R^2$  and MSE of 0.92 and 0.036, respectively, three weeks after immobilizing the nitrate reductase on the surface of the biosensor's electrode. Besides, the IoT platform developed in this study can reduce the cost of the smart portable nitrate biosensors by ca. 25% due to considering a unique decision-making unit in the server instead of considering a processor capable of implementing machine learning tasks for each sensor. This can also be useful to gather all information from the nitrate sensors for environmental pollution monitoring on a large scale.

**Keywords:** Enzyme, machine learning, support vector machines, intelligent biosensors



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## Res-U-Net-Based Sleep Arousal Detection Using Limited Polysomnography Channels and Multi-Step Training Techniques

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### Abstract

Sleep arousal, a type of sleep disorder, occurs when one wakes up and then goes back to sleep. It is crucial to assess the frequency and duration of sleep arousals to determine sleep quality. Sleep arousal is mainly divided into two categories. The first category is caused by apnea and hypopnea, while the second category is attributed to factors unrelated to apnea and hypopnea. Identifying the latter type can be challenging in a clinical setting as it is relatively concealed. While current methods provide satisfactory results in identifying arousals caused by apnea, the ongoing challenge in sleep research lies in accurately identifying arousals that are not associated with apnea. In this paper, we proposed an automatic non-apnea sleep arousal detection algorithm based on polysomnography (PSG) data. As sleep-related physiological signals impact natural sleep, reducing the number of recording sensors can enhance sleep quality. Thus, we have developed an advanced deep-learning architecture that uses 7 crucial signals from the 13 PSG channels as input. This architecture combines residual blocks with U-Net's encoder and decoder layers to improve detection accuracy by considering local and global features simultaneously. We used datasets from the Public Cardiology Challenge 2018 to validate our approach. To tackle the problem of imbalanced data, we utilized the Synthetic Minority Over-Sampling Technique (SMOTE) to increase the representation of the minority class. Additionally, we enhanced our model's performance by incorporating multi-step training techniques. Our results highlight how the algorithm efficiently



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detects non-apnea arousal using fewer signals. Our algorithm achieved the area under the receiver operating characteristic (AUROC) of 0.869 and the area under the precision-recall curve (AUPRC) of 0.433, outperforming other studies that did not incorporate electromyogram (EMG) and electrooculogram (EOG) signals.

**Keywords:** sleep arousal, polysomnography, non-apnea, deep learning, residual blocks



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## An Intelligent Controller Assignment Method for QOS and Reliability Improvement in SDN-Smart Grid

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### Abstract

Smart grid as the extended form of a traditional electricity network facilitates two-way energy supply through digital communication. In this new scheme, a lack of real-time reaction to any malfunction may disrupt the entire network. Consequently, an efficient communication network for providing the smart grid quality of service requirements and ensuring reliability is imperative. Software-defined networking improves quality of service of time-critical smart grid services by separating data and control plane. Also, proper controller placement in software-defined networking is an inevitable prerequisite for meeting quality of service requirements. So, here a quality of service-aware reinforcement learning based method is proposed for controller placement in software-defined smart grid networks. Also, improving smart grid reliability is another concern during controller placement process. Quality of service amendment of time-sensitive services in smart grid and reliability improvement are the superiorities of the paper over similar methods.

**Keywords:** Neighborhood Area Networks, Quality of Service, Reliability, Smart Grid, Software-defined Networking.



# تخمین مکان تطبیقی توسط ترکیب الگوریتم K- نزدیکترین همسایه و شبکه عصبی عمیق بر مبنای روش اثر انگشت در محیط داخلی

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چکیده

- در سالهای اخیر فناوری اطلاعات و ارتباطات به سرعت توسعه یافته است و در نتیجه آن سرویسهای خدماتی متعددی پدیدار شدهاند. از جمله در محیط داخلی سیستمهای رهگیری با تجزیه و تحلیل متنوع تر دادههای مکانی منجر به نتایج بهتر در سرویسهای امنیتی و تجاری شدهاند. متأسفانه دادههای اندازه گیری شده در محیط داخلی به اندازه کافی دقیق نیست؛ زیرا محیط داخلی بسیار بیشتر آلوده به نویز است. در تحقیق پیش رو یک رویکرد جدید به منظور تخمین مکان در محیط داخلی که می تواند به طور تطبیقی پردازشی مناسب را توسط دادههای پایگاه داده اثر انگشت با توجه به سیگنالهای جمع آوری شده اتخاذ کند، پیشنهاد شده است. رویکرد پیشنهادی توسط الگوریتم K- نزدیکترین همسایه یک ناحیه حضور گره هدف توسط مقایسه سیگنالهای دریافتی با پایگاه داده اثر انگشت تعیین می کند که این امر منجر به افزایش دقت تخمین مکان توسط شبکه عصبی عمیق می شود. شبکه عصبی عمیق اطلاعات ناحیه تعیین شده و سیگنالهای دریافتی توسط گره هدف را که آلوده به نویز هستند در لایه های مخفی خود مورد پردازش قرار



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می‌دهد و منجر می‌شود رویکرد تخمین مکان به طور تطبیقی و با دقت مطلوب در محیط به موقعیت‌یابی بپردازد. نتایج معیارهای ارزیابی نشان‌دهنده صحت رویکرد پیشنهادی است.

## کلید واژه

الگوریتم  $K$ -نزدیک‌ترین همسایه، روش اثرانگشت، شبکه عصبی عمیق، محیط داخلی



## طراحی و شبیه سازی آنتن مستطیلی میکرواستریپ دو بانده با زمین ناقص برای کاربردهای مبتنی بر Wi-Fi و BlueTooth با استفاده از شبکه عصبی

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### چکیده

در این مقاله، با آموزش دادن یک شبکه عصبی مصنوعی با انتشار بازخورد پیشرو همراه با الگوریتم بهینه‌سازی *Levenberg-Marquardt* که شامل ۱۰ نورون عصبی است، یک آنتن مستطیلی میکرواستریپ با زمین ناقص طراحی شده است. هدف از این طراحی، پوشش همزمان کاربردهای *Bluetooth* با فرکانس ۲/۴ گیگاهرتز و *Wi-Fi* با فرکانس ۵ گیگاهرتز است. بعلاوه جهت ایجاد تطبیق امپدانس مناسب، از خط میکرواستریپ ربع طول موج جهت تغذیه استفاده می‌شود. مزیت استفاده از ساختار زمین ناقص، کاهش ابعاد آنتن می‌باشد. ساختار این آنتن شامل یک زیر لایه با ثابت دی الکتریک ۲/۹۴ و تانژانت تلفات ۰/۰۰۱۲ می‌باشد که در ابعاد ۸۰ در ۸۲ میلی‌متر مربع طراحی شده است. ساختار آنتنی بدست آمده از شبکه عصبی پیاده شده در برنامه *Matlab* با ۷۴ نمونه جهت آموزش، حاصل شده است. بعلاوه، تلفات بازگشتی و الگوی تشعشعی آنتن نهایی بکمک برنامه *CST* شبیه سازی شده است.

کلید واژه

هوش مصنوعی، شبکه عصبی، آنتن میکرواستریپ، آنتن دوباند



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## The Impact of Chatbots on Consumer Purchase Intent and Product Perception on Official Websites

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### Abstract

The motive of this paper is to explore the extent to which communicate with a talk-bot on an official internet site can change the fee perception of merchandise and affect the client buy goal. The observe additionally investigates the position of chatbots on brand familiarity and the have an effect on of preceding revel in of interaction with chat-bots on purchaser shopping for intention. two laboratory experiments were performed to evaluate the effect of chatbot use on consumer purchase aim. Chatbots on net-sites shift the cost belief of hedonic and utilitarian goods closer to respectively utilitarian and hedonic values. Chatbots make a contribution to the brand cognizance decreasing the effect of familiarity on the client buy intention. retailers must include effective chatbots at the same time as operating and designing shopping websites to stimulate the shopping intention of customers. companies must layout and carefully man-age chatbots by way of tracking user involvement and first-class of patron enjoy with a purpose to feed a calibrated continuous development process on employer goals. The paper represents a first step method in addressing e-service dealers towards the web customer purchasing revel in. digital assistants can also trade the online shop-ping context increasing the hedonic price experience but on the equal time reducing the time for selection making by using reinforcing the utilitarian fee belief of the utilitarian and hedonic merchandise.

**Keywords:** Chatbot, Conversational commerce, customer buy intention, cost perception, brand familiarity





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## Efficient Mapping and Improved Visual Representations in Multimodal Systems using the Visual Extractor

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### Abstract

The integration of visual perception and linguistic description is a significant challenge in computer vision. This paper introduces an enhancement to the Generative Image-to-text Transformer (GIT) model, which combines a vision encoder and a text decoder to process and interpret image features. To further enhance the model's capabilities, we propose a novel module called Visual Extractor, inspired by the Perceiver model—a scalable, attention-based architecture capable of processing diverse input types such as images, audio, and text through cross-attention mechanisms with a set of latent variables. By leveraging the Perceiver's ability to handle inputs of different sizes, the Visual Extractor aims to enhance the semantic representation of images while optimizing computational efficiency. It operates by resampling the output sequence from a transformer encoder into a fixed array of tokens. This paper discusses the design of the GIT model, the integration of the Visual Extractor module, and the future implications of this integration for image-text representation learning.

**Keywords:** Multimodal processing, Image-text integration, Semantic visual representations, Computational efficiency



## Generative-AI in E-Commerce: Use-Cases and Implementations

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### Abstract

In recent years, the advancement of generative AI has profoundly influenced its application across various industries. One such industry is e-commerce where this technology can enhance both customer experience as well as merchants' productivity and profitability. In this paper, our objective is to review some of the potential use cases of generative AI technology in different areas of an online store. Specifically, we will focus on the use cases of product description generation, sentiment analysis of product reviews, and product tagging and categorization. We utilize various prompt engineering techniques to suggest exemplary implementations of these applications using large language models (LLMs). Lastly, the paper will discuss the possible risks and challenges that come with using generative AI in these contexts.

**Keywords:** product description, taxonomy, generative AI, large language models (LLMs), e-commerce, product reviews



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## Transforming the Energy Sector: Unleashing the Potential of AI-Driven Energy Intelligence, Energy Business Intelligence, and Energy Management System for Enhanced Efficiency and Sustainability

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### Abstract

This manuscript aims to explore the utilization of artificial intelligence (AI)-driven energy intelligence, energy business intelligence, and energy management systems to enhance efficiency and sustainability within the energy sector. The transformation of the energy sector is imperative to address the global challenges posed by climate change and energy demand. To achieve this, it is crucial to harness advancements in AI technology and leverage its potential to revolutionize energy systems. This manuscript presents a comprehensive study investigating the integration of AI and energy management systems to optimize energy consumption and improve sustainability, while also analyzing the potential benefits and challenges associated with its implementation. The findings emphasize the importance of adopting AI-driven energy intelligence and business intelligence methodologies to optimize energy generation, foster sustainable practices, and achieve energy efficiency targets for a greener and more sustainable future. In this regard, Energy Intelligence (EI), Energy Business Intelligence (EBI), and Energy Management System (EMS) are being considered and addressed.

**Keywords:** Artificial Intelligence (AI), Energy Intelligence (EI), Energy Business Intelligence (EBI), Energy Management System (EMS), Enhanced Efficiency, Sustainability



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## An opposition-based learning election algorithm for UAV placement in 3D space

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### Abstract

Unmanned aerial vehicles (UAVs) are important tools to realize smart city applications due to their maneuver-ability and versatility. Recently, some machine learning methods were proposed for UAV placement and achieved encouraging results. However, the reported performances in literature are not ideal and there is room for more improvement in the field. As an element of research, this paper presents a novel oppositionbased learning election algorithm (OBLEA) algorithm for UAV placement. With a test on ten benchmark placement scenarios, the proposed OBLEA algorithm is proven to generate better results than counterpart algorithms and is a competitive method for UAV placement.

**Keywords:** Unmanned aerial vehicle (UAV) placement, Machine learning, Opposition-based learning, Election algorithm (EA), OBLEA algorithm.



## EEG Anomaly Detection using Generative Adversarial Networks (GANs)

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### Abstract

Abnormality is the unusual behavior or feature of a sample compared to the whole population. In medical applications, the task of anomaly detection is meritorious in early or in-time diagnosis of diseases by detecting disease markers in for example different neuroimaging data such as Electroencephalogram (EEG) etc. Anomaly detection approaches include supervised, unsupervised, and semi-supervised machine learning algorithms. However unsupervised and semi-supervised approaches are more preferred due to the arduous task of labeling the data and due to the intrinsic unknown definition of anomaly. The development of applications of generative adversarial networks in recent years has made them a competent tool for anomaly detection problems. They learn (normal) data distribution and detect anything different as an anomaly. The task of EEG anomaly detection is one proposed interdisciplinary problem that can have applications in early pathology detection as a starting point for later treatment plans, or in brain-computer interface studies. In this work, we used a generative adversarial model and an image representation of EEG data to detect abnormal EEG samples. The whole pipeline and the results indicate the proper standing of this approach among peers on Temple University Hospital's (TUH) abnormal EEG corpus data set.

**Keywords:** EEG, Anomaly Detection, GAN, Generative Adversarial Networks, Ganomaly



## Dual Cross-Attention Parkinson's Disease Classification Using Vocal Feature Sets

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### Abstract

Parkinson's disease is a disabling condition that affects the quality of life of individuals with both motor and non-motor symptoms. Auditory disorders are one of the nonmotor symptoms that individuals will face in the early stages of the disease. Therefore, the use of vocal features for early detection of Parkinson's disease is a crucial aspect of diagnosis. This paper presents a novel approach to Parkinson's disease diagnosis using vocal features and advanced neural network architectures. In this study, a structure based on dual cross-attention is introduced that combines features extracted from time-frequency representations, specifically the Wavelet Transform (WT) and Tunable Q factor Wavelet Transforms (TQWT), describing both temporal and frequency features of the audio signal simultaneously. Ultimately, a self-attention block is responsible for determining the class assignment. The results demonstrate that the proposed network performs well compared to existing networks in the context of Parkinson's disease diagnosis.

**Keywords:** dual cross-attention, Parkinson's disease classification, vocal features, Wavelet Transform, Tunable Q factor Wavelet Transforms



## A Transfer-Learning-based Strategy for Autonomous Driving: Leveraging Driver Experience for Vision-Based Control

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### Abstract

This paper explores the utilization of a novel transformer-based architecture for end-to-end learning in predicting steering angles in self-driving scenarios while leveraging a novel robust image processing pipeline to handle diverse environmental situations. Our approach relies solely on visual perception as the input to generate control commands. We trained and evaluated our methodology using a proprietary dataset from a self-driving car simulator consisting of image frames paired with their corresponding steering angles. The presented methodology is robust against overfitting, and it shows superior performance in terms of Mean Squared Error (MSE) and Mean Absolute Error (MAE) compared to previous methods.

**Keywords:** Self-Driving Cars, Autonomous Driving, Vision Transformer, Control, Behavioral Cloning, Computer Vision, Image Processing, Imitation Learning, Transfer Learning



## Diagnosing thyroid-associated ophthalmopathy with AI algorithms based on facial images: a review

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### Abstract

Thyroid-associated ophthalmopathy (TAO) is a common orbital disease that can cause visual impairment and affect patients' appearance, hindering them from being able to work. This article provides the most up-to-date information on the use of artificial intelligence (AI) for the diagnosis of TAO. This research particularly focuses on using facial image-based artificial intelligence for early disease diagnosis and timely treatment, as these are the two most developed fields. In search of the latest innovations, we reviewed only the most recent publications of specific types published from 2000 to 2024. Eventually, we selected the five most relevant ones for our work. In all the reviewed studies, artificial intelligence algorithms were compared with experts, and they reached acceptable results. In conclusion, there is significant potential for the use of artificial intelligence in the early diagnosis of TAO in the future.

**Keywords:** Artificial intelligence, Thyroid-associated ophthalmopathy, Diagnosis, Facial image, orbital disease.





## هوشمندسازی ساختمان، راهکاری در جهت کاهش اتلاف مصرف انرژی

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چکیده

آگاهی از بحران‌های ناشی از مصرف بی‌رویه انرژی‌های فسیلی بر محیط زیست و بحث هزینه‌های مصرف سوخت در ساختمان‌های مسکونی، انسان‌ها را متوجه اهمیت بحران کرده است. در این راستا، در جهت کاهش مصرف انرژی، طراحان و مهندسان با پیشرفت‌هایی که در حوزه تکنولوژی و فناوری به وجود آمده، به سمت روش‌های هوشمندسازی و سیستم مدیریت ساختمان (BMS) رفته‌اند. معماری هوشمند، نگرش جدید برخی از مهندسين معمار به آینده ساختمان‌سازی است. ساختمان‌هایی که قادر هستند خود را با شرایط محیطی داخل و خارج بنا تطبیق دهند در سیستم مدیریت ساختمان بسیاری از اعمالی که ساکنان از روی عادت و بصورت غیرارادی انجام می‌دهند، توسط سیستم‌های هوشمند انجام می‌گردد که باعث صرفه‌جویی در زمان و هزینه نیروی انسانی شده به علاوه کاهش مصرف انرژی، کاهش خطاپذیری و افزایش اثربخشی سیستم و در نتیجه پایداری را به دنبال دارد. در این مقاله سیستم مدیریت انرژی در ساختمان و روش‌های پیاده‌سازی آن بیان می‌گردد.

### کلید واژه

ساختمان هوشمند، سیستم BMS، مدیریت مصرف انرژی

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Computer Society of Iran

# 20th CSI International Symposium on Artificial Intelligence and Signal Processing

(AISP 2024)

Mazandaran University of Science and Technology, Babol, Iran. Feb 21-22 2024



Mazandaran University of Science and Technology

## Call for Paper:

Mazandaran University of Science and Technology and Computer Society of Iran are holding the 20th international symposium on artificial intelligence and signal processing with aim of developing artificial intelligence and signal processing knowledge and technology. All the professors, students and researchers are invited to participate and promote this prestigious event by sending their specialized articles around the following tracks.

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1 Machine Learning

2 Deep Learning

3 Natural Language Processing

4 Computer Vision

5 Data Mining and Analytics

6 Intelligent Systems

7 Signal Processing and Filtering

8 Robotics and Automation

9 Human-Machine Interaction

10 Computational Cognitive Science

11 Applications of Artificial Intelligence and Signal Processing

## Website:

## Important Dates:

## Organizing Committee:



[aisp2024.ustmb.ac.ir](http://aisp2024.ustmb.ac.ir)

**Paper Submission Deadline:**

**January 8 2024**

**Workshop Registration Deadline:**

**January 20 2024**

**Notification of Acceptance:**

**January 30 2024**

**Registration Deadline:**

**February 6 2024**

**Symposium Date:**

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