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# BOOK ABSTRACT



كلية العلوم والتقنيات بني ملال  
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Faculté des Sciences et Techniques de Beni Mellal



## Chairs of CBI'22 :

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## Preface

In 2022, we had the great opportunity to organize the 7th edition of the International Conference on Business Intelligence (CBI 2022). The conference has grown to be a reputable event for the scientific and business communities. This book of proceedings collects papers accepted for presentation at CBI 2022.

CBI 2022 was organized by the Faculty of Sciences and Techniques (FST) and the laboratory of Information Processing and Decision Support (TIAD) at Sultan Moulay Slimane University along with the Association of Business Intelligence (AMID), and held during May 26–28, 2022, in Khouribga, Morocco.

For this edition, we received 68 submissions, which were reviewed by a Program Committee of 72 international experts in various fields related to business intelligence and decision support. Out of these submissions, the Program Committee decided to accept 23 regular papers, yielding an acceptance rate of 33.8%. The contributions are organized in topical sections: Decision Support and Artificial Intelligence; Business Intelligence and Database; and Optimization and Dynamic Programming.

As program chairs of CBI 2022 and editors of these proceedings, we would like to thank the President of Sultan Moulay Slimane University and the Dean of the Faculty of Sciences and Techniques for their support to the conference. In addition, we want to warmly thank again all the authors for their high-quality contributions and all the Program Committee members for their invaluable hard work. We also sincerely thank our keynote speakers for sharing their precious insights and expertise. Finally, our special thanks go to the Organizing Committee and to all the local arrangements coordinators. We cordially invite you to visit the CBI website at <https://www.cbi-bm.com/> and to join us at future CBI conferences.

Organizing committee Chairs

Mohamed FAKIR

Mohamed BASLAM

Rachid EL AYACHI

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## Papers Abstracts

<b>Section_01: Decision Support and Artificial Intelligence</b>
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### **Optimization Focused On Parallel Fuzzy Deep Belief Neural Network For Opinion Mining**

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**Abstract**— In this work, we propose a new parallel fuzzy deep belief neural network for sentiment analysis. We have applied several prepro-cessing tasks to enhance data quality and remove noisy data. Then, we have applied a semi-automatic data labeling over the dataset by com-bining two techniques: Vader lexicon and Mamdani's fuzzy system. In addition, we have used four extraction techniques, which are: TFIDF (Unigram), TFIDF (Bigram), TFIDF (Trigram) and GloVe in order to represent each tweet by numerical vector. Further, we have implemented three feature selection techniques which are : The mutual information approach, the chi-square method and the ANOVA technique. Finally, we have applied the deep belief network as classi\_er in order to classify each tweet into a neutral, negative or positive and our hybrid parallel deep-fuzzy belief neural network is deployed in a parallel design employing the Hadoop framework to overcome the issue of long runtime of huge data sets. Also, a comparisons of the proposed model's e\_ectiveness with other existing models in the literature is carried out and the experimental results shown that our suggested parallel fuzzy model surpasses the baseline models by a considerable margin in terms of recall, runtime, F1 score, accuracy, error rate and precision.

**Keywords**—: Deep belief neural network, Sentiment analysis, Hadoop, HDFS, MapReduce, Selectors of features, Extractors of features, Fuzzy logic

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**A Convolutional Neural Networks-Based Approach  
For Potato Disease Classification**

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**Abstract**— Identifying the various diseases that affect potato plants is a fundamental thing for farmers to avoid losses every year. Among them, there are two common diseases known as early blight and late blight. The early detection of these diseases then the application of the appropriate treatment can prevent economic loss and save a lot of waste. The treatments for early blight and late blight are different thus it's important that we should accurately identify what kind of disease is in every potato plant. In this work, using deep learning, we propose a model that seeks to classify these potato plant diseases based on convolutional neural networks using one of the most widely used datasets. The model should be a solution that enables farmers to identify the early blight and late blight diseases present in their potato plants thus they can choose the appropriate treatment.

**Keywords**— Precision agriculture, Potato disease classification, Potato leaf blight, Convolutional neural networks, Deep learning

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**Performance Investigation of a Proposed CBIR Search Engine Using  
Deep Convolutional Neural Networks**

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**Abstract**— During the last decade, the volume of image databases and collections has significantly increased. Further, most current image retrieval systems are moving from traditional methods, which are mainly metadata-based approaches, to Content-Based Image Retrieval (CBIR) approaches. These latter use an image as an input query without considering any metadata associated with the image. Generally, a CBIR-based system extracts visual features such as color, image edge, and texture to search and retrieve similar images. Our goal is to develop a fast and accurate CBIR-based search engine. In this paper, we investigated the performance of two Convolutional Neural

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Networks (CNN) models, namely VGG16 and MobileNet, in a real-life project environment. Further, we used both Faiss and Annoy libraries for indexing and similarity search, while the Principal Component Analysis (PCA) technique is applied for reducing the dimensionality of the feature vector space. From the experiments, we found that the VGG16 and MobileNet models differ in terms of precision, recall, and response time recorded. However, they both have succeeded in supporting the CBIR-based search engine.

**Keywords**— CBIR Search Engine, Convolutional Neural Networks, VGG16, MobileNet, Faiss, Annoy, Principal Component Analysis

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### **Decision Boundary to improve the sensitivity of deep neural networks models**

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**Abstract**— In spite of their performance and relevance on various image classification fields, deep neural network classifiers encounter real difficulties face of minor information perturbations. In particular, the presence of contradictory examples causes a big weakness and insufficiency of deep learning models in many areas, such as illness recognition. The aim of our paper is to improve the robustness of deep neural network models to small input perturbations using standard training and adversarial training to maximize the distance between predict instances and the boundary decision area. We shows the decision boundary performance of deep neural networks during model training, the minimum distance of the input images from the decision boundary area and how this distance develops during the deep neural network training. The results shows that the distance between the images and the decision boundary decreases during standard training. However, adversarial training increases this distance, which improve the performance of our model. Our work presents a new solution to the deep neural networks sensitivity problem. We found a very strong relationship between the efficiency of the deep neural networks model and the training phase. We can say that the efficiency is created during training, it is not predetermined by the initialization or architecture.



**Keywords**— Deep neural network, boundary decision, adversarial training, image classification

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### **Facial Expression Recognition Using a Hybrid ViT-CNN Aggregator**

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**Abstract**— Facial Emotion Recognition (FER) is an important and challenging task in computer vision due to different issues such as quality of images, the correlation between same expression, computational complexity, and it requires a large amount of data. This paper presents a novel approach to the FER task. We are motivated by the success of Vision Transformer (ViT) and the Convolutional Neural Network (CNN) on image classification in general and facial emotion recognition.

The Swin Transformer (ST) is a hierarchical transformer that uses shifted windows to compute representation. The advantages of ST include limiting self-attention computing, and has linear computational complexity to image size. This paper studies and compares both ST and Deep CNN architecture when merged by different merging layers. The proposed approach is tested on the FER2013 and CK+ data sets. Experimental results demonstrate the high performance of the Average Merging Layer (AML), and our method outperforms state-of-the-art methods on FER2013 and CK+.

**Keywords**— Convolutional Neural Network (CNN), Transformers, Facial Emotion Recognition (FER)

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### **Machine Learning Approach to Automate Decision Support on Information System Attacks**

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**Abstract**— As more software solutions are now cloud based taking advantage of the powerful computing performance of remote servers and super computers, the machine learning industry is also switching to this technology

providing promising solutions such as Google Cloud Artificial Intelligence, Amazon Web Services, and Microsoft Azure Machine Learning. With the adoption of the cloud technology for nowadays computer transactions and operations, a cloud IDS solution that can compete with the emerging technology challenges is crucially needed to help network administrators secure data and prevent any intrusions. The machine learning approaches often require high computing performance and gigantic memory space to process mega datasets and come up with better prediction results. This paper introduces a new aspect of using cloud-based machine learning solution as an online computing resource for the application of machine learning concepts to predict intrusions in IDS systems based on network packet behavior, while the traditional way is to use local computer resources through data mining solutions such as Weka or Orange. We used Microsoft Azure Machine Learning Studio along with CSE-CIC-IDS 2018 dataset from the Canadian Institute for Cyber Security to apply various techniques and algorithms to come up with a powerful network model. The aim of this paper is to explain how a cloud-based data mining tool can be used for its better performance and high accuracy for data mining and building a strong intrusion detection system. As a start point, we used a saved dataset that contains a collection of anomaly detection records applied on an IDS while various attributes are registered. To differentiate between normal and anomalous traffic, two profiles are used: B-profile and M-profile to generate benign and malicious traffic respectively in the network.

**Keywords**— Intrusion Detection System, Machine learning, Deep learning, Neural network, Azure ML Studio, Multi Class Regression, Multi Class Neural Network.

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### **Deep Reinforcement Learning for Bitcoin Trading**

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**Abstract**— Arti\_cial intelligence (AI) is showing its success in various types of applications. Motivated by this trend, automatic trading has taken a keen interest in applying of arti\_cial intelligence methods to predict the future price of a \_nancial asset to overcome trading challenges including asset price

uctuations and dynamics, Investors must therefore understand when it is appropriate to use the optimal strategy that maximizes their investment return. But achieving a perfect strategy is difficult for an asset with a complex and dynamic price. To overcome these challenges. In this study, we apply a new rule-based strategy technique to train one of the successful machine learning algorithms, known as Deep Reinforcement Learning (DRL) for bitcoin trading. Our proposed method is based on dueling double deep q-learning networks, proximal policy optimization, and advantage actor-critic to achieve an optimal policy. The profit reward functions and Sharpe ratio are used to assess the proposed DRL. The results of the experiments demonstrate that combining three agents is the most efficient strategy for automatic bitcoin trading.

**Keywords**— Markov decision process\_ deep reinforcement learning \_ dueling double deep q-learning networks \_ proximal policy optimization, advantage actor-critic

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### **An exploration of student grade retention prediction using machine learning algorithms**

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**Abstract**— Education is an important determinant of nation that succeed, nowadays, artificial intelligence algorithms have been applying practically in all field of science. As a result, learning analytics was born, referring to artificial intelligence techniques used in the field of education. The aim of this work is to build a machine learning models that can predict the student grade retention in K-9 grade. This work, first, applies six supervised artificial intelligence techniques, and validate them within four scenarios according the normalization and balancing of data in a second step, finally, these models was validated according to four recognized measures in order to choose the one that fit very well. The final purpose of our work is to contribute to the education field, we achieve this by providing some new idea where we have applied machine learning algorithms in grade retention research issue.

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**Keywords**— grade retention, prediction, machine learning algorithms

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**DEEP LEARNING MODEL FOR EDUCATIONAL RECOMMENDER SYSTEMS**

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**Abstract**— Research in the field of recommender systems is evolving rapidly and these systems are increasingly being applied to specific domains, including educational technologies. In the field of education, in general, recommender systems are used to improve the processes of online learning and teaching. However, with the growth in the number of educational resources and their diversities, the problem of information overload is becoming increasingly critical. Therefore, providing learners with personalized educational recommendation tools is a necessity. The objective of this work is to propose a new approach to recommend resources to students according to their preferences. This recommendation approach introduces a general framework called collaborative filtering (CF) based on neural networks, which complements classical models and machine learning algorithms such as KNN, SVD of collaborative filtering. The experiments we have performed prove the performance of the proposed approach.

**Keywords**— Collaborative filtering, Matrix factorization, Deep learning, Neural networks

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**Comparative Study of Deep Learning Models for detection and classification of intracranial hemorrhage**

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**Abstract**— Today's technologies have deeply influenced human health and daily life. Consequently, the health care process is widely improved to automate and detect diseases. Deep Learning and Transfer Learning classifiers are within emergent technologies that impact health care. In this paper, we used Transfer Learning and Convolutional Neural Network to classify and detect the Intracranial hemorrhage (ICH). The performance of the used classifiers is evaluated and compared on the Intracranial Hemorrhage Dataset that contains 2814 images. The results show that the detection accuracy of Transfer Learning with Inception V3, which achieves 88.97%, is superior to that of the Convolutional neural network.

**Keywords:** Deep Learning, classification, Convolutional Neural Networks

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<b>Section_02: Business Intelligence and Database</b>
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**Increasing Student Engagement in Lessons and Assessing MOOC Participants Through Artificial Intelligence**

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**Abstract**— In today's generation of MOOCs, videos are fundamental to the student learning experience. Due to the prominence of video content in MOOCs, production staff and instructional designers invest significant time and resources in creating these videos. With instructional videos, they want to increase student involvement. Without formative assessment, however, actual engagement is hard to quantify. Nonetheless, a large number of students necessitates a larger pool of questions; to address this issue, we considered mixing machine-learning methods with automatic natural language processing in order to expand the number of questions evaluated and ensure their validity. To accomplish this, we implemented a methodology that generates questions automatically from video transcripts. Following each course comes an evaluation issue, which is typically a multiple-choice question designed to measure a student's comprehension of the video's material.

machine-generated questions performed comparably to human-generated questions when it came to judging skill and resemblance. Additionally, the findings indicate that the majority of the questions generated improve e-assessment when the new technology is applied.

**Keywords**— massive open online courses, assessment, Automatic question generation, Computer Assisted Testing, Artificial Intelligence, Machine learning

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### **Mining frequents itemset and association rules in diabetic dataset**

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**Abstract**— Data mining is a field of science to extract and analyses the information from large dataset. One of the most techniques is association rule mining. It aim is to find the relationship between the different attributes of data. Several algorithms for extracting data have been developed. Among the existing algorithms the FP-Growth algorithm is one of well-know algorithm in finding out the desired association rules. The aim of this paper is the extraction of association rules by FP-Growth algorithm and its variants using a diabetic dataset, which are the CFP-Growth and ICFP-Growth. Experimental results show that the ICFP-Growth is more accurate than CFP-Growth and FP-Growth.

**Keywords**— Data mining, Association rules, frequent patterns, FP-Growth, CFP-Growth, ICFP-Growth.

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### **Automatic text summarization for Moroccan Arabic dialect using an artificial intelligence approach**

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**Abstract**— A major advantage of artificial intelligence is its ability to automatically perform tasks at a human-like level quickly; this is needed in many fields, and more particularly in Automatic Text Summarization (ATS). Several advances related to this technique were made in recent years for both extractive and abstractive approaches, notably with the advent of sequence-to-sequence (seq2seq) and Transformers-based models. In spite of this, the Arabic language is largely less represented in this field, due to its complexity and a lack of datasets for ATS. Although some ATS works exist for Modern Standard Arabic (MSA), there is a lack of ATS works for the Arabic dialects that are more prevalent on social networking platforms and the Internet in general. Intending to take an initial step toward meeting this need, we present the first work of ATS concerning the Moroccan dialect known as Darija. This paper introduces the first dataset intended for the summarization of articles written in Darija. In addition, we present state-of-the-art results based on the ROUGE metric for extractive methods based on BERT embeddings and K-MEANS clustering, as well as abstractive methods based on Transformers models.

**Keywords**— Text summarization, Extractive, Abstractive, BERT, T5, Transformers, Arabic, Moroccan dialect

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### **Automatic Change Detection based on the Independent Component Analysis and Fuzzy C-means Methods**

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**Abstract**— Change analysis, an automated process to measure the change on the Earth surface by jointly analyzing two temporally separated images, becomes a significant research domain to understand the changes in land-cover, it provides important knowledge and data to be used in many other fields such as land-cover analyses, mapping generation, planning traffics, etc. This paper describes and evaluates an unsupervised method for change detection in satellite images by following two major steps: The first step focuses on data reduction using the ICA algorithm to improve the efficiency of the classifier. The second step deals with the Fuzzy C-Means classification method to find specified clusters. Changed and unchanged areas are mapped

in a binary image. Three different datasets are used to evaluate the result performance of the proposed system, and experiments results show that the used approach can detect changes in multi-temporal satellite images with good accuracy. To show the effectiveness, the comparisons with some other methods from state-of-the-art are shown on multitemporal images captured by Radarsat1 satellite SAR on the Ottawa area.

**Keywords**— Change detection, Satellite images, ICA algorithm, Fuzzy c-means, Segmentation

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### **Sentiment analysis decision system for tracking climate change opinion in Twitter**

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**Abstract**— Global warming or climate change is one of the most trend topics of the decade in the world, according to scientists the earth is getting warm more every year, hence people are more and more complaining about this phenomenon, some of them believe that climate change is happening, and we should worry and act about it. Despite that, the Intergovernmental Panel on Climate Change (IPCC) confirms that global warming is real and causes climate change, the majority of people are still in doubt about that, this group is generally called deniers or skeptics who think that it is not real and not caused by human. This group of people is costing a lot for countries, by affecting others who think that we should take corrective actions toward global warming. Thus, it is required to create models that identify the impact of people's thoughts to help governments for achieving better control of their citizens. In this work we present a new model for analyzing public opinion on social media platforms especially Twitter about climate change subject, we adopted the Sentiment Analysis technique, which is a field of natural language processing, we provided an effective model based on Convolutional Neural Network (CNN) for detecting people's reviews on climate change in social media platforms. Our model may assist decision-makers in producing



appropriate strategies to ameliorate the impacts of the climate change phenomenon.

**Keywords**— Twitter, Sentiment Analysis, Climate change

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### **Analysis of Decision Tree Algorithms for Diabetes Prediction**

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**Abstract**— Data Mining (DM) is a helpful tool to extract and exploit the information from a large data set. There are different methods and algorithms available in data mining field. Several DM algorithms are used for classification such as Artificial Neural Network (ANN), K-Nearest Neighbor (K-NN), etc. The Decision Tree (DT) mining remains the best algorithm. In this paper, different classification methods including decision tree, C-RT, C5.0, AD-Tree and CS-MC4 algorithms are presented. These algorithms are evaluated using Recall, precision and F-measure. Experimental results show that AD-Tree is faster and present higher accuracy than the other classifier using a Diabetes data set.

**Keywords**— Data Mining technique, Classification techniques, Decision tree, C5.0, C-RT, AD-Tree, CS-MC4, diabetes dataset

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### **How far can Deep Learning improve Arabic Part of Speech Tagging?**

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**Abstract**— The use of Deep Learning (DL) in Natural Language Processing (NLP) has seen a significant growth in the last few years. Part of Speech (POS) tagging is an important element for many NLP applications, including machine translation, sentiment analysis, and text summarization. It consists in identifying the very likely tag (noun, verb or particle, adverbs, adjectives etc.) for each word in a given text. The goal of this research is to conduct a systematic literature review of deep learning methods applied to Arabic POS tagging for the last two decades. The review was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses

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(PRISMA) framework. More than 4000 papers were reviewed to extract all DL approaches used to develop POS taggers for the Arabic language. After multiple exclusion steps 12 articles were selected for a full review. Results show that Long Short-Term Memory (LSTM) and its extension Bidirectional LSTM (Bi-LSTM) models are the most used DL techniques for Arabic POS tagging, and they give better results according to the reviewed papers.

**Keywords**— Neural network, deep learning, Arabic POS-tagger, ANLP, PRISMA

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### **Section\_03: Optimization and Dynamic Programming**

#### **Analysis of Several Algorithms for DOA Estimation in Two Different Communication Models by a Comparative Study**

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**Abstract**— Direction-of-arrival (DOA) is a critical parameter in array signal processing. The classical DOA estimation approaches are inefficient in applications such as underwater array processing because it consists of a high number of snapshots. In the recent advancement of technology, wideband signals are preferable to narrowband signals. Wideband signals can estimate DOAs more effectively with fewer side lobes and antenna elements. In this study, we compare the performance of DOA estimation for narrowband and broadband signals by evaluating the angular spectrum of the multiple signal classification (MUSIC) algorithm and the Capon method. We will estimate the spectral position using various parameters such as the number of antennas, and signal-to-noise ratio (SNR). In addition, we will look for the spectral peak location and calculate the final DOA. As a result, studying and analyzing wideband signals is crucial, particularly in applications such as 5G MIMO systems.

**Keywords**— DOA estimation, Narrowband signals, Wideband signals, Uniform linear array, MUSIC algorithm, Capon algorithm

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**A Novel hybrid Approach for improving the accuracy of the  
Supervised Link Prediction based on Graph Structure Features in  
Social Networks**

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**Abstract**— Now a day's, the analysis of social networks has grown significantly. Link prediction is a challenging issue in the social network analysis area, which uses existing network information in order to predict the future link. Many different link prediction techniques have been proposed in order to predict the future link in the network. Recently, supervised link prediction has become a growing field in which several research efforts have been made. In this context, this paper deals with a new hybrid approach to supervised link prediction based on the merging of local and global similarity methods. It attempts to improve the performance of supervised link prediction by combining various similarity measures. This research considers multiple topological features for training supervised machine learning classifiers. Practical implementation proved that the proposed approach revealed satisfactory results as compared to the existing methods. Our results show that using both local and global features outperforms similarity features when applied individually. Further, the hybridization of multiple features can achieve the highest accuracy.

**Keywords**— Social network, link prediction, feature extraction, hybrid model, Supervised Learning

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**Intelligent system based on GAN model for decision support in  
brain Tumor segmentation**

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**Abstract**— The most prevalent malignant brain tumors are gliomas, with a variety of grades, and each grade has a significant impact on a patient's chances of survival. Low-grade gliomas are usually found in the human brain and spinal cord. Low-grade glioma may be accurately diagnosed and detected early, lowering the risk of mortality for patients. In the examination gliomas of low grade, segmentation of MRI images is critical. The result, manual of Segmentation Techniques takes a long time and require a lot of pathology knowledge. in our study, we provide a unique generative adversarial network-based approach for segmenting images of tumors in the brain. The network is a structure between two neurons the generator and the discriminator. The generator is taught to construct an input mask of a take original image, The discriminator can tell the difference between the original and created masks, the end goal is to create masks for the input. The suggested model achieves a dice result of 0.97 in generalized experimental results from the TCGA LGG dataset, with a loss coefficient of 0.030, which is more effective and efficient than the compared approaches.

**Keywords**— TCGA-LGG, Deep learning, Segmentation, GAN

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### **Hospital room management for Covid-19 patients using Petri nets**

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**Abstract**— This paper treat the design of the sequence organization and then the optimization of a discrete event system (DES) modelled by Temporal Petri Net (T-PN) comprising a set of specifications corresponding to time intervals to activate or access another event. A Petri net is a well-known model that describes distributed systems. It is commonly used to describe various aspects of distributed systems, such as choice and synchronization.

This paper focuses on the organizing problems in the hospitalization domain during the Covid-19 pandemic. We advocate the use of a real time approach based on TemporalPN and mathematical modeling to help drive the healthcare system in the face of occurrence of this type of giving many

patients currently, which requires rethinking the predictive decision. The proposed solution permits to optimize the time to find all empty rooms using PN Temporal and the Dijkstra approach.

**Keywords**— Covid-19, Reachability graph RG, Discrete event system(DES), Timed Petri Net, Petri Net, Dijkstra

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**Dimensionality reduction of MI-EEG data via convolutional autoencoders with a low size dataset**

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**Abstract**— Electroencephalography has a poor spatial resolution, as experimental setups demand many electrodes around the motor cortex to reach the best results. Yet, it increases the data to be stored or transmitted in real-time for later uses. Thus, researchers have suggested autoencoders (AE) that transmit the compressed latent variable instead of the data itself. In this paper, we propose an AE and a Supervised Autoencoder (SupAE) designed for mobile applications treating Motor Imagery (MI). The introduced Encoder and Decoder derive from the previously published AMSI-EEGNet, a fast-to-train and lightweight architecture.

The results found that the proposed methods perform better than base-lines, especially for a high compression ratio (CR). Also, SupAE is a better option when the transmitted data needs classification. Further, we studied the evolution of the AE training and found that it learns similar features to previous studies.

**Keywords**— Data compression, Brain-Computer Interface, Electroencephalography, Convolutional Neural Network, Autoencoder

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**Car tracking technique for DLES Project**

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**Abstract**— Object tracking problem is considered as one of interesting area of research due to the large utilization of video surveillance systems these days. In this paper, a real-time tracking method based on HSV color space is proposed for car location detection in a specific area applied on surveillance videos. This method begins with pre-processing step in which a 3D to 2D transformation on the extracted tracking area is made in order to get the bird's eye view, alongside a bilateral filter or so-called edge preserving filter is used to reduce noises. Then, the following step is extracting the car's movement information by computing Structural Similarity Index between pre-extracted patches from frames side by side with Morphological operation for more noise removing. At the end, the obtained result is sent to a post-processing step in order to detect the location of the car and save their path for further treatment. The main goal of using this approach is to supervise Car Reverse Test (CRT) for driving license exam in Morocco which is the second part of the project called Driving License Exam Supervisor (DLES). The performance of the presented tracking system is evaluated on real surveillance scenes and shown in the experiments results. Experimental result demonstrates that the proposed method can generate a path similar to which is made by the vehicle with considerable level of efficiency for all possible situations compared to the ground truth.

**Keywords**— Object Tracking, Structural Similarity Index, Car Detection, Surveillance System, LMA, National Road Safety Strategy, Driving License Exam Supervisor

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