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Pořadové číslo: 1/10

ID publikace:	43877598
Stav:	Přijatý
Literární forma:	J_ ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	Multilayer Framework for Botnet Detection Using Machine Learning Algorithms
Rok publikace:	2021
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Název zdroje:	IEEE Access
Místo publikace:	PISCATAWAY
Číslo/kód:	February
ISSN:	2169-3536
Ročník:	9
Strany:	48753-48768
Abstrakt orig.:	<p>A botnet is a malware program that a hacker remotely controls called a botmaster. Botnet can perform massive cyber-attacks such as DDOS, SPAM, click-fraud, information, and identity stealing. The botnet also can avoid being detected by a security system. The traditional method of detecting botnets commonly used signature-based analysis unable to detect unseen botnets. The behavior-based analysis seems like a promising solution to the current trends of botnets that keep evolving. This paper proposes a multilayer framework for botnet detection using machine learning algorithms that consist of a filtering module and classification module to detect the botnet's command and control server. We highlighted several criteria for our framework, such as it must be structure-independent, protocol-independent, and able to detect botnet in encapsulated technique. We used behavior-based analysis through flow-based features that analyzed the packet header by aggregating it to a 1-s time. This type of analysis enables detection if the packet is encapsulated, such as using a VPN tunnel. We also extend the experiment using different time intervals, but a 1-s time interval shows the most impressive results. The result shows that our botnet detection method can detect up to 92% of the f-score, and the lowest false-negative rate was 1.5%.</p>
Počet stran:	16
Odkazy:	https://ieeexplore.ieee.org/abstract/document/9359784
Hlavní klíč:	Botnet; Servers; Malware; Command and control systems; Security; Encryption; Virtual private networks; Behavior-based analysis; botnet; flow-based feature selection; k-nearest neighbor; structure independent
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Multilayer Framework for Botnet Detection Using Machine Learning Algorithms
Datum vložení:	14.04.2021
Financování:	S -

Pořadové číslo: 2/10

ID publikace:	43877600
Stav:	Přijatý
Literární forma:	J_ ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	Information-based Analysis of the Coupling between Dynamic Visual Stimuli, Eye Movements, and Brain Signals
Rok publikace:	2021
Autor:	Hamidreza Namazi (Prac.: CZAV)
Autor:	A. Menon (Prac.:)
Autor:	Ondřej Krejcar (Prac.: CZAV)
Název zdroje:	Fluctuation and Noise Letters
Číslo/kód:	06
ISSN:	0219-4775
Ročník:	20
Strany:	"Article number: 2150048"
Abstrakt orig.:	<p>Our eyes are always in search of exploring our surrounding environment. The brain controls our eyes' activities through the nervous system. Hence, analyzing the correlation between the activities of the eyes and brain is an important area of research in vision science. This paper evaluates the coupling between the reactions of the eyes and the brain in response to different moving visual stimuli. Since both eye movements and EEG signals (as the indicator of brain activity) contain information, we employed Shannon entropy to decode the coupling between them. Ten subjects looked at four moving objects (dynamic visual stimuli) with different information contents while we recorded their EEG signals and eye movements. The results demonstrated that the changes in the information contents of eye movements and EEG signals are strongly correlated ($r=0.7084$), which indicates a strong correlation between brain and eye activities. This analysis could be extended to evaluate the correlation between the activities of other organs versus the brain. © 2021 World Scientific Publishing Company.</p>
Počet stran:	10
Odkazy:	https://www.worldscientific.com/doi/abs/10.1142/S0219477521500486
Hlavní klíč:	brain; dynamic visual stimuli; Electroencephalography (EEG) signals; Eye; eye movements; information content; Shannon entropy
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Information-based Analysis of the Coupling between Dynamic Visual Stimuli, Eye Movements, and Brain Signals
Datum vložení:	14.04.2021
Financování:	S -

Pořadové číslo: 3/10

ID publikace:	43877603
Stav:	Přijatý
Literární forma:	J_ ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	Information-Based Analysis of the Coupling between the Alterations of Heart and Brain Activities in Response to Auditory Stimuli
Rok publikace:	2021
Autor:	Hamidreza Namazi (Prac.: CZAV)
Autor:	T. Kumarasinghe (Prac.:)
Autor:	Ondřej Krejcar (Prac.: CZAV)
Název zdroje:	Fluctuation and Noise Letters
Číslo/kód:	06
ISSN:	0219-4775
Ročník:	20
Strany:	"Article number: 2150049"
Abstrakt orig.:	<p>In this work, we investigated the coupling among the activities of the brain and heart versus the changes in auditory stimuli using information-based analysis. Three music were selected based on the difference in their complexity. We applied these auditory stimuli on 11 subjects, and accordingly, computed and compared the Shannon entropy of electroencephalography (EEG) signals and heart rate variability (R-R time series). The results demonstrated a correlation among the alterations of the information contents of EEG signals and R-R time series. This finding shows the coupling between the activities of the brain and heart. This analysis could be expanded to analyze the activities of other organs versus the brain's reaction in various conditions. © 2021 World Scientific Publishing Company.</p>
Počet stran:	11
Odkazy:	https://www.worldscientific.com/doi/abs/10.1142/S0219477521500498
Hlavní klíč:	brain; EEG signals; Heart; heart rate variability (HRV); information; music; Shannon entropy
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Information-Based Analysis of the Coupling between the Alterations of Heart and Brain Activities in Response to Auditory Stimuli
Datum vložení:	14.04.2021
Financování:	S -

Pořadové číslo: 4/10

ID publikace:	43877644
Stav:	Přijatý
Literární forma:	D_ ČLÁNEK VE SBORNÍKU
Rozšíření LiF:	D_ Článek ve sborníku
Titul (v originále):	Session Based Recommendations Using Recurrent Neural Networks - Long Short-Term Memory
Rok publikace:	2021
Autor:	Michal Dobrovolný (Prac.: CZAV)
Autor:	Ali Bin Selamat (Prac.: CZAV)
Autor:	Ondřej Krejcar (Prac.: CZAV)
Název zdroje:	Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)
Místo publikace:	Cham
ISSN:	0302-9743
ISBN:	978-3-030-73279-0
Ročník:	12672 LNAI
Strany:	53-65
Abstrakt orig.:	<p>This paper describes the use of long short-term memory (LSTM) for session-based recommendations. This paper aims to test and propose the best solution using word-level LSTM as a real-time recommendation service. Our method is for general use. Our model is composed of embedding, two LSTM layers and dense layer. We employ the mean of squared errors to assess the prediction results. Also, we tested our prediction of recall and precision metrics. The best performing network has been a trainer for the last year of likes on an image-based social platform and contained about 2000 classes. Our best model has resulted in recall value 0.0213 and precision value 0.0052 on twenty items. © 2021, Springer Nature Switzerland AG.</p>
Počet stran:	13
Odkazy:	https://link.springer.com/chapter/10.1007%2F978-3-030-73280-6_5
Hlavní klíč:	Collaborative filtering; Deep learning; Long short-term memory; Neural networks; Recommender systems
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Session Based Recommendations Using Recurrent Neural Networks - Long Short-Term Memory
Datum konání:	07.04.2021
Datum vložení:	05.05.2021
Financování:	S -

Pořadové číslo: 5/10

ID publikace:	43877722
Stav:	Přijatý
Literární forma:	J_ ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	Analysis of the correlation between static visual stimuli, eye movements, and brain signals
Rok publikace:	2021
Autor:	Hamidreza Namazi (Prac.: CZAV)
Autor:	A. Menon (Prac.:)
Autor:	Ondřej Krejcar (Prac.: CZAV)
Název zdroje:	Fluctuation and Noise Letters
Číslo/kód:	06
ISSN:	0219-4775
Ročník:	20
Strany:	"Article number: 2150056"
Abstrakt orig.:	<p>Analysis of the correlation among the activities of the eyes and brain is an important research area in physiological science. In this paper, we analyzed the correlation between the reactions of eyes and the brain during rest and while watching different visual stimuli. Since every external stimulus transfers information to the human brain, and on the other hand, eye movements and EEG signals contain information, we utilized Shannon entropy to evaluate the coupling between them. In the experiment, 10 subjects looked at 4 images with different information contents while we recorded their EEG signals and eye movements simultaneously. According to the results, the information contents of eye fluctuations, EEG signals, and visual stimuli are coupled, which reflect the coupling between the brain and eye activities. Similar analyses could be performed to evaluate the correlation among the activities of other organs versus the brain. © World Scientific Publishing Company</p>
Počet stran:	9
Odkazy:	https://www.worldscientific.com/doi/abs/10.1142/S0219477521500565
Hlavní klíč:	Electroencephalography (EEG) signals; Eye movements; Information content; Shannon entropy; Visual stimuli
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Analysis of the correlation between static visual stimuli, eye movements, and brain signals
Datum vložení:	09.06.2021
Financování:	S -

Pořadové číslo: 6/10

ID publikace:	43877805
Stav:	Přijatý
Literární forma:	J_ ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	Multiclass Prediction Model for Student Grade Prediction Using Machine Learning
Rok publikace:	2021
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Autor:	Hamido Fujita (Prac.:)
Autor:	Nor Azura Md Ghani (Prac.:)
Název zdroje:	IEEE Access
Místo publikace:	PISCATAWAY
Číslo/kód:	Summer
ISSN:	2169-3536
Ročník:	9
Strany:	95608-95621
Abstrakt orig.:	<p>Today, predictive analytics applications became an urgent desire in higher educational institutions. Predictive analytics used advanced analytics that encompasses machine learning implementation to derive high-quality performance and meaningful information for all education levels. Mostly know that student grade is one of the key performance indicators that can help educators monitor their academic performance. During the past decade, researchers have proposed many variants of machine learning techniques in education domains. However, there are severe challenges in handling imbalanced datasets for enhancing the performance of predicting student grades. Therefore, this paper presents a comprehensive analysis of machine learning techniques to predict the final student grades in the first semester courses by improving the performance of predictive accuracy. Two modules will be highlighted in this paper. First, we compare the accuracy performance of six well-known machine learning techniques namely Decision Tree (J48), Support Vector Machine (SVM), Naive Bayes (NB), K-Nearest Neighbor (kNN), Logistic Regression (LR) and Random Forest (RF) using 1282 real student's course grade dataset. Second, we proposed a multiclass prediction model to reduce the overfitting and misclassification results caused by imbalanced multi-classification based on oversampling Synthetic Minority Oversampling Technique (SMOTE) with two features selection methods. The obtained results show that the proposed model integrates with RF give significant improvement with the highest f-measure of 99.5%. This proposed model indicates the comparable and promising results that can enhance the prediction performance model for imbalanced multi-classification for student grade prediction.</p>
Počet stran:	14
Odkazy:	https://ieeexplore.ieee.org/abstract/document/9468629
Hlavní klíč:	Predictive models; Prediction algorithms; Support vector machines; Machine learning; Classification algorithms; Data models; Machine learning algorithms; Machine learning; predictive model; imbalanced problem; student grade prediction
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Multiclass Prediction Model for Student Grade Prediction Using Machine Learning
Datum vložení:	01.08.2021
Financování:	S -

Pořadové číslo: 7/10

ID publikace:	43878036
Stav:	Přijatý
Literární forma:	J_ ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	Phishing webpage classification via deep learning-based algorithms: An empirical study
Rok publikace:	2021
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Autor:	H. Fujita (Prac.:
Název zdroje:	Applied Sciences
Číslo/kód:	19
ISSN:	2076-3417
Vydání:	19
Ročník:	11
Strany:	"Article number: 9210"
Abstrakt orig.:	<p>Phishing detection with high-performance accuracy and low computational complexity has always been a topic of great interest. New technologies have been developed to improve the phishing detection rate and reduce computational constraints in recent years. However, one solution is insufficient to address all problems caused by attackers in cyberspace. Therefore, the primary objective of this paper is to analyze the performance of various deep learning algorithms in detecting phishing activities. This analysis will help organizations or individuals select and adopt the proper solution according to their technological needs and specific applications' requirements to fight against phishing attacks. In this regard, an empirical study was conducted using four different deep learning algorithms, including deep neural network (DNN), convolutional neural network (CNN), Long Short-Term Memory (LSTM), and gated recurrent unit (GRU). To analyze the behaviors of these deep learning architectures, extensive experiments were carried out to examine the impact of parameter tuning on the performance accuracy of the deep learning models. In addition, various performance metrics were measured to evaluate the effectiveness and feasibility of DL models in detecting phishing activities. The results obtained from the experiments showed that no single DL algorithm achieved the best measures across all performance metrics. The empirical findings from this paper also manifest several issues and suggest future research directions related to deep learning in the phishing detection domain. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.</p>
Počet stran:	32
Odkazy:	https://www.mdpi.com/2076-3417/11/19/9210
Hlavní klíč:	Convolutional neural network (CNN); Deep learning (DL); Deep neural network (DNN); Gated recurrent unit (GRU); Long short-term memory (LSTM); Phishing detection
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Phishing webpage classification via deep learning-based algorithms: An empirical study
Datum vložení:	18.10.2021
Financování:	S -

Pořadové číslo: 8/10

ID publikace:	43878063
Stav:	Přijatý
Literární forma:	D_ ČLÁNEK VE SBORNÍKU
Rozšíření LiF:	D_ Článek ve sborníku
Titul (v originále):	Session Based Recommendations Using Char-Level Recurrent Neural Networks
Rok publikace:	2021
Autor:	Michal Dobrovolný (Prac.: CZAV)
Autor:	Jaroslav Langer (Prac.: CZAV)
Autor:	Ali Bin Selamat (Prac.: CZAV)
Autor:	Ondřej Krejcar (Prac.: CZAV)
Název zdroje:	Communications in Computer and Information Science
Místo publikace:	Cham
ISSN:	1865-0929
ISBN:	978-3-030-88112-2
Ročník:	1463
Strany:	30-41
Abstrakt orig.:	<p>The use of long short-term memory (LSTM) for session-based recommendations is described in this research. This study uses char-level LSTM as a real-time recommendation service to test and offer the optimal solution. Our strategy can be used to any situation. Two LSTM layers and a thick layer make up our model. To evaluate the prediction results, we use the mean of squared errors. We also put our recall and precision metrics prediction to the test. The best-performing network had roughly 2000 classes and was a trainer for the last year of likes on an image-based social platform. On twenty objects, our best model had a recall value of 0.182 and a precision value of 0.061. © 2021, Springer Nature Switzerland AG.</p>
Počet stran:	12
Odkazy:	https://link.springer.com/chapter/10.1007%2F978-3-030-88113-9_3
Hlavní klíč:	Collaborative filtering; Deep learning; Long short-term memory; Neural networks; Recommender systems; Session-based filtering
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Session Based Recommendations Using Char-Level Recurrent Neural Networks
Datum konání:	29.09.2021
Datum vložení:	21.10.2021
Financování:	S -

Pořadové číslo: 9/10

ID publikace:	43878267
Stav:	Přijatý
Literární forma:	J_ ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	Enhancing big data feature selection using a hybrid correlation-based feature selection
Rok publikace:	2021
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Autor:	H. Fujita (Prac.:)
Název zdroje:	Electronics
Číslo/kód:	23
ISSN:	2079-9292
Vydání:	23
Ročník:	10
Strany:	"Article number: 2984"
Abstrakt orig.:	<p>This study proposes an alternate data extraction method that combines three well-known feature selection methods for handling large and problematic datasets: the correlation-based feature selection (CFS), best first search (BFS), and dominance-based rough set approach (DRSA) methods. This study aims to enhance the classifier's performance in decision analysis by eliminating uncorrelated and inconsistent data values. The proposed method, named CFS-DRSA, comprises several phases executed in sequence, with the main phases incorporating two crucial feature extraction tasks. Data reduction is first, which implements a CFS method with a BFS algorithm. Secondly, a data selection process applies a DRSA to generate the optimized dataset. Therefore, this study aims to solve the computational time complexity and increase the classification accuracy. Several datasets with various characteristics and volumes were used in the experimental process to evaluate the proposed method's credibility. The method's performance was validated using standard evaluation measures and benchmarked with other established methods such as deep learning (DL). Overall, the proposed work proved that it could assist the classifier in returning a significant result, with an accuracy rate of 82.1% for the neural network (NN) classifier, compared to the support vector machine (SVM), which returned 66.5% and 49.96% for DL. The one-way analysis of variance (ANOVA) statistical result indicates that the proposed method is an alternative extraction tool for those with difficulties acquiring expensive big data analysis tools and those who are new to the data analysis field. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.</p>
Počet stran:	24
Odkazy:	https://www.mdpi.com/2079-9292/10/23/2984
Hlavní klíč:	Big data; Correlation-based feature selection; Deep learning; DRSA; Feature selection; Neural network; Support vector machines (SVM)
Jazyk (originál):	angličtina (eng)
Titul anglicky:	Enhancing big data feature selection using a hybrid correlation-based feature selection
Datum vložení:	07.12.2021
Financování:	S -

Pořadové číslo: 10/10

ID publikace:	43878341
Stav:	Rozpracovaný
Literární forma:	J_ČLÁNEK V ODBORNÉM PERIODIKU
Rozšíření LiF:	Jimp
Titul (v originále):	A hybrid lightweight system for early attack detection in the IoMT fog
Rok publikace:	2021
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Název zdroje:	Sensors
Místo publikace:	Basilej
Číslo/kód:	24
ISSN:	1424-8220
Vydavatel:	MDPI-Molecular diversity preservation international
Vydání:	24
Ročník:	21
Strany:	"Article number: 8289"
Abstrakt orig.:	Cyber-attack detection via on-gadget embedded models and cloud systems are widely used for the Internet of Medical Things (IoMT). The former has a limited computation ability, whereas the latter has a long detection time. Fog-based attack detection is alternatively used to overcome these problems. However, the current fog-based systems cannot handle the ever-increasing IoMT's big data. Moreover, they are not lightweight and are designed for network attack detection only. In this work, a hybrid (for host and network) lightweight system is proposed for early attack detection in the IoMT fog. In an adaptive online setting, six different incremental classifiers were implemented, namely a novel Weighted Hoeffding Tree Ensemble (WHTE), Incremental K-Nearest Neighbors (IKNN), Incremental Naïve Bayes (INB), Hoeffding Tree Majority Class (HTMC), Hoeffding Tree Naïve Bayes (HTNB), and Hoeffding Tree Naïve Bayes Adaptive (HTNBA). The system was benchmarked with seven heterogeneous sensors and a NetFlow data infected with nine types of recent attack. The results showed that the proposed system worked well on the lightweight fog devices with ~100% accuracy, a low detection time, and a low memory usage of less than 6 MiB. The single-criteria comparative analysis showed that the WHTE ensemble was more accurate and was less sensitive to the concept drift. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.
Počet stran:	25
Odkazy:	https://www.mdpi.com/1424-8220/21/24/8289
Hlavní klíč:	Fog computing; HIDS; Hybrid attack detection; Incremental learning; IoMT; IoT; Machine learning; NetFlow data; NIDS; Sensor's data
Jazyk (originál):	angličtina (eng)
Titul anglicky:	A hybrid lightweight system for early attack detection in the IoMT fog
Datum vložení:	01.01.2022
Financování:	S -