Project list (2020): Python/Matlab

SENTIMENT ANALYSIS OF TOP COLLEGES USING TWITTER DATA

ABSTRACT - In today's world, opinions and reviews accessible to us are one of the most critical factors in formulating our views and influencing the success of a brand, product or service. With the advent and growth of social media in the world, stakeholders often take to expressing their opinions on popular social media, namely twitter. While Twitter data is extremely informative, it presents a challenge for analysis because of its humongous and disorganized nature. This paper is a thorough effort to dive into the novel domain of performing sentiment analysis of people's opinions regarding top colleges in India. Besides taking additional preprocessing measures like the expansion of net lingo and removal of duplicate tweets

BUILDING AN INTRUSION DETECTION SYSTEM USING A FILTER-BASED FEATURE SELECTION ALGORITHM

ABSTRACTRedundant and irrelevant features in data have caused a long-term problem in network traffic classification. These features not only slow down the process of classification but also prevent a classifier from making accurate decisions, especially when coping with big data. In this paper, we propose a mutual information based algorithm that analytically selects the optimal feature for classification. This mutual information based feature selection algorithm can handle linearly and nonlinearly dependent data features. Its effectiveness is evaluated in the cases of network intrusion detection.

A NOVEL RECOMMENDATION MODEL REGULARIZED WITH USER TRUST AND ITEM RATINGS

ABSTRACT -We propose TrustSVD, a trust-based matrix factorization technique for recommendations. TrustSVD integrates multiple information sources into the recommendation model in order to reduce the data sparsity and cold start problems and their degradation of recommendation performance. An analysis of social trust data from four real-world data sets suggests that not only the explicit but also the implicit influence of both ratings and trust should be taken into consideration in a recommendation model.

Automatic License plate recognition using ANN

Automatic Plate Recognition plays an important roll in intelligent transportation systems. However, most license plate recognition methods work under restricted conditions like slow speed and good illumination. That is a restriction on industrial application. In this thesis, the constraints are relaxed by vanished points distortion-recovery method and denoising method. This thesis implements a license plate recognition method by morphological edge detection method and convolution neural network recognition method. The thesis is constructed contributes to several papers optimization methods. The proposed approach can be trained for recognition of country-specific license plates. More than 500 images are collected for training and over 300 images are collected for recognition test. This paper achieves 97.05% on license plate recognition for detecting total characters and numbers of the license plates.

License plate recognition consists three parts, pre-processing image, locating license plate and identifying license numbers and characters. License plate location is important to obtain license images and plays a key role in identifying plates. The plate recognition has two major steps, character separation and identification. In this paper, machine learning method is applied for license plate recognition.

Indian License Plate Recognition Using Convolutional Neural Networks (CNN)

Abstract—In the last few years, the deep learning technique in particular Convolutional Neural Networks (CNNs) is using massively in the field of computer vision and machine learning. This deep learning technique provides state - of-the-art accuracy in different classification, segmentation, and detection tasks on different benchmarks such as MNIST, CIFAR-10, CIFAR-100, Microsoft COCO, and ImageNet. However, there are a lot of research has been conducted for Bangla License plate recognition with traditional machine learning approaches in last decade. None of them are used to deploy a physical system for Bangla License Plate Recognition System (BLPRS) due to their poor recognition accuracy. In this paper, we have implemented CNNs based Bangla license plate recognition system with better accuracy that can be applied for different purposes including roadside assistance, automatic parking lot management system, vehicle license status detection and so on. Along with that, we have also created and released a very first and standard database for BLPRS

Handwritten Character Recognition using CNN

Many localized languages struggle to reap the benefits of recent advancements in character recognition systems due to the lack of substantial amount of labeled training data. This is due to the difficulty in generating large amounts of labeled data for such languages and inability of deep learning techniques to properly learn from small number of training samples. We solve this problem by introducing a technique of generating new training samples from the existing samples, with realistic augmentations which reflect actual variations that are present in human hand writing, by adding random controlled noise to their corresponding instantiation parameters. Our results with a mere 200 training samples per class surpass existing character recognition results in the EMNIST-letter dataset while achieving the existing results in the three datasets: EMNIST-balanced, EMNIST-digits, and MNIST. We also develop a strategy to effectively use a combination of loss functions to improve reconstructions. Our system is useful in character recognition for localized languages that lack much labeled training data and even in other related more general contexts such as object recognition.

Recognition of handwritten text using long short term memory (LSTM) recurrent neural network (RNN)

ABSTRACT

Handwriting recognition is a technique which is used to produce machine readable text from a given text image. The hand written text is captured as an image from mobile. Handwritten characters are usually recognized with Optical Character Recognition (OCR) scanners. But with the large usage of mobile phones, detecting text from mobile camera has plenty of applications

such as medical script processing, exam script evaluation etc. Camera image has lot of noises when compared to the OCR scanned images. Therefore, the image is pre-processed to reduce noise using image processing techniques such as binarization, thresholding and etc. The letters are segmented and extracted from an image. The features such as binary codes are extracted from the letters. The neural network classifier is built using Long Short Term Memory (LSTM) network which is trained using an already built character dataset. The neural network is used to test the input images. The output is provided as a text document with the recognized words. Since the input feed is obtained from images, the noise will be high compared to the existing system input set which uses scanned images. Noise reduction technique such as low intensity pixel removal is applied to reduce the noise from the input image for improving the efficiency.

Real-Time Vehicle Make and Model Recognition System

Abstract: A Vehicle Make and Model Recognition (VMMR) system can provide great value in terms of vehicle monitoring and identification based on vehicle appearance in addition to the vehicles' attached license plate typical recognition. A real-time VMMR system is an important component of many applications such as automatic vehicle surveillance, traffic management, driver assistance systems, traffic behavior analysis, and traffic monitoring, etc. A VMMR system has a unique set of challenges and issues. Few of the challenges are image acquisition, variations in illuminations and weather, occlusions, shadows, reflections, large variety of vehicles, inter-class and intra-class similarities, addition/deletion of vehicles' models over time, etc. In this work, we present a unique and robust real-time VMMR system which can handle the challenges described above and recognize vehicles with high accuracy. We extract image features from vehicle images and create feature vectors to represent the dataset. We use two classification algorithms, Random Forest (RF) and Support Vector Machine (SVM), in our work. We use a realistic dataset to test and evaluate the proposed VMMR system. The vehicles' images in the dataset reflect real-world situations. The proposed VMMR system recognizes vehicles on the basis of make, model, and generation (manufacturing years) while the existing VMMR systems can only identify the make and model. Comparison with existing VMMR research demonstrates superior performance of the proposed system in terms of recognition accuracy and processing speed

Plant disease diagnosis using CNN

Abstract

Deep learning with convolutional neural networks (CNNs) has achieved great success in the classification of various plant diseases. However, a limited number of studies have elucidated the process of inference, leaving it as an untouchable *black box*. Revealing the CNN to extract the learned feature as an interpretable form not only ensures its reliability but also enables the validation of the model authenticity and the training dataset by human intervention. In this study, a variety of neuron-wise and layer-wise visualization methods were applied using a CNN, trained with a publicly available plant disease image dataset. We showed that neural networks can capture the colors and textures of lesions specific to respective diseases upon diagnosis, which resembles human decision-making. While several visualization methods were used as they are, others had to be optimized to target a specific layer that fully captures the features to generate consequential outputs. Moreover, by interpreting the generated attention maps, we identified several layers that were not contributing to inference and removed such layers inside the

network, decreasing the number of parameters by 75% without affecting the classification accuracy. The results provide an impetus for the CNN *black box* users in the field of plant science to better understand the diagnosis process and lead to further efficient use of deep learning for plant disease diagnosis.

AI-powered banana diseases and pest detection

Banana (*Musa* spp.) is the most popular marketable fruit crop grown all over the world, and a dominant staple food in many developing countries. Worldwide, banana production is affected by numerous diseases and pests. Novel and rapid methods for the timely detection of pests and diseases will allow to surveil and develop control measures with greater efficiency. As deep convolutional neural networks (DCNN) and transfer learning has been successfully applied in various fields, it has freshly moved in the domain of just-in-time crop disease detection. The aim of this research is to develop an AI-based banana disease and pest detection system using a DCNN to support banana farmers.

Rice Blast Disease Recognition Using a Deep Convolutional Neural Network

Rice disease recognition is crucial in automated rice disease diagnosis systems. At present, deep convolutional neural network (CNN) is generally considered the state-of-the-art solution in image recognition. In this paper, we propose a novel rice blast recognition method based on CNN. A dataset of 2906 positive samples and 2902 negative samples is established for training and testing the CNN model. In addition, we conduct comparative experiments for qualitative and quantitatively analysis in our evaluation of the effectiveness of the proposed method. The evaluation results show that the high-level features extracted by CNN are more discriminative and effective than traditional hand-crafted features including local binary patterns histograms (LBPH) and Haar-WT (Wavelet Transform). Moreover, quantitative evaluation results indicate that CNN with Softmax and CNN with support vector machine (SVM) have similar performances, with higher accuracy, larger area under curve (AUC), and better receiver operating characteristic (ROC) curves than both LBPH plus an SVM as the classifier and Haar-WT plus an SVM as the classifier. Therefore, our CNN model is a top performing method for rice blast disease recognition and can be potentially employed in practical applications.

A Novel Method for Improving Air Pollution Prediction Based on Machine Learning Approaches

Abstract: Environmental pollution has mainly been attributed to urbanization and industrial developments across the globe. Air pollution has been marked as one of the major problems of metropolitan areas around the world, especially in Tehran, the capital of Iran, where its administrators and residents have long been struggling with air pollution damage such as the health issues of its citizens. As far as the study area of this research is concerned, a considerable proportion of Tehran air pollution is attributed to PM10 and PM2.5 pollutants. Therefore, the present study was conducted to determine the prediction models to determine air pollutions based on PM10 and PM2.5 pollution concentrations in Tehran. To predict the air-pollution, the data related to day of week, month of year, topography, meteorology, and pollutant rate of two nearest neighbors as the input parameters and machine learning methods were used. These methods include a regression support vector machine, geographically weighted regression,

artificial neural network and auto-regressive nonlinear neural network with an external input as the machine learning method for the air pollution prediction. A prediction model was then proposed to improve the afore-mentioned methods, by which the error percentage has been reduced and improved by 57%, 47%, 47% and 94%, respectively. The most reliable algorithm for the prediction of air pollution was autoregressive nonlinear neural network with external input using the proposed prediction model, where its one-day prediction error reached 1.79 µg/m3 . Finally, using genetic algorithm, data for day of week, month of year, topography, wind direction, maximum temperature and pollutant rate of the two nearest neighbors were identified as the most effective parameters in the prediction of air pollution.

Smart Real-Time Video Surveillance Platform for Drowsiness Detection Based on Eyelid Closure

We propose drowsiness detection in real-time surveillance videos by determining if a person's eyes are open or closed. As a first step, the face of the subject is detected in the image. In the detected face, the eyes are localized and filtered with an extended Sobel operator to detect the curvature of the eyelids. Once the curves are detected, concavity is used to tell whether the eyelids are closed or open. Consequently, a concave upward curve means the eyelid is closed whereas a concave downwards curve means the eye is open. The proposed method is also implemented on hardware in order to be used in real-time scenarios, such as driver drowsiness detection. The evaluation of the proposed method used three image datasets, where images in the first dataset have a uniform background. The proposed method achieved classification accuracy of up to 95% on this dataset. Another benchmark dataset used has significant variations based on face deformations. With this dataset, our method achieved classification accuracy of 70%. A real-time video dataset of people driving the car was also used, where the proposed method achieved 95% accuracy, thus showing its feasibility for use in real-time scenarios.

Deep Anomaly Detection for Generalized Face Anti-Spoofing

Face recognition has achieved unprecedented results, surpassing human capabilities in certain scenarios. However, these automatic solutions are not ready for production because they can be easily fooled by simple identity impersonation attacks. And although much effort has been devoted to develop face anti-spoofing models, their generalization capacity still remains a challenge in real scenarios. In this paper, we introduce a novel approach that reformulates the Generalized Presentation Attack Detection (GPAD) problem from an anomaly detection perspective. Technically, a deep metric learning model is proposed, where a triplet focal loss is used as a regularization for a novel loss coined "metric-softmax", which is in charge of guiding the learning process towards more discriminative feature representations in an embedding space. Finally, we demonstrate the benefits of our deep anomaly detection architecture, by introducing a few-shot a posteriori probability estimation that does not need any classifier to be trained on the learned features. We conduct extensive experiments using the GRAD-GPAD framework that provides the largest aggregated dataset for face GPAD. Results confirm that our approach is able to outperform all the state-of-the-art methods by a considerable margin.

Vision-based fall detection system for improving safety of elderly people

Recognition of human movements is very useful for several applications, such as smart rooms, interactive virtual reality systems, human detection and environment modeling. The objective of this work focuses on the detection and classification of falls based on variations in human silhouette shape, a key challenge in computer vision. Falls are a major health concern, specifically for the elderly. In this study, the detection is achieved with a multivariate exponentially weighted moving average (MEWMA) monitoring scheme, which is effective in detecting falls because it is sensitive to small changes. Unfortunately, an MEWMA statistic fails to differentiate real falls from some fall-like gestures. To remedy this limitation, a classification stage based on a support vector machine (SVM) is applied on detected sequences. To validate this methodology, two fall detection datasets have been tested: the University of Rzeszow fall detection dataset (URFD) and the fall detection dataset (FDD). The results of the MEWMA-based SVM are compared with three other classifiers: neural network (NN), naïve Bayes and K-nearest neighbor (KNN). These results show the capability of the developed strategy to distinguish fall events, suggesting that it can raise an early alert in the fall incidents.

A CNN-Based Framework for Comparison of Contactless to Contact-Based Fingerprints

Accurate comparison of contactless 2-D fingerprint images with contact-based fingerprints is critical for the success of emerging contactless 2-D fingerprint technologies, which offer more hygienic and deformation-free acquisition of fingerprint features. Convolutional neural networks (CNNs) have shown remarkable capabilities in biometrics recognition. However, there has been almost nil attempt to match fingerprint images using CNN-based approaches. This paper develops a CNN-based framework to accurately match contactless and contact-based fingerprint images. Our framework first trains a multi-Siamese CNN using fingerprint minutiae, respective ridge map and specific region of ridge map. This network is used to generate deep fingerprint representation using a distance-aware loss function. Deep fingerprint representations generated in such multi-Siamese network are concatenated for more accurate cross comparison. The proposed approach for cross-fingerprint comparison is evaluated on two publicly available databases containing contactless 2-D fingerprints and respective contact-based fingerprints. Our experiments presented in this paper consistently achieve outperforming results over several popular deep learning architectures and over contactless to contact-based fingerprints comparison methods in the literature

DeepIris: Iris Recognition Using A Deep Learning Approach

Abstract—Iris recognition has been an active research area during last few decades, because of its wide applications in security, from airports to homeland security border control. Different features and algorithms have been proposed for iris recognition in the past. In this paper, we propose an end-to-end deep learning framework for iris recognition based on residual convolutional neural network (CNN), which can jointly learn the feature representation and perform recognition. We train our model on a well-known iris recognition dataset using only a few training images from each class, and show promising results and improvements over previous approaches. We also present a visualization technique which is able to detect the important areas in iris images which can mostly impact the recognition results. We believe this framework can be widely used for other biometrics recognition tasks, helping to have a more scalable and accurate systems.

Hotel Recommendation System Based on Hybrid Recommendation Model

We presented Machine Learning and Sentiment Word Net based method for opinion mining from hotel reviews and sentence relevance score based method for opinion summarization of hotel reviews. The classified and summarized hotel review information helps web users to understand review contents easily in a short time. Opinion Mining for Hotel Review system that detects hidden sentiments in feedback of the customer and rates the feedback accordingly. The system uses opinion-mining methodology in order to achieve desired functionality. Opinion mining for hotel reviews is a web application, which gives review of the feedback that is posted by various users. The system takes review of various users, based on the opinion, system will specify whether the posted hotel is good, bad, or worst. Based on users search on hotels, recommendations will be shown to the user based on how many times a user visited that particular hotel page. We use a database of sentiment based keywords along with positivity or negativity weight in database and then based on these sentiment keywords mined in user review is ranked. Once the user login to the system he views the hotels and gives review about the hotel. System will use database and will match the review with the keywords in database and rank the review accordingly. System will rate the hotel based on the rank of review. The role of the admin is to post new hotel and add keywords in database. This application is useful for those who are exploring new places and also useful for those who travel often. Using this application, a user will get to know which hotel is best and suitable for them. User can decide which hotel to accommodate before they reach the place.

Music Genre Classification using Machine Learning Techniques

Categorizing music files according to their genre is a challenging task in the area of music information retrieval (MIR). In this study, we compare the performance of two classes of models. The first is a deep learning approach wherein a CNN model is trained end-to-end, to predict the genre label of an audio signal, solely using its spectrogram. The second approach utilizes hand-crafted features, both from the time domain and the frequency domain. We train four traditional machine learning classifiers with these features and compare their performance. The features that contribute the most towards this multi-class classification task are identified. The experiments are conducted on the Audio set data set and we report an AUC value of 0.894 for an ensemble classifier which combines the two proposed approaches.

Kannada Handwritten Document Recognition using Convolutional Neural Network

Abstract:

In this paper, character recognition system for documents written in Kannada language is proposed. Paper provides the technical details of design and implementation of proposed. Convolutional Neural Network (CNN) model is used for the implementation and Chars74K dataset is used for training the model. System has achieved accuracy of 98% for the document containing non-overlapping lines of characters.

Brain Tumor Detection and Segmentation

Abstract

In recent years, Brain tumor detection and segmentation has created an interest on research areas. The process of identifying and segmenting brain tumor is a very tedious and time consuming task, since human physique has anatomical structure naturally. Magnetic Resonance Image (MRI) scan analysis is a powerful tool that makes effective detection of the abnormal tissues from the brain. Among different techniques, Magnetic Resonance Image (MRI) is a liable one which contains several modalities in scanning the images captured from interior structure of human brain. A novel hybrid energy-efficient method is proposed for automatic tumor detection and segmentation. The proposed system follows K-means clustering, integrated with Fuzzy C-Means (KMFCM) and active contour by level set for tumor segmentation. An effective segmentation, edge detection and intensity enhancement can detect brain tumor easily. For that, active contour with level set method has been utilized. The performance of the proposed approach has been evaluated in terms of white pixels, black pixels, tumor detected area, and the processing time. This technique can deal with a higher number of segmentation problem and minimum execution time by ensuring segmentation quality. Additionally, tumor area length in vertical and horizontal positions is determined to measure sensitivity, specificity, accuracy, and similarity index values. Further, tumor volume is computed. Knowledge of the information of tumor is helpful for the physicians for effective diagnosing in tumor for treatments. The entire experimentation was implemented in MATLAB environment and simulation results were compared with existing approaches.

Vision-Based Traffic Sign Detection and Recognition Systems

Abstract: The automatic traffic sign detection and recognition (TSDR) system is very important research in the development of advanced driver assistance systems (ADAS). Investigations on

vision-based TSDR have received substantial interest in the research community, which is mainly motivated by three factors, which are detection, tracking and classification. During the last decade, a substantial number of techniques have been reported for TSDR. This paper provides a comprehensive survey on traffic sign detection, tracking and classification. The details of algorithms, methods and their specifications on detection, tracking and classification are investigated and summarized in the tables along with the corresponding key references. A comparative study on each section has been provided to evaluate the TSDR data, performance metrics and their availability. Current issues and challenges of the existing technologies are illustrated with brief suggestions and a discussion on the progress of driver assistance system research in the future. This review will hopefully lead to increasing efforts towards the development of future vision-based TSDR system.