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Final Year Projects

Digital Image Processing

Titles & Abstract

2023-2024

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EPRO_DSP_001

Gender-Specific Characteristics for Hand-Vein Biometric Recognition: Analysis and Exploitation

In recent years, vein-based biometric recognition has received ever-increasing attention from both academia and industry, due to the advantages it offers over traditional biometric traits such as fingerprint, iris, and face. Nonetheless, some issues related to the use of vein biometrics still need to be investigated and understood. Specifically, in this study, we speculate about the gender-related variations in vein patterns, and their effects on biometric verification performance. An analysis on the feasibility of recognizing male and female subjects depending on their hand-vein patterns, and on the level of similarity characterizing the biometric templates extracted from male and female populations, are here carried out considering three different databases. Specifically, the public VERA dataset, containing samples of palm-vein patterns, and two datasets containing images of finger-vein patterns, i.e., the UTFVP public database, and an in-house dataset collected with an on the-move contactless modality, are here considered.

EPRO_DSP_002

Automated Segmentation of Brain Tumor MRI Images Using Deep Learning

Segmenting brain tumors automatically using MR data is crucial for disease investigation and monitoring. Due to the aggressive nature and diversity of gliomas, well-organized and exact segmentation methods are used to classify tumors intra-tumorally. The proposed technique uses a Gray Level Co-occurrence matrix extraction of features approach to strip out unwanted details from the images. In comparison with the current state of the art, the accuracy of brain tumor segmentation was significantly improved using Convolutional Neural Networks, which are frequently used in the field of biomedical image segmentation. By merging the results of two separate segmentation networks, the proposed method demonstrates a major but simple combinatorial strategy that, as a direct consequence, yields much more precise and complete estimates. A U-Net and a Three-Dimensional Convolutional Neural Network. These networks are used to break up images into their component parts. Following that, the prediction was constructed using two distinct models that were combined in a number of ways. In comparison to existing state-of-the-art designs, the proposed method achieves the mean accuracy (%) of 99.40, 98.46, 98.29, precision (%) of 99.41, 98.51, 98.35, F-Score (%) of 99.4, 98.29, 98.46 and sensitivity (%) of 99.39, 98.41, 98.25 for the whole tumor, enhanced tumor, tumor core on the validation set, respectively

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EPRO_DSP_003

Glioma Grade Classification Using CNNs and Segmentation With an Adaptive Approach Using Histogram Features in Brain MRIs

Artificial intelligence (AI) applications have become popular due to their advantages in solving health problems with high accuracy and confidence. One such application is the diagnosis of brain tumors or anomalies. This paper presents two new approaches for brain tumor grade classification and segmentation. Convolutional neural network (CNN) models were used as the first approach to classify High-Grade Glioma (HGG) and Low-Grade Glioma (LGG) tumors and achieved with 99.85% accuracy, 99.85% F1 and 99.92% AUC scores. A new pipeline consisting of normalization, modality fusion and CNN model for HGG-LGG classification tasks was also proposed and developed. A novel algorithm based on histograms, thresholding and morphological filtering with feature fusion was also proposed and developed for the segmentation task. 70.58% Dice Similarity (DS) on average was achieved with the complete tumor segmentation

EPRO_DSP_004

utomatic Segmentation of Kidney Volume Using Multi-Module Hybrid Based U-Shape in Polycystic Kidney Disease

Polycystic kidney disease (Autosomal Dominant Polycystic Kidney Disease, ADPKD) is the most common genetic disease of the kidney, and the measurement of Total Kidney Volume (TKV) in clinical research of this disease is essential to study the progression of ADPKD. At present, the volume segmentation of polycystic kidneys mainly relies on doctors to manually outline the kidney boundary on the radiological image. This process is time-consuming, labor-intensive, inefficient, subjective, and difficult to guarantee consistency. In the research of this paper, A multi-module hybrid U-shape segmentation method is proposed (HUNet), which introduces wavelet pooling, cascade residual, and efficient multi-head self-attention into the U-shape structure. We use wavelet pooling instead of traditional down-sampling to reduce the loss of detailed features, the use of cascaded residual modules can improve the ability of model feature reuse, and the use of efficient multi-head self-attention modules can effectively capture global multi-scale information

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EPRO_DSP_005

Urinary Stones Segmentation in Abdominal X-Ray Images Using Cascaded U-Net Pipeline With Stone-Embedding Augmentation and Lesion-Size Reweighting Approach

In this research, we proposed a two-stage pipeline for segmenting urinary stones. The first stage U-Net generated the map localizing the urinary organs in full abdominal x-ray images. Then, this map was used for creating partitioned images input to the second stage U-Net to reduce class imbalance and was also used in stone-embedding augmentation to increase a number of training data. The U-Net model was trained with the combination of real stone-contained images and synthesized stone-embedded images to segment urinary stones on the partitioned input images. In addition, we proposed to use an inverse weighting method in the focal Tversky loss function in order to rebalance lesion size. The U-Net model using our proposed pipeline produced a 71.28% pixel-wise F_{2} score and a 69.82% region-wise F_{2} score, which were 2.88% and 7.63%, respectively, higher than those of a baseline method.

EPRO_DSP_006

Multi-Class Classification of Plant Leaf Diseases Using Feature Fusion of Deep Convolutional Neural Network and Local Binary Pattern

Plant diseases are one of the primary causes of decreased agricultural production quality and quantity. With ongoing changes in plant structure and cultivation techniques, new diseases are constantly arising on plant leaves. Thus, accurate classification and detection of plant leaf diseases in their early stages will limit the spread of the infection and support the healthy development of plant production. This work proposes a novel lightweight deep convolutional neural network (CNN) model for obtaining high-level hidden feature representations. The deep features are then fused with traditional handcrafted local binary pattern (LBP) features to capture local texture information in plant leaf images. The proposed model is trained and tested on three publicly available datasets (Apple Leaf, Tomato Leaf, and Grape Leaf). On the three datasets, the proposed approach achieves 99%, 96.6%, and 98.5% validation accuracies, respectively, and 98.8%, 96.5%, and 98.3% test accuracies, respectively. The results of the experiments show that the proposed approach can provide a better control solution for plant diseases.

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EPRO_DSP_007

Compressive Wavelet Domain Deep CNN for Image Classification Using Genetic Algorithm Based Sensing Mask Learning

Using a novel Genetic Algorithm-based Compressive Learning (GACL), a compressed domain-learning framework is proposed that is implemented on the Haar wavelet approximation coefficient images of the standard kaggle RGB cat dog dataset with every images resized to 256×256×3 . The compressive sensing (CS) measurements on the selected dataset is achieved by using a simple reduced pixel scheme by retaining only P% of the pixels of the approximation coefficient images and forcing the remaining pixels to 0 using the Primitive Walsh Hadamard (PWH) binary mask and the masked images are used for further learning. A numerical experiment is conducted to analyze the image classification performance of deep convolution neural network (DCNN) learning on compressive sensing (CS) measurements of wavelet approximation coefficient image of the selected dataset. The unmasked wavelet approximation coefficients images are of size only one fourth of the original image, but they visually resembles the original image

EPRO_DSP_008

A Comprehensive Joint Learning System to Detect Skin Cancer

Skin, the body's biggest organ and a barrier against heat, light, damage, and infection can be affected by many diseases. However, a correct diagnosis can lead to proper treatment. Skin diseases must be identified early to reduce skin lesion growth and spread. The medical field has a significant dependency on Information Technology and in this era, there is a need for a mechanism that can detect skin diseases at an early stage with higher accuracy capable of working with rapidly growing data. This research offers a joint learning system using Convolutional Neural Networks (CNN) and Local Binary Pattern (LBP) followed by its concatenation of all the extracted features through CNN and LBP architecture. The proposed system is trained and tested using the widely used publicly accessible dataset for skin cancer detection to solve multiclass skin disease issues.

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EPRO_DSP_009

iational Retinex Model With Structure-Awareness Regularization for Single-Image Low-Light Enhancement

Low-light image enhancement (LLIE) is a method of improving the visual quality of images captured in weak illumination conditions. In such conditions, the images tend to be noisy, hazy, and have low contrast, making them difficult to distinguish details. LLIE techniques have many practical applications in various fields, including surveillance, astronomy, medical imaging, and consumer photography. The total variational method is a sound solution in this field. However, requirement of an overall spatial smoothness of the illumination map leads to the failure of recovering intricate details. This paper proposes that the interaction between the global spatial smoothness and the detail recovery in the total variational Retinex model can be optimized by adopting a structure-awareness regularization term. The resultant non-linear model is more effective than the original one for LLIE. As a model-based method, its performance does not rely on architecture engineering, super-parameter tuning, or specific training dataset

EPRO_DSP_010

Performance Enhancement of Skin Cancer Classification Using Computer Vision

Nowadays, computer vision plays an essential role in disease detection, computer-aided diagnosis, and patient risk identification. This is especially true for skin cancer, which can be fatal if not diagnosed in its early stages. For this purpose, several computer-aided diagnostic and detection systems have been created in the past. They were limited in their performance because of the complicated visual characteristics of skin lesion images, which included inhomogeneous features and hazy borders. In this paper, we proposed two methods for detecting and classifying dermoscopic images into benign and malignant tumors. The first method is using k-nearest neighbor (KNN) as classifier when pretrained deep neural networks are used as feature extractors. The second one is AlexNet with grey wolf optimizer, that optimizes AlexNet's hyperparameters to get the best results. We also tested two approaches in classifying skin cancer images, which are machine learning (ML) and deep learning (DL). T

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EPRO_DSP_011

Brain Tumor Detection and Classification Using Intelligence Techniques: An Overview

A tumor is carried on by rapid and uncontrolled cell growth in the brain. If it is not treated in the initial phases, it could prove fatal. Despite numerous significant efforts and encouraging outcomes, accurate segmentation and classification continue to be a challenge. Detection of brain tumors is significantly complicated by the distinctions in tumor position, structure, and proportions. The main disinterest of this study stays to offer investigators, comprehensive literature on Magnetic Resonance (MR) imaging's ability to identify brain tumors. Using computational intelligence and statistical image processing techniques, this research paper proposed several ways to detect brain cancer and tumors. This study also shows an assessment matrix for a specific system using particular systems and dataset types. This paper also explains the morphology of brain tumors, accessible data sets, augmentation methods, component extraction, and categorization among Deep Learning (DL), Transfer Learning (TL), and Machine Learning (ML) models.

EPRO_DSP_012

Segmentation of White Blood Cells Based on CBAM-DC-UNet

Monitoring the morphology of blood leukocytes, plays an important role in medical research, especially in the treatment of diseases such as immunodeficiency. Traditional manual detection methods are susceptible to numerous interference factors. Therefore, blood cells are often segmented using deep-learning algorithms. This study proposes a U-Net model based on a combination of an attention mechanism and dilated convolutions. First, the traditional convolution in a double convolutional module in a network is replaced by dilated convolution, and multi-scale features are obtained by expanding the receptive field. Second, after each convolution layer in the upsampling layer, an attention mechanism module is combined to refine the adaptive features and improve the segmentation performance of the model. Finally, the RAdam optimizer was used to enhance the robustness of the learning rate variations.

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EPRO_DSP_013

Deep Learning and Optimization-Based Methods for Skin Lesions Segmentation: A Review

Skin cancer is a senior public health issue that could profit from computer-aided diagnosis to decrease the encumbrance of this widespread disease. Researchers have been more motivated to develop computer-aided diagnosis systems because visual examination wastes time. The initial stage in skin lesion analysis is skin lesion segmentation, which might assist in the following categorization task. It is a difficult task because sometimes the whole lesion might be the same colors, and the borders of pigment regions can be foggy. Several studies have effectively handled skin lesion segmentation; nevertheless, developing new methodologies to improve efficiency is necessary. This work thoroughly analyzes the most advanced algorithms and methods for skin lesion segmentation

EPRO_DSP_014

DeepSkin: A Deep Learning Approach for Skin Cancer Classification

Skin cancer is one of the most rapidly spreading illnesses in the world and because of the limited resources available. Early detection of skin cancer is crucial accurate diagnosis of skin cancer identification for preventive approach in general. Detecting skin cancer at an early stage is challenging for dermatologists, as well in recent years, both supervised and unsupervised learning tasks have made extensive use of deep learning. One of these models, Convolutional Neural Networks (CNN), has surpassed all others in object detection and classification tests. The dataset is screened from MNIST: HAM10000 which consists of seven different types of skin lesions with the sample size of 10015 is used for the experimentation. The data pre-processing techniques like sampling, dull razor and segmentation using autoencoder and decoder is employed. Transfer learning techniques like DenseNet169 and Resnet 50 were used to train the model to obtain the results.

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EPRO_DSP_015

Feature Fusion Classifier With Dynamic Weights for Abnormality Detection of Amniotic Fluid Cell Chromosome

Chromosomal karyotype is important to determine whether a newborn has a genetic disorder. There are two main categories of chromosomal abnormalities: structural abnormalities, in which the chromosome structure is altered, and chromosome number abnormalities. Manual karyotyping is complex and takes a lot of time because it requires a high degree of domain expertise. Based on this investigation, we propose a new method of chromosome defect detection based on deep learning with 20,299 chromosome images from Dongguan Kanghua Hospital as data that integrates the diversity of chromosome features and trains a classifier model based on feature fusion for chromosome abnormality detection. We put forward a feature fusion classifier with dynamic weights (FFCDW) for chromosomal abnormality detection, after data augmentation with three deep learning networks, ResNet, SENet, and VGG19, the three trained models are combined using a dynamic weighting approach.

EPRO_DSP_016

Image Encryption Algorithm Based on Chaotic Mapping and Binary Bidirectional Zigzag Transform

With the continuous development of chaotic systems, they have increasingly become the core of the field of image encryption, and the good performance of chaotic systems is crucial for image encryption. Some two dimensional chaotic maps still have drawbacks such as uneven distribution and small key space, which are prone to destruction. To this end, a new two-dimensional logic infinite folding iterative mapping is proposed, and an encryption algorithm is designed based on this. Experimental analysis shows that the chaotic map has good chaotic characteristics. Secondly, a binary bidirectional zigzag transform image scrambling algorithm is proposed. Compared with traditional zigzag transform, binary bidirectional zigzag transform has more sufficient dislocation effects and greatly reduces the correlation between adjacent pixels in the image.

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EPRO_DSP_017

Infrared and Visible Image Fusion Based on Autoencoder Composed of CNN-Transformer

With high sensitivity to capture rich details, visible imaging equipment can take images containing more textures and contours which are important to visual perception. Unlike visible cameras, infrared imaging devices can detect targets invisible in visible images, because the imaging principle of infrared sensors derives from differences of thermal radiation. Thus, the purpose of image fusion is to merge as much meaningful feature information from the infrared and visible images into the fused image as possible, such as contours as well as textures of the visible image and thermal targets of the infrared image. In this paper, we propose an image fusion network based on variational auto-encoder (VAE), which performs the image fusion process in deep hidden layers. We divide the proposed network into image fusion network and infrared feature compensation network.

EPRO_DSP_018

Leaf Disease Detection Based on Lightweight Deep Residual Network and Attention Mechanism

In today's leaf disease detection, the accuracy of recognition has never been of such importance as it is now. In this aspect, leaf disease recognition method based on machine learning relies heavily on the size of the region of interest and the dispersion of lesions. Professional instrument for leaf disease detection remains a challenging task in accuracy and convenience. A new lightweight model based on advanced residual network and attention mechanism for extracting more accurate region of interest and the lesion, SE-VRNet, was proposed. The proposed SE-VRNet incorporated deep variant residual network (VRNet) and a squeeze-and-excitation (SE) module with attention mechanism, in order to solve the problem that the feature extraction was difficult due to the dispersed location of the leaf disease. The accuracy of top-1 and top-3 obtained by the model SE-VRNet on NewData is 99.73% and 99.98%, respectively, and the accuracy of top-1 and top-3 obtained by the model on SelfData is 95.71% and 99.89%, respectively. The experimental results on the datasets of PlantVillage, OriData, NewData and SelfData were better than other state-of-the-art methods, demonstrating the effectiveness and feasibility of the proposed SE-VRNet in identifying leaf diseases with mobile devices.

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EPRO_DSP_019

Malaria Disease Cell Classification With Highlighting Small Infected Regions

Deep learning-based methods have become an active research area in medical imaging. Malaria is diagnosed by testing red blood cells. Deep learning methods can be used to distinguish malaria infected cell images from non-infected cell images. The small number of malaria dataset may limit the application of deep learning. Moreover, the infected area in the cell images is generally vague and small, requiring more complex models and a larger dataset to train on. Motivated by the tendency of humans to highlight important words when reading, we propose a simple neural network training strategy for highlighting the infected pixel regions that are mainly responsible for malaria cell classification. In our experiments on the NIH(National Institutes of Health) malaria dataset available in public domain, the proposed method significantly improved classification accuracy for our four different sized models, ranging from simple to complex including Resnet and Mobilenet. Our proposed method significantly improved classification accuracy.

EPRO_DSP_020

Multiple Types of Cancer Classification Using CT/MRI Images Based on Learning Without Forgetting Powered Deep Learning Models

Cancer is the second biggest cause of death worldwide, accounting for one of every six deaths. On the other hand, early detection of the disease significantly improves the chances of survival. The use of Artificial Intelligence (AI) to automate cancer detection might allow us to evaluate more cases in less time. In this research, AI-based deep learning models are proposed to classify the images of eight kinds of cancer, such as lung, brain, breast, and cervical cancer. This work evaluates the deep learning models, namely Convolutional Neural Networks (CNN), against classifying images with cancer traits. Pre-trained CNN variants such as MobileNet, VGGNet, and DenseNet are employed to transfer the knowledge they learned with the ImageNet dataset to detect different kinds of cancer cells. We use Bayesian Optimization to find the suitable values for the hyperparameters. However, transfer learning could make it so that models can no longer classify the datasets they were initially trained. So, we use Learning without Forgetting (LwF), which trains the network using only new task data while keeping the network's original abilities.

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EPRO_DSP_021

Diagnosis of Malaria Using Double Hidden Layer Extreme Learning Machine Algorithm With CNN Feature Extraction and Parasite Inflator

Malaria, a life-threatening disease worldwide, can be diagnosed using antigen tests and microscopy tests. However, both of them are erroneous and time-consuming. Therefore, a trustworthy and fast early malaria prognosis infrastructure is required. In this age of machine learning (ML), there are several ML-based methods to do the task. This paper proposes an unorthodox method for malaria prognosis based on an extreme learning machine (ELM) algorithm. In this regard, Convolutional Neural Networks (CNN), ELM, and double hidden layer (DELM) have been used as classifiers. A CNN model has been used as a feature extractor and also as a classifier to perform a comparative study. The derived features have been used to train ELM and DELM. Two versions of the malaria image dataset have been used: one is the original dataset, and the other is a modified dataset where ambiguous samples have been removed.

EPRO_DSP_022

A Real-Time Face Detection Method Based on Blink Detection

Face anti-spoofing refers to the computer determining whether the face detected is a real face or a forged face. In user authentication scenarios, photo fraud attacks are easy to occur, where an illegal user logs into the system using a legitimate user's picture. Aiming at this problem and the influence of illumination in real-time video face recognition, this paper proposes a real-time face detection method based on blink detection. The method first extracts the image texture features through the LBP algorithm, which eliminates the problem of illumination changes to a certain extent. Then the extracted features are input into the ResNet network, and the facial feature extraction is enhanced by adding an attention mechanism is added to enhance the face feature extraction. Meanwhile, the BiLSTM method is used to extract the temporal characteristics of images from different angles or at different times to obtain more facial details. In addition, the fusion of local and global features is realized by SPP pooling, which enriches the expression ability of feature maps and improves detection accuracy.

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EPRO_DSP_023

Accuracy Enhancement of Hand Gesture Recognition Using CNN

Human gestures are immensely significant in human-machine interactions. Complex hand gesture input and noise caused by the external environment must be addressed in order to improve the accuracy of hand gesture recognition algorithms. To overcome this challenge, we employ a combination of 2D-FFT and convolutional neural networks (CNN) in this research. The accuracy of human-machine interactions is improved by using Ultra Wide Bandwidth (UWB) radar to acquire image data, then transforming it with 2DFFT and bringing it into CNN for classification. The classification results of the proposed method revealed that it required less time to learn than prominent models and had similar accuracy

EPRO_DSP_024

Change Detection Method for Wavelength Resolution SAR Images Based on Bayes' Theorem: An Iterative Approach

This paper presents an iterative change detection (CD) method based on Bayes’ theorem for very high frequency (VHF) ultra-wideband (UWB) SAR images considering commonly used clutter-plus-noise statistical models. The proposed detection technique uses the information of the detected changes to iteratively update the data and distribution information, obtaining more accurate clutter-plus-noise statistics resulting in false alarm reduction. The Bivariate Rayleigh and Bivariate Gaussian distributions are investigated as candidates to model the clutter-plus-noise, and the Anderson-Darling goodness-of-fit test is used to investigate three scenarios of interest. Different aspects related to the distributions are discussed, the observed mismatches are analyzed, and the impact of the distribution chosen for the proposed iterative change detection method is analyzed

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EPRO_DSP_025

CNN Learning Strategy for Recognizing Facial Expressions

The ability to recognize facial expressions using computer vision is a crucial task that has numerous potential applications. Although deep neural networks have achieved high performance, their use in the recognition of facial expressions is still challenging. This is because different facial expressions have varying degrees of similarities among themselves, and numerous variations cause diversity in the same facial images. In this study, we propose a novel divide-and-conquer-based learning strategy to improve the performance of facial expression recognition (FER). The face area in an image was detected using MobileNet, and a ResNet-18 model was employed as a backbone deep neural network for recognizing facial expressions. Subsequently, groups containing similar facial expressions were categorized by analyzing the confusion matrix, which represents the inference results of the trained ResNet-18 model, and these similar facial expression groups were then utilized to re-train the deep learning model.

EPRO_DSP_026

Facial Expression Recognition in the Wild Using Face Graph and Attention

Facial expression recognition (FER) in the wild from various viewpoints, lighting conditions, face poses, scales, and occlusions is an extremely challenging field of research. In this study, we construct a face graph by selecting action units that play an important role in changing facial expressions, and we propose an algorithm for recognizing facial expressions using a graph convolutional network (GCN). We first generated an attention map that can highlight action units to extract important facial expression features from faces in the wild. After feature extraction, a face graph is constructed by combining the attention map with face patches, and changes in expression in the wild are recognized using a GCN. Through comparative experiments conducted using both lab-controlled and wild datasets, we prove that the proposed method is the most suitable FER approach for use with image datasets captured in the wild and those under well-controlled indoor conditions.

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EPRO_DSP_027

Facial Expression Transfer Based on Conditional Generative Adversarial Networks

With the development of computer vision and image transfer, facial expression transfer has been more and more widespread applications. But there are still some problems, such as lack of realistic expression, poor retention of facial identity features and low synthesis efficiency. In order to solve the problems of facial expression transfer, the paper proposes a facial expression transfer model based on conditional generative adversarial network, which can generate a highly realistic face image with source facial expression and target facial identity features, when gave a source face image and a target face image. The model consists of two parts: the facial feature point fusion module and the expression transfer module. Among them, the facial feature point fusion module uses an auto-encoder to encode the face key feature point image of the source facial expression and the face feature key point image of the target face

EPRO_DSP_028

Hand Gesture Recognition for Characters Understanding Using Convex Hull Landmarks and Geometric Features

With the latest advancements, hand gesture recognition is becoming an effective way of communication and gaining popularity from a research point of view. Hearing impaired people around the world need assistance, while sign language is only understood by a few people around the globe. It becomes challenging for untrained people to communicate easily, research community has tried to train systems with a variety of models to facilitate communication with hearing impaired people and also human-computer interaction. Researchers have detected gestures with numerous recognition rates; however, the recognition rate still needs improvement. As the images captured via cameras possess multiple issues, the light intensity variation makes it a challenging task to extract gestures from such images, extra information in captured images, such as noise hinders the computation time, and complex backgrounds make the extraction of gestures difficult. A novel approach is proposed in this paper for character detection and recognition. The proposed system is divided into five steps for hand gesture recognition

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EPRO_DSP_029

Road Crack Detection Using Deep Neural Network Based on Attention Mechanism and Residual Structure

Intelligent detection of road cracks is crucial for road maintenance and safety. because of the interference of illumination and totally different background factors, the road crack extraction results of existing deep learning ways square measure incomplete, and therefore the extraction accuracy is low. we tend to designed a brand new network model, referred to as AR-UNet, that introduces a convolutional block attention module (CBAM) within the encoder and decoder of U-Net to effectively extract global and local detail information. The input and output CBAM features of the model are connected to increase the transmission path of features. The BasicBlock is adopted to replace the convolutional layer of the original network to avoid network degradation caused by gradient disappearance and network layer growth. we tested our method on DeepCrack, Crack Forest Dataset, and our own tagged road image dataset (RID). The experimental results show that our method focuses additional on crack feature info and extracts cracks with higher integrity. The comparison with existing deep learning ways conjointly demonstrates the effectiveness of our projected technique. The code is out there at: https://github.com/18435398440/ARUnet .

EPRO_DSP_030

Role of Zoning in Facial Expression Using Deep Learning

Facial expression is an unspoken message essential to collaboration and effective discourse. An inner emotional state of a human is expressed using facial expressions and is very effective for communication with actual emotions. Anger, happiness, sadness, contempt, surprise, fear, disgust, and neutral are eight common expressions of humans. Scientific community proposed several face emotion recognition techniques. However, due to fewer face landmarks and their intensity for deep learning models, performance improvement for facial expression recognition still needs to be improved for accurately predicting facial emotion recognition. This study proposes a zoning-based face expression recognition (ZFER) to locate more face landmarks to perceive deep face emotions indemnity through zoning. After face extraction, landmarks from the face, such as the eyes, eyebrows, nose, forehead, and mouth, are extracted

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EPRO_DSP_031

Universal Domain Adaptation for Remote Sensing Image Scene Classification

The domain adaptation (DA) approaches available to date are usually not well suited for practical DA scenarios of remote sensing image classification, since these methods (such as unsupervised DA) rely on rich prior knowledge about the relationship between label sets of source and target domains, and source data are often not accessible due to privacy or confidentiality issues. To this end, we propose a practical universal domain adaptation setting for remote sensing image scene classification that requires no prior knowledge on the label sets. Furthermore, a novel universal domain adaptation method without source data is proposed for cases when the source data is unavailable. The architecture of the model is divided into two parts: the source data generation stage and the model adaptation stage. The first stage estimates the conditional distribution of source data from the pre-trained model using the knowledge of class-separability in the source domain and then synthesizes the source data. With this synthetic source data in hand, it becomes a universal DA task to classify a target sample correctly if it belongs to any category in the source label set, or mark it as ``unknown'' otherwise. In the second stage

EPRO_DSP_032

Classification of Liver Fibrosis From Heterogeneous Ultrasound Image

With the advances in deep learning, including Convolutional Neural Networks (CNN), automated diagnosis technology using medical images has received considerable attention in medical science. In particular, in the field of ultrasound imaging, CNN trains the features of organs through an amount of image data, so that an expert-level automatic diagnosis is possible only with images of actual patients. However, CNN models are also trained on the features that reflect the inherent bias of the imaging machine used for image acquisition. In other words, when the domain of data used for training is different from that of data applied for an actual diagnosis, it is unclear whether consistent performance can be provided by the domain bias.

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EPRO_DSP_033

Noise-Against Skeleton Extraction Framework and Application on Hand Gesture Recognition

Extracting stable skeletons from noisy images is a challenging problem since the skeletonization method is prone to be affected by inner and border noise. Although many methods have been proposed in the past for increasing the antinoise ability of skeletonization methods, most of them either only overcome border noise or, at the cost of lost topology, degrade the effects of two noises. In this paper, we propose a skeleton extraction framework to enhance the robustness of the existing skeletonization method against both inner and border noise. In our approach, we first use the different scales of Gaussian filters to smooth the input image and obtain multiple representations. Then, binarization and skeletonization were performed to produce a series of binary images and a series of skeletal images. Next, we use our measure on these binary and skeletal images to find the most suitable skeleton. Since our measure considers both the skeleton image changes and binary image changes caused by using a filter, the selected skeleton is sufficiently robust and has all the necessary skeletal branches..

EPRO_DSP_034

Road Crack Detection Using Deep Neural Network Based on Attention Mechanism and Residual Structure

Intelligent detection of road cracks is crucial for road maintenance and safety. because of the interference of illumination and totally different background factors, the road crack extraction results of existing deep learning ways square measure incomplete, and therefore the extraction accuracy is low. we tend to designed a brand new network model, referred to as AR-UNet, that introduces a convolutional block attention module (CBAM) within the encoder and decoder of U-Net to effectively extract global and local detail information. The input and output CBAM features of the model are connected to increase the transmission path of features. The BasicBlock is adopted to replace the convolutional layer of the original network to avoid network degradation caused by gradient disappearance and network layer growth. we tested our method on DeepCrack, Crack Forest Dataset, and our own tagged road image dataset (RID). The experimental results show that our method focuses additional on crack feature info and extracts cracks with higher integrity. The comparison with existing deep learning ways conjointly demonstrates the effectiveness of our projected technique. The code is out there at: https://github.com/18435398440/ARUnet

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EPRO_DSP_035

Multi-Orientation Local Texture Features for Guided Attention -Based Fusion in Lung Nodule Classification

Computerized tomography (CT) scan images are widely used in automatic lung cancer detection and classification. The lung nodules' texture distribution throughout the CT scan volume can vary significantly, and accurate identification and consideration of discriminative information in this volume can greatly help the classification process. Deep stacks of recurrent and convolutional operations cannot entirely represent such variations, especially in the size and location of the nodules. To model this complex pattern of inter/intra dependencies in the CT slices of each nodule, a multi-orientation-based guided-attention module (MOGAM) is proposed in this paper, which provides high flexibility in concentrating on the relevant information extracted from different regions of the nodule in a non-local manner. Moreover, to provide the model with finer-grained discriminative information from the nodule volume, specifically-designed local texture feature descriptors (TFDs) are extracted from the nodule slices in multiple orientations. These TFDs not only represent the distribution of textural information across multiple slices of a nodule but also encode and approximate this distribution within each slice.

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