Caiwen Xu

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Objectives: To obtain an offer of acceptance into the MRes/PhD program

Educational Background

Northeastern University, *Sheyang, China*   Sept.2016-Jun.2019

B.E. in Biomedical Engineering

GPA: 88.1/100 (3.81/5.0)

Related coursework: *Advanced Mathematics, Introduction to Computer and C Programming Language, C++ Programming Design, Computer Graphics and Visualization, Database Principal, Data Structure, Signal and System, Technology of Analog Electronics, etc.*

Research Experiences

Project: *COVID-19 Identification using CT images and deep learning*

Apr.2020-Present

Key Laboratory of Intelligent Computing in Medical Image, Ministry of Education, Northeastern University, Shenyang, China

◆ Used multiple instance learning to distinguish COVID-19 from community-acquired pneumonia (CAP). The training and test sets were separated by patients in every fold in 10-fold cross-validation and the performance of the model was evaluated in a cohort of 241 patients; The proposed method achieved an accuracy of 95% (In script editing period).

◆ Further trained ResNet-50 on our dataset and took the network as a feature generator;

◆ Utilized a combination of PCA and LDA to project high-dimension features into a low-dimension space and took Citation KNN as a classifier;

◆ Performed Grad-CAM algorithm to visualize the reasons for deep CNN decision-making and the reason for Citation-KNN' decision was also explained by finding representative instances.

◆ Compared several CNN models (MedicalNet (3D-ResNet-50), ResNet-50 and Xception), feature selection methods(Lasso and reliefF) and feature dimension reduction methods (PCA, LDA, PLS);

◆ The future work in the current program will include automatic detection of lesion, integration of deep-learning and multiple-instance learning and studying the vascular changes of COVID-19 patients in different datasets.

Project: *Deep CNN transferred multiple instance learning for COPD identification using CT images*

Apr.2019-Dec.2019

Key Laboratory of Intelligent Computing in Medical Image, Ministry of Education, Northeastern University, Shenyang, China

◆ Proposed a hybrid method called Deep CNN transferred multiple instance learning (DCT-MIL) to study the classification of COPD and healthy controls via CT images;

◆ Used a data reduction strategy;

◆ Extracted the outputs (features) of a certain layer from CNN;

◆ Compared three MIL models: Citation k-Nearest-Neighbor (Citation-KNN), multiple instance support vector machine (MI-SVM), and expectation-maximization diverse density (EM-DD), and the experiment showed Citation-KNN performed best;

◆ A patent has been accepted and is being reviewed (Application No.: 202010189494.8; file No.: 2020031800945740);

◆As the first author, one paper has been published in the international journal of Physics in Medicine and Biology (Impact factor, 2.883).

Group project, Expressway Intelligence Toll System   Jul.2018-Aug.2018
Neusoft Talent Training Center
◆Responsible for automatically segmenting character blocks by using SVM to screen license plates and ANN to recognize characters;
◆Mainly used C++ language for programming.

Extracurricular Activities

Debater, Xiamen Summer Vacation Social Practice Group   Jul.2018
◆Got a spot into key teams

Team leader, Admission Presentations Social Practice in Anshan   Jan.2017
◆Participated in debating and got a spot into key teams

Awards and Honors

Team's second and sixth place in school sports meeting swimming contests   2018&2019
The third prize of scholarship of Northeastern University   2017&2018

Publication

Caiwen Xu, Shouliang Qi, Jie Feng, Shuyue Xia, Yan Kang, Yudong Yao, Wei Qian. DCT-MIL: deep CNN transferred multiple instance learning for COPD identification using CT images. [Accepted Manuscript online 1 April 2020]. Physics in Medicine and Biology. DOI: 10.1088/1361-6560/ab857d

Skills

Language skills: IELTS 6.5（Reading: 7.5, Listening: 7, Writing: 5.5, Speaking: 5.5）
Computer skills:
Programming Language: Matlab, Python, C++, C
Deep Learning Platform: PyTorch, TensorFlow, Keras