

## Editorial: Special Issue on Transfer Learning

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Transfer Learning is a Machine Learning Paradigm which Reuses Previously Trained Models to help Solve a new Learning task. The Advantage of Model Reusing, Especially Pretrained Large Scale deep Neural Networks, has made Transfer Learning Being Successfully Applied to many Fields, such as Computer Vision, Natural Language Processing, Medical Information, Finance and so on. This Special Issue Intends to Investigate Recent Advancements and Applications of Transfer Learning in Terms of General Design, Domain Study, and Literature Review in the Field. Through call for Papers and the Review Process, the

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Special Issue has Accepted 22 Articles Covering Transfer Learning Model Designs and Applications.

The first class is transfer learning model design. The paper entitled "Partial Domain Adaptation by Progressive Sample Learning of Shared Classes" by Lei Tian, Yonggiang Tang and Wensheng Zhang proposed a partial domain adaption method based on progressive sample learning of shared classes, which consists of two parts: shared classes identification and progressive target sample learning. Experimental results verified the superiority of the proposed method over existing ones. To solve premature convergence and poor initial clustering centers problem, the paper entitled "A Derived Multi-Population Genetic Algorithm For Adaptive Fuzzy C-Means Clustering" by Weiping Ding, Zhihao Feng, Javier Andreu-Perez, and Witold Pedrycz proposed a derivative operator on initialized populations to improve the algorithm's searchability and an adaptive probability fuzzy control operator to dynamically adjust the genetic probability to avoid premature convergence. The paper entitled "Fair Transfer Learning with Factor Variational Auto-Encoder" by Shaofan Liu, Shiliang Sun and Jing Zhao proposed a fair representation learning method for fair transfer learning where the labels of downstream tasks are unknown. The paper entitled "Mini-Batch Dynamic Geometric Embedding for Unsupervised Domain Adaptation" by Siraj Khan, Yuxin Guo, Yuzhong Ye, Chunshan Li and Qingyao Wu proposed an end-to-end unsupervised domain adaption method named mini-batch dynamic geometric embedding to extract discriminative features for transfer learning. To adapt to transfer learning scenario and decrease the computational complexity, the paper entitled "Concept Drift Adaptation for Time Series Anomaly Detection via Transformer" by Chaoyue Ding, Jing Zhao and Shiliang Sun proposed a concept drift method to dynamic tune the learning rate and designed a root square sparse self-attention. To make full use of the source and target domain information, the paper entitled "Image-text Sentiment Analysis via Context Guided Adaptive Finetuning Transformer" by Xingwang Xiao, Yuanyuan Pu, Zhengpeng Zhao, Rencan Nie, Dan Xu, Wenhua Qian and Hao Wu proposed a context guided adaptive fine-tuning transformer for multi-modal sentiment analysis. To project users' privacy, the paper entitled "Secure Multi-Party Computation for Personalized Human Activity Recognition" by David Melanson, Ricardo Maia, Hee-Seok Kim, Andeerson Nascimento and Martine De Cock proposed a secure multi-party computation protocol for personalized model and showed good accuracy on human activity recognition tasks.

The second class is computer vision application of transfer learning. The paper entitled "Learning Un-Occluded Face Texture Completion from Single Image in the Wild" by Yongtang Bao, Pengfei Zhou, Peng Zhang and Yue Qi proposed a multi-task learning model unoccluded face synthesis to jointly learn multiple de-occlusion tasks such as face frontalization, image inpainting and glasses removal. The paper entitled "A Novel Distant Domain Transfer Learning Framework for Thyroid Image Classification" by Fenghe Tang, Jianrui Ding, Lingtao Wang and Chunping Ning proposed a transfer learning method with distant domain high-level feature fusion model to classify Thyroid images. The paper entitled "Intelligent Identification of Jute Pests based on Transfer Learning and Deep Convolutional Neural Networks" by Md Sakib Ullah Sourav and Huidong Wang developed an intelligent model based on transfer learning and deep CNN to identify the jute pests based on their photographs. The paper entitled "Learning Transferable Feature Representation with Swin Transformer for Object Recognition" by Jian-Xin Ren, Yu-Jie Xiong, Xi-Jiong Xie and Yu-Fan Dai provided a swim Transformer to extract feature and perform fine-tuning to learn transferable feature representation for object detection. The paper entitled "Efficient Deep Feature Based Semantic Image Retrieval" by Suneel Kumar, Manoj Kumar Singh and Manoj Mishra proposed a modified-VGG16 model for feature extraction and then used them for image indexing and retrieval to get better performance.

The third class is natural language processing application of transfer learning. The paper entitled "Improving the Polarity of Text through Word2Vec Embedding for Primary Classical Arabic Sentiment Analysis" by Aoumeur Nour Elhouda, Zhiyong Li and Eissa M. Alshari created a new classical Arabic data set CASAD from many art books and then use word embedding to extract features to feed for several classification methods for sentiment analysis. To study the people's perception of the COVID-19, the paper entitled "AI Assisted Attention Mechanism for Hybrid Neural Model to Assess Online Attitudes about COVID-19" by Harnin Kour and Manoj K. Gupta fine-tuned a pre-trained BERT model and adopted two LSTMs to propose a residual encoder transformation Network to assess people's online attitudes about COVID-19.

The fourth class is medical information or bioinformatics application of transfer learning. The paper entitled "Vascular Enhancement Analysis in Lightweight Deep Feature Space" by Tingting Chai, Jiahui Li, Yanhong Wang, Guoying Sun, Changyong Guo and Zhaoxin Zhang explored transfer learning to finger-vein recognition by learning a lightweight CNN model and learning informative features without image enhancement. The paper entitled "HFMD Cases Prediction using Transfer One-step-ahead Learning" by Yaohui Huang, Peisong Zhang, Ziyang Wang, Zhenkun Lu and Zhijin Wang proposed a transfer one-step-ahead learning method to predict hand, foot, and mouth disease, which considers the approximately unidirectional influences from temperature to confirmed cases. The paper entitled "Multi-task Pre-training with Soft Biometrics for Transfer-learning Palmprint Recognition" by Huanhuan Xu, Lu Leng, Ziyuan Yang, Andrew Beng Jin Teoh and Zhe Jin pre-trains a multi-task network with soft palmprint attributes and then transferred to palmprint recognition task. The paper entitled "COVID-19 Variants and Transfer Learning for the Emerging Stringency Indices" by Ayesha Sohail, Zhenhua Yu and Alessandro Nutini used the transfer learning method to explore the most important and appropriate predictors to forecast the COVID-19 death rates and identified them are stringency index and cardiovascular death rates. The paper entitled "An Empirical Mode Decomposition Fuzzy Forecast Model for COVID-19" by Bo-Lun Chen, Yi-Yun Shen, Guo-Chang Zhu, Yong-Tao Yu and Min Ji provided an empirical mode decomposition model to obtain the change trends of epidemic data at different time scales and then trained with extreme learning machine to get the corresponding prediction values and finally predict by fitting through adaptive network-based fuzzy inference system. The paper entitled "Saliency Transfer Learning and Central-Cropping Network for Prostate Cancer Classification" by Guokai Zhang, Mengpei Jia, Lin Gao, Jihao Luo, Aijun Zhang, Yongyong Chen, Peipei Shan and Binghui Zhao proposed a saliency transfer learning network that allows the model to focus on the salient and influential regions of MRI images to classify the prostate cancer well. The paper entitled "COVID-19 Detection from Chest X-rays using Trained Output based Transfer Learning Approach" by Sanjay Kumar and Abhishek Mallik proposed a trained output-based transfer learning method for COVID-19 detection from chest X-rays images.

Besides the above works, a survey named "A survey on adversarial domain adaptation" by Mahta HassanPour Zonoozi and Vahid Seydi categorized adversarial domain adaption methods according to their structures and compared on common datasets to obtain some conclusions. Some new thoughts are also provided to help inspire future research. These 22 articles in this special issue provide a general picture of the development and applications of transfer learning method.

At last, guest editors express our sincere thanks to all the authors for their supports and contributions and all the dedicated reviewers for their papers' evaluation and selection. We also highly thank the Editors-in-Chief, Michel Verleysen and Mohamad H. Hassoun, for providing us the opportunity to organize this special issue. They worked closely with the Guest Editors to guarantee this special issue's success.

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