Qiyuan Wang

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EDUCATION

Chinese University of Hongkong, Shenzhen **09/2018-Present**

- **Senior undergraduate in** Data science
- **Expected year of graduations:** 2022
- **GPA**: 3.30/4.00 **Ranking**: 78/200
- **Research Interests**: Machine Learning, Object detection, Federated Learning (FL), Transfer Learning

RESEARCH EXPERIENCE

Application of federated learning in power grid and other industry **07/2020-Present**
Internship in AIRS, Research Assistant, Advisor: Dr. Nan, Li **AIRS, Shenzhen**

- Conducted vast experiments on various existing FL platforms, including tensorflow-federated, FATE/FedVision, and PaddlePaddle. Implemented self-designed algorithms in the existing platform.
- Used the existing FL platform to conduct experiments related to computer vision and data analysis work, model include but not limited to Yolo-V3 & V4 Mobilenet, PP-Yolo, Meta-RCNN, BAG, random forest, logistic and linear regression, etc.
- Completed two survey papers about the solutions to the two most critical problems in FL, which are non-i.i.d. dataset and asynchronous model update.
- Implemented a codeless user interface (UI) for federated learning platform based on FATE. Introduced the UI to China Southern Power Grid and a research group in Nanjing University.

Study on Federated Learning in Over-the-Air Computation **06/2019-03/2020**
Undergraduate Research Assistant, Advisor: Prof. Jie, Xu **Shenzhen**

- Reviewed more than 50 papers on Federated Learning (FL) related to communication system and learning paradigm. Completed a survey paper about transmission optimization in FL. Simulated an FL system with Federated Average algorithm and Over-the-Air-Computation.
- Studied the performance of FL model in a multi-access wireless channel; conducted simulations to explore different ways to optimize transmission efficiency and error rate of the communication model in Federated Learning; Analyzed the convergence rate of the Federated Learning model with communication loss.

PROJECTS

Research Project: Clustering Enabled Few-shot Load Forecasting **07/2021-09/2021**
Advisor: Prof. Chenye Wu

- Proposed a few-shot LSTM framework for time series data forecasting based on ensemble clustering result of historical data. So far, our team is the first to propose few-shot learning paradigm in time series forecasting.
- Implemented the ensemble clustering model based on feature extraction technique using discrete wavelet analysis and other relative statistical features. Implemented a two-phase LSTM model utilizing prior knowledge of the historical data. Conducted ablation experiments to compare the proposed method with traditional LSTM. Conducted sensitive analysis of our method by tuning different hyper-parameters.
- Published the relevant paper on IEEE-ISPEC as the first author. The paper finished peer-reviewed phase on the online conference held on December 22nd, 2021. The Paper number is iSPEC 2021CP0775 O6-11.
- Completed a patent application. Cooperated with China Southern Power Grid to apply for relevant patents based on our paper. The patent application has been preliminarily approved by the State Intellectual Property Office of China, and the patent number is 202111200796.1.

Research Project: Stochastic input transformation against adversarial samples in federated learning 06/2021-Present
Advisor: Dr. Nan Li

- Conducted a comprehensive survey related to adversarial machine learning (AML). Assessed the feasibility of relevant approaches against deep fake and noisy label in federated scenario.
- Investigated performance of FL framework on adversarial dataset. Applied stochastic input transformation methods including color bit depth reduction, local smoothing and JPG compression to refine FL's performance.
- Conducted ablation experiments to investigate the merits of stochastic input transformation.
- Completed a paper that proposed a data preprocessing mechanism for each local user in FL.

Programming Project: Code-Free User Interface for Federated Learning 05/2021-Present
Advisor: Dr, Nan Li

- Designed and developed a code-free UI based on FedVision using Bokeh and Docker. Encapsulated the entire environment as an executable file.
- Developed multiple modules in the UI, including dataset visualization and segmentation, model hyperparameter configuration, dynamic visualization of training results and online batch image detection.
- Advertised our code-free UI and FedVision framework to China Southern Power Grid Corporation. Guided the company's technical staff on cluster deployment of the FedVision and FATE frameworks and introduced the basic structure and usage of these frameworks.

Research Project: Image object detection using federated learning 12/2010-05/2021
Advisor: Prof. Ning, Ding

- Conducted object detection tasks in federated learning framework, including pavement disease detection, bridge cable disease detection and honeycomb on pylon detection. Used various local models such as YOLO Mobilenet, Mask-RCNN and Fast-RCNN.
- Conducted experiments comparing detection performance between centralized learning and federated learning in terms of Bbox-Mean AP, global convergence rate and loss.

SOCIAL ACTIVITY

Internship in Hangzhou City Brain, Department Member, Advisor: Mr. Guangjin Wu 2021/07-2021/09

- Implemented part of the source code of the MySQL database storing Index of Urban ecological civilization in Zhejiang Province. Implemented Python script for data query and selection.
- Offered return visits to citizens with health code and vaccination issues by querying information at different points in the databases of different agencies.

Volunteer Teaching in Bali, Volunteer teacher, 2020/12-2021/01

- Taught English and Chinese language to local primary school students
- Engaged in various after-class activities with the students. Introduced the traditional Chinese culture to local people.

ADDITIONAL INFORMATION

- **Technical:** Programming Languages: Python (fluent), C++ (fluent), R (fluent), MySQL (fluent), Shell (fluent), Java (comprehend), Matlab (comprehend);
- **Languages:** English (Fluent), Chinese Mandarin (Native); Standardized Test Scores: TOEFL: 105 GRE: 327+
- **Honors and Scholarships**: Bowen Scholarship (2018-2020); Undergraduate Research Awards (2020, 2021)