KAIWEN ZHOU

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EDUCATION

Zhejiang University (ZJU) *B.S. in Statistics* ***GPA: 3.89/4.00*** Sep 2017 – Present

- Main courses: *Fundamentals of Data Structure, Natural Language Processing, Object-Oriented Programming, Advanced Algebra, Mathematical Analysis, Probability Theory, Mathematical Statistics, Multi-Variable Statistical Analysis, etc.*

RESEARCH EXPERIENCES

A differential privacy version of GCN with high accuracy July 2020 – Present

Research Assistant Advisor: Prof. Bo Li, Secure learning lab in University of Illinois at Urbana-Champaign

- **Design Framework**
- Putted an adjacency matrix ensuring differential privacy into GCN network to keep the training process from using private data and to make it convenient to analyze sensitivity.
- **Privacy mechanism design**
- Proved that using exponential or laplacian mechanism directly on adjacency matrix will result in data inefficiency.
- Applied adjacency matrix generated from differential private Hierarchical Random Graph dendrogram to GCN for node level tasks.
- Designed a differential private mechanism to generate adjacency matrix from a differential private Hierarchical Agglomerative graph Clustering dendrogram with further reduction of noise scale and edge reconstruction error.

Scalable differentially private GAN via private aggregation of teacher discriminators May 2020 – June 2020

Research Assistant Advisor: Prof. Bo Li, Secure learning lab in University of Illinois at Urbana-Champaign

- Applied signSGD-a compressed optimization method on GAN.
- Tested the effectiveness of using signSGD on DCGAN, with utility test accuracy just 2.5% lower than that of vanilla DCGCN on MNIST, while 10% lower on celebA.
- Provided the foundation of the framework to solve the problems of pattern collapse and convergence failure by visualization of parameters during training and adjusting hyperparameters.
- Designed a differential private aggregation method on multiple teachers setting with less privacy budget leveraging the binary property of signSGD.

Pressure control mechanism design for pressure tubing system Sep. 2019

Research Leader Advisor: Prof. Zhiyi Tan, Professor in the school of mathematics, Zhejiang University

- **Establishment of mathematical models**
- Fitted the functional relationship between variables using polynomial fitting, trigonometric function fitting and spline interpolation.
- Constructed a set of partial differential equations to describe the relationship between multiple variables in tubing operation under different settings.
- Designed the work mode of two nozzles and pressure reducing value to help increase the time overlap of oil pumping and spraying to the most extent and successfully reduced the variance of the oil pressure
- **Simulation and conclusion**
- Simulated the operation of the system using Euler method and modified Euler method.
- Computed the parameters by dichotomy using the monotone relationship between the parameters and indexes.
- Successfully controlled the pressure in the tubing at any level and significantly reduced the variance of the pressure from 0.53 to 0.026.

PDE-based image denoising Jul 2019 – Aug 2019

Research Leader Advisor: Prof. Xiaoliang Cheng, Professor in the school of mathematics, Zhejiang University

- Summarized PDE denoising algorithms, and created several new combinations of them.
- Effectively prevented over-diffusion and edge blurring in image denoising by stopping denoising when SNR start falling.
- Improved the results of selected algorithms on several types of pictures by automatic stop denoising.

ACADEMIC AWARDS

- Honorable Mention in Mathematical Contest In Modeling Mar 2020
- First Prize in China Undergraduate Mathematical Contest in Modeling(0.75%) Sep 2019
- Zhejiang Provincial Government Scholarship Oct 2019
- Zhejiang University Second-class Scholarship(8%) Sep 2019
- Third Prize in Zhejiang Undergraduate Physics (Theory) Innovation Contest Dec 2018
- Third Prize in Zhejiang Undergraduate Advanced Mathematics (Calculus) Competition May 2018

SKILLS & LANGUAGES

Computer skills: Python, C/C++, Matlab, R, Stata, SQL

Languages: Chinese (Native), English (Proficient)