Xian Sun

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EDUCATION

Duke University, Durham, North Carolina **Aug 2019 - May 2021**
Master of Science in Electrical and Computer Engineering GPA: 3.97 (Max: 4.0)
Relevant Coursework: Computer Vision, Machine Learning, Deep Learning, Random Signal and Noise, Systems Programming & Engineering, Software Engineering

Jilin University, Changchun, China **Aug 2015 - Jun 2019**
Bachelor of Science in Electrical Engineering GPA: 3.90 (Max: 4.0)
Relevant Coursework: Probability and Statistics, Advanced Mathematics, Digital Signal Processing Embedded Systems, Signal and Systems, Linear Algebra

RESEARCH & PROJECT EXPERIENCE

Research Assistant, Computer Vision Lab, Duke University **June 2020 - Present**
Advisor: Dr. Carlo Tomasi

- Developed LeavesImageEditor to reduce the class imbalance ratio in Leaves Dataset to 205 from 500. Designed a copy/paste data augmentation algorithm to further reduce the class imbalance ratio to 45.
- Working on two-branch model to improve the overall performance.

Research Assistant, Almost Matching Exactly Lab, Duke University **July 2020 - Apr 2021**
Advisor: Dr. Cynthia Rudin, Dr. Sudeepa Roy, Dr. Alexander Volfovsky

- Developed the Python package for Fast Large-scale Almost Matching Exactly on Database (FLAME-DB) Algorithm and R package for Adaptive Hyper Box Matching (AHB) Algorithm. Both packages provide processing tools like data type checking & mapping, missing data handling, average treatment effect (ATE), average treatment effect on treated (ATT).
- Improved the accuracy and speed of the FLAME-DB by combining fixed and adaptive weight matching. FLAME-DB can work for large dataset with more than 1M units and 100 categorical covariates.
- Improved the speed of AHB by parallel programming and reduce the number of times of prediction. AHB can match the dataset with both continuous and categorical covariates.
- Lab Website: https://almost-matching-exactly.github.io

Research Assistant, Deep Learning (DL) & Hardware Research Group, Duke University **Oct 2020 - Mar 2021**
Advisor: Dr. Krishnendu (Krish) Chakrabarty, Dr. Biresh Joardar

- Explored the relationship between model sparsity and resistance to stuck at faults (SAF) by implementing a SAF injecting method and one-shot global pruning method on CNN models like Lenet5, VGG16, Resnet18.
- Explored the model sparsity and crossbar saving on ReRAM. Replicate Lottery-tickets experiments to get extremely sparse CNNs by iteratively and globally pruning 95%-99% weights to save more than 80 percent the number of crossbars (128x128) for VGG, Resnet and Alexnet, etc.

DL Project: Improved Regularization of Convolutional Neural Networks, Duke University **Dec 2020**

- Implemented Cutout and Mix-up to address overfitting problems for ResNet18, 34 and 50.
- Do grid search for a good combination of cutout and Mix-up for ResNet18-CIFAR10.
- Transfer the best combination of cutout and Mix-up to SVHN and Fashion MNIST, trained on ResNet18.
- Improved the test accuracy by 1% for Fashion-MNIST and 3% for SVHN.

ML Project: Exploring Probabilistic Classifiers on Binary Classification, Duke University **Apr 2020**

- Implemented Bayes classifier with different assumptions regarding covariance structure of dataset and linear discriminant classifier and logistic discriminant to four different 2-dimensional datasets.
- Applied cross-validation to estimate classifier performance using the available training data.
- Compared three classifiers and analyzed the advantages and disadvantages of them.

Image Processing Project: Image Recovery by Compressed Sensing, Duke University **Feb 2020**

- Implemented DCT transformation and inverse DCT to compress images and then recover the full image.

- Implemented principal component analysis (PCA) to compress images and then recover the full image.
- Applied median filter to improve the quality of recovered images and compare performances of two techniques.

Software Project: Develop RISK Game in Java, Duke University **Apr 2021**

- Designed and implemented the game server and chat server with multithreading and state machine.
- Game server supports 3 main phases: user log phase, game room phase, game phase. It can support multiple players play from different devices at a time and recover all games to consistent states from any problems by Hibernate.
- Implemented chat server with Non-blocking IO to save thread resources.
- Project codes: https://github.com/ALEXLANGLANG/Risk-game

Software Project: Mini Linux Command Shell, Duke University **Nov 2019**

- Designed a miniature version of Linux Command Shell functionally with C++
- Implemented command processing functions that can take multiple arguments and search for commands without a full path, which also support escaped quotation marks and backslashes.
- Implemented functions to modify environment variables, which allows user to set variables into current environment, export variables into environment for other programs and reverse the value of variable.
- Implement input redirection, output redirection and pipes.

INDUSTRIAL EXPERIENCE

Machine learning Intern, Neacova, United States **June 2020- Aug 2020**

- Developed a linear regression model that calculates the percentage change in valuation of the model and a binomial logistic model that calculates the probability of positive/negative growth.
- Selected 5 most significant statistically variables with LASSO and 5 demographic variables with Decision Tree from more than 500 variables.

Electrical & Software Intern, Firmenich Aromatics (China) Co. Ltd **Apr 2019 - Jun 2019**

- Designed and implemented a wireless rating device that allowed blind participants in food assessment lab to rate various features of food products, that then sent data to a computer after pushing the button on the device.
- Designed and implemented a GUI application using Qt, which allowed users to classify data based on different features of food products and output the result into excel. The program worked on Windows 8 or 10.
- Improved the efficiency and accuracy of data processing by streamlining the data collecting process.

RELEVANT SKILLS

- Languages: Python, Java, C++, R, C, SQL, Markdown
- Frameworks: PyTorch, Scikit-learn, Pandas, TensorFlow
- Software: Emacs, Jupyter Notebook, PyCharm, IntelliJ, RStudio, PostgreSQL

TEACHING EXPERIENCE

- Teaching Assistant to Dr. Carlo Tomasi for the graduate course CS527: Computer Vision 2021
- Teaching Assistant to Dr. Ivan Mura for the graduate course ECE650K: System Programming & Engineering 2021
- Teaching Assistant to Dr. Loren Nolte for the graduate course ECE581: Random Signal and Noise 2020
- Teaching Assistant to Dr. Elchanan Solomon for the undergraduate course Math216: Linear Algebra and Differential Equations 2020

SCHOLARSHIPS

- ECE Merit Scholarship, ECE department, Duke University 2020
- CASC Scholarship, China Aerospace Science and Technology Corporation (top 10 out of 43,500) 2018
- China National Scholarship, China Ministry of Education (top 1% out of 43,500) 2017&2018