Weijia Cai

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Department of Civil and Environmental Engineering, 5000 Forbes Avenue, Pittsburgh, PA 15213

EDUCATION

Carnegie Mellon University Pittsburgh, Pennsylvania, US.
Master of Science in *Civil and Environmental Engineering* Aug 2019 – Dec 2020

- GPA (first two semesters): 3.52/4.00
- Awards: Civil Engineering Department Scholarship (2019-2020)
- Related courses: Introduction to Machine learning(10601), Introduction to Deep learning(11785), Probabilistic and Mathematic Statistic(36700), Engineering Optimization(24785), Data Analytics for Engineered Systems(12709), BIM for Engineering, Construction and Facility Management(12711).

Jilin University Changchun, Jilin, China
Bachelor of Engineering in *Engineering Geology* Sept 2015 – Jul 2019

- Overall GPA: 3.41/4.00, 86.2/100.0

Taiwan National Central University Taoyuan, Taiwan, China
Exchange student in *Civil Engineering Dpt.* Sept 2017 – Jan 2018

- Overall GPA: 3.73/4.00, 87.6/100.0

PROFESSIONAL PROJECT

Valuable Data Preservation of Drone-generated Data for bridge inspection Jun 2020 – Aug 2020
Researcher in Summer research program in CEE Dept. in CMU

- Designed an integrated indicator that helps recognize the criticality of bridge components
- Built a Finite Element Model in a bridge structural model in Autodesk Robot Structural Analysis
- Built an integrated system in Python for data preprocessing, simulation function and data visualization

Guangdong Institute of Intelligent Manufacturing Guangzhou, Guangdong, China
Intern Jan 2018 – Mar 2018

- Developed an interface that can detect faces by catching dynamic images from a camera.
- Processed images using modules in **OpenCV**; Trained **AdaBoost** classifiers and cascade classifier using HAAR-like feature.

ACADEMIC PROJECT

Course projects in *Introduction to Deep Learning* (11785 in CMU) Jan 2020 – Mar 2020

- Handwriting Number Recognition on **MNIST**: Implemented a Multi-Layer Perceptron (**MLP**) model based on the NumPy based library, including useful activations, loss criterions and batch normalization; achieved a 95% of accuracy.
- Frame-level Speech recognition on WJ0 Dataset: built a 6-layer MLP within AWS services platforml; adjusted the hyperparameters of network using techniques such as **callback** function, **scheduling learning rate** and **ensemble method**; achieved an accuracy of 63.4 % ranked as **A** level among the class.
- Implemented distributed scanning MLP architecture using self-built **1D Convolutional layer** function using Numpy.
- Face Recognition: Designed a **CNN** model based on **ResNet34** to do classification task with 2300 classes of human face and achieved an accuracy of **79.4%,** ranked 14/300 in Kaggle in-class competition.
- Face Verification: implemented an open-set protocol human face **verification** using Cosine Similarity; achieved an AUC score of **92.2%.**
- Language generation on WikiText-2 language modeling Dataset: built RNN cell and GRU cell as the basics of the language model; applied **locked Dropout** and **weight tying** to the model as regularization;
- Language Generation on WJ0 Dataset: built a probabilistic language model based on the LAS model; implemented the QKV **Attention mechanism** with static Teacher Forcing; achieved an average Levenshtein distance of 9.81 which ranked A in the class

Course Projects in *Introduction to Machine Learning* (10601 in CMU) Aug 2019 – Dec 2019

- Political party Identifier: Constructed a political party classifier by implementing a **Decision Tree** algorithm based on Mutual Information as decision threshold in Python.
- Polarity analysis on Movie Review Polarity dataset challenge: combined **Bag-of-Words** Model and **Binary Logistic Regression** in Python to predict whether a comment of a movie is positive or negative; achieved an accuracy of 85%.
- Word Order Decoding: implemented a first-order **Hidden Markov Model** using Viterbi algorithm as decoding paradigm to predict tag sequences from word sequences.

- MountainCar-v0: built a **Q-learning** model with Q value approximated by linear regression; accomplished the challenge within 5 epochs.

Data Analysis and Interpretation of EMS Incident Dispatch Data in NYC Opendata Aug 2019 – Dec 2019

Course Project in *Data Analytics in Engineered Systems* (12709)

- Made an EDA of the million-level dataset and **cleaned abnormal data** such as NULL values and outliers using **R** module and **Tableau Prep**.
- Proposed three research questions one of which inferred the relationship between EMS response time and ineffective call.
- Used R square test to evaluate the dependency of EMS response time on ineffective call.

Design of Genetic Algorithm applied to Analysis of Slope Stability Mar 2019 – Jun 2019

Undergraduate Dissertation

- Analyzed the Geological characteristics of a foundation of a high-rise building and extracted the related data
- Designed a framework for the implementation of the **Genetic Algorithm** in the field of Slope Analysis
- Combined the genetic algorithm with Limit Analysis which helps reduce 1.5 times of the cost estimation by confirming a more precise sliding plane

Remote Control Car Model Apr 2017 – Jun 2017

Jilin University Open Innovation Experiment Project

- Designed a single chip system (51 single chip) and assemble it into a car model.
- Implemented a decoding algorithm in C language to recognize the NEC IR Protocol for controlling the car's moving.

PUBLICATION

- WANG Yan-long, DU Li-zhi, HE Sai, CAI Wei-jia,(2018). Application of logistic regression model in slope stability analysis[J]. Global Geology, 2018,37(03):945-951.
- Xu Sh.B, Zhang X.P, Cai W.J,(2019). The Application of Seismic Refraction Tomography and High-Density Resistivity Method in Tunnel Investigation. Subgrade Engineering, (submitted).

EXTRACURRICULAR ACTIVITIES

The technical team of Publicity department, *Education Without Barriers*

Group Member Oct 2018 – Oct 2019

- Designed a database management system using Access. Composed a technical manual about the use of DingTalk APP.
- Organized database of faculty information and donations. Registered new email addresses for Zoom VIP accounts for online teaching.