

Zhiyuan Liu

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1475 Folsom St., Boulder, CO 80302

EDUCATION

Ph.D in Computer Science

University of Colorado Boulder

Aug. 2015–Present

Department of Computer Science

Bachelor in Computer Science

University of Science and Technology of China

Aug. 2011–May 2015

Department of Computer Science

RESEARCH PROJECTS

- **SmartControl** (A fast control system for large scale networks) Jan.–Sep. 2020
 - Contributed **15K+** lines of code including data processing, network construction, autonomous control, result analysis and state inference in **Python** using **OpenDSS**, **MongoDB**, **Networkx**.
 - Proposed an accelerated algorithm which reduced communication burden (**by half**), running time (**from 2 hours to 130 seconds**) and memory (**from 1GB to 25MB**) for 1 million network nodes.
 - Accepted as **Standard Library** by PSEC of NREL (**US Patent publication number: 2021/0013720 A1**).
- **DeepKoopman** (A time-series prediction system based on deep neural networks) Jan.–May 2020
 - Constructed a machine learning model with time-series data sampled from synthetic biological systems.
 - Implemented the Koopman learning algorithm based on **TensorFlow**, **sqlite3** and **Scikit-learn**.
 - Improved the accuracy by **17%** for one step prediction and **24%** for 200-step prediction compared to **E-DMD**.
- **Dis-GridSim** (A simulator for large-scale smart grid control) Jul.–Dec. 2019
 - Built a hierarchical distributed algorithm to solve OPF problem with LinDistFlow model.
 - Implemented the algorithm in **Python**, designed GUI with **Tkinter** and analyzed data with **pandas**.
 - Improved the simulation accuracy by **3%** compared to standard simulation tool **OpenDSS**.

EXPERIENCE

Summer Intern (Data Science and Analytics Group, PNNL)

Richland, WA

- Multiple step predictions for high dimensional nonlinear dynamics

Jun.–Aug. 2018

- Proposed the distributed operator learning algorithm for prediction of high dimensional dynamics.
- Developed systems based on **PyTorch**, **MySQL** and **Dispy** with **1/4** running time compared to baselines.
- Organized our group's poster session at PNNL and wrote two research papers accepted by ACC, 2020.

Summer Intern (Data Science and Analytics Group, PNNL)

Richland, WA

- Network clustering and model decomposition based on Koopman learning

Jul.–Aug. 2017

- Proposed new data-driven criteria for network clustering to improve the privacy and stability.
- Implemented the algorithm for IEEE 39 Bus System in **Java** and visualized the result utilizing **D3.js**.
- Improved the robustness of each cluster which could tolerate up to **19%** node failure (**45%** improvement).

Research Assistant

CU Boulder, CO

- Incentived exploration for Multi-armed Bandit algorithms

Sep.–Dec. 2019

- Proved current MAB algorithms (UCB, ϵ -Greedy and TS) are still effective under drifted rewards.
- Wrote two research papers accepted by **AAAI**(2020) and active learning workshop at **ICML**(2020).

Teaching Assistant

CU Boulder, CO

- Taught recitation courses, designed quizzes and graded assignments for **Operating System** (Fall 2015, Spring 2016), **Computer Systems** (Fall 2016, Spring 2017, Fall 2020), **Algorithms** (Fall 2017, Fall 2018, Spring 2020).
- Won departmental research fellowship for Ph.D student with both excellent TA and research performance.

SKILLS

Languages: Python, C/C++, Java, SQL, R, Matlab. **Libraries:** TensorFlow, Socket, OpenDSS, MongoDB

SELECTED PUBLICATIONS(FIRST AUTHOR)

- [1] Incentivized Exploration for Multi-Armed Bandits under Reward Drift, **AAAI**, 2020
- [2] A Smoothed Analysis of Online Lasso for the Sparse Contextual Bandits Problem, Workshop at **ICML**, 2020
- [3] Towards Scalable Koopman Operator Learning Convergence and Distributed Learning Algorithm, **ACC**, 2020
- [4] Signal-Anticipation in Local Voltage Control in Distribution Systems, **TSG**, 2019
- [5] Decomposition of Nonlinear Dynamical Systems Using Koopman Gramians, **ACC**, 2018