Jiayi "Jerry" Su

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Seeking Positions in Computer Vision/State Estimation/
Deep Learning/Data Analysis or Related Area

Education

- **Marquette University** — Milwauke, USA
  Doctor of Philosophy - Electrical and Computer Engineering — *May 2018 - Present*
- **Marquette University** — Milwauke, USA
  Master of Science - Electrical and Computer Engineering — *August 2016 - May 2018*
  Thesis: *Sensor Intrusion Detection in Control Systems Using Estimation Theory*

SUMMARY

- Jerry is a fourth-year Ph.D. student working with Dr. Edwin Yaz in the Modeling, Analysis, Control and Estimation (MACE) Group at EECE Department, Marquette University, where he works on deep learning based computer vision, state/parameter estimation theory and its applications.
- **Computer vision & Deep Learning**: He has 2 years academic experience on deep learning based image/video analysis, with a focus on object tracking and human activities recognition using 2D-/3D-CNNs. He's proficient in Pytorch/Horovod/Ray Tune and the use of High Performance Cluster (HPC) for building, training and tuning CNN models. He also has basic knowledge on medical image processing such as CT reconstruction.
- **State & Parameter Estimation**: He has 5 years of research experience on state estimation and parameter identification with a focus on Kalman filter (and its variants like EKF, SPKF) based Multiple Model Adaptive Estimation (MMAE) technique.

Academic Project & Experience

- **Multi-Target Tracking (Computer Vision & State Estimation)** — Milwaukee
  NSF Project — *Dec 2021 - Present*
  - Implemented an online multi-target tracking algorithm using MMAE to track pedestrians detected by CNN based object detectors. Could track pedestrians' bounding boxes with intermittent bounding box measurements from object detector. Demo
- **Human Actions Detection (Deep Learning & Computer Vision)** — Milwaukee
  NSF Project — *May 2020 - Present*
  - Implemented a 3D Convolutional Neural Network (3D-CNN) with Pytorch to detect pedestrian abnormal behaviors from videos captured by surveillance cameras around the Marquette campus. Validation accuracy outperformed state of the art on several video datasets using transfer learning. Demo
  - Developed a two-stream (RGB+flow) based 3D-CNN to detect abnormal behaviors from videos using Pytorch, achieved state of the art performance on several violence video datasets. Demo
  - Used Raj, a High Performance Cluster (HPC) at Marquette University, and Horovod, a distributed training framework, to speed up the training process. Used Ray Tune for hyperparameter tuning.
- **Lithium-ion Cells SOC and SOH Estimation (State & Parameter Estimation)** — Milwaukee
  Research Project — *May 2019 - Present*
  - Developed an online SOC estimation algorithm for LiFePO4 cells using Multiple Model Adaptive Estimation (MMAE) technique. Brought much faster ($\sim 30\%$) speed convergence and smaller ($\sim 25\%$) estimation error compared to EKF under same initial state estimates and error covariance. Could still converge fast even if initial conditions are poor. ACC 2021
  - Reduced the computation cost and the quantization error of MMAE approach by combining MMAE and EKF together, while still achieved higher ($\sim 2\%$) estimation accuracy compared to MMAE alone. ECC 2021
  - Came up with a simultaneous SOC and cell capacity estimation technique using MMAE approach. Achieved faster speed convergence and smaller estimation error compared to Joint and Dual estimation technique under the same initial set up.
- **Sensor and Actuator Intrusions Detection** — Milwaukee
  Research Project — *August 2017 - Dec 2018*
  - Developed a bank of Kalman filters based Multi-Model technique to detect either sensor or actuator intrusions on Cyber-Physical Systems when it is under attack by unknown type of signals. DSCC 2020
  - Implemented a fading memory technique that can speed up the convergence of the Kalman filter, applied on Multi-Model detection technique to decrease the detection time delay. CDSR 2020

Skills Summary

- **Languages**: Python, MATLAB/Simulink, Octave, Bash, R, HTML/CSS
- **Frameworks**: Pytorch, Keras, OpenCV, Scikit-learn, Ray Tune, Horovod
- **Tools**: Git, LaTeX, Markdown
- **Platforms**: Linux, HPC
- **High Performance Computing**: Slurm