MingYu Lu

Email: mingyulu@mit.edu
Mobile: 857-800-5671
Github: https://github.com/q8888620002

Education

Harvard Medical School Boston, MA
M.S. in Biomedical Informatics. GPA: 3.74/4.0 *May 2019*

- Thesis *Sensitivity Analysis of Deep Q-Learning for Sepsis Treatment.* Advisor: LiWei Lehman, Finale Doshi-Velez, Roger Mark
- Courses include Computational Statistics, Artificial Intelligence, Machine Learning, Data Science in Medicine, and Database Design.

Kaohsiung Medical University Kaohsiung, Taiwan
Doctor of Medicine. GPA: 3.71/4.0, Last 60: 3.99/4.0 *June 2017*

- Studies included biochemistry, genetics, pharmacology, pathology, anatomy, physiology and microbiology.

MIT Open CourseWare *May 2015*

- Computer science courses included Introduction to Algorithms, and Elements of Software Construction.

Research Interests

My broad research interests are:

- Sequential decision-making models including reinforcement learning and Bayesian methods.
- Counterfactual prediction for treatment effects and patient outcomes
- Representation learning for biomedicine in multi-mics (genomics, epigenomics, transcriptomics, and proteomics), drug discovery, and precision health

Research Experience

MIT Laboratory for Computational Physiology Cambridge, MA
Postdoctoral/Graduate Research, Advisor: LiWei Lehman, Roger Mark *Oct 2018 - Present*

My research focuses on dynamical treatment regimes, counterfactual simulation models, and reinforcement learning in clinical decision making

- Currently developing methodology for simulation of disease trajectory and long-term treatment regime using cardiovascular simulator with the goal of validating the counterfactual prediction by the use of G-computation and Recurrent Neural Network.
- Independently formalized, designed and discretized states, action and reward of Dueling Double DQN agent of sepsis treatment. Queried and imputed 4 millions records of multivariate time series data of 19,000+ ICU patients from MIMIC electronic health database.
- Designed evaluation metrics to characterize learned policies of Deep Reinforcement Learning for clinical decision making.
- Analyzed the influence of states definition, embedding modules, reward function and other environmental intrinsic factors on DDDQN.

Academia Sinica, Institution of Information Science Taipei, Taiwan
Research Assistant, Advisor: TingYi Sung *Aug 2017 - Feb 2018*

- Improved efficiency of protein spectrum viewer by refactoring data structure and deploying visitor pattern of fragmented spectrum. Designed and implemented user interface of the spectrum viewer.
- Standardized data of breast cancer genomics, 100,000+ DNA, RNA, and phosphates, and selected clinical features to predict expression level of breast cancer proteome in collaboration with computational scientists and biologists.

National Taiwan University Hospital, Taipei, Taiwan
Research Assistant Advisor: LaiFei Pi *May 2016 - Dec 2016*

- Imputed data of electronic health record of 200,000+ patients of SQL database and established prediction model of patient visiting time in outpatient Department of Pulmonary Medicine.
- Independently implemented random forest regression and factorization machine with Libm in Python, with an MSE of 4.3 minutes as the outcome.

Awards

LEAP Fellowship of the Ministry of Science and Technology of Taiwan 2019

- Exclusively for applicants who have M.D. degree or Ph.D. degree with significant academic achievement, data analytics, statistical, and programming experience.

Publications (Accepted)

MingYu Lu, Zach Shah, Finale Doshi Velez, Li-Wei Lehman. Sensitivity Analysis of Deep Reinforcement Learning for Sepsis Treatment. *New In ML Workshop at NeurIPS 2019*.

Niklas Rindtorff, **MingYu Lu**, Nisarg Patel, Huahua Zheng, and Alexander D'Amour. A Biologically Plausible Benchmark for Contextual Bandit Algorithms in Precision Oncology Using in vitro Data. *Machine Learning for Health (ML4H) Workshop at NeurIPS 2019*.

(Submitted)

Rui Li, Zach Shahn(co-first authors), Jun Li, **MingYu Lu**, Prithwish Chakraborty, Daby Sow, Mohamed Ghalwash, Li-wei H Lehman. G-Net: A Deep Learning Approach to G-computation for Counterfactual Outcome Prediction Under Dynamic Treatment Regimes. *AISTATS 2020,* Submitted.

Editorial Activities

Reviewer of *NeurIPS Machine Learning for Health (ML4H) Workshop 2019*

Teaching Experience

Collaborative Data Science in Medicine, Harvard-MIT — Cambridge, MA
Faculty/Teaching Assistant, HST953. Health Sciences and Technology — *Fall 2019*

- Faculty of the Health Sciences and Technology course for Harvard and MIT students. Topics includes Predictions, Exploration Data Analysis, and ML and AI in Healthcare.
- Organized the curriculum and workshops. Supervised and instructed students with lectures, workshops and medical data analysis.
- Led a team to perform data exploration and building prediction models for hemodilution effect of intensive unit care (ICU) patients with MIMIC Critical Care database.

Milan Critical Care Datathon — Milan, Italy
Invited Mentor — *Feb 2019*

- Helped participants understand medical concept of topics. Instructed and assisted participants with the technique issue of data analytic tool.
- Led a multidisciplinary team physicians, data analysts, and computer scientists, investigating the effect of Capillary Leakage. Organized and facilitated team communication.

Professional Experience

National Taiwan University Hospital — Taipei, Taiwan
Medical Intern — *May 2016 - May 2017*

- Core clinical rotation in major specialties, primary care duty, surgical assistance. Analyzed laboratory results, and gathered information during examination to properly diagnose illness.

TinyNote https://thetinynotes.com/ — Taipei, Taiwan
CoFounder & CTO — *2016 - Present*
A website of physician-authored clinical decision support resources, allowing medical professionals to follow the more than 1500+ latest guidelines of diseases and clinical inquiry with monthly 180,000+ active users.

- Responsible for AWS deployment, development and maintenance of back-end APIs, database, text-searching package of NodeBB, and Google search engine optimization.

Leadership

President of Guitar Club Leader at Kaohsiung Medical University. 2013 - 2014
Chief Information Officer of KMU Class of 2017.

Skills

Programming/Scripting Languages: Python, R, JavaScript, Java, php, C#, HTML, CSS.
Data analysis/Machine learning: Numpy, Scikit-Learn, Pandas, Tensorflow, Keras, Pytorch.
Database/Query: Postgre, MySQL, MongoDB, BigQuery.
Cloud/Web Services/Framework: AWS, GCP, IBM cloud, Nginx, NodeJS, Express.
Virtual Environment: Docker, OpenAI Gym/Universe, Anaconda.