MingYu Lu

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Education

Massachusetts Institute of Technology Aug 2019 - Present, Cambridge, MA
Postdoctoral Research. Laboratory for Computational Physiology.
Research focuses on dynamical treatment regimes, counterfactual simulation models, and reinforcement learning in clinical decision making.

Harvard Medical School May 2019, Boston, MA
Master of Biomedical Informatics. Thesis: Sensitivity Analysis of Deep Q-Learning for Sepsis Treatment. Studies include Computational Statistics, Artificial Intelligence, Machine Learning, Data Science in Medicine, and Database Design.

Kaohsiung Medical University June 2017, Kaohsiung, Taiwan
Doctor of Medicine. Studies included biochemistry, genetics, pharmacology, pathology, anatomy, physiology and medical microbiology.

MIT Open CourseWare May 2015
Computer science courses included introduction to algorithms, 6.006, and elements of software construction, 6.005.

Research Experience

MIT Laboratory for Computational Physiology Oct 2018 - Present, Cambridge, MA
Advisor: LiWei Lehman, Finale Doshi-Velez, Roger Mark
Working in collaborating with IBM researchers, 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 of multivariate time series data of 19,000+ ICU patients from MIMIC electronic health database.

Designed evaluation metrics to characterize behavior 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 2017 - 2018, Taipei, Taiwan
Advisor: TingYi Sung
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 2016 - 2017 Taipei, Taiwan
Advisor: LaiFei Pi
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.

Publications

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

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

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

Editorial Activities

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

Teaching Experience

Collaborative Data Science in Medicine Aug 2019 - Present, Cambridge, MA
Faculty of HST.953, Health Sciences and Technology, Harvard-MIT.
Organized curriculum and workshop. Supervised and instructed students with lectures, workshops and medical data analysis. Led a team to perform data exploration and building prediction models with intensive unit care data.

Milan Critical Care Datathon Feb 2019, Milan, Italy
Invited Mentor. Helped participants understand medical concept of topics. Organized and facilitated team communication. Instructed and assisted participants with the technique issue of data analytic tool.

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.

Professional Experience

National Taiwan University Hospital 2016 - 2017, Taipei, Taiwan
Medical Intern. 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/ 2016 - Present, Taipei, Taiwan
CoFounder & CTO. A website of physician-authored clinical decision support resources, allowing medical professionals to follow the more than 800+ 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
ChiefInformation Officer of KMU Class of 2017. 2015 - 2016

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.