# MingYu Lu

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**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.*
- Courses include Computational Statistics, Biostatistics, 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.

**Research Experience**

**MIT Laboratory for Computational Physiology** — Cambridge, MA
***Postdoctoral/Graduate Research*** **(Oct 2018 - Present)**
My research focuses on dynamical treatment regimes, causal inference, 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 Duel-DDQN 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 Duel-DDQN.

**Academia Sinica, Institution of Information Science** — Taipei, Taiwan
***Research Assistant*** **(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*** **(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.

**Publications (Accepted)**

**MingYu Lu**, Zach Shah, Finale Doshi Velez, Li-Wei Lehman. Is Deep Reinforcement Learning Ready for Practical Applications in Healthcare? A Sensitivity Analysis of Duel-DDQN for Hemodynamic Management in Sepsis Patients Reinforcement Learning for Sepsis Treatment. ***AMIA 2020*****. (Nominated for Distinguished Paper)**

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*****.**

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. ***AAAI 2020***.

**MingYu Lu**, Chenyu Lu, Jingyi Chen, Leo Anthony Celi. Predicting Hemodilution with Machine Learning. ***Beth Israel Deaconess Medical Center Artificial Intelligence/Machine Learning Symposium 2020***

Rui Li, Zach Shahn, Jun Li, **Mingyu Lu**, Prithwish Chakraborty, Daby Sow, Mohamed Ghalwash, Li-wei H. Lehman. Learning Optimal DTRS From Temporal ICU Monitoring Data. ***MIT-IBM Watson AI Lab Virtual Poster Session 2020***

**Academic Activity**

**Organizer** of *NewInML at NeurIPS 2020*

**Reviewer** of *NeurIPS Machine Learning for Health (ML4H) Workshop 2019, 2020, ACM Conference on Health, Inference, and Learning 2020, AMIA 2020*

**Teaching Experience**

**Faculty, Health Sciences and Technology, Harvard-MIT,**
***Teaching Assistant*,** HST953. ***Collaborative Data Science in Medicine*** **(Fall 2019)**

- Moderator and Organizer 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.

**Society of Critical Care Medicine Datathon, Milan Critical Care Datathon, Beth Israel Deaconess Medical Center Artificial Intelligence/Machine Learning Datathon (2018 - 2019)**
***Mentor/Team leader***

- Helped participants understand medical concept of topics. Instructed and assisted participants with the technique issue of data analytic tool. Organized and facilitated team communication. Instructed and assisted participants with the technique issue of data analytic tool.

**Professional Experience**

**Philips Research North America** Cambridge, MA
***Senior Clinical Data Scientist*** **(July 2020 - Present)**

- Analyzed electronic medical record and hospital workflow. Developed and implemented algorithms for predicting disease and treatment outcomes.

**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 & Web Developer*** **(2016 - 2019)**
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.

**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.

**Awards/Activity**

**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.

**MIT Open CourseWare 2015**

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

**Leadership**

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