



***A6-to-One Program Intern Research Training-Project-Based Learning**

Preparation for Research Experience Training (*IP and Copyright reserved by AARD)

Python/Machine Learning for Data Sciences & Quantum Computing

Instructors: Dr. Mikhail Shalaginov, MIT (email: mys@mit.edu)

Dr. Jack Zhao, Boston University (email: jack7z@bu.edu)

Teaching Assistant: Emma Chen (Brown University) at Office MIT E70 (5th floor, 10am-4pm)

Hybrid: [Online Zoom ID 82917014280; password 120168; onsite MIT E70 11th Floor Singapore/14th Charles Rooms](#)

This course is designed for students to gain and hone the skills of coding in python and learn the basics of engineering artificial neural networks as well as quantum computing fundamentals for problem-solving.

Intended learning outcomes: by the end of the course the students will be able to:

- comprehend and compose basic programs in python
- perform elements of data processing
- select a suitable type of network for the problem at hand
- engineer and train available and custom-built neural nets and more advanced research in computing.

11 Sessions: June 17th -Jul 18th (Jul 4th no class)

Office Hours M/Th 9am-11am, then individual supervision for research remotely or onsite.

More RAs and Advisors will step in to support your project since Jul 1st. Communication Tool: Slack

Python ABCs	Day/Week Day	Time	Every Day Individual Work
Simple inputs and operations (Misha)	June 17/Sat	7pm-8:30pm	Developing topic
Functions, branches & loops (Jack)	June 19/M	8:00am-9:30am	Developing topic
Objects and classes (Jack)	June 21/Wed	8:00am-9:30am	Developing topic
Machine Learning			
Decision trees (Misha)	June 23/F	8am-9:30am	Developing topic
Anatomy of neural nets	June 27/Tue	8:30am-10am	Developing topic
Natural language processing	June 29/Th	8:30am-10am	Developing topic
Convolutional nets	July 1/Sat	9am-11am	Individual Research
Datasets for training NNs	July 6/Th	9am-11am	Individual Research
Entering intensive research training	Jul 7/F*	11am-2pm	Research plan presentation
Meeting with advisors as need	Jul 7-Aug 11	do project 4-6hours/daily	focus on your own project meetings with your advisors/RA
MIT E70	All Fridays	11am-2pm	lunch meetings with advisors/RA
	Project PPT	weekly progress	present to advisors, similar as MIT/Harvard students do
Preparing for Advanced Research			
Quantum Computing			
Quantum states and gates	July 11/Tue	8:30am-10am	Research progress
Quantum circuits	July 13/Th	9am-11am	Research progress
Blockchain			
Cryptographic functions and algorithms	July 18/Tue	9am-11am	Research Plan Presentation

References:

- Dane Hillard, 'Practices of the Python Pro', Manning Publications, 2020.
- Sylvain Gugger and Jeremy Howard "Deep Learning for Coders with fastai and PyTorch: AI Applications Without a PhD", 2020.
- Qiskit textbook: <https://qiskit.org/learn/>

July 7th-Aug 11th, we have regular Friday lunch meetings at MIT E70, and online review students progress for those who cannot come onsite. Individual supervision is available as needs M-Fridays.

Jul 28: Friday, Future World Leadership Training at MIT E70 onsite/Online video record will be available.

Aug 10th: Final Project Presentations; Aug 13-27th: Writing Project Paper Draft (IEEE Template)

Seniors have to get the paper draft done by Aug 8th-10th for revision submission by deadline.

A6-to-One Integrated Programs

Data Sciences and Computing Subgroup

Research Advisory Team: Mentor Professor Rainer Weiss (MIT, Nobel Prize Winner in 2017)

Director: Senior Principal Investigator: Prof. Dr. Tingying Helen Zeng

Principal Investigators:

Associate Prof., Dr. Mikhail Shalaginov (MIT) (Data Sciences, Quantum Computing)

Assistant Prof., Dr. Jack Zhao (BU) (Machine Learnings for big data analysis)

Assistant Prof., Dr. Zi Chen, Harvard Medical School, Harvard (Modeling and Computing)

Associate P.I., Dr. George Chen, Harvard Dental School, Forsyth Research Institute (Bioinformatics)

Research Assistants: Our outstanding Alumni

(Selective qualifications: Excellent personality and leaderships, positive mind to help others, scholarships winners, papers published, top ranking majors in college studies and good internships in college years):

Kevin Bruce Zeng: BC, Finance and Physics: Business Analytics, Investments, Computing; 3D Printing

Aaron Lee: Stanford University, Machine Learnings/ Bio-APP

Emma Chen: Brown University, Python, Machine Learnings/Bioinformatics

Kevin Zhao: Applied Math and Computer Sciences, MIT: Algorithms/Computing

Andrew Tao: Computer Sciences, UC Berkely, Natural Language Processing

Aaron Zhang: Brown University, Computer Sciences, Computing/Algorithms

*College Application Counseling: Edward Lee (Harvard University)

*Graduate School applications, career development and job marketing counselling: all P.I. advisors