Amin Rakhsha

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Research Interests

Machine Learning, Reinforcement Learning, Multi-model Planning, Long-horizon Planning

Education

University of Toronto Ph.D. in Computer Science — Expected Nov. 2025
- Supervisor: Prof. Amir-massoud Farahmand

Sharif University of Technology
B.Sc. in Computer Engineering — Sep. 2020
- GPA: 19.52/20, ranked 2^{nd} among 111 students admitted in 2016

Research Experience

University of Toronto and Vector Institute, Toronto, Canada
Research Assistant, Supervisor: Prof. Amir-massoud Farahmand — Sep. 2020 - present
- Working on Model-Based Reinforcement Learning.

Max Planck Institute for Software Systems (MPI-SWS), Saarbrücken, Germany
Research Intern, Supervisor: Prof. Adish Singla — Jul. - Sep. 2019
- Formulated the problem of adversarial attacks in reinforcement learning (RL).
- Inspected the problem of poisoning rewards in online and offline RL settings.

Chinese University of Hong Kong (CUHK), Hong Kong
Funded Summer Research Program Participant — Jul. - Aug. 2018
- Worked on improving the optimization algorithm used for distributionally robust logistic regression under the supervision of Prof. Anthony Man-Cho So (in a team of three students).
- Analyzed randomness extraction from generalized Santha-Vazirani sources with infinite possible distributions under the supervision of Prof. Andrej Bogdanov (in a team of three students).

Honors and Awards

Awards

- Ray Reiter Graduate Award In Computer Science (1000 CAD) — Jan. 2023
- Borealis AI Global Fellowship (10,000 CAD) — May 2022
- Ray Reiter Graduate Award In Computer Science (1000 CAD) — Dec. 2021
- Computer Science 50th Anniversary Graduate Scholarship (2000 CAD) — Dec. 2020
- Iran's National Elite Foundation Fellowship — 2015 - 2020

Competitions and Olympiads

- Silver Medal in International Mathematical Olympiad **(IMO)** [link] — Jul. 2016
- Gold Medal in Iran National Mathematical Olympiad — Sep. 2015
- Silver Medal in International Mathematics Competition (IMC) [link] — Jul. 2014
- Champion Team in International Mathematics Competition (IMC) [link] — Jul. 2014

Publications

- Lee, J.[†], Rakhsha, A., Ryu E., and Farahmand, A.m. PID Accelerated Temporal Difference Algorithms. *Preprint*, 2024 [pdf]
- Bedaywi, M.[*†], Rakhsha, A.[*], and Farahmand, A.m. PID Accelerated Temporal Difference Algorithms. In *Reinforcement Learning Conference 1* ***(RLC)***, 2024 [pdf]
- Rakhsha, A., Kemertas, M., Ghaavamzadeh, M., and Farahmand, A.m. Maximum Entropy Model Correction in Reinforcement Learning. In *International Conferece on Learning Representations 12* ***(ICLR)***, 2024 [pdf]
- Rakhsha, A., Wang, A.[†], Ghavamzadeh, M., and Farahmand, A.m. Operator Splitting Value Iteration. In *Advances in Neural Information Processing Systems 36* ***(NeurIPS)***, 2022 [pdf]

- Rakhsha, A.*, Zhang, X.*, Zhu, X., and Singla, A. Reward poisoning in reinforcement learning: Attacks against unknown learners in unknown environments. In *NeurIPS Workshop on Learning and Decision-Making with Strategic Feedback* ***(StratML)***, 2021 [pdf]
- Rakhsha, A., Radanovic, G., Devidze, R., Zhu, X., and Singla, A. Policy teaching in reinforcement learning via environment poisoning attacks. In *Journal of Machine Learning Research* ***(JMLR)***, 22(210):1–45, 2021 [pdf]
- Rakhsha, A., Radanovic, G., Devidze, R., Zhu, X., and Singla, A. Policy teaching via environment poisoning: training-time adversarial attacks against reinforcement Learning. In *International Conference on Machine Learning 37* ***(ICML)***, 2020. [pdf]

* Equal Contribution † Mentored Undergraduate/Master's Student Intern

Teaching Experience

Introduction to Artificial Intelligence, (multiple instructors) Winter 2021 - Winter 2024
Instructed tutorial classes. Held assignment help sessions. Graded exams.

Design of Algorithms, Instructor: Prof. Mohammad Ali Abam Fall 2019
Instructed the discussion classes. Designed assignments. Graded exams.

Linear Algebra, Instructor: Prof. Abolfazl Motahari Fall 2018
Designed the syllabus. Designed and graded assignments.

Data Structures and Algorithms, Instructor: Prof. Mohammad Ghodsi Fall 2018 Designed and graded assignments.

Probability and Statistics, Instructor: Prof. Abolfazl Motahari Fall 2017
Instructed the discussion classes. Created reading materials. Designed and graded assignments.

Mentorship Experience

- Mark Bedaywi Jan. 2023 - Mar. 2024
  Mentoring Mark Bedaywi, an undergraduate student at the University of Toronto, for his research experience course CSC494. The project led to an RLC 2024 publication.
- Jongmin Lee May. 2023 - Sep. 2023
  Mentored Jongmin Lee, a master's student in math at Seoul National University, for his summer research internship at Vector Institute.
- Andrew Wang Nov. 2021 - Jun. 2022
  Mentored Andrew Wang, an undergraduate student at the University of Toronto, for his research internship. The project led to a NeurIPS 2022 publication.

Other Experiences

Conference Paper Reviewing
Served as a reviewer in ICML (4 instances), NeurIPS (4 instances), and ICLR (2 instances).

Data Days Machine Learning and Data Science Competition Dec. 2018
Designed the tasks and judged contestants' results and methods as a member of the scientific staff.

SharifWorks Job-Finder Website Oct. - Dec. 2018
Developed a job-finding website using Django as a course project with two other students.

An Analysis of Globally Famous People Mar. - Jul. 2018
Studied 13 000 globally famous people using multiple datasets as well as crawling Wikipedia. Proposed the project for university Data Analysis course, tied for first place among 70+ students.

Field Introduction Seminar Series (FieldIn) Jan. 2018
Directed a staff of 16 as co-head of the execution team.

Rahnema Co. Jul. - Aug. 2017
As a software developer intern, worked on a minimal location-based social network. Participated in the development of the iOS and Android applications as well as the back-end.

Sina Neurosurgical Assist Aug. 2014
Developed an Android application to assist certain brain surgical procedures. The app has been used in various publications by different authors.

Technical Skills

- General Programing Skills:
  - Proficient: Java, R, Python
  - Intermediate: C, Git
- Machine Learning: PyTorch, Deep Reinforcement Learning
- Android and iOS Application Development: React-Native
- Website Development: Django, Node.js