

Md Masudur Rahman

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Research Interests

I specialize in AI, Reinforcement Learning, and Robotics, focusing on creating intelligent agents that make critical decisions under uncertainty. My current work centers on generalization in reinforcement learning, aiming to develop robust algorithms against confounders for real-world tasks. I am also investigating the use of foundational models as prior knowledge in RL, exploring its potential in applications like surgical robotics, medical imaging, and automating burn injury treatment.

Education

Ph.D. Candidate in Computer Science.

- Purdue University, West Lafayette, IN, USA.
Advisor: Yexiang Xue.
Expected Graduation: May 2024

M.S. in Computer Science, December 2018.

- University of Virginia, Charlottesville, VA, USA.
CGPA: 3.96.
Research Topic: Software Engineering, Information Retrieval.
Advisor: Baishakhi Ray.

B.Sc. in Computer Science and Engineering, February 2013.

- Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh.
CGPA: 3.84 (*Ranked 6th out of 142 students in class*).
Thesis: Future (Quantum) Computing and The Steiner Tree Problem.
Advisor: Masud Hasan.

Publications

Peer Reviewed Full Conference Papers

1. [ECML-PKDD 2022] *Bootstrap State Representation using Style Transfer for Better Generalization in Deep Reinforcement Learning*.
Md Masudur Rahman and Yexiang Xue. In Proceedings of the 2022 European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases (ECML-PKDD), 2022.
2. [ICMLA 2022] *Bootstrap Advantage Estimation for Policy Optimization in Reinforcement Learning*.
Md Masudur Rahman and Yexiang Xue. In Proceedings of the IEEE International Conference on Machine Learning and Applications (ICMLA), 2022.
3. [ICRA 2021] *DESERTS: Delay-Tolerant Semi-Autonomous Robot Teleoperation for Surgery*.
Glebys Gonzalez, Mridul Agarwal, Mythra Varun Balakuntala Srinivasa Mur, **Md Masudur Rahman**, Upinder Kaur, Richard Voyles, Vaneet Aggarwal, Yexiang Xue, Juan Wachs. In Proceedings of the 2021 IEEE International Conference on Robotics and Automation, 8 Pages.
4. [RO-MAN 2021] *Sequential Prediction with Logic Constraints for Surgical Robotic Activity Recognition*.
Md Masudur Rahman, Richard Voyles, Juan Wachs, Yexiang Xue. In Proceedings of the 30th IEEE International Conference on Robot & Human Interactive Communication - 2021, 8 pages.

5. [RO-MAN 2021] *Dexterous Skill Transfer between Surgical Procedures for Teleoperated Robotic Surgery*. Mridul Agarwal, Glebys Gonzalez, Mythra V. Balakuntala, **Md Masudur Rahman**, Vaneet Aggarwal, Richard M. Voyles, Yexiang Xue, Juan Wachs. In Proceedings of the 30th IEEE International Conference on Robot & Human Interactive Communication - 2021, 7 pages.
6. [RO-MAN 2019] *Transferring Dexterous Surgical Skill Knowledge between Robots for Semi-autonomous Teleoperation*. **Md M. Rahman***, N. Sanchez-Tamayo*, G. Gonzalez, M. Agarwal, V. Aggarwal, R. M. Voyles, Y. Xue, and J. Wachs [* equal authorship]. 2019. Ro-Man 2019, 6 pages.
7. [IROS 2019] *DESK: A Robotic Activity Dataset for Dexterous Surgical Skills Transfer to Medical Robots*. N. Madapana*, **Md M. Rahman***, N. Sanchez-Tamayo*, M. V. Balakuntala, G. Gonzalez, J. P. Bindu, L. N. V. Venkatesh, X. Zhang, J. B. Noguera, T. Low, R. Voyles, Y. Xue, J. Wachs. [* equal authorship]. 2019. IROS 2019, 8 pages.
8. [SCAM 2019] *Toward Optimal Selection of Information Retrieval Models for Software Engineering Tasks*. **Md Masudur Rahman**, Saikat Chakraborty, Gail Kaiser, and Baishakhi Ray, In 19th IEEE International Working Conference on Source Code Analysis and Manipulation, 12 pages.
9. [MSR 2018] *Evaluating How Developers Use General-Purpose Web-Search for Code Retrieval*. **Md M. Rahman**, J. Barson, S.y Paul, J. Kayan, F. A. Lois, S. F. Quezada, C. Parnin, K. T. Stolee, B. Ray. 11 pages, 2018.
10. [SIGIR 2016] *Topic Model based Privacy Protection in Personalized Web Search*. W. Ahmad, **Md M. Rahman**, H. Wang, 4 pages, 2016.

Peer Reviewed Full Journal Papers

1. [CMBBE Journal 2020] *SARTRES: A Semi-Autonomous Robot TeleopeRation Environment for Surgery*. **Md Masudur Rahman***, Mythra Varun Balakuntala Srinivasa Mur*, Mridul Agarwal, Upinder Kaur, Vishnunandan Lakshmi Venkatesh, Glebys Gonzalez, Natalia Sanchez Tamayo, Yexiang Xue, Richard Voyles, Vaneet Aggarwal, Juan Wachs. [* equal authorship], Computer Methods in Biomechanics and Biomedical Engineering: Imaging & Visualization Journal - AECAL-2020 Special Issue , 14 Pages. (Link)
2. [Military Medicine Journal 2020] *From the DESK (Dexterous Surgical Skill) to the Battlefield - A Robotics Exploratory Study*. Glebys T. Gonzalez*, Upinder Kaur*, **Md Masudur Rahman***, Vishnunandan Venkatesh, Natalia Sanchez, Gregory Hager, Yexiang Xue, Richard Voyles, Juan Wachs. [* equal authorship], Military Health System Research Symposium (MHSRS) Journal (Military Medicine) 2020.
3. [IEEE Access 2018] *Recommending GitHub Projects for Developer Onboarding*. Chao Liu, Dan Yang, Xiaohong Zhang, Baishakhi Ray, **Md Masudur Rahman**, 13 pages.

Peer Reviewed Short Papers

1. [MHSRS 2022] *ASAP: A Semi-Autonomous Precise robotic framework for remote surgery under delays*. Glebys Gonzalez, Mythra Balakuntala, Mridul Agarwal, **Md Masudur Rahman**, Thomas Low, Vaneet Aggarwal, Yexiang Xue, Richard M. Voyles, Juan Wachs., Abstract Paper at Military Health System Research Symposium (MHSRS) 2022.
2. [MHSRS 2021] *A Semi-autonomous Robotic Framework for Remote Surgery under Delays*. Glebys Gonzalez, Mythra Varun Balakuntala Srinivasa Murthy, Mridul Agarwal, **Md Masudur Rahman**, Richard M. Voyles, Vaneet Aggarwal, Yexiang Xue, Juan Wachs., Abstract Paper at Military Health System Research Symposium (MHSRS) 2021.
3. [MHSRS 2020] *ASTRO: A Semi-Autonomous Telemedicine Robot for Operative Surgery*. Glebys Gonzalez, **Md Masudur Rahman**, Mridul Agarwal, Mythra Balakuntala, Vishnu Venkatesh, Vaneet Aggarwal, Yexiang Xue, Richard Voyles, Gregory Hager, MAJ Andrew W Kirkpatrick, MAJ Steve Overholser, Juan Wachs. Abstract Paper at Military Health System Research Symposium MHSRS 2020. 3 pages.
4. [ICSE '18 Companion] *Which Similarity Metric to Use for Software Documents? A study on Information Retrieval based Software Engineering Tasks*. **Md M. Rahman**, S. Chakraborty, B. Ray, 2 pages, 2018.

Workshop

1. *Accelerating Policy Gradient by Estimating Value Function from Prior Computation in Deep Reinforcement Learning*.
Md Masudur Rahman and Yexiang Xue. Workshop on Reincarnating Reinforcement Learning (RRL) at ICLR 2023.
2. *Morality in Decision-Making: A Causal Approach*.
Md M. Rahman. Accepted for oral presentation at RLDM Workshop on Moral Decision Making (MoDeM) 2019. [MoDeM Link][RLDM Link] [Video].
3. *Finding Similar Projects in GitHub using Word2Vec and WMD*.
Md M. Rahman. Workshop on the Naturalness of Software (NL+SE 2016) at FSE 2016. [Slides]

Preprint

1. *A Case Study on the Impact of Similarity Measure on Information Retrieval based Software Engineering Tasks*.
Md Masudur Rahman, Saikat Chakraborty, Gail Kaiser, Baishakhi Ray. Technical Report 2018, 22 pages.

Working Paper

1. *Constraint Advantage Estimation for Policy Gradient in Deep Reinforcement Learning*. 2023.
Md Masudur Rahman, Yexiang Xue.
2. *Robust Policy Optimization in Deep Reinforcement Learning*. 2022.
Md Masudur Rahman, Yexiang Xue.
3. *Adversarial Style Transfer for Robust Policy Optimization in Deep Reinforcement Learning*. 2022.
Md Masudur Rahman, Yexiang Xue.
4. *Adversarial Policy Optimization in Deep Reinforcement Learning*. 2022.
Md Masudur Rahman, Yexiang Xue.
5. *Double Descent in Deep Reinforcement Learning*. 2022.
Zachery Berg*, **Md Masudur Rahman***, Yexiang Xue.

Research Experience

- Research Assistant, Computer Science, Purdue University, Spring 2019 - Summer 2020, Fall 2021 to Present.
- Research Assistant, Computer Science, University of Virginia, Summer 2016 - Summer 2018

Teaching Experience

Teaching Assistant

- Statistical Machine Learning (Graduate), Spring 2021, Purdue University
- Web Information Search And Management (Undergraduate), Fall 2020, Purdue University
- Introduction to Information Retrieval (Graduate), Fall 2018, University of Virginia
- Data Science for Software Engineering (Graduate), Spring 2016, University of Virginia
- Theory of Computation (Undergraduate), Fall 2015, University of Virginia
- Computer Architecture (Undergraduate), Fall 2015, Spring 2016, Fall 2018, University of Virginia

Instructor

- Data Structure (Undergraduate), Fall 2014, Spring 2015, Summer 2015, BRAC University, Bangladesh
- Digital Logic Design (Undergraduate), Summer 2015, BRAC University, Bangladesh
- Introduction to Computer (Undergraduate), Fall 2014, Spring 2015, BRAC University, Bangladesh

Mentoring

- Zachery Peter Berg (Undergrad - Spring 2021, Grad, Purdue University, 2021-2022). Topic: Reinforcement Learning.
- Brian Yifei Sun (Undergrad, Purdue University, 2021). Topic: Reinforcement Learning.
- Chao Liu (Ph.D Student, Chongqing University, China, 2018). Topic: Recommending GitHub Project for Developer Onboarding. Paper: IEEE Access 2018.
- Jed Barson (Undergrad, University of Virginia, 2018). Topic: Code Search. Paper: MSR 2018. First appointment after graduation: Software Engineer at Cisco.
- Eliza Yixuan Nie (Undergrad, University of Virginia, 2017). Topic: GitHub Project Search. First appointment after graduation: Software Engineer at Facebook

Service

- Conference Reviewer:
 - ICLR 2024
 - NeurIPS 2022, 2023
 - ICML 2023, 2022 (**Outstanding reviewer, Top 10%**)
 - AISTATS 2023
 - AAMAS 2023, 2022
 - ECML PKDD 2021
 - ICRA 2021
 - ICMLA 2021
 - RO-MAN 2021
- Sub-reviewer: ICLR (2023), NeurIPS (2019, 2020, 2021), ICML (2019, 2021), IJCAI (2019, 2021), UAI (2020, 2021), AISTATS 2020, AAMAS 2021, KDD-DMAIC (workshop) 2019, VLDB Journal 2019.
- Journal Reviewer: IEEE Access 2018.

Awards & Honors

- Student Travel Awards: ICSE/MSR 2018, NL4SE@FSE 2016, SIGIR 2016
- Enrolled in Dean List for academic excellence in B.Sc for three academic years (2008-2013).

Selected Coursework

- AI for Scientific Discovery (Ph.D.@Purdue)
- Algorithm Design, Analysis, And Implementation (Ph.D.@Purdue)
- Advance Machine Learning - Causality (Ph.D.@Purdue)
- Machine Learning (M.S.@UVa)
- Information Retrieval (M.S.@UVa)
- Text Mining (M.S.@UVa)
- Design and Analysis of Algorithms (M.S.@UVa)
- Natural Language Processing (M.S.@UVa)
- Vision and Language (M.S.@UVa)

Online Links

- [Google Scholar](#)
- [LinkedIn](#)