Md Masudur Rahman

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Webpage: `https://mmasudurrah.github.io`
Residential Status: US Permanent Resident

RESEARCH INTEREST

My research focuses on developing **principled and adaptable intelligence** for autonomous systems operating in **high-stakes environments** where errors carry significant cost and adaptability is essential. I aim to bridge the gap between powerful simulation-trained agents and the unpredictable demands of the real world by unifying **reinforcement learning (RL)** with **vision-language models (VLM)** to enable systems that **reason, adapt, and act** under uncertainty. This work advances both **generalization and sample efficiency** in decision-making and integrates learning with structured reasoning to produce agents capable of grounded, interactive behaviors. These contributions drive **real-world impact** in domains such as **burn diagnosis through medical imaging** and **emergency medical robotics**, where systems must perceive affordances and improvise actions in unstructured, rapidly evolving conditions.

EDUCATION

Purdue University, West Lafayette, IN, USA
    Doctor of Philosophy (Ph.D.), Dept. of Computer Science, Jan 2019 - October 2024
        Advisor: Yexiang Xue (Purdue University), Committee: Clifton W. Bingham (Purdue University),
        Juan P. Wachs (Purdue University), Ahmed H. Qureshi (Purdue University)

University of Virginia, Charlottesville, VA, USA
    Master of Science (M.S.), Dept. of Computer Science, Dec 2018
        Advisor: Baishakhi Ray (UVA), Committee: Mary Lou Soffa (UVA), Alfred C. Weaver (UVA),
        Hongning Wang (UVA)

Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh
    Bachelor of Science (B.Sc.), Dept. of Computer Science and Engineering, Feb 2013
        Advisor: Masud Hasan

WORK EXPERIENCES

Purdue University, West Lafayette, IN, USA
    Post Doctoral Research Assistant, Edwardson School of Industrial Engineering, Nov 2024 - Current
    Supervisor: Dr. Juan P. Wachs
Purdue University, West Lafayette, IN, USA
    Graduate Research Assistant, Dept. of Computer Science, Jan 2019 - Oct 2024
    Graduate Teaching Assistant, Dept. of Computer Science, Aug 2020 - May 2021
University of Virginia, Charlottesville, VA, USA
    Graduate Research Assistant, Dept. of Computer Science, May 2016 - Jul 2018
    Graduate Teaching Assistant, Dept. of Computer Science, Aug 2015 - Dec 2018
BRAC University, Dhaka, Bangladesh
    Lecturer, Dept. of Computer Science and Eng., Feb 2013 - Jul 2015

GRANTS

- **NSF Robust Intelligence (RI) Grant**: *EAGER: Theoretical Foundations for Integrating Foundational Models into Reinforcement Learning* (Award #2521982), Key Personnel, **$300,000**, 2025-2027. PI: Juan P Wachs. [Link]

- **Health of the Forces Pilot Funding Program** (Purdue University): *Accelerated Expertise: AI-Powered Diagnostic Pathways for Rapid Clinical Mastery of Burns*, Co-Investigator, **$10,000**, 2025-2026.

Ongoing Proposals: NIH R01 [Under Submission], NSF SCH (Smart and Connected Health) [In Preparation], NSF FRR (Foundational Research in Robotics)[In Preparation].

AWARDS & HONORS

- **Best Paper Award** (Full Paper Poster Category), Medical Image Understanding and Analysis (MIUA) 2025.

- **Best Poster Presentation Award**, Medical Image Understanding and Analysis (MIUA) 2025.

- **Postdoctoral Supplemental Travel Award**, Purdue University, Fall 2025 (Top 38% of applicants across 9 Purdue colleges).

- **Outstanding reviewer**, Top 10%, ICML, 2022

- Complimentary ICML Conference Registration for Outstanding Reviewer, 2022

- Complimentary ICLR Conference Registration Sponsored by Google, 2023

- NSF ICSE Travel Support, 2018

- Student Travel Support for Attendance at the NL4SE Workshop at FSE Conference, 2016

- Student Travel Support for Attendance at the SIGIR Conference, 2016

- Dean's List Award for Academic Excellence, 2008-2013.

- University Merit Scholarship, 2009-2013.

- Department Scholarship for all eight terms for good results in B.Sc (2008-2013).

- National Higher Secondary School Merit Scholarship by Bangladesh Government, 2007-2013

- National Secondary School Merit Scholarship by Bangladesh Government, 2005-2007

PUBLICATIONS

I have authored **28 peer-reviewed** publications spanning machine learning, robotics, medical imaging, and clinical research, with work published in venues such as ECML-PKDD, NAACL, ICRA, IROS, RO-MAN, MIUA, Military Medicine Journal, and MHSRS (the leading forum for military health research). This includes 11 full conference papers, 5 journal articles, 8 short papers, and 4 workshop papers, with contributions featured in top venues such as NeurIPS and ICLR.

Peer Reviewed Full Conference Papers

11. [**MIUA 2025**] *Knowledge-Driven Hypothesis Generation for Burn Diagnosis from Ultrasound with Vision-Language Model.*
    Md Masudur Rahman, Mohamed El Masry, Gayle Gordillo, and Juan P Wachs. In Proceedings of the Annual Conference on Medical Image Understanding and Analysis, 2025. [**Best Paper Award**]

10. [**NAACL 2024**] *Natural Language-based State Representation in Deep Reinforcement Learning.*
    Md Masudur Rahman and Yexiang Xue. In Proceedings of the Annual Conference of the North American Chapter of the Association for Computational Linguistics, Findings, 2024.

9. [**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 European Conference on Machine Learning and Principles and Practice of Knowledge Discovery in Databases, 2022.

8. [**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, 2022.

7. [**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 IEEE International Conference on Robotics and Automation, 2021.

6. [**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.

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.

4. [**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], In Proceedings of the 28th IEEE International Conference on Robot and Human Interactive Communication, 2019.

3. [**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]. In Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems, 2019.

2. [**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.

1. [**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. In Proceedings of the 15th International Conference on Mining Software Repositories, 2018.

Peer Reviewed Full Journal Papers

5. [**JMIR 2025**] *AI-Driven Integrated System for Burn Depth Prediction With Electronic Medical Records: Algorithm Development and Validation.*
Md Masudur Rahman, Mohamed El Masry, Surya Gnyawali, Yexiang Xue, Gayle Gordillo, Juan P. Wachs. JMIR Medical Informatics, 2025.

4. [**MilMed 2025**] *A Framework for Advancing Burn Assessment with Artificial Intelligence.*
Md Masudur Rahman, Mohamed El Masry, Surya Gnyawali, Gayle Gordillo, Yexiang Xue, Juan P. Wachs. Military Medicine Journal, 2025.

3. [**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 - AECAI Special Issue, 2020.

2. [**MilMed 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 Medicine Journal, 2020.

1. [**IEEE Access 2018**] *Recommending GitHub Projects for Developer Onboarding.*
Chao Liu, Dan Yang, Xiaohong Zhang, Baishakhi Ray, **Md Masudur Rahman**. In IEEE Access, vol. 6, pp. 52082-52094, 2018.

Peer Reviewed Short Papers

8. [**MHSRS 2025**]*A Chain-of-Thought AI Reasoning Framework for Burn Diagnosis.*
Md Masudur Rahman, Mohamed El Masry, Gayle Gordillo, Juan P. Wachs, Abstract Paper at Military Health System Research Symposium (MHSRS), 2025.

7. [**MIUA 2025**]*A Scalable AI Copilot for High Stake Medical Scenarios.*
Yupeng Zhuo, Eddie Zhang, Aditya Pachpande, Xiangchen Yu, Krish Iyengar, Nihar Turlapati, Xiyue Chen, Trung Duc Lam, Andrew W. Kirkpatrick, Kyle Couperus, Christopher Colombo, Jessica McKee, **Md Masudur Rahman**, Juan P. Wachs. Abstract Paper at the Annual Conference on Medical Image Understanding and Analysis (MIUA), 2025.

6. [**MHSRS 2024**]*Advancing Burn Depth Assessment through Ultrasound Imaging with Vision Transformers.*
Md Masudur Rahman, Mohamed El Masry, Surya Gnyawali, Gayle Gordillo, Yexiang Xue, Juan P. Wachs., Abstract Paper at Military Health System Research Symposium (MHSRS), 2024.

5. [**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.

4. [**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.

2. [**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, In Proceedings of 40th International Conference on Software Engineering Companion, 2018.

1. [**SIGIR 2016**] *Topic Model based Privacy Protection in Personalized Web Search.*
W. Ahmad, **Md M. Rahman**, H. Wang, In Proceedings of the 39th International ACM SIGIR Conference on Research and Development in Information Retrieval, 2016.

Peer Reviewed Workshop Papers

4. [**FMDM@NeurIPS 2023**]*Natural Language-based State Representation in Deep Reinforcement Learning.*
Md Masudur Rahman and Yexiang Xue. Foundation Models for Decision Making Workshop at the thirty-seventh Annual Conference on Neural Information Processing Systems, 2023.

3. [**RRL@ICLR 2023**]*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 at he Eleventh International Conference on Learning Representations, 2023.

2. [**MoDeM@RLDM 2019**]*Morality in Decision-Making: A Causal Approach.*
Md M. Rahman. Accepted for oral presentation at RLDM Workshop on Moral Decision Making, 2019. [MoDeM Link][RLDM Link] [Video].

1. [**NLSE@FSE 2016**]*Finding Similar Projects in GitHub using Word2Vec and WMD.*
Md M. Rahman. Workshop on the Naturalness of Software at the 24th ACM SIGSOFT International Symposium on Foundations of Software Engineering, 2016. [Slides]

Preprint

3. *Robust Policy Gradient Optimization through Parameter Perturbation in Reinforcement Learning* Md Masudur Rahman, Juan P. Wachs, Yexiang Xue [arXiv] [pdf] [Website] [Code] [Adapted: ClearRL, 7.6K GitHub Star][Adapted: skrl, 800 GitHub Star]

2. *Open RL Benchmark: Comprehensive Tracked Experiments for Reinforcement Learning.* [arXiv] [pdf] [GitHub] Shengyi Huang, Quentin Gallouédec, Florian Felten, Antonin Raffin, Rousslan Fernand Julien Dossa, Yanxiao Zhao, Ryan Sullivan, Viktor Makoviychuk, Denys Makoviichuk, Mohamad H. Danesh, Cyril Roumégous, Jiayi Weng, Chufan Chen, **Md Masudur Rahman**, João G. M. Araújo, Guorui Quan, Daniel Tan, Timo Klein, Rujikorn Charakorn, Mark Towers, Yann Berthelot, Kinal Mehta, Dipam Chakraborty, Arjun KG, Valentin Charraut, Chang Ye, Zichen Liu, Lucas N. Alegre, Alexander Nikulin, Xiao Hu, Tianlin Liu, Jongwook Choi, Brent Yi. 2024

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.

SERVICE

- Ogranizer:
  - NAACL 2024: Organizer and Chair of the Birds of a Feather (BoF) session on Vision-Language Models in Medical Surgery.

- Conference Reviewer:
  - AAAI (Main Track, AI Alignment Track, AI for Social Good Track) 2026
  - WACV 2026
  - NeurIPS 2022, 2023, 2025
  - ICML 2022, 2023, 2024, 2025
  - MICCAI 2025
  - ICLR 2024
  - MIUA 2025
  - BMVC 2025
  - UAI 2023, 2024
  - AISTATS 2023
  - AAMAS 2022, 2023, 2024
  - 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 Robotics and Automation Letters (RA-L) 2023, 2024
  - MHSRS/Military Medicine 2022-2024
  - IEEE Access 2018

- Institutional Service:
  - Faculty Search Committee Representative, Computer Science Graduate Student Association (CSGSA), Purdue University, 2022-2023
  - General Secretary, Bangladesh Students Association (BDSA), Purdue University, 2019-2020

TEACHING EXPERIENCES

Purdue University, West Lafayette, IN, USA

- IE 549: Machine Vision in Intelligent Robotic Systems, 2025
  Role: Co-Instructor (Guest Lectures)

- CS 578: Statistical Machine Learning (Graduate), Spring 2021
  Role: Teaching Assistant

- CS 47300: Web Information Search And Management (Undergraduate), Fall 2020
  Role: Teaching Assistant

University of Virginia, Charlottesville, VA, USA

- CS 4780: Introduction to Information Retrieval (Graduate), Fall 2018
  Role: Teaching Assistant

- CS 6501: Data Science for Software Engineering (Graduate), Spring 2016
  Role: Teaching Assistant

- CS 3102: Theory of Computation (Undergraduate), Fall 2015
  Role: Teaching Assistant

- CS 3330: Computer Architecture (Undergraduate), Fall 2015, Spring 2016, Fall 2018
  Role: Teaching Assistant

BRAC University, Dhaka, Bangladesh

- CSE 220: Data Structure (Undergraduate), Fall 2014, Spring 2015, Summer 2015
  Role: Instructor

- CSE 260: Digital Logic Design (Undergraduate), Summer 2015
  Role: Instructor

- CSE 101: Introduction to Computer (Undergraduate), Fall 2014, Spring 2015
  Role: Instructor

MENTORSHIP

Yupeng Zhuo (2024-Current)
   PhD Student, Edwardson School of Industrial Engineering, Purdue University, USA
   Topic: AI-Copilot for Emergency Medicine
Pronoma Banerjee (2025-Current)
   PhD Student, Edwardson School of Industrial Engineering, Purdue University, USA
   Topic: Reinforcement Learning with Foundation Model (LLM/VLM)
Maxwell Ryan Kawada (2025-Current)
   PhD Student, Edwardson School of Industrial Engineering, Purdue University, USA
   Topic: Medical Robotics
Zachery Peter Berg, Purdue University, USA, 2021-2022
   B.Sc. in Computer Science, 2021
   M.S. in Computer Science 2022
   Topic: Double Descent in Deep Reinforcement Learning
Peter Khlebnikov, Purdue University, USA, 2022
   B.Sc. in Computer Science, 2022
   Topic: Exploration in Deep Reinforcement Learning
Brian Yifei Sun, Purdue University, USA, 2021
   B.Sc. in Computer Science, 2021
   Topic: Reinforcement Learning
Chao Liu, Chongqing University, China, 2018
   Ph.D. in Software Engineering, 2018
   Topic: Recommending GitHub Project for Developer Onboarding
   Paper: IEEE Access 2018
   Appointment (2023): Associate Professor, Chongqing University, China

Jed Barson, University of Virginia, USA, 2018
    B.Sc. in Computer Science, 2018
    Topic: Code Search
    Paper: MSR 2018
    First Job Appointment: Software Engineer at Cisco
Eliza Yixuan Nie, University of Virginia, USA, 2017
    B.Sc. in Computer Science, 2017
    Topic: GitHub Project Search
    First Job Appointment: Software Engineer at Facebook

REFERENCE

Available upon request.

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