Ayan Mukhopadhyay

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Google Scholar Profile

Research

I am broadly interested in probabilistic modeling, decision-making under uncertainty, multi-agent systems, and robust machine learning applied to societal problems. I primarily work in the domains of emergency response, transportation, and conservation. I am also exploring fairness and equity of decision-making in the context of smart cities.

Experience

Vanderbilt University, USA (2020-)
Research Scientist,
Department of Electrical Engineering and Computer Science
Received "Google AI Impact Scholar Award", 2021

Stanford University, USA (2019-2020)
Post-Doctoral Research Fellow,
Stanford Intelligent Systems Lab
Advisor: Prof. Mykel Kochenderfer
Received "Center of Automotive Research Post-Doctoral Fellowship Award", 2019

Education

Vanderbilt University, USA (2014-2019)
Ph.D. (Computer Science)
(GPA : 3.98/4)
Advisor: Prof. Yevgeniy Vorobeychik
Thesis: "Robust Incident Prediction, Resource Allocation and Dynamic Dispatch"
Nominated for "Victor Lesser Distinguished Dissertation Award 2020" (1 out 7 nominations worldwide)

West Bengal University of Technology, India (2007-2011)
B.Tech, Computer Science, 2011 (GPA : 8.91/10)

Honors and Awards

1. Google AI Impact Scholar Award, 2021.
2. One of the best papers of ICCPS 2021 (TCPS Special Issue Invite).
3. Nominated for IFAAMAS Victor Lesser Distinguished Dissertation Award, 2020.
4. Center of Automotive Research at Stanford Post-Doctoral Fellowship Award, 2019.
5. Best paper award, AI for Social Good Workshop (ICLR), 2019.
6. Russell G. Hamilton Graduate Leadership Development Institute Professional Development Award, Spring 2019.
7. Governer's Award for Academic Excellence, 2005.

Publications

Pre-prints

1. Mukhopadhyay, Ayan, et al., "A Review of Emergency Incident Prediction, Resource Allocation and Dispatch Models", *arXiv pre-print* (Under Review at the Journal of Accident Analysis and Prevention).

2. Pettet, Geoffrey, et al., "Hierarchical Planning for Resource Allocation in Smart and Connected Communities, *arXiv pre-print* (Under Review at ACM Transactions on Cyber-Physical Sytems).

3. Patel, Shruti, et al., "Using Deep Learning to Count Monarch Butterflies in Dense Clusters, *arXiv pre-print*.

Peer-reviewed Conferences

1. Vazirizade, Mohsen, et al., "Learning Incident Prediction Models Over Large Geographical Areas for Emergency Response Systems", *IEEE Conference on Smart Computing (SmartComp 2021)*

2. Wilbur, Michael, et al., "Energy and Emission Prediction for Mixed-Vehicle Transit Fleets Using Multi-Task and Inductive Transfer Learning", *European Conference on Machine Learning (ECML 2021)*.

3. Pettet, Geoffrey, et al., "Hierarchical Planning for Resource Allocation in Emergency Response Systems", *ACM/IEEE Conference on Cyber-Physical Systems (ICCPS 2021)*. [**One of the best papers**, TCPS Special Issue Invite]

4. Singla, Samridhhi, et al., "Raptor Join: In-situ Processing of Big Raster + Vector Data", *IEEE International Conference on Data Engineering (ICDE 2021)*.

5. Mukhopadhyay, Ayan, et al., "Robust Spatio-Temporal Incident Prediction", *Conference on Uncertainty in Artificial Intelligence (UAI 2020)*.

6. Pettet, Geoffrey, et al., "On Algorithmic Decision Procedures in Emergency Response Systems in Smart and Connected Communities", *Conference on Autonomous Agents and MultiAgent Systems (AAMAS 2020)*.

7. Mukhopadhyay, Ayan, et al., "An Online Decision-Theoretic Framework for Responder Dispatch", *ACM/IEEE Conference on Cyber-Physical Systems (ICCPS 2019)*.

8. Mukhopadhyay, Ayan, et al.,"A Decision Theoretic Framework for Emergency Responder Dispatch", *Conference on Autonomous Agents and MultiAgent Systems. (AAMAS 2018)*.

9. Mukhopadhyay, Ayan, et al., "Incident Prediction and Response Optimization", *Conference on Autonomous Agents and MultiAgent Systems. (AAMAS 2018)* (Doctoral Consortium Paper).

10. Mukhopadhyay, Ayan, et al., "Prioritized Allocation of Emergency Responders based on a Continuous-Time Incident Prediction Model", *Conference on Autonomous Agents and MultiAgent Systems. (AAMAS 2017)*.

11. Mukhopadhyay, Ayan, et. al., "Optimal Allocation of Police Patrol Resources Using a Continuous-Time Crime Model", *Conference on Decision and Game Theory for Security (GameSec 2016)*.

12. Zhang, Chao, et al.,"Using abstractions to solve opportunistic crime security games at scale.", *Conference on Autonomous Agents & Multiagent Systems (AAMAS 2016).*

13. Sen, Nandita et al., "Efficiency analysis of indian thermal power plants: A unit level cross-sectional perspective" *North American Power Symposium (NAPS, 2011)*

Peer-reviewed Workshops

1. Singla, Samriddhi, et al., "WildfireDB: A Spatio-Temporal Dataset Combining Wildfire Occurrence with Relevant Covariates", *NeurIPS-20 AI for Earth Sciences Workshop (AIES at NeurIPS 2020)* [**Spotlight Talk**].

2. Mukhopadhyay, Ayan, et al., "Designing Emergency Response Pipelines : Lessons and Challenges", *AAAI Fall Symposium Series on AI for Social Good 2020 (AAAI-FSS 2020).*

3. Diao, Tina, et al., "A Pipeline for Emergency Response", *AAAI Fall Symposium Series on AI for Social Good 2020 (AAAI-FSS 2020).*

4. Mukhopadhyay, Ayan; Vorobeychik, Yevgeniy, "A Pipeline for Emergency Response", *The ICLR-19 Workshop on AI for Social Good (AISC at ICLR 2019)* [**Best Paper Award**].

5. Mukhopadhyay, Ayan, et al., "Prioritized allocation of emergency responders based on a continuous-time incident prediction model", *The AAMAS-17 Workshop on Adversarial Reasoning in Multi-agent Systems (ADVERSE 2017).*

6. Mukhopadhyay, Ayan, et al., "Optimal allocation of police patrol resources using a continuous-time crime model", *The AAAI 2017 Spring Symposium on AI for Social Good (AAAI-AISOC 2017).*

Patents

1. Mukhopadhyay Ayan, et al., "A Security Device", Reference: E-2/2217/2013-KOL, Application: 616/KOL/2012. (Publication and Patent Pending)

2. Narsaria, Ankit et al., "Hybrid Car Power Transition Mechanism", *Official Journal Of The Patent Office, Government of India, Issue No. 31/2012.* (Patent Pending)

Software and Datasets

1. *StatResp*: An open-source tool for first-responders consisting of statistical methods for emergency response.

2. *WildfireDB*: An open-source database that connects wildfire occurrences with features extracted from satellite imagery and weather (17 million data points).

Funding

1. Research Grant (2021), co-Principal Investigator, "EdgeNet: An Online Edge Computing Based Generative Anomaly Detection and Prognostics Solution for Networked Equipment at Customer Premises" funded by **Cisco University Research Program Fund** for $100,000.

2. Research Gift (2021), Principal Investigator, "Data-driven Vaccine Demand Forecasting and Health Interventions in Nigeria" funded by **Google AI for Social Good** for $30,000 ($20,000 to the non-profit entity and $10,000 to PI).

3. Research Grant (2021), Principal Investigator, "Using Deep Learning for Counting Monarch Butterflies is Dense Clusters", funded by **Microsoft AI for Earth Program** for $15,000 in computation credits.

Service

Peer-reviewed Conferences and Workshops

1. Conference on Autonomous Agents and Multi-Agent Systems, 2022 (AAMAS) (PC Member)
2. Conference on Neural Information Processing Systems, 2021 (NeurIPS) (Reviewer)
3. Workshop on Intelligent Systems in Smart Cities, 2021 (ACM CPS-Week) (Chair)
4. AAAI Conference on Artificial Intelligence, 2021 (AAAI) (PC Member)
5. Conference on Autonomous Agents and Multi-Agent Systems, 2021 (AAMAS) (PC Member)
6. Workshop on AI for Social Good, 2020 (PC Member)
7. Bay Area Machine Learning Symposium, 2020 (BayLearn) (Reviewer)
8. Conference on Autonomous Agents and Multi-Agent Systems, 2021 (AAMAS) (PC Member)
9. Workshop on AI for Social Good, 2020 (PC Member)
10. Bay Area Machine Learning Symposium, 2020 (BayLearn) (Reviewer)
11. Conference on Autonomous Agents and Multi-Agent Systems, 2018 (AAMAS) (OC Member)
12. Workshop on Optimization and Learning in Multiagent Systems, 2020 (AAMAS) (PC Member)
13. Conference on Autonomous Agents and Multi-Agent Systems, 2019 (AAMAS) (Reviewer)
14. Conference on Autonomous Agents and Multi-Agent Systems, 2017 (AAMAS) (Reviewer)
15. International Joint Conference on Artificial Intelligence, 2018 (IJCAI) (Reviewer)
16. AAAI Conference on Artificial Intelligence, 2021 (AAAI) (Reviewer)
17. Conference on Decision and Game Theory, 2018 (GameSec) (Reviewer)
18. Conference on Decision and Game Theory, 2017 (GameSec) (Reviewer)
19. ACM Conference on Economics and Computation, 2018 (EC) (Reviewer)

Peer-reviewed Journals

1. Artificial Intelligence Review (Reviewer)
2. IEEE Access (Reviewer)
3. IEEE Transactions on SMC: Systems (Reviewer)
4. Springer Machine Learning (Reviewer)
5. International Journal of Disaster Risk Reduction (Reviewer)

Invited Talks and Tutorials

1. "Multi-Agent Systems for Emergency Response" Los Alamos National Laboratory Seminar Series. (Invited Talk) (Slides).
2. Stanford University CS+Social Good Impact Lab Panel 2021. (Invited Panel).
3. "Smart Emergency Response", NSF Doctoral Consortium on Computational Sustainability, 2020 (CompSust-DC) (Tutorial) (Video).
4. "Robust Incident Forecasting and Response", University of Utah Data Science Seminar 2020. (Invited Talk) (Video).
5. "Robust Incident Forecasting for Animal Conservation", University of Cambridge Environmental Data Science AI4ER Seminar Series 2020 (Invited Talk) (Video).
6. "Transition to Research and Doctoral Programs", Stanford University CS and Social Good Impact Lab Panel 2020 (Invited Talk)
7. "Intelligent Emergency Response", Center of Automotive Research at Stanford Annual Symposium 2019 (Invited Talk)

Others

1. Member, Stanford Energy Systems Committee, 2020
2. Technical Mentor, Stanford CS+Social Good Impact Lab 2020.
3. Board Member, HelpMum (non-profit), Nigeria.
4. AI Mentor, Wildlife.ai (non-profit), New Zealand.

Teaching and Mentoring

Courses

1. Teaching Assistant, Artificial Intelligence (Under-Graduate/Graduate Level), Vanderbilt University, 2016. TA Evaluation : 4.2/5 (16% above dept. average)
2. Teaching Assistant, Machine Learning (Graduate Level), Vanderbilt University, 2017. TA Evaluation : 4.6/5 (21% above dept. average)
3. Guest Lecturer, AI and Society (Under-Graduate Level), Washington University in St. Louis, 2020.

Students Mentored

1. Tina Diao (PhD student, Stanford University)
2. Zilin Wang (Undergraduate, Vanderbilt University)
3. Elom Dumenyo (Research Intern, Vanderbilt University)
4. Sidhart Krishnan (Research Intern, Stanford University)
5. Yihan Shao (Research Intern, Vanderbilt University)

References

1. Yevgeniy Vorobeychik (PhD Advisor)
   Associate Professor,
   School of Engg. and Applied Sciences,
   University of Washington at St. Louis
   yvorobeychik@wustl.edu

2. Abhishek Dubey,
   Asst. Professor,
   Electrical Engineering and Computer Science,
   Vanderbilt University
   abhishek.dubey@vanderbilt.edu

3. Mykel Kochenderfer (Post-Doc Advisor),
   Asst. Professor,
   Aeronautics and Aerospace Engineering/Computer Science,
   Stanford University
   mykel@stanford.edu