

Pawan Raghav Poojary

PERSONAL DATA

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EDUCATION

SEPTEMBER 2018 - Present	Doctor of Philosophy, Electrical Engineering CGPA: 3.59/4.0 Advisor: Dr. Randall Berry, Northwestern University, Evanston, IL.
JULY 2015 - AUGUST 2018	Master of Science, Electrical Engineering Thesis: "Caching policies under content freshness constraints" CGPA: 8.63 Advisors: Dr. Krishna Jagannathan, Indian Institute of Technology Madras, Chennai, India. Dr. Sharayu Moharir, Indian Institute of Technology Bombay, Mumbai, India.
JULY 2010 - MAY 2014	Bachelor of Engineering, Electronics Engineering, Percentage: 77.33 Vidyalankar Institute Of Technology, Mumbai University, Mumbai, India.

RESEARCH INTERESTS

Stochastic processes, Estimation, Game theory, Reinforcement Learning.

RESEARCH EXPERIENCE

SEPT 2018 - PRESENT: GRADUATE RESEARCH ASSISTANT AT NORTHWESTERN UNIVERSITY

- *Study of learning in partially-observable Mean-Field games:*
We gave a sequential decomposition method that characterizes the Markov perfect equilibria of the game. We characterized the phenomenon of "herding" in such games, which typically hinders learning. We analysed the impact of varying the observation quality on the learning outcome of the game and showed that this can exhibit a non-monotonic behaviour, where in many instances, poorer observations lead to better pay-offs.
- *Effects of ex-ante bias and tie-breaking rules on observational learning with Fake Agents:*
Prior work assumed that ordinary agents do not have an ex-ante bias in their actions and that they follow their private information in case of an ex-post tie between actions. Here, we showed that varying either of these can lead to cases where, unlike in the prior work, the addition of fake agents leads to a gain in agents' welfares.
- *Study on observational learning with pay-off externalities:*
We studied the learning behavior of Bayesian agents when their choices exhibit a negative externality so that the value of a choice may decrease depending on the history of other agents selecting that choice. We showed that this can lead to very different outcomes compared to models without such an externality.

- *Study on the impact of Fake Agents on Information Cascades:*

Networks that provide agents with access to a common database of the agents actions enable an agent to easily learn by observing the actions of others, but are also susceptible to manipulation by “fake” agents. We characterize how the fraction of such fake agents impacts the behavior of rational agents and the learning outcome given a fixed quality of private information.

JUNE - AUG 2020: RESEARCH INTERN AT FUTUREWEI TECHNOLOGIES

- *eXtended Reality (XR) traffic model for Split-Computing architecture:*

We focussed on XR delivery. where the UE (Head Mounted Display) tethered to the users smartphone, off-loads the real-time rendering of the virtual environment to the XR server (back-end) through the 5G Network. Here, limiting the motion-to-photon (round-trip) latencies within permissible limits to preserve the notion of an immersive experience is the key challenge. We proposed an XR traffic model abstraction that combines the salient features of both video-streaming traffic and interactive web-browsing traffic. The model accounts for the key aspects, namely; motion-to-render and render-to-photon delay, UE interaction and pose-change behavior, UEs desired Quality of Experience (QoE) etc. We applied this traffic model to a 5G link to better understand the trade-offs between the number of XR UEs supported and the QoE of the delivered XR service.

JULY 2015 - AUG 2018: GRADUATE RESEARCH ASSISTANT AT IIT MADRAS

- *Analysis of Least Frequently Used (LFU) Policy under user freshness constraints:* We analytically obtained content-wise hit-rates for the LFU policy and provided sufficient conditions for the asymptotic optimality of cache performance under this policy.
- *Accurate approximation for LRU hit-rates under user freshness constraints:* We obtained an accurate approximation for the LRU hit-rates in the regime of large content population. We achieved this by mapping the “characteristic time” of a content in the LRU policy to the classical Coupon Collector’s Problem.
- *Asymptotic analysis of the Coupon Collector’s Problem:* We showed that the waiting time for the Coupon Collector’s Problem enjoys exponential concentration about its mean and the concentration becomes sharper with an increase in content population. Further, for Zipf-distributed coupon draws, we proved that the waiting time converges in probability to a constant.

PUBLICATIONS

1. P. Poojary and R. Berry, “Impact of Fake Agents on Information Cascades,”
– under review in IEEE Transactions on Network Science & Engineering (TNSE)
2. P. Poojary and R. Berry, “[Observational Learning in Mean-Field Games with Imperfect Observations](#),”
– in 59th Annual Allerton Conference on Communication, Control, & Computing, 2023.
3. P. Poojary and R. Berry, “[Welfare effects of ex-ante bias and tie-breaking rules on Observational Learning with Fake Agents](#),”
– in 21st International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks (WiOpt), 2023. (**Best Student Paper Award**).
4. P. Poojary and R. Berry, “[Observational learning with negative externalities](#),”
– in IEEE International Symposium on Information Theory (ISIT), 2022.
5. P. Poojary and R. Berry, “[Observational learning with Fake Agents](#),”
– in IEEE International Symposium on Information Theory (ISIT), 2020.

6. P. Poojary, S. Moharir, and K. Jagannathan, “[A Coupon Collector based approximation for LRU cache hits under Zipf requests](#),”
– in 19th International Symposium on Modeling and Optimization in Mobile, Ad hoc, and Wireless Networks, (WiOpt) 2021.
7. P. Poojary, S. Moharir, and K. Jagannathan, “[Caching policies under content freshness constraints](#),”
– 10th International Conference on Communication Systems and Networks (COMSNETS), 2018. (**Best Poster Paper Award**)

POSTERS

1. P. Poojary and R. Berry, “Bayesian learning in Mean-Field Games with observational noise,”
– in Midwest Machine Learning Symposium (MMLS), 2023.
2. P. Poojary and R. Berry, “Bayesian Observational Learning with Imperfect Observations,”
– in the annual meeting of Institute for Data, Econometrics, Algorithms, and Learning (IDEAL), 2023.
3. P. Poojary, S. Moharir, and K. Jagannathan, “Caching policies under content freshness constraints,”
– 10th International Conference on Communication Systems and Networks (COMSNETS), 2018.

COURSE WORK

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| • Probability and Stochastic processes | • Martingales & Concentration Measures |
| • Detection and Estimation Theory | • Reinforcement Learning |
| • Game theory and Mechanism Design | • Real Analysis |
| • Convex optimization | • Adaptive Filtering |

PROFESSIONAL EXPERIENCE

- SEPT 2018 to PRESENT - Teaching Assistant at Northwestern University for the following courses. The work included delivering few lectures, conducting tutorial classes and doubt-solving sessions, and grading assignments and examinations.
 - ELEC ENG 422: Random Processes in Communications & Control - Winter 2020, 2021
 - GEN ENG 205: Engineering Analysis 1 - Fall 2021
- JUNE 2016 - Attended two-week Advanced Instructional School (AIS) on Optimization conducted by National Centre for Mathematics (NCM) covering the topics:
 - Convex Optimisation
 - Non-linear Programming Algorithms
 - Integer Programming
- JULY 2015 to AUG 2018 - Teaching Assistant at IIT Madras for the following courses. The work included delivering few lectures, conducting tutorial classes and doubt-solving sessions, setting up weekly assignments and grading assignments and examinations.
 - EE5110 Probability foundations (computational) - Winter 2016
 - EE5110 Probability foundations (measure-theoretic) - Fall 2016, Fall 2017
 - EE5121 Convex Optimization - Winter 2017, Winter 2018

- Reviewed articles for Transactions on Networking (ToN-2021), Journal on Selected Areas in Communication (JSAC-2017), Intl. Symposium on Information Theory (ISIT-2021), National Conference on Communications (NCC-2018).
- Volunteered for National Conference on Communications (NCC-2017) and Mobile AdHoc Networking and Computing (ACM MobiHoc 2017).
- JULY 2010 to MAY 2014:
 - Worked in the Instrumentation Lab and Integrated Electronics Lab at VIT Mumbai for the project titled “ECG and Pulse Oximeter Based Health Monitoring System”. The project primarily focussed on wirelessly monitoring the cardiac signals and body vitals through a portable device and used arrhythmia and other abnormality detection algorithms to process these signals in real time.

REFERENCES

Dr. Randall Berry,

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