Andrew Estornell

PHD STUDENT · COMPUTER SCIENCE

Washington University in Saint Louis

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Research Interests

My research interests fall broadly within the fields of Machine Learning, Algorithmic Fairness, Optimization, Game Theory, Strategic Classification, and Adversarial Machine Learning. I enjoy working on computational problems, especially those involving the use of Machine Learning in novel or unexpected ways, and those involving multiple strategic agents. Recently my thesis work has focused on Algorithmic Fairness and Strategic Classification, with an emphasis on how these two fields relate to one another. In particular, I have been working on the development of Machine Learning models which are both fair and robust to manipulation by strategic agents. Outside of my thesis work I have recently been pursuing Adversarial Machine Learning in the context of robustness for image classification models, as well as Multi-Agent Deep Reinforcement Learning in the context of ride-sharing.

Education

Washington University in Saint Louis   *Saint Louis Missouri*
PHD IN COMPUTER SCIENCE   *Aug 2018 - [May-2023]*
- Advisor: Yevgeniy Vorobeychik
- Advisor: Sanmay Das

Temple University   *Philadelphia PA*
BS IN MATHEMATICS, MINOR IN COMPUTER SCIENCE   *Aug 2015 - May 2018*
- Advisor: Chelsea Walton

Research Experience

Washington University in St Louis - Dept of Computer Science   *St Louis, MO*
ADVISORS: YEVGENIY VOROBEYCHIK, SANMAY DAS   *Aug 2018 - Present*
- PhD dissertation [ongoing]: My thesis, titled "Consequences and Incentives of Group-Fair Learning", has focused on bridging the fields of Algorithmic Fairness and Strategic Classification. When the decisions of machine learning models are highly consequential to individuals (e.g., lending, employment, healthcare, etc.) there is a need to ensure that those decisions are fair, as well as a need to consider any potential incentives for individuals to manipulate the model in order to gain a more favorable decision. While both fields have been studied in isolation, they are fundamentally intertwined and their intersection necessitates exploration; my work has focused on the unification of these fields.

Temple University - Dept of Computer Science   *Philadelphia, PA*
ADVISOR: KAI ZHANG   *Jan 2018- Jun 2018*
- Undergraduate research: In collaboration with the Temple University Hospital I worked on developing machine learning models which could help assist physicians in early diagnosis of neurological disorders via patient EEG data. Through a combination of GNN and LSTM architectures we were able to take advantage of both the spacial and temporal nature of the EEG data in order to build models which performed reasonably well on a preliminary set of patient data.

Temple University - Dept of Mathematics   *Philadelphia, PA*
ADVISOR: CHELSEA WALTON   *May 2017 - Jun 2018*
- Undergraduate research: In 1996 Braverman and Gaitsgory provided necessary and sufficient conditions for a Filtered Algebra to be a Poincaré-Birkhoff-Witt (PBW) deformation of a Koszul Algebra. While universal, these conditions are not efficiently computable, even for simple Algebras. One important family of simple Algebras are Quadratic Monomial Algebras. In this research project I helped develop equivalent conditions to the Braverman-Gaitsgory Theorem for Quadratic Monomial Algebras, which are efficiently computable. These more tractable conditions allowed us to prove that every Quadratic Monomial Algebra yields a non-trivial PBW deformation (a result which does not hold for general Koszul Algebras).

Publications

PUBLISHED

[1] Popularizing Fairness: Group Fairness and Individual Welfare.
   Andrew Estornell, Sanmay Das, Brendan Juba, Yevgeniy Vorobeychik. Conference on Artificial Intelligence (AAAI) 2023.

[2] Location Spoofing Attacks on Autonomous Fleets.
   Jinghan Yang, Andrew Estornell, Yevgeniy Vorobeychik. [TO APPEAR] Conference on Vehicle Security and Privacy (VehicleSec) 2023

[3] Manipulating Elections by Changing Voter Perceptions.
   Junlin Wu, Andrew Estornell, Lecheng Kong, Yevgeniy Vorobeychik. International Joint Conference on Artificial Intelligence (IJCAI) 2022

[4] Incentivizing Truthfulness Through Audits in Strategic Classification.
   Andrew Estornell, Sanmay Das, Yevgeniy Vorobeychik. Conference on Artificial Intelligence (AAAI) 2021.

[5] Election Control by Manipulating Issue Significance.
   Andrew Estornell, Sanmay Das, Edith Elkind, Yevgeniy Vorobeychik. Conference on Uncertainty in Artificial Intelligence (UAI) 2020.

[6] Deception Through Half-Truths.
   Andrew Estornell, Sanmay Das, Yevgeniy Vorobeychik. Conference on Artificial Intelligence (AAAI) 2020.

[7] PBW Deformations of Quadratic Monomial Algebras.
   Andrew Estornell, Zachary Cline, Chelsea Walton, Matthew Wynne. Communications in Algebra 2019.

PRE-PRINTS AND UNDER REVIEW

[8] Unfairness Despite Awareness: Group-Fair Classification with Strategic Agents.
   Andrew Estornell, Sanmay Das, Yang Liu, Yevgeniy Vorobeychik. Appeared at the AAMAS workshop Learning with Strategic Agents (LSA) 2022, and NeruIPS workshop Strategic Machine Learning Workshop (StratML) 2021.

[9] Which Features are the Fairest of them All? The Impact of Features Used by Algorithms on Perceptions of Fairness.
   Andrew Estornell, Tina Zhang, Sanmay Das, Chien-Ju Ho, Brendan Juba, Yevgeniy Vorobeychik. 2023

[10] Incentivizing Recourse through Auditing in Strategic Classification.
   Andrew Estornell, Sanmay Das, Yang Liu, Yatong Chen, Yevgeniy Vorobeychik. 2023

[11] Individual Impacts of Group Fairness in Machine Learning.
   Andrew Estornell, Sanmay Das, Patrick Fowler, Brendan Juba, Pauline Kim, Yevgeniy Vorobeychik. 2022.

Awards

Best paper award at (LSA) "Unfairness Despite Awareness: Group-Fair Classification with Strategic Agents" 2022

Francis James Sholomskas Scholarship for Outstanding Students in Mathematics 2017-2018

Contributed Presentations and Talks

Presented "Popularizing Fairness: Group Fairness and Individual Welfare" at AAAI 2023

Presented "Manipulating Elections by Changing Voter Perceptions" at IJCAI 2022

Presented "Unfairness Despite Awareness: Group-Fair Classification with Strategic Agents" at LSA (AAMAS workshop) 2022, and at StratML (NeurIPS workshop) 2021.

Presented "Incentivizing Truthfulness Through Audits in Strategic Classification" at AAAI, 2021.

Presented "Election Control by Manipulating Issue Significance" at UAI 2020.

Presented "Deception Through Half-Truths" at AAAI 2020.

Professional Development and Skills

Teach Experience

Spring 2022   **Adversarial AI (CSE.555T)**, Teaching Assistant

Washington University in Saint Louis

Reviewer for Conferences and Journals

AAMAS: 2023, 2022;   AAAI: 2023, 2022, 2021, 2020;   IJCAI: 2023, 2022;   JAIR: 2023;   NeurIPS: 2022, 2021, 2020;   ICML: 2023, 2022; FAccT: 2023, 2022;   KAIS: 2022;   LSA: 2022;   AASG: 2020;   UAI: 2020

Programming Languages

Languages: Python, Mathematica, C, Java, (some) Haskell
Libraries: Pytorch, Sklearn, BoTorch, Gym, Tensorflow