Mauricio Tec

@ mauriciogtec@gmail.com +1 737-837-5975
Boston, MA Google Scholar mauriciogtec.com

About Me

I'm a postdoctoral fellow at Harvard University working in real-world *reinforcement learning* (RL) and *deep learning* for higher-order spatial data. My research pursues generalizable methodology motivated by real-world applications, particularly in the climate and health domains. I'm also personally interested in robotics and food.

Education

Ph.D. in Statistics (2017–2022), The University of Texas at Austin, USA
- *Dissertation*: Spatial Applications of Markov Random Fields and Neural Networks in Spatio-temporal Denoising, Causal Inference and Reinforcement Learning. *Supervisors*: Dr. James G. Scott, Dr. Corwin M. Zigler
- Affiliated to the Learning Agents Research Group (LARG) at the AI Laboratory directed by Dr. Peter Stone. Participated in two robotics competitions and collaborated in RL and robotics research.

M.Sc. in Mathematics (2014–2015), University of Cambridge, UK

B.Sc. in Applied Mathematics (2007–2012), ITAM, Mexico

Academic Appointments

- Postdoctoral Fellow (2022+), *Harvard University, USA*
- Graduate Research Assistant (2019-2021), *The University of Texas at Austin, USA*

Work Experience

- Facebook AI Research (Summer 2020), TX. *Research Intern*. Evaluated and improved RL algorithms based on world models in experiments using robotic simulators.
- Intel AI (Summer 2019), CA. *Research Intern*. Performed resilience and mitigation experiments addressing neural network corruption in edge computing without error correction code memory.
- CIBanco (2016–2017), Mexico. *Data analyst*. Optimized investment strategies using statistical methods.

Scholarships, Grants, and Awards

- *NIH Supplement 3RF1AG080948-01S1* (2023–2025). Enhancing SpaCE, an innovative Python package for benchmarking spatial confounding machine-learning methods. *Role*: Research personnel. Substantial role in writing the proposal and co-leading the work. *PI*: Michelle Bell. *Amount:* $220k direct.
- *Harvard Chan-NIEHS Pilot Project (2023–2024)*. developing deep learning methods to estimate the effects of climate change on PM2.5 exposure and disparities across racial/ethnic and income groups. *Role*: Co-PI with F. Dominici. *Amount*: $30k direct.
- *Keller Award* (2022). Awarded to doctoral students demonstrating exceptional leadership skills by engaging in academic, research, and social community-building activities.
- *UT Austin GC Fellowship* (2021–2022). $32,000 and full tuition. Awarded to Ph.D. students based on major accomplishments and research program for last year of doctoral studies.
- *Robocup Competition. Autonomous Robot Soccer, SPL League* (4th place 2021; 5th place 2022). Leaded work on field object detection using neural networks.
- *10th place Textworld by Microsoft Research* (2019). Open competition to design AI agents learning from text-based feedback.
- *Conacyt Cambridge Trust Scholarship* (2014–2015). $5,000 and full tuition for graduate studies.
- *Fulbright Garcia-Robles Scholarship* (2013). Full scholarship for graduate studies. Award declined.

Software

- `broach` (2024). The *Bayesian Rewards Over Actual Climate Data* project (BROACH) provides a Python simulator for training RL agents to optimize the issuance of heat alerts to minimize health impacts. The simulator uses real weather data and a learned rewards model using deep learning and Bayesian inference. Companion of our JASA submission. *To be released upon paper acceptance*.
- `SpaCE` (2023). A Python package providing the first benchmarking toolkit for spatial causal inference. Companion of our ICLR submission. URL: `https://github.com/NSAPH-Projects/space`.
- `weather2vec-app` (2022). Provides access to self-supervised embeddings of weather variables in the US. These embeddings work as substitutes of weather covariates and are better suited for confounding adjustment in causal inference studies. Users can specify a set of locations and time points of interest. Companion of our AAAI paper. URL: `https://huggingface.co/spaces/mauriciogtec/w2vec-app`.

- `AdaptiveRejectionSampling.jl` (2018) Julia Package for super-fast sampling of log-concave densities. The package is handy in efficient Bayesian inference (used in the Graph-fused Elastic Net). The package is currently used as a core component of other community Julia packages. URL: https://github.com/mauriciogtec/AdaptiveRejectionSampling.jl

Professional Service and Leadership

Program Committee/Reviewer
- *ML Conferences & Workshops*:
  NeurIPS (2023); WCB@ICML (2022); IEEE RA-L (2022); AISTATS (2023, 2021); AAAI (2023).
- *Journals*:
  JASA (2023); AJE (2023); JABE(2022); IJPH(2022); JCGS (2022); Nature SR (2021); Biometrics (2021);.

Organizational
- Organizing committee Robocup: Standard Platform League 2023.
- Co-founder *PAcMan*: *P*ostdoc *A*ccelerated *MAN*uscripts. Pilot group to accelerate collaborative publishing among postdocs. NSAPH, Harvard T.H. Chan School of Public Health (2022–2023).
- Organizing committee WCB@ICML Workshop (2022).
- Co-organizer of the RL in Statistics Reading Group. UT Austin (2021).
- Organizing committee 50th Wolfson College Research Event, University of Cambridge (2015).

Community Engagement
- Secretary, Tenant Advisory Board, University Housing, UT Austin (2021–2022).
- Seminar Speaker-student Liaison. Statistics Department, UT Austin (2019).
- Graduate Student Assembly Representative. UT Austin (2018).

Talks and Seminars

- Invited Speaker. AI for Environmental Risk Seminar 2024. University of Cambridge, Cambridge, UK
- Invited Speaker. Joint Statistical Meeting (JSM) 2024. Portland, OR.
- Invited Speaker. Causal Inference Seminar Spring 2024. Michigan State University.
- Contributed talk. AAAI 2023, Artificial Intelligence for Social Impact
- Contributed talk. Harvard Biostatistics Department Lightning Talks (Fall 2022 and Spring 2023).
- Invited Speaker. ENAR 2023, International Biometric Society.
- Invited Speaker. Biology Scholars Program Seminar, 2020.

Publications

* indicates shared first authorship; ** indicates senior authorship.

Submitted

1. Considine E, Nethery R, Wellenius G, Dominici F, and **Tec M****. *Optimizing Heat Alert Issuance for Public Health in the United States with Reinforcement Learning*. Under review at JASA. 2024
2. Tosh C, **Tec M**, [...], and Tansey W. *A Bayesian active learning platform for scalable combination drug screens*. Under review at Nature Biotechnology. 2024
3. **Tec M**, Trisovic A, Audirac M, and Dominici F. *SpaCE: The Spatial Confounding Environment*. Under review at ICLR 2024. 2024
4. **Tec M**, Mudele O, Josey K, and Dominici F. *Causal Estimation of Exposure Shifts with Neural Networks*. Under review at ICLR 2024. 2024

Refereed ML conferences

5. **Tec M**, Scott J, and Corwin Z. "Weather2vec: Representation Learning for Causal Inference with Non-Local Confounding in Air Pollution and Climate Studies". In: *Association for the Advancement of Artificial Intelligence (AAAI)*. 2023
6. Durugkar I, **Tec M**, Niekum S, and Stone P. "Adversarial Intrinsic Motivation for Reinforcement Learning". In: *Neural Information Processing Systems (NeurIPS)* (2021)
7. Holman B, Anwar A, Akash S, **Tec M**, Hart J, and Stone P. "Watch where you're going! Gaze and head orientation as predictors for social robot navigation". In: *IEEE International Conference on Robotics and Automation (ICRA)* (2021)
8. Williamson S and **Tec M**. "Random clique covers for graphs with local density and global sparsity". In: *Uncertainty in Artificial Intelligence (UAI)* (2019)

Peer-reviewed journals

9. Kim, C, **Tec M**, and Corwin Z. "Bayesian Nonparametric Adjustment of Confounding". In: *Biometrics* (2023)

10. **Tec M**, Duan Y, and Müller P. "Bayesian Sequential Design and Reinforcement Learning: A Comparative Tutorial". In: *The American Statistician* (2022)
11. Müller P, Duan Y, and **Tec M**. "Simulation-based sequential design". In: *Pharmaceutical Statistics* 21.4 (2022), pp. 729–739
12. Audirac M*, **Tec M***, Meyers LA, Fox S, and Zigler CM. "How Timing of Stay-home Orders and Mobility Reductions Impacted First-Wave COVID-19 Deaths in US Counties". In: *The American Journal of Epidemiology* (2021)
13. Fox S*, Lachmann M*, **Tec M**, ..., and Meyers LA. "Real-time pandemic surveillance using hospital admissions and mobility data". In: *Proceedings of the National Academy of Sciences (PNAS)* (2021)
14. Cramer EY, ..., **Tec M**, ..., and Reich N. "Evaluation of Individual and Ensemble Probabilistic Forecasts of COVID-19 Mortality in the US". in: *Proceedings of the National Academy of Sciences (PNAS)* (2021)
15. Zuniga-Garcia N, **Tec M**, Scott J, and Machemehl R. "Evaluation of E-Scooters as Transit Last-Mile Solution". In: *Transportation Research Part C* (2021)
16. Audirac M, **Tec M**, Garcia-Tejeda E, and Fox S. "Estimating Importation Risk of COVID-19 in Hurricane Evacuations: A Prediction Framework Applied to Hurricane Laura in Texas". In: *International Conference on Geospatial Information Sciences (iGISc)* (2021)
17. Aiken A, Starling J, Gomperts R, **Tec M**, Scott J, and Aiken C. "Demand for Self-Managed Online Telemedicine Abortion in the United States During the Coronavirus Disease 2019 (COVID-19) Pandemic". In: *Obstetrics and Gynecology* 136.4 (2020)
18. Zuniga-Garcia N, **Tec M**, Scott J, Ruiz-Juri N, and Machemehl R. "Evaluation of Ride-Sourcing Search Frictions and Driver Productivity: A Spatial Denoising Approach". In: *Transportation Research Part C* (2019)

Workshop and symposium papers (non-archival, peer reviewed)

19. **Tec M**, Trisovic A, Audirac M, and Dominici F. "SpaCE: The Spatial Confounding (Benchmarking) Environment". In: *Causal Learning and Reasoning (CLeaR)* (2023)
20. **Tec M**, Cadei R., Dominici F., and Zigler C. "Projecting the climate penalty on pm2.5 pollution with spatial deep learning". In: *ICLR 2023 Workshop on Tackling Climate Change with Machine Learning*. 2023
21. **Tec M**, Duan Y, and Müller P. "A Comparative Tutorial for Bayesian Sequential Design and Reinforcement Learning for Clinical Applications". In: *Reinforcement Learning and Decision Making (RLDM)*. 2022
22. **Tec M**, Scott J, and Zigler M. "Weather2vec: Representation Learning for Causal Inference with Non-Local Confounding in Air Pollution and Climate Studies". In: *Causal Representation Learning Workshop at Uncertainty in Artificial Intelligence (CRL@UAI)*. 2022
23. Narayanaswami S, **Tec M**, ..., and Stone P. "Towards a Real-Time, Low-Resource, End-to-end Object Detection Pipeline for Robot Soccer". In: *Robot World Cup XXV Proceedings*. 2022
24. Zuniga-Garcia N, **Tec M**, ..., and Machemehl R. "Evaluation of Ride-Sourcing Search Frictions and Driver Productivity: A Spatial Denoising Approach". In: *INFORMS*. 2018

Technical reports and other unpublished manuscripts

25. Tosh C, **Tec M**, and Tansey W. "Targeted active learning for probabilistic models". In: (2023)
26. **Tec M**, Zuniga-Garcia N, Machemehl R, and Scott J. "How Likely are Ride-share Drivers to Earn a Living Wage? Large-scale Spatio-temporal Density Smoothing with the Graph-fused Elastic Net". In: *arXiv:1911.08106* (2021)
27. Fox S, Pasco R, **Tec M**, Du Zhanwei, Lachmann M, Scott J, and Meyers LA. "The impact of asymptomatic COVID-19 infections on future pandemic waves". In: *medRxiv 2020.06.22.20137489* (2020)
28. Woody S*, **Tec M***, Dahan M, Gaither K, Lachmann L, Fox S, Meyers LA, and Scott J. *Projections for first-wave COVID-19 deaths across the US using social-distancing measures derived from mobile phones*. medRxiv 2020.04.16.20068163. 2020

Teaching

Teaching Assistant. The University of Texas at Austin (2017–2019)

- *Courses:* Biostatistics; International Economics with Python; Data Analysis for Health Sciences.

Assistant Instructor/Lecturer. Department of Applied Mathematics, ITAM (2015–2017)

- *Courses:* Computational Statistics and Stochastic Processes.
- *Student Advising*: Supervised two undergraduate honors thesis.