

Mauricio Tec

Machine-Learning Research Scientist

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Research Areas/Interests

Reinforcement learning (RL), foundation world models, autonomous agents in robotics and decision-making AI, topological/graph neural networks and computer vision, AI for social impact, experimental data science.

Education

Ph.D. in Statistics/Machine Learning, *The University of Texas at Austin, USA*, 2017–2022
Conducted RL research in the *Learning Agents Research Group* at the computer science dept. • Member of the UT Austin Villa Robot Soccer Team where I implemented an efficient neural robot vision system and competed at the Robocup • Developed spatial and causal deep learning methods at the statistics and data science dept. • Key contributor to the university-wide modeling efforts as part of the emergency response to Covid-19.

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

Work Experience

Harvard University, *Research Associate*, 2022–date
Developing new generalizable methodologies for using foundation world models for training AI agents, novel deep-learning architectures for graph and topological domains, and applications of these technologies to develop innovative solutions for climate change adaptation focused on health • *Other responsibilities*: Writing grant proposals • Co-mentoring doctoral students.

Facebook AI Research (FAIR), *Research Intern*, 2020
Implemented model-based RL algorithms, performing code optimizations and algorithmic improvements to outperform the original Dreamer implementation for MuJoCo robotic simulator benchmarks.

Intel AI, *Research Intern*, 2019
Measured neural network corruption when removing error correction code in edge computing. Developed a mitigation strategy to increase resiliency. Tested on ResNet ImageNet benchmarks.

CIBanco Asset Management, *Data Scientist*, 2016–2017
Applied ML/stats methods to optimize multi-asset class investments. • Integrated production-level analytics with the bank's financial information streamed databases. • Actively participated in weekly committees with senior stakeholders, influencing investment decisions.

Other Relevant Experience

Active Learning for Drug Discovery, *Memorial Sloan Kettering Cancer Center*, 2022
Co-designed the underlying probabilistic model and code implementation of a novel experiment design framework using *active learning* to discover synergistic drug combinations for cancer treatment. • The framework is being used in Tansey's lab to conduct weekly experiments, leading to new combination therapy discoveries.

Autonomous Robot Soccer Vision System and Behavior, *RoboCup World Cup Competition*, 2020–2022
Published a lightweight real-time robotic computer vision framework for detecting soccer field objects; trained the deep learning model in PyTorch for super low-resolution YUYV robot vision and transferred it to TFLite. • Competed for the UT Austin Villa team using our proposed model implemented in our in-house robotic OS and C++, achieving fourth and fifth place in the SPL league (2020, 2021).

10th place in Text-based RL Agents Competition, *Microsoft Research Textworld Competition*, 2019
Designed a reinforcement learning agent that learns to play text-based games using Monte Carlo Tree Search and an attention neural network to evaluate unseen game states. • Achieved tenth place in the competition.

Skills

- *Programming Languages*: Python (preferred); Julia, R, C++;
- *Data Science*: tidyverse, ggplot, pandas, networkx (proficient); NLP; SQL;
- *Development and Pipelines*: Git, Docker, SnakeFlow, Linux; high-performance Computing;
- *Deep Learning*: PyTorch, Tensorflow, Image segmentation/Object detection, Spatial methods, GNNs, Attention-based models; Multi-GPU, Distributed training;

Software

- **weather2alert** (2024). OpenAI gym environment for training RL agents to optimize the issuance of heat alerts, calibrated from a large data set of weather and health data in the US. [code] [paper].
- **SpaCE** (2023). Python package providing the first realistic benchmark data set for machine learning methods in spatial causal inference tasks. [code] [paper].

- [weather2vec-app](#) (2022). Provides access to trained self-supervised embeddings of weather covariates better suited for confounding adjustment in causal inference studies. Users can specify locations and time points. [code] [paper].
- [AdaptiveRejectionSampling.jl](#) (2018) Julia library for super-fast sampling of log-concave densities, handy in efficient Bayesian inference. It has been used in research publications by the community and as a component of other Julia packages. [code] [paper].

Scholarships, Grants, and Awards

- [NIH Supplement Grant 3RF1AG080948-01S1](#) (2023–2025). Enhancing SpaCE, an innovative Python package for benchmarking spatial confounding machine-learning methods. Substantial role in writing the proposal and co-leading the work. *Amount*: \$220k direct.
- [Harvard Chan-NIEHS Pilot Project Grant \(2023–2024\)](#). Novel spatial deep learning methods to estimate the effects of climate change. *Role*: Co-PI with F. Dominici. *Amount*: \$30k direct.
- [Keller Award](#) (2022). Distinction to doctoral students demonstrating exceptional leadership skills by engaging in academic, research, and social community-building activities.
- [UT Austin GC Fellowship](#) (2021–2022). Awarded to last-year Ph.D. students based on academic merit (less than one per program of study). *Amount*: Stipend and full tuition.
- [Conacyt-Funed Cambridge Trust Scholarship](#) (2014–2015). Academic merit scholar at the University of Cambridge. *Amount*: Stipend and 80% tuition.
- [Fulbright Garcia-Robles Scholarship](#) (2013). Stipend and tuition for graduate studies. Award declined.
- [ITAM Bailleres-Mancera](#) (2007–2012). Stipend and full tuition for five years of undergraduate studies

Professional Service

Organizational Leadership

- Chair/organizer of the *Training Agents with Foundation Models* Workshop at the RL Conference (RLC) 2024.
- Co-organizer of the *Robocup: Standard Platform League* international robot soccer competition 2023.
- Co-organizer of the WCB workshop at ICML 2022.
- Organizer of *RL in Statistics* reading group at UT Austin, 2021.

Reviewer/Programs Committee

ML Conferences: KDD (2024); NeurIPS (2023); WCB@ICML (2022); IEEE (2022); AISTATS (2023, 2021); AAAI (2023). *Journals*: JASA (2023); AJE (2023); IJPH(2022); JCGS (2022); Nature (2021); Biometrics (2021).

Selected Publications

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

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 JMLR. 2024
2. **Tec M**, Trisovic A, Audirac M, Khoshnevis N, Hu K, Woodward S, and Dominici F. “SpaCE: The Spatial Confounding Environment”. In: *ICLR*. 2024
3. **Tec M**, Scott J, and Corwin Z. “Weather2vec: Representation Learning for Causal Inference with Non-Local Confounding in Air Pollution and Climate Studies”. In: *AAAI*. 2023
4. **Tec M**, Duan Y, and Müller P. “Bayesian Sequential Design and Reinforcement Learning: A Comparative Tutorial”. In: *The American Statistician* (2022)
5. 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
6. Durugkar I, **Tec M**, Niekum S, and Stone P. “Adversarial Intrinsic Motivation for Reinforcement Learning”. In: *NeurIPS* (2021)
7. 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)
8. 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 ICRA* (2021)
9. Williamson S and **Tec M**. “Random clique covers for graphs with local density and global sparsity”. In: *Uncertainty in Artificial Intelligence (UAI)* (2019)

*The full list of publications is available on my [Google Scholar](#).