MAURICIO TEC

Research Scientist

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EXPERIENCE

Research Intern
Intel AI - Movidius — Summer 2019
Movidius provides solutions for deploying vision algorithms at ultra-low power
Investigated the resilience of image-recognition neural networks in mission-critical scenarios. Detected vulnerabilities and characterized failures with respect to bit errors—common in hardware accelerators. Developed a small-overhead mitigation strategy. Coded in Python.

Graduate Research Assistant
The University of Texas at Austin — 2018 – 2019
Large-scale spatiotemporal density smoothing (with James G. Scott)
Developed a fast parallel ADMM algorithm for smoothing along the edges of a general graph with noisy and sparse data at each vertex. Coded in Julia and tested on a Linux supercomputer with attention to memory efficiency and parallelism at all level (distributed, multithreaded and vectorized). Applied the method to ride-sharing data in a case study to detect spatiotemporal effects in driver productivity.

endingglobalhunger.org (with Kate Weaver)
Created a web app and a Python toolkit with scrapers and content analysis tools for tracking vote information and news from Members of Congress on Food Security policy issues.

Data Scientist
CIBanco — 2016 – 2017
Financial group that offers portfolio management, and brokerage services
Developed an in-house portfolio optimization toolkit using R and C++ used for successful mid-term investment strategies. Implemented a data warehouse and a wide range of reporting tools using SQL, R, and Shiny.

RESEARCH PROJECTS

Variational Models for Commonsense Knowledge Extraction
with James G. Scott, Jeremiah Liu and Deepak Ramachandran
Collaborating with Google researchers to develop a framework for the automatic construction of high-quality knowledge of quantitative attributes of objects from millions of web documents. We are designing new statistical tools that are robust to the noise in extraction from web corpora. We plan to leverage different ingredients such as hierarchical modeling, variational Bayesian models, neural networks and vector representations in order to produce meaning disambiguation mechanisms and model the correlation between the different object's attributes.

Reinforcement Learning for Text-based Games
with Stephen Walker
Designed a reinforcement learning agent that uses Monte Carlo Tree Search guided by a transformer neural network for playing text-based games. The method addresses the problem of partial observability by using a memory system with attention that queries a game's historical feedback. Used the agent to participate at the competition TextWorld, ending in 10th place. Python code: `github.com/mauriciogtec/Neural-MCTS-TextWorld`.

Random Clique Covers
with Sinead Williamson
Proposed Bayesian Random Network models based on clique covers that match the local clustering coefficient and sparsity of real-world networks. These new models have very few parameters to learn and better represent the behavior of real-world graphs when compared to state-of-the-art fully Bayesian frameworks.

EDUCATION

Ph.D. in Machine Learning
The University of Texas at Austin, USA
Department of Statistics & Data Science
2017 to date
GPA: 4.0
Advisor: James G. Scott

M.Sc. in Mathematics
University of Cambridge, UK
2014 – 2015
Cambridge Trust Scholarship (full funding)
SEP Scholarship (4k USD stipend)

B.Sc. Applied Mathematics
ITAM, Mexico
2007 – 2012
Bailleres Scholarship (full funding)
Mancera Scholarship (monthly stipend)

Exchange student
Universite Paris Dauphine, France
2011-2012
Masters (M1) Applied Mathematics
All courses in French

SKILLS

Computing

Python | R | Julia | C++ | Parallel Computing | Linux

Statistics / Machine Learning

Reinforcement Learning | Natural Language Processing | Deep Learning | Bayesian Machine Learning | Graph Models

LANGUAGES

- English (fluent)
- Spanish (fluent)
- French (advanced)
- German (beginner)

PUBLICATIONS

Journal Articles

- Zuniga-Garcia, Natalia, Mauricio Tec, James G. Scott, Natalia Ruiz-Juri, and Randy Machemehl (2019). "Evaluation of Ride-Sourcing Search Frictions and Driver Productivity: A Spatial Denoising Approach". In: *Transportation Research Part C*.

Conference Proceedings

- Williamson, Sinead and Mauricio Tec (2019). "Random clique covers for graphs with local density and global sparsity". In: *Conference on Uncertainty in Artificial Intelligence (UAI)*.
- Zuniga-Garcia, Natalia, Mauricio Tec, James G. Scott, Natalia Ruiz-Juri, and Randy Machemehl (2018). "Evaluation of Ride-Sourcing Search Frictions and Driver Productivity: A Spatial Denoising Approach". In: *INFORMS*.

Preprints

- Tec, Mauricio, James G. Scott, and Natalia Zuniga-Garcia (2019). *Large-Scale Spatiotemporal Density Smoothing with the Graph-fused Elastic Net: Application to Ride-sourcing Driver Productivity*. URL: `https://arxiv.org/abs/1911.08106`.

TEACHING

Teaching Assistant
The University of Texas at Austin — 2017 – 2019
- Biostatistics
- International Economics with Python
- Data Analysis for Health Sciences

Lecturer
Instituto Tecnologico Autonomo de Mexico — 2015 – 2017
- Introduction to Data Science
- Markov Decision Processes
- Stochastic Processes
- Computational Statistics
- Numerical Analysis

REFEREES

Prof. James G. Scott
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Prof. Stephen G. Walker
@ The University of Texas at Austin
s.g.walker@math.utexas.edu

Prof. Mingyuan Zhou
@ The University of Texas at Austin
mingyuan.zhou@mccombs.utexas.edu

Prof. Beatriz Rumbos
@ Instituto Tecnologico Autonomo de Mexico (ITAM)
rumbos@itam.mx

ORGANIZATIONAL

Student Liaison
The University of Texas at Austin
2019 to date
Graduate student host of the seminar speakers at the Department of Statistics and Data Science.

GSA Representative
The University of Texas at Austin
2017 – 2018
Representative of the students of the Department of Statistics at the Graduate Student Assembly (GSA) of the University of Texas.

Communication Officer
50th Wolfson College Research Event
The University of Cambridge
2015
Co-organizer of the 50th Wolfson College Research Event at the University of Cambridge.