

# Iván Jaen Márquez

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## EDUCATION

### University of Wisconsin – Madison

Ph.D in Computer Sciences. Research focus: Machine Learning.

Madison, WI, United States

Aug 2022 – Ongoing

### Centro de Investigacion en Matematicas, CIMAT

M.S. in Computer Science and Industrial Mathematics

Guanajuato, GTO, Mexico

Jul 2016

Thesis: “A Univariate Boltzmann based Estimation of Distribution Algorithm

Using the Natural Gradient for Updating the Parameters” (in English)

Awarded Full scholarship for Master studies (CONACYT) and “Beca Mixta” for a six-months research stay in the UK.

### Tecnologico Nacional de Mexico campus Veracruz

Veracruz, VER, Mexico

B.S. in Computer Systems Engineering

Jul 2014

Thesis: “Object Tracking via Particle Filters and Stochastic Algorithms” (in Spanish)

Awarded “Mención honorífica” (Distinction) on final oral defense. Highest GPA in the department’s graduating class.

## AWARDS

- Computer Science Summer Research Assistantship, UW-Madison CS Dept. Summer 2023
- Fulbright-Garcia Robles Fellowship for pursuing doctoral studies in the US Aug 2022 – Aug 2025
- Best undergraduate thesis in Computer Science in Mexico (nationwide annual contest) Oct 2014  
Asociacion Nacional de Instituciones de Educacion en Tecnologias de Informacion (ANIEI)

## RESEARCH EXPERIENCE

### UW-Madison - Independent Studies - Machine Learning and Optimization Group

Madison, WI

Graduate student, advised by Prof. Grigoris Chrysos

Summer 2024

- Worked with modern deep learning architectures (ResNets, CNN, ViT, MoE) analyzing and quantifying inductive biases such as spectral, low-rank embedding and simplicity bias.

### UW-Madison - Computer Science Summer Research Assistantship

Madison, WI

Graduate student, advised by Prof. Stephen Wright

Summer 2023

- Worked with block-coordinate descent methods for tackling the Multi-Task/Multi-modal Non-negative Matrix Factorization (NMF) problem. This formulation was applied to cell clustering (RNA-seq, ATAC-seq data).

### Robert Gordon University - Computational Intelligence Group

Aberdeen, UK

Visiting Graduate student, advised by Prof. John McCall

Jan – Jul 2015

- Worked with the formal mathematical approach of Estimation of Distribution Algorithms and explored connections with existing state-of-the-art global optimization methods (Covariance Matrix Adaptation, CMA-ES).

### CIMAT - Masters Research Thesis

Guanajuato, Mexico

Graduate student, advised by Prof. Arturo Hernandez-Aguirre

Jun – Dec 2014

- Worked with Optimization and Machine Learning methods from the perspective of Information Geometry. Proposed a practical approach by minimizing the KL-divergence of the probability densities w.r.t. the Boltzmann distribution.

### CIMAT - Undergraduate Researcher

Guanajuato, Mexico

Undergraduate student

Aug 2012 – Jul 2013

- Worked with the particle filter for target estimation and tracking. Proposed an approach to combine population based meta-heuristics with the particle filter method to improve state estimation for video object tracking.

### Mexican Academy of Sciences - National Summer Research Program

Guanajuato, Mexico

Undergraduate student

Jun – Jul 2012

- Attended short courses at CIMAT on Machine Learning, Pattern Recognition, Image processing and Robotics.

## RELEVANT CLASS PROJECTS

### CS 744: Big Data Systems - Memory Efficient Low-Rank Systems for Large Vision/Language Models

- We explore the utility of multiple low-rank methods for training. We then apply these methods across task domains. Our primary motivation is that this reduces memory cost, as a form of compression.

<https://github.com/ivanjaenm/Low-Rank-training-GalLTE>

## CS 826: Theoretical Foundations of Large-Scale ML - Quantifying modern inductive biases for deep learning.

- I performed 1) a review of simplicity biases, identifying their notions of “simple”, main assumptions and investigating possible relationships. Additionally, 2) experimentally quantify these biases across MLPs under different settings. <https://github.com/ivanjaenm/QuantifyingBiases>

## GRADUATE COURSEWORK

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### • CS/Engineering/Math at UW-Madison:

- Math 521: Analysis I
- ECE 532: Matrix Methods in ML
- CS 784: Foundations of Data Management
- CS 524: Intro to Optimization
- CS 744: Big Data Systems
- ECE 826: Theoretical Foundations of Large-scale ML
- CS 525: Linear Optimization
- CS 760: Machine Learning
- CS 726: Nonlinear Optimization
- CS 839: Foundation Models

## TEACHING EXPERIENCE

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### Lecturer:

UNAM - Faculty of Sciences - Mathematics Dept.

Mexico City

- Genetic Algorithms:

Spring 2018 & Spring 2019

### Graduate Teaching Assistant:

CIMAT - Computer Science Dept.

Guanajuato, Mexico

- Algorithms and programming (C++):

Fall 2015

University of Wisconsin–Madison - Computer Sciences Dept.

Madison, USA

- CS 320: Data Science Programming II (Python):

Fall '22, '23, Spring '22, '23

- CS 400: Programming III (Java):

Fall '24

## PUBLICATIONS

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- **Mario Ivan Jaen-Marquez**, Arturo Hernandez-Aguirre, Rafael Rivera-Lopez, “Object tracking via bio-inspired optimization algorithms” (in Spanish), Talk at *XXIV Escuela Nacional de Optimización y Análisis Numérico*, (ENOAN 2014), Guanajuato, Mexico.
- **Mario Ivan Jaen-Marquez**, Arturo Hernandez-Aguirre, “A parallel numerical integration method based on the Particle Swarm Optimization algorithm” (in Spanish), Talk at *5th. International Supercomputing Conference in Mexico (ISUM 2014)*, Baja California, Mexico.

## TECHNICAL SKILLS SUMMARY

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- **Programming languages:** C/C++, Python, Julia, Java, Matlab
- **Frameworks/Tools:** PyTorch, Lightning, Docker, PySpark, Scikit-learn, Hydra, Condor/CHTC, Git, Bash, L<sup>A</sup>T<sub>E</sub>X
- **Languages:** English (Full professional), Native Spanish

## WORK EXPERIENCE

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### Microsoft - Azure

Remote

*Data and Applied Scientist*

Nov 2020 - Jul 2022

- Applied Statistical Learning and experimentation techniques to get better analytics on Azure products
- Proposed and implemented a k-way merge algorithm to integrate data quality streams from distributed systems.

### BBVA bank - Global Markets

Mexico City

*Quant Developer*

Dec 2015 – Oct 2020

- Productionized a wide range of pricing/risk computational models for the front office trading platform.
- Researched and developed algorithmic trading strategies: optimization for portfolio compression (delta hedging)

## SERVICE AND LEADERSHIP

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Committee member, Student Chapter of the ACM - UW-Madison

Jan 2023 - Present, Madison, WI

Delta Research Mentor Program

Summer 2023, Madison, WI

Mentor for Incoming CS PhD students at UW-Madison

Fall 2023, Madison, WI

Mentor/Mentee, LatinX in Artificial Intelligence

Sep - Nov 2022, Remote

Fulbright Pre-Academic Program

Summer 2022, Syracuse, NY