Mauro M. Monsalve Mercado, Ph.D.

Theoretical physicist • Computational neuroscientist

Research scientist with a strong quantitative and computational background. Succesful trajectory developing mathematical and statistical models of complex systems. Experienced programmer (10+ years) and data analyst (7+ years). Comfortable using machine learning and statistics to extract meaning from large scale data. Practical implementation of deep learning frameworks for modelling high dimensional systems.

Academic profile

2014 – 2018 • Munich, Germany

Doctorate in computational neuroscience (Ph.D.)

Space in the brain: Of learning and representations

Graduate school of systemic neurosciences
Bernstein Center for Computational Neuroscience
Ludwig-Maximilians-Universität München

2011 – 2014 • Munich, Germany

Master of Science in theoretical physics (M.Sc.)

Geometric Constructions on $AdS_5 \otimes M_5$ Type IIB Supergravity Backgrounds and Implications for their Field Theory Duals

Elite Master Course Theoretical and Mathematical Physics
Max-Planck-Institut für Physik
Ludwig-Maximilians-Universität München

2006 – 2010 • Bogota, Colombia

Undergraduate degree in physics

Physics Department • National University of Colombia

Quantitative Skills

Theory

Probability and statistics • Stochastic processes • PDEs • Signal processing • Multivariate and Numerical analysis • Non-linear dynamics • Pattern formation

Computing

Python • Pandas • Pytorch • Scikit-learn • Matlab • Git • Deep learning and machine learning • Computer vision • Natural language processing • Statistical modelling • Classification • Regression • Clustering • Data mining • Dimensionality reduction (PCA, NMF, t-SNE, UMAP) • Feature engineering/learning • Artificial neural networks

Professional experience

2019 – Today • New York City, USA

Postdoctoral research scientist

Center for Theoretical Neuroscience
Columbia University • Zuckerman Institute

Researching the developing visual system, the role of neural circuits in visual perception, the geometry of the neural representation in decision making, and how genetic changes in the brain influence behaviour.

2018 • Trondheim, Norway

Research fellow

Kavli Institute for Systems Neuroscience

Data analysis of entorhinal cortex recordings to verify the predictions of mathematical models

2012 – 2018 • Munich, Germany

Teaching assistant

Ludwig-Maximilians-Universität München
Technische Universität München

Statistical mechanics and thermodynamics
Advanced mathematical statistical physics
Mathematical stochastic processes
Introduction to computational physics (python)
Calculus, PDEs, mathematical methods for physics

2014 • Trieste, Italy

Research fellow

Scuola Internazionale Superiore di Studi Avanzati

Research in theoretical high energy physics

2009 – 2010 • Bogota, Colombia

Research assistant

Astrophysics group • Physics department
National University of Colombia

High resolution simulations in C++ of the dynamical effects of deformations on spheroidal dwarf galaxies

Jerome L Greene Science Center
3227 Broadway, L6-070, Mail Code: 9864, New York NY 10027, United States

Website • Email • Mobile • Google Scholar

Publications

2022 • Nature

Schmidt, E.R.E., Zhao, H.T., Park, J.M. et al.

A human-specific modifier of cortical connectivity and circuit function

2021 • Association for Computational Linguistics

Katharina Kann and Mauro M. Monsalve-Mercado

Coloring the Black Box: What Synesthesia Tells Us about Character Embeddings

2020 • Physical Review Research

Mauro M. Monsalve-Mercado and Christian Leibold

Effect of boundaries on grid cell patterns

2019 • Hippocampus

Mauro M. Monsalve-Mercado and Yasser Roudi

Hippocampal spike-time correlations and place field overlaps during open field foraging

2017 • Physical Review Letters

Mauro M. Monsalve-Mercado and Christian Leibold

Hippocampal Spike-Timing Correlations Lead to Hexagonal Grid Fields

2017 • Nature Scientific Reports

Christian Leibold and Mauro M. Monsalve-Mercado

Traveling Theta Waves and the Hippocampal Phase Code

2016 • Neural Computation

Christian Leibold and Mauro M. Monsalve-Mercado

Asymmetry of Neuronal Combinatorial Codes Arises from Minimizing Synaptic Weight Change

Meetings

2020 • Denver, Colorado, USA

Computational and Systems Neuroscience (COSYNE)

2019 • Boston, Massachusetts, USA

Boston University: Invited speaker

2018 • Antibes – Juan les Pin, France

International Conference on Mathematical Neuroscience

Speaker: Grid cells: Oscillations and boundaries

2017 • Taormina, Italy

Spring Hippocampal Research Conference

2017 • Boulder, Colorado, USA

International Conference on Mathematical Neuroscience

Speaker: Feedforward learning of grid cells

2016 • Tokyo, Japan

RIKEN neuroscience summer programm

2015 • Göttingen, Germany

Summer Course on Computational Neuroscience

2015 • Salt Lake City, Utah, USA

Computational and Systems Neuroscience (COSYNE)

2014 • Munich, Germany

Workshop on computational methods in biophysics

2013 • Trieste, Italy

Geometric Correspondences of Gauge Theories

Languages

English	Fluent proficiency
Spanish	Native language
German	Intermediate (level CEFR B2)
Japanese	Basic

Jerome L Greene Science Center
3227 Broadway, L6-070, Mail Code: 9864, New York NY 10027, United States

Website • Email • Mobile • Google Scholar