Lauro
Morales Montesinos

PhD. Science

CONTACT

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CDMX / México

LinkedIn

LANGUAGES

Native

Spanish

Conversational

English

ABOUT ME

I consider myself a curious, skilled, and adaptable individual with extensive expertise in applied mathematics and science.

I am interested in studying coherent structures that emerge from nonlinear models of continuous media. My recent work includes research on phase transitions in complex materials, the spectral and nonlinear stability of magnetic domains in ferromagnetic thin films, and the spectral stability of gas diffusion in glassy polymers

EDUCATION

PhD science (Mathematics)

Instituto de Matemáticas – UNAM 2016-2020

Minimizing structures for elastic energy in phase transitions under the regime of linear geometric theory in thin film

Msc. Mathematics

Instituto de Matemáticas – UNAM 2014-2016

Phase transitions in thin film geometric linear theory

Bsc. Physics

Facultad de ciencias – UNAM 2005-2010

Existence of annular vortices with boundaries close to internal Hill's spherical vortex streamlines

CURRENT JOB

Postdoctoral position (Conahcyt)

IIMAS – UNAM 2022-2025

Variational analysis and stability of coherent structures in continuum mechanics

RESEARCH INTERESTS

- Calculus of variations
- Differential Equations
- Analysis
- Probability and Statistics
- Data Science

SOFTWARE

- Python 8/10
- Arduino 7/10
- Matlab 8/10
- R 6/10

PUBLICATIONS

Capella, A., Melcher C., Morales, L. & Plaza R. *Nonlinear stability of static Néel Walls in ferromagnetic thin films.* Preprint. (2024). https://arxiv.org/abs/2409.04023

Capella, A., Melcher C., Morales, L. & Plaza R. *Nonlinear stability of static Néel Walls in ferromagnetic thin films.* Accepted for publication on Arch. Ration. Mech. Anal. (2024). *https://arxiv.org/abs/2309.04432*

Capella, A., Morales, L. *On the quasiconvex hull for a three-well problem in two dimensional linear elasticity.* Calc. Var. 61, 100 (2022). *https://doi.org/10.1007/s00526-022-02209-4*

Capella, A., Morales, L. *On the Symmetric Lamination Convex and Quasiconvex Hull for the Coplanar n-Well Problem in Two Dimensions.* J Elast 148, 27–54 (2022). *https://doi.org/10.1007/ s10659-021-09878-w*

TALKS

The symmetric quasiconvex and lamination convex hull for the coplanar n-well problem and its relation to pattern formation in thin-film shape memory alloys
UJED Durango "57th SMM National congress"
October -2024

Spectral and Nonlinear sability of Néel walls in ferromagnetic thin films
IMATE-UNAM "SEDNOL seminary"
April -2024

Nonlinear stability of coherent structures in PDEs (mini course).
CIMAT - Guanajuato
November -2023.

Nonlinear stability of magnetic Néel walls in thin film
IIMAS-UNAM Mexico city: "Coloquio de matemáticas y mecánica"
September-2023.

Nonlinear stability of magnetic Néel walls in thin film
ITAM Ciudad de México: "SIAM sección México"
July-2023.

REFERENCIAS

Dr. Antonio Capella Kort

IMATE-UNAM

capella@im.unam.mx

Dr. Ramón G. Plaza Villegas

IIMAS-UNAM

plaza@aries.iimas.unam.mx

Dr. Luis Fernando López Ríos

IIMAS-UNAM

Luis.lopez@aries.iimas.unam.mx

Some Results on the Quasiconvex Hull for a n-well Problem in 2D Under Geometrically Linear Elastic Regime.
MPI - Leipzig Alemania: "AG seminar Arbeitsgemeinschaft Applied Analysis"
December-2019.

The Quasiconvex Hull for a Three-well problem in 2D under Geometrically Linear Elastic Regime.
CIMAT – Guanajuato: "12th Americas Conference on Differential Equations and Nonlinear Analysis"
December – 2019.

Microstructure in alloys and the n-well problem in geometrically linear elasticity.
UAM-I Ciudad de México: "Seminario de Análisis Matemático"
Noviembre – 2018.

INDUSTRY EXPERIENCE

Estimation of water consumption in Mexico City
ACCUBO-SACMEX-UNAM
Marzo 2022 - Agosto 2022

Dr. Antonio Capella, Mat. Sergio Fernández, and myself developed predictive models of water consumption at different levels of aggregation at Mexico City. My main contributions were:
Model development & implementation:

- A Bayesian Gaussian mixture regressor to estimate meter's mechanical tear.
- Automative predictive variable selector based on different metrics (Variables used on predictive models).
- Classical and Bayesian regressors for per-capita consumption.

Developed software:

- Cleaning and coupling of databases from different public and private sources as Catastro & SACMEX databases.
- Address' splitting.
- Implementation, training and selection of regressors.
- Final-user webapp

AWARDS & DISTINTIONS

2022-2024 CONACYT – *SNII candidacy.*

2022-2024 CONACYT –P*ostdoctoral position by Mexico.*

2016-2020 CONACYT - *PhD Scholarship.*

2014-2016 CONACYT - *Master's Scholarship.*

2012-2013 CONACYT -SNI 3 - *Research assistant.*

TEACHING

Subject Instructor / Science Faculty – UNAM / 2019-2024

- Differential and Integral Calculus I-IV

Subject Instructor /ENP1 – UNAM / 2022-2023

- Mathematics IV, V, VI areas 2 y 3

On-line Instructor / Mathematics – UnADM / 2021-2022

- Introduction to Matematical thinking
- Statistics I
- Multivariable Calculus I

Teacher Asistant /Science Faculty – UNAM / 2010-2017

- Differential and Integral Calculus I-IV
- Complex Variable
- Fourier Analysis
- Estochastic Processes I y II
- Electromagnetism I

POSTERS

Quasiconvex hull for three wells in 2D under Geometrically linear Elastic Regime /CNA Pittsburgh PA / Marzo 2019

"Mathematical Models for Pattern Formations"

Rigidity and non-Rigidity for Cubic-to-Tetragonal Phase Transition in GL Thin Film Theory / PIRE-CNA Pittsburgh PA / Junio - 2016

"2016 Summer School: New Frontiers in Nonlinear Analysis for Materials"

Rigidity results for cubic-to-tetragonal phase transition in geometrically linear thin-film theory / IMA Eugene OR / Octubre 2015

"IMA workshop: Mathematics and Mechanics in the 22nd Century: seven decades and counting..."

CONGRESS ATTENDANCE

October 2024 – 57th *National Congress SMM.* UJED-Durango México.

September 2023 - *Potential Theory Workshop: Intersections in Harmonic Analysis, Partial Differential Equations and Probability.* CIMAT-Guanajuato México.

July 2023 – *Annual Meeting SIAM Section Mexico: Building Bridges for Interdisciplinary Research*. ITAM-Ciudad de México.

May 2021 - *Integrative Think Tank on Environmental shock resilience in Mexico; data, models and policy.* CIMAT-Guanajuato México.

May 2019 - *Workshop on differential equations and calculus of variations: The Monge-Ampere equation.* CIMAT-Guanajuato México.

March 2019 - *Mathematical Models for Pattern Formations.* CNA Pittsburgh PA.

December 2018 - *Workshop on Multiscale Models: Theory and Applications.* CIMAT-Guanajuato México.

May 2018 - BUC13-GUQ2018: *Workshop on Uncertainty Quantification.* CIMAT-Guanajuato México.

September 2016 - CMO-BIRS 16w5021: *Mathematical Problems of Orientationally Ordered Soft Solids*. CMO-Oaxaca México.

June 2016 - PIRE-CNA 2016 Summer School: *New Frontiers in Nonlinear Analysis for Materials.* CNA Pittsburgh PA.

October 2015 - IMA workshop: *Mathematics and Mechanics in the 22nd Century: seven decades and counting…* Eugene OR.