DAVID ABELLA BUJALANCE

PhD in Physics

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SUMMARY

I am David Abella Bujalance, currently a PhD student and researcher at IFISC. My research focuses on applying complex systems physics to social and urban issues, including housing market dynamics, urban segregation, and collective behavior. My work includes studying human activity patterns and emergent urban structures, via data driven tools, network science and statistical physics.

SKILLS

Languages: Català, Castellano and English

Coding Languages: Python, Julia, Fortran, SQL and HTML.

Tools: Windows, Linux, Git/Github, Inkscape, Pandas, GeoPandas, Parallel Computing and TensorFlow.

EXPERIENCE

2023 – 2024 **Predoctoral Researcher** — **Instituto de Fisica Interdisciplinar y Sistemas Complejos (IFISC - UIB/CSIC)**
- Real estate data analysis and modelling via geolocalization techniques and clustering methods.

09 – 12/2023 **iMOVE Grant – Research stay** — **School of Mathematical Sciences, QMUL, London**
- Development of new tools to asses social segregation from first principles. Deep data treatment and analysis of many segregation datasets.

2022 – 2023 **SOIB Grant - Youn Research Talent** — **Universitat de les Illes Balears (UIB)**
- Agent based modelling of socio-technical systems, focused on complex contagion.

2021 – 2022 **Predoctoral Researcher** — **Instituto de Fisica Interdisciplinar y Sistemas Complejos (IFISC - UIB/CSIC)**
- Study of segregation with aging dynamics. Phase diagram analysis and modelling.

EDUCATION

10/2021 - 10/2024 **Ph.D in Physics of Complex Systems** — **Instituto de Fisica Interdisciplinar y Sistemas Complejos (IFISC - UIB/CSIC)**
PhD program focussed on the analysis of the emergent dynamics in social and economic systems.

6/2022 **Summer School in AI challenges** — **AIHUB - CSIC**
Summer School to familiarize with current AI tools used in different areas of science.

9/2019 - 12/2021 **Master in Physics of Complex Systems** — **Instituto de Fisica Interdisciplinar y Sistemas Complejos (IFISC - UIB/CSIC)**
Master program including the study of emergent properties in complex systems, data analysis, stochastic processes and data-driven modeling.

9/2015 - 6/2019 **Bachelor degree in Physics. Minor in Fundamental Physics.** — **Universitat de Barcelona**
With Minor in Fundamental Physics.

PUBLICATIONS

2024 **Exploring the spatial segmentation of housing markets from online listings** — **Published preprint**
We propose a methodology using multipartite networks to detect spatial segmentation in the real estate market, demonstrating robust results across different countries and scales

2024 **Ordering dynamics and aging in the symmetrical threshold model** — **Published article**
We study a symmetric version of the Granovetter–Watts model via statistical mechanics, finding three phases—mixed, ordered, and heterogeneous frozen—across and explore how introducing aging alters these phases.

2023 **Aging in binary-state models: The Threshold model for complex contagion** — **Published article**
We investigate how aging impacts binary-state dynamics in complex networks using the Threshold model technology adoption, finding that it slows down adoption processes, resulting in stretched exponential or power law patterns in various network structures.

2023 **Many-body contributions in water nanoclusters** — **Published article**
We assess the relevance of many-body interactions in water by evaluating their impact on nanoclusters up to 20 molecules, finding that including the first coordination shell approximates the global energy minimum within 5%.

2022 **Aging effects in Schelling segregation model** — **Published article**
We extend the Schelling model by introducing an aging effect where agents' probability of moving decreases with their satisfaction duration, simulating emotional attachment to their location. This modification alterates both its statics and dynamics.