

Irem TOPAL

Statistical Physicist | Postdoctoral Researcher

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EDUCATION

2023 PhD in Computational Applied Science and Engineering, Kadir Has University, Istanbul, Türkiye.
2019 PhD in Physics Engineering, Istanbul Technical University, *Courses Transferred*.
2017 MSc in Physics Engineering, Istanbul Technical University.
2014 BSc in Physics Engineering, Istanbul Technical University.

RESEARCH AND EXPERIENCE

Present	Postdoctoral Researcher, UNIVERSITAT POMPEU FABRA, Barcelona, Spain.
May 2025	Grammar and Cognition Lab
May 2025	Postdoctoral Researcher, UNIVERSITY OF PADOVA, Padova, Italy.
June 2023	Department of Biomedical Sciences
May 2023	Research Assistant, KADIR HAS UNIVERSITY, Istanbul, Türkiye.
October 2019	PhD funded by TUBITAK
Sept 2021	Visiting PhD Student, INTERNATIONAL CENTER FOR THEORETICAL PHYSICS, Trieste, Italy.
July 2021	Quantitative Life Sciences Section
October 2019	Physics Tutor, BAĞCESEHIR, Istanbul, Türkiye.
November 2018	Worked one-on-one with undergraduate engineering students to prepare them for the exams in Physics I and II.
October 2019	Data Scientist, MILETOS INC., Istanbul, Türkiye.
April 2018	

PUBLICATIONS

POGGIALINI, A., TOPAL, I., LOMBARDI, F. & DE MARTINO, D. (2026). Synchronization, Kinematic Waves and Spike-Phase-Separation in Feed-back Ising Neural Networks on Heterogeneous Graphs. *arXiv preprint arXiv:2607.28275*.

TOPAL, I., CHEREVKO, A., BUGAI, Y., SHISHLENIN, M., BARBIER, J., EROGLU, D., ROLDÁN, É. & BELOUSOV, R. (2026). Data-Driven Modeling and Classification of Brain Blood-Flow Pathologies. *AI*, 7(3), 105.

TOPAL, I., MORENO ANCALMO, P., MONTAÑA VALVERDE, G., HOMAN, P. & HINZEN, W. (2026). Early psychosis shows deviations in scaling behaviour within a critical regime. *arXiv preprint arXiv:2606.06290*.

TOPAL, I., POGGIALINI, A., MASCHIO, M. D., DE MARTINO, D., SHRIKI, O. & LOMBARDI, F. (2026). Scaling and tuning to criticality in resting-state human magnetoencephalography. *arXiv preprint arXiv:2602.17820*.

TOPAL, I. & EROGLU, D. (2023). Reconstructing Network Dynamics of Coupled Discrete Chaotic Units from Data. *Physical Review Letters*, 130, 117401. <https://doi.org/10.1103/PhysRevLett.130.117401>

TOPAL, I. & SERVANTIE, J. (2019). Molecular dynamics study of the thermal conductivity in nanofluids. *Chemical Physics*, 516, 147-151.

TALKS AND POSTERS

- 2026 *Coarse-Grained Brain Dynamics Reveal Altered Scaling Regimes in Early Psychosis* (Talk), 4th International Workshop on Neurodynamics, Universidad de Zaragoza, Castro-Urdiales, Spain.
- 2026 *Altered Scaling and Brain Criticality in Early Psychosis* (Talk), BARCCSYN RETREAT 2026, Centre de Recerca Matemàtica, Barcelona, Spain.
- 2026 *Alterations in Critical Neural Dynamics in Early Psychosis* (Poster), Alpine Brain Imaging Meeting, University of Geneva, Champéry, Switzerland.
- 2025 *Scaling and criticality in brain-wide neural activity of larval zebrafish* (Invited Talk), 27. İstatistiksel Fizik Günleri, Kadir Has University, Istanbul, Türkiye.
- 2024 *Scaling and criticality in brain-wide neural activity of larval zebrafish* (Poster), Italian Network for Computational Neuroscience, Istituto Superiore di Sanità, Roma, Italy.
- 2024 *Revealing Criticality in Neuronal Activity Data Through Coarse-Graining* (Poster), Youth in High Dimensions : Recent Progress in Machine Learning, High-Dimensional Statistics and Inference, ICTP, Trieste, Italy.
- 2022 *Reconstructing network dynamics of weakly coupled chaotic units from data* (Talk), Inverse Network Dynamics, Max Planck Institute for the Physics of Complex Systems, Dresden, Germany.
- 2021 *Network Reconstruction from Data* (Poster), The EPS conference on Statistical Physics of Complex Systems, ICTP, Trieste, Italy.
- 2021 *Reconstructing Network Dynamics of Weakly Coupled Chaotic Units* (Online), SIAM Conference on Applications of Dynamical Systems.
- 2020 *Sensing Network Dynamics of Weakly Coupled Chaotic Units* (Online), Dynamics Days Digital 2020.
- 2018 *Prediction of DNA Binding Sites for a Transcription Factor* (Poster), Machine Learning Summer School at Bosphorus (BYOYO), Istanbul, Türkiye.
- 2018 *Molecular Dynamics Study of the Thermal Conductivity in Nanofluids* (Talk), The annual Statistical Physics Days, İzmir, Türkiye.

RESEARCH SKILLS

Methods	fMRI, MEG and calcium-imaging analysis; time-series analysis; computational modeling; complex network analysis
Programming	Python, Fortran, MATLAB
Tools	Git, LaTeX, Inkscape

LANGUAGES

Turkish	Native
English	Fluent
Spanish	Intermediate

OUTREACH AND VOLUNTEERING

- 2022 *Caliban and the Witch : Professions Lost by Women* (Podcast), Fiskos Masası, Kadir Has University, Istanbul.
- 2021 *Introduction to Network Sciences* (Online Lecture), 19th Physics Days, Istanbul.
- 2020 *Synchronization of Chaotic Systems* (Online Lecture), 17th Physics Days, Istanbul.
- 2013 İstanbul Technical University, Students' Representative Council, Undergraduate Student Representative of Physics Engineering