

Malihe Ghodrat

Assistant Professor

Statistical and Soft Matter Physics

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® Malihe Ghodrat

Profile

Assistant Professor in Statistical and Soft Matter Physics with research interests in active matter, soft condensed matter, computational statistical physics, and physics of living systems.

Research Interests

Active Matter and Self-Propelled Particles; Soft Matter Physics; Physics of Living Matter; Computational Physics; Statistical Physics; Collective Motion; Hydrodynamics; Microfluidics and Confined Transport; Machine learning approach to collective motion of active matter.

Academic Appointments

- 2016–Present **Assistant Professor**, *Tarbiat Modares University*, Tehran
Department of Physics
- 2013–2015 **Postdoctoral Research Associate**, *Inst. Res. Fund. Sci. (IPM)*, Tehran
Soft Matter, Biological and Statistical Physics Group

Education

- Ph.D. **Statistical Physics**, *Shiraz University*
Thermostatistical properties of a relativistic gas
- M.Sc. **Statistical Physics**, *Shiraz University*
- B.Sc. **Solid State Physics**, *Sharif University of Technology*

Research Projects

- Current
- Active transport in confined microchannels
 - Collective behavior of active Brownian particles
 - Hydrodynamic interactions in active suspensions
 - Machine learning approach to active material
 - Physics-informed image analysis of living matter
 - Computational modeling of soft biological materials

Student Supervision

- Ph.D. **S. Babossalami**, *Investigating the effect of substrate stiffness on migration and collective behaviors of cancer cell lines*, Co-supervised by Dr. F. Ataie.
- Ph.D. **M. Maleki**, *Machine Learning approach to study the collective behavior of self-propelled particles in the critical regime*
- Ph.D. **A. Bahrami**, *Investigating hydrodynamic effects on the motion of self-Propelled microswimmers in narrow channels with variable width*
- M.Sc. **A. Abbaszadeh**, *studying the phase transition and active clusters in Vicsek and Kuramoto models*

- M.Sc. **M. Fatemi**, *studying the phase transition and active clusters in Vicsek and Kuramoto models*, Co-supervised by Dr. E. Saievar
- M.Sc. **A. Maleki**, *Fluid-controlled transport of bacteria in confined environment*
- M.Sc. **A. Bigdely**, *Collective behaviors of self-propelled colloidal particles: The effect of interparticle interactions*
- M.Sc. **A. Bahrami**, *Statistical physics of active Brownian particles in shear flow*
- M.Sc. **H. Masoodzade**, *The effect of the external electric fields on fluid suspensions of self-propelled colloidal particles*
- M.Sc. **H. Hemmati**, *Studying the motion and statistical properties of spherical Janus swimmers*

Selected Publications

- Activity-induced asymmetric dispersion in confined channels. *Physical Review Fluids*, 2024.
- Transport coefficients for hard-sphere relativistic gas. *Physical Review E*, 2020.
- Molecular dynamics approach to dissipative relativistic hydrodynamics. *Physical Review C*, 2016.
- Ion-mediated interactions between net-neutral slabs. *Journal of Chemical Physics*, 2015.
- Strong coupling electrostatics for randomly charged surfaces. *Soft Matter*, 2015.
- Asymmetric Coulomb fluids at randomly charged dielectric interfaces: Anti-fragility, overcharging and charge inversion. *Journal of Chemical Physics*, 2014.
- Thermodynamics of a morphological transition in a relativistic gas. *Physica A Statistical Mechanics and Its Applications*, 2014.

Teaching

- PhD Statistical Physics II
Soft Matter Physics
- MSC Statistical Physics I
Computational Physics
Solid State Physics

Technical Skills

- Programming Python, C/C++,
- Simulation Molecular Dynamics, Monte Carlo, Lattice Boltzmann, Machine learning
- Software ESPResSo, COMSOL Multiphysics, Mathematica, LaTeX