Pouria Akbari Mistani

Computational Physicist — HPC — Research Scientist

Contact Information

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Research Interests

- Computational science and engineering (CSE)
- High performance scientific computing
- Sharp interface physics and level-set methods
- Inverse statistical physics

Education

PhD in Mechanical Engineering Sep 2016 - ongoing
University of California Santa Barbara, USA
Concentrations in computational science and engineering
Advisor: Prof. Frederic Gibou

Graduate Researcher Jun 2014 - Jun 2016
University of California Riverside, USA
Concentrations in computational astrophysics

MSc in Physics Sep 2013 - Jun 2014
University of California Riverside, USA
Concentrations in computational astrophysics

BSc in Physics Sep 2009 - Jun 2013
Sharif University of Technology, Tehran, Iran

BSc in Aerospace Engineering Sep 2008 - Jun 2013
Sharif University of Technology, Tehran, Iran

Professional Experience

Visiting Scholar Jun 2014 - Jul 2014
Institute for Theory and Computation (ITC)
Center for Astrophysics (CfA), Harvard University, MA, USA
With Prof. Lars Hernquist

Software Developer Oct 2012 - Jun 2013
Research Center for Intelligent Signal Processing (RCISP)
Ministry of Science, Research and Technology (MSRT), Tehran, Iran
Developed a real-time star identification system

Internship Jun 2012 - Aug 2012
Department of Aerospace Engineering
Sharif University of Technology, Tehran, Iran
Designed and built a helmholtz coil and a sun sensor

Technical & Specialized Skills

- Programming Languages: C/C++, Python, MATLAB, Unix, Shell Script, HTML
- Libraries: MPI, Petsc, Boost, gsl, Pandas, NumPy, Scipy, H5Py, Pyfits, Matplotlib
- Numerical Methods: FEM, FVM, Level Set, Voronoi Interface Method (VIM)
- Software: ParaView, Qt Creator, Microsoft Office, Latex
- Operating Systems: Linux, Mac OS, Windows
- HPC facilities: TACC Stampede, SDSC Comet, Harvard Odyssey, UCR FOAM/FIONA
- Job Management: SLURM, Torque

Publications

Journals

- **A parallel Voronoi-based approach for meso-scale simulations of cell aggregate electropermeabilization** published, 2019
  Pouria Mistani; Arthur Guittet; Clair Poignard; Frederic Gibou
  Journal of Computational Physics, Elseviere
- **The island dynamics model on parallel quadtree grids** published, 2018
  Pouria Mistani; Arthur Guittet; Daniil Bochkov; Joshua Schneider; Dionisios Margetis; Christian Ratsch; Frederic Gibou
  Journal of Computational Physics, Elseviere
- **On the assembly of dwarf galaxies in clusters and their efficient formation of globular clusters** published, 2016
  Mistani, Pouria A.; Sales, Laura V.; Pillepich, Annalisa; Sanchez-Janssen, Ruben; Vogelsberger, Mark; Nelson, Dylan; Rodriguez-Gomez, Vicente; Torrey, Paul & Hernquist, Lars
  Monthly Notices of the Royal Astronomical Society, Oxford University Press

Conference Presentations

- **Towards a realistic tissue simulation engine: multi-scale simulations of cell aggregate electropermeabilization**
  Talk at the CSE 19, Spokane, Washington, 2019
  Pouria Mistani
- **Multi-scale simulations of cell aggregate electropermeabilization**
  Poster Presentation at Southern California Applied Mathematics Symposium 2018, University of California Santa Barbara
  Pouria Mistani, and Frederic Gibou
- **Multi-scale simulations of epitaxial growth: mound formation**
  Poster Presentation at Southern California Applied Mathematics Symposium 2018, University of California Santa Barbara
  Pouria Mistani, and Frederic Gibou
- **Velocity dispersion profile of cetus dwarf spheroidal galaxy**
  Poster Presentation at 8th Sackler Conference on Dark Matter 2014, CfA, Harvard University
  Pouria Mistani, Soroush Sotoudeh

Book Chapters

- **Tensor network representation of complex systems**
  2^{nd} edition of the *Sustainable Interdependent Networks, from Theory to Applications*, Springer International Publishing 2019,
  Pouria Mistani, Samira Pakravan, Frederic Gibou

- **Tensor network renormalization as an ultra-calculus for complex system dynamics**
  2^{nd} edition of the *Sustainable Interdependent Networks, from Theory to Applications*, Springer International Publishing 2019,
  Pouria Mistani, Samira Pakravan, Frederic Gibou

Projects

- **Parallel simulations of epitaxial growth on quadtree grids**
  University of California Santa Barbara Sep 2016 - ongoing
  This project introduces a novel approach for efficiently simulating epitaxial growth using the island dynamics model. In this approach we make use of a forest of quadtree grids in a parallel environment in the context of level-set method.
  Using: MPI, PETSC, Boost, C++

- **Parallel simulations of cell aggregate electroporation**
  University of California Santa Barbara Sep 2016 - ongoing
  Simulations of cell aggregate electroporation in a parallel environment and on Octree grids. We investigate different aspects of cell aggregate electroporation in a huge cluster of cells seeking an improvement to cancer treatment techniques using electric pulses to enhance cell membrane permeability of drugs.
  Using: MPI, PETSC, C++

- **Assembly of dwarf galaxies - the Illustris simulations**
  University of California Riverside Sep 2014 - Jan 2016
  We studied the assembly of dwarf galaxies using the Illustris hydrodynamical and cosmological simulations. As part of this project, I implemented a semi-analytic model for formation of globular clusters on top of the Illustris simulations.
  Using: Python, Fortran

- **Stabilization of rigid body dynamics and orbital dynamics using canonical approach**
  Sharif University of Technology Sep 2012 - Jun 2013
  In this project, the reduction of the rigid body problem and orbital dynamics by canonical Serret-Andoyer and Dealunay variables respectively is discussed and stabilizing control for both of them is presented using the method introduced by Pini Gurfil.
  Using: MATLAB

Peer Review Services

- Journal of Computational Physics
- IEEE Conference on Smart Energy Systems and Technologies 2018

Honors & Awards

- Travel award for SIAM Conference on Computational Science and Engineering, Spokane, Washington, USA 2019
- Finalist for the 3rd edition of the IEEE entrepreneurship forum and startup contest IEEE Robotics and Automation Society (IEEE RAS) 2017
- Awarded 740,082 SUs computing allocation on Stampede supercomputer 2016
  Proposal: "Dwarf Galaxies as Cosmological Laboratories of Galaxy Formation"
  PI: Laura Sales, Co-PIs: **Pouria A.Mistani**, Peter Creasey, Federico Marinacci
- FIELDS fellowship for big data and visualization, NASA MIRO program 2015
- Michael Devirian award for outstanding research by a 2nd year graduate student, University of California Riverside 2015
- Winner of dean's distinguished fellowship award, University of California Riverside 2013
- Merit based admission offer to the graduate program in aerospace engineering, Sharif University of Technology, Tehran, Iran 2013
- Ranked 1^{st} among BSc students in department of aerospace engineering, Sharif University of Technology, Tehran, Iran 2013
- Top 0.1% (rank 258) among more than 300,000 high school students in the national university entrance exam, Iran 2008
- 4 year "National Elite Foundation Undergraduate Fellowship Award", Ministry of Education, Iran 2007
- Silver medal in the 3^{rd} national olympiad in astronomy, Iran 2007

Teaching Experience

Teaching Associate

- *University of California Santa Barbara, Department of Mechanical Engineering*
  ME16: Engineering Dynamics, Undergraduate Course, Spring 2018

Teaching Assistant

- *University of California Santa Barbara, Department of Mechanical Engineering*
  - Statics
  - Fluid Mechanics I
  - Fluid Mechanics II
- *University of California Riverside, Department of Physics*
  - Physics General Labs, 6 classes (sections 2LA, 2LC, 2C)
  - General Physics Discussions, 12 classes in total (2A, 2B, 2C)
- *Sharif University of Technology, Department of Aerospace Engineering*
  - Orbital Mechanics (5 semesters)
  - Aircraft Design II

Professional Membership

- Society for Industrial and Applied Mathematics (SIAM) Sep 2018 - present