Pouria Akbari Mistani

Computational and Data Scientist — Aerospace Engineer

Contact Information

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Career Interests

Computational	**Analytical**
High performance scientific computing	Mathematical modeling
Scientific software development	Physics-based modeling
Scientific machine learning	Statistical analysis
Numerical methods for differential equations	Dynamical systems
Big data and visualization	

Education

- **PhD in Mechanical Engineering**   Sep 2016 - present
  University of California Santa Barbara, USA
  Concentration in *computational science and engineering (CSE)*
  Advisor: Prof. Frederic Gibou

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

- **MS in Physics** *summa cum laude*   Sep 2013 - Jun 2014
  University of California Riverside, USA
  Concentration in *computational astrophysics*

- **BS in Physics** *summa cum laude*   Sep 2009 - Jun 2013
  Sharif University of Technology, Tehran, Iran
  Concentration in *astronomy*

- **BS in Aerospace Engineering** *summa cum laude*   Sep 2008 - Jun 2013
  Sharif University of Technology, Tehran, Iran
  Concentration in *astronautical engineering*

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

- **Undergraduate 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

	Techniques	Skilled at
Technical Skills	Programming languages	C/C++, Python, MATLAB, Shell Script, HTML
	Data analysis	Tensorflow, Keras, Apache Spark, SQL, Pandas, Scipy, etc.
	Data visualization	Matplotlib, seaborn, bokeh
	Computations	MPI, Petsc, Boost, gsl
	Numerical methods	FDM, FVM, Level-set methods
	Softwares	Qt, ParaView, Microsoft Office, Latex
	Operating systems	Linux, Mac OS, Windows
	Cloud computing	TACC Stampede/-2, SDSC Comet, IBM data platform

Licenses & Certifications

- **Fundamentals of Scalable Data Science**, Coursera
  IBM Advanced Data Science specialization series, certificate ID: 8V3JCPPQ7BY7

- **Advanced Machine Learning and Signal Processing**, Coursera
  IBM Advanced Data Science specialization series, certificate ID: in progress

Projects

- **Parallel simulations of cell aggregate electroporation**
  University of California Santa Barbara   Sep 2016 - present
  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 to chemotherapy.
  Using: MPI, PETSC, C++, Python

- **Parallel simulations of epitaxial growth on quadtree grids**
  University of California Santa Barbara   Sep 2016 - Sep 2019
  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 methods.
  Using: MPI, PETSC, Boost, 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 a canonical variables approach**
  Sharif University of Technology   Sep 2012 - Jun 2013
  In this project, dimensional reduction of the rigid body problem and orbital dynamics by canonical Serret-Andoyer and Dealunay variables is discussed and stabilizing control for orbital position and orientation is implemented.
  Using: MATLAB

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

  - **Multi-scale simulations of cell aggregate electropermeabilization**
    Poster Presentation at Southern California Applied Mathematics Symposium 2018, University of California Santa Barbara

  - **Multi-scale simulations of epitaxial growth: mound formation**
    Poster Presentation at Southern California Applied Mathematics Symposium 2018, University of California Santa Barbara

  - **Velocity dispersion profile of cetus dwarf spheroidal galaxy**
    Poster Presentation at 8th Sackler Conference on Dark Matter 2014, CfA, Harvard University

- **Book Chapters**

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

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 1st 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 3rd 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
	
	ME: Department of Mechanical Engineering, PHYS: Department of Physics,
	AE: Department of Aerospace Engineering
	• *University of California Santa Barbara, USA*
	
	  – ME: Statics
	  – ME: Fluid Mechanics I, II (2 quarters each)
	  – ME: Engineering Vibrations (2 quarters)
	  – PHYS: Intermediate Mechanics
	
	• *University of California Riverside, USA*
	
	  – PHYS: Physics General Labs, 6 classes (sections 2LA, 2LC, 2C)
	  – PHYS: General Physics Discussions, 12 classes in total (2A, 2B, 2C)
	
	• *Sharif University of Technology, Iran*
	
	  – AE: Orbital Mechanics (5 semesters)
	  – AE: Aircraft Design II

Mentorship	• Menghang(David) Wang, 2019 Summer Undergraduate Research Project, College of Creative Studies, UCSB, Project title: *The influence of galaxy cluster environment on the kinematics of the stripped globular clusters*, Watch David's presentation at KITP