

Pouria Mistani

Data Scientist
with physics background

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- My LinkedIn Profile
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Hard Skills

- Multi-Variable Calculus, Statistics,
Linear Algebra, Stochastic
Processes
- Machine Learning,
Scientific Computing
- Data Intuition Extraction
- Python, C/C++, HTML
- Tensorflow, Keras, Scikit-Learn,
Scipy, Pandas, Boost, GSL
- SQL, Apache Spark
- Matplotlib, ParaView, Seaborn
- MPI, Petsc
- Linux, Mac OS, Windows

Soft Skills

- Multi-disciplinary
- Fast-paced
- Critical Thinking
- Problem Solving
- Team Player
- 6 years experience in several
scientific collaborations
- Communication
- 10 years of teaching
experience

Working Experience

- 2016 – now **Research/Teaching Assistant** University of California Santa Barbara
Developed two parallel computing softwares to numerically integrate nonlinear PDEs. Also I developed a stochastic model based on data.
- 2013 – 2016 **Research/Teaching Assistant** University of California Riverside
Analyzed terabytes of high-dimensional datasets produced by the *illustris* simulations of the Universe, and developed a theory for assembly of dwarf galaxies from data.
- 2014 – 2014 **Visiting Scholar** Harvard University
Developed several Python routines to effectively filter through *illustris* datasets.
- 2012 – 2013 **Scientific Software Developer** RCISP, Iran
I was involved in development of a real-time star identification system. This project involved data acquisition and calibration of opto-electronic devices, followed by image processing and fast search algorithms for pattern recognition.

Education

- 2016 – now **PhD in Mechanical Engineering** University of California, Santa Barbara
Focus: Computational Science and Engineering (GPA: 3.95/4.0)
- 2013 – 2016 **MS Physics** University of California, Riverside
Focus: Computational Astrophysics (GPA: 3.95/4.0)
- 2009 – 2013 **BS Physics** Sharif University of Technology
Focus: Astronomy (GPA: 18.45/20.0)
- 2008 – 2013 **BS Aerospace Engineering** Sharif University of Technology
Focus: Astronautics (GPA: 18.45/20.0)

Projects

- Electroporation** </> C++, Petsc, Python, Scikit-Learn, Scipy, Tensorflow, Keras, (Biophysics)
Visualization, Data Wrangling, Linux
2016-now
We numerically solved partial differential equations with nonlinear boundary conditions on tens of thousands of interfaces with arbitrary geometries. We used a finite volume discretization on adaptive interface-fitted Voronoi grids. I implemented more than 5,000 lines of parallel C++ code, tested, then ran it on Stampede2 supercomputer using 2,048 processors for 24 hours. I simulated the evolution of more than 200 million Voronoi cells over 100 timesteps. The generated raw datasets were ≥ 25 GB per snapshot, which I processed on-the-fly to generate a total of 100 MB reduced measurements per simulation for use in post-processing. I used ParaView in parallel over 256 processors to visualize the results, then I extensively analyzed the datasets in Python (I wrote a class with more than 2,000 lines of code performing a variety of statistical analysis over $\sim 1,000,000$ time series). The product is a high fidelity reduced model that predicts observations with minimal computations, e.g. on your smartphone.

- Epitaxy** </> C++, Petsc, Boost, p4est, Visualization, Linux
(Materials)
We developed a novel approach for efficiently simulating epitaxial growth using the island dynamics model, i.e. an evolutionary nonlinear PDE model. In this approach we made use of a forest of quadtree grids using p4est library in a parallel environment. This work extended previous studies by combining mesh adaptivity and multi-core parallelism that enabled simulations of mound formation in orders of magnitude larger domains. We used C++ using parallel framework Petsc as an interface to BLAS and LAPACK linear algebra libraries, as well as Boost for fast mathematical operations.

- Dwarf Galaxies** </> Python, C, MPI, GSL, matplotlib, Scipy, Scikit-Learn, Pandas, (Astrophysics)
Data Wrangling, Linux
2014-2016
I analyzed 250TB of correlated datasets generated by the *Illustris* cosmological and hydrodynamical simulation suite to study the assembly of dwarf galaxies. I developed a semi-analytic model for the formation and stripping of globular clusters that support our findings.

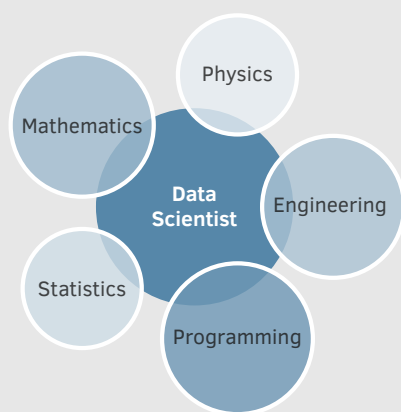
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About Me

I build multiscale mathematical models from big data. I develop parallel scientific computing softwares (multi-core and GPU) to generate and analyze large datasets, which I then use to develop physics-informed predictive models at different scales of time and length. These models can accelerate decision making or enhance complex technological, biomedical and financial processes.

Persona



Barskills

>_ Programming

Analysis

📺 Presentation

+ Conceptualization

Memberships



Society for Industrial and Applied Mathematics, USA



National Elite Foundation, Iran

Awards

- 2019 Travel award for **SIAM** conference on computational science and engineering
Spokane, Washington, USA
- 2017 Finalist for the 3rd edition of the **IEEE** entrepreneurship forum and startup contest **IEEE** Robotics and Automation Society
IEEE RAS
- 2016 Awarded **740,082** SUs computing allocation on Stampede supercomputer
XSEDE TACC
- 2015 **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
- 2013 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
- 2013 Ranked 1st among BS students in department of aerospace engineering
Sharif University of Technology
- 2008 Top 0.1% (rank 258) among more than 300,000 high school students in the national university entrance exam
Ministry of Education, Iran
- 2007 4 year "National Elite Foundation Undergraduate Fellowship Award"
Ministry of Education, Iran
- 2007 Silver medal in the 3rd national olympiad in astronomy
Ministry of Education, Iran

Publications

- 2019 A parallel Voronoi-based approach for meso-scale simulations of cell aggregate electroporation
Pouria Mistani, A Guittet, C Poignard, F Gibou
Journal of Computational Physics
- 2019 Towards a tensor network representation of complex systems
Pouria Mistani, S Pakravan, F Gibou
Springer International Publishing
- 2019 Tensor network renormalization as an ultra-calculus for complex system dynamics
Pouria Mistani, S Pakravan, F Gibou
Springer International Publishing
- 2018 The island dynamics model on parallel quadtree grids
Pouria Mistani, D Bochkov, A Guittet, J Schneider, D Margetis, C Ratsch, F Gibou
Journal of Computational Physics
- 2016 On the assembly of dwarf galaxies in clusters and their efficient formation of globular clusters
Pouria Mistani, L Sales, A Pillepich, R Sanchez-Janssen, M Vogelsberger, D Nelson, V Roldán-Gómez, P Torrey, L Hernquist
Monthly Notices of Royal Astronomical Society

Teaching

ME	Engineering Dynamics (main instructor)	UC Santa Barbara
ME	Statics	UC Santa Barbara
ME	Fluid Mechanics I, II (twice)	UC Santa Barbara
ME	Engineering Vibrations (twice)	UC Santa Barbara
PHYS	Intermediate Mechanics	UC Santa Barbara
PHYS	General Physics Discussions (sections 2A, 2B, 2C)	UC Riverside
PHYS	Physics General Labs (sections 2LA, 2LC, 2C)	UC Riverside
AE	Orbital Mechanics (5 semesters)	Sharif University of Technology
AE	Aircraft Design II	Sharif University of Technology