

Pouria Mistani

Computational Scientist

Work Authorization:
Permanent Resident

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Santa Barbara, CA 93117
- +1 951 386 9775
- <http://www.pouriamistani.com>
- My LinkedIn Profile
- p.a.mistani@gmail.com

Hard Skills

- Multivariate 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, p4est
- 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

Certificates



Fundamentals of Scalable
Data Science



Applied AI with Deep
Learning



Advanced Machine Learning
and Signal Processing

Work Experience

- Merck** **Postdoctoral Research Fellow** **2020 – now**
Multiscale modeling of biotherapeutics and vaccines. Developing
next-generation computational and statistical tools to predict and
mitigate physical instability challenges in protein-based formula-
tions.
- UCSB** **Research/Teaching Assistant** **2016 – 2020**
Developed two parallel computing softwares to solve nonlinear PDEs.
Also I developed a stochastic model based on data.
- UCR** **Research/Teaching Assistant** **2013 – 2016**
Analyzed terabytes of data produced by the *illustris* simulations of
the Universe, and developed a theory for assembly of dwarf galaxies.
- Harvard University** **Visiting Scholar** **2014 – 2014**
Developed several Python routines to analyze *illustris* datasets.
- MSRT** **Scientific Software Developer** **2012 – 2013**
Ministry of Science, Research and Technology, Iran

Education

- 2016 – 2020** **PhD in Mechanical Engineering** University of California, Santa Barbara
Focus: Computational Science and Engineering
- 2013 – 2016** **MS Physics** University of California, Riverside
Focus: Computational Astrophysics
- 2009 – 2013** **BS Physics** Sharif University of Technology
Focus: Astronomy
- 2008 – 2013** **BS Aerospace Engineering** Sharif University of Technology
Focus: Astronautics

Projects

- Inverse PDEs** (</> Python, Tensorflow, Keras, Linux
(Machine Learning)
2019-now
We developed the “Blended Inverse-PDE Networks” (BIPDE-Nets)
that combine traditional methods for numerical computations
of PDEs with modern deep learning architectures to discover
hidden fields in data. BIPDE-Nets seamlessly incorporate domain-
knowledge about physics of the problem.
- Electroporation** (</> C++, Petsc, Python, Scikit-Learn, Scipy, Tensorflow, Keras,
(Biophysics) Visualization, 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 on 2,048 processors. I used ParaView to visualize
the results, and I extensively analyzed the datasets in Python. The
product is a reduced order model that predicts observations with
minimal computations.
- Epitaxy** (</> C++, Petsc, Boost, p4est, Visualization, Linux
(Materials)
2016-2019
We developed a novel approach for simulating epitaxial growth
in parallel. In this approach we made use of a forest of quadtree
adaptive 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) 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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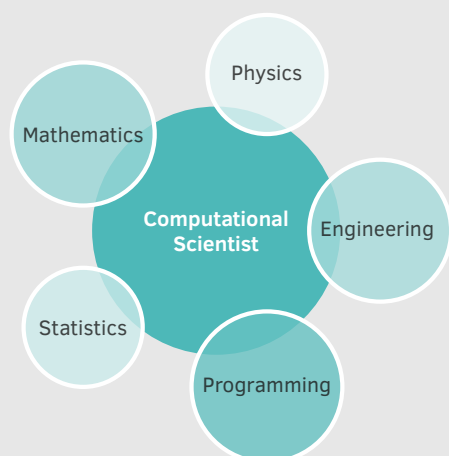
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About Me

I build multiscale mathematical models from big data. I develop parallel scientific computing softwares (C++ multi-core) to generate and analyze large datasets, using adaptive mesh refinement and in parallel environments.

I have extensive experience in developing data analysis pipelines and visualizations using Python, which I leverage to develop physics-informed predictive models.

Analytics



Programming Skills

>_ Python

>_ C++

Memberships



Society for Industrial and Applied Mathematics, USA



National Elite Foundation, Iran

Awards

- 2020 **Graduate Division Dissertation Fellowship Award**
University of California, Santa Barbara
- 2019 **Travel award for SIAM conference on computational science and engineering**
Spokane, Washington, USA
Awarded 740,082 SUs computing allocation on Stampede supercomputer
XSEDE TACC
- 2016 **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
- 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

- 2020 **A fractional stochastic theory for interfacial polarization of cell aggregates**
Pouria Mistani, S Pakravan, F Gibou
arXiv - under review
- 2020 **Solving inverse-PDE problems with physics-aware neural networks**
S Pakravan, Pouria Mistani, MA Calvo, F Gibou
arXiv - under review
- 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 Bochlov, 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 Rodriguez-Gomez, 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

October 17, 2020

Pouria Mistani