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Manu Jayadaran, PhD

Education.

- 2016–Aug **Doctor of Philosophy in Mathematics**, *University of Pittsburgh*,
2021 - Topics in numerical analysis, high performance computing, scientific ML, CFD.
- Dietrich School of Arts and Sciences Graduate Fellowship recipient.
- Developed high performance computing methods and code-bases. GPA: 3.9/4
- 2011–May **BS and MS dual degree in Mathematics**, *Indian Institute of Science*
2016 *Education and Research, Mohali*
- Admitted with full DST- INSPIRE fellowship (renewed for 5 years).
- Top rank holder in the department of mathematics.
- Merit certificate for academic excellence in mathematics.
- Internship in Mathematical Biology, Major CPI: 9.1/10.

Publications

- **M. Jayadharan** and I. Yotov, *Multiscale mortar mixed finite element methods for the Biot system of poroelasticity*, [arxiv math.NA](#), **2022**, preprint.
- **M. Jayadharan**, M. Kern, M. Vohralík, and I. Yotov. *A space-time multiscale mortar mixed finite element method for parabolic equations*. SIAM Journal on Numerical Analysis, **2022** (to appear) [link](#).
- **M. Jayadharan**, E. Khattatov, and I. Yotov, *Domain decomposition and partitioning methods for mixed finite element discretizations of the Biot system of poroelasticity*. Computational Geosciences 25, 1919–1938, Springer **2021**, [link](#).
- M. Jayadharan, *Domain Decomposition And Time-Splitting Methods For The Biot System Of Poroelasticity*, Doctoral Dissertation, University of Pittsburgh. **2021**, [link](#).
- M. Jayadharan, *Study of Cauchy's Basic Equations and Convex functions*, MS Dissertation, IISER Mohali **2016**, [link](#).

Computational Software Development

- [VTNNS](#) Fortran based variable topology biological neural network simulator, [research article link](#).
- [FluidLearn](#) Python based open-source software package to solve Multiphysics PDEs using supervised physics informed neural networks (PINNs) .
- [SpaceTime PDE solver](#) C++ based parabolic PDE solver, using a combination of space and time domain decomposition techniques to improve computational efficiency, [research article link](#).
- [BiotDDSolver](#) C++ based poroelastic fluid flow simulator, using HPC domain decomposition techniques to improve computational efficiency, [research article link](#)
- [Others](#) Detailed list of packages on [GitHub](#).

Industry and Research Work Experience

- 2021-Present **Quantitative Research-Analyst, AVP, Citigroup Inc.** New York,
Responsible for developing and implementing mathematical analytics library to price and risk-control financial derivatives. This involves the application of mathematical finance, numerical methods and statistical learning techniques.
- 2015 **Computational Biology Research Intern**, *National Network for Mathematical and Computational Biology, India.*
Worked on topology of neural networks with Prof. Deepak Mishra. [research report](#)
- 2012 and 2013 **Research Intern**, *Indian Institute of Space Science and Technology.*
Worked on advanced probability and queueing theory with Prof. T. G. Deepak.

Technical and Mathematical Skills

- Math** Numerical methods, scientific computing, probability, stochastic calculus, time-series analysis, math finance, statistical learning, algorithm and complexity.
- Languages** Active: Python, C++, Prior experience: Matlab, Fortran, Perl.
- Data/ ML** Numpy, Pandas, Jupyter notebook, Keras-Tensorflow, anaconda, Scikit-learn.
- Comput.** HPC, Parallel computing (MPI), CFD, FEM, deal.II, FreeFem++, FEniCS.
- Dev.** Eclipse, VS, PyCharm, Slurm, git and version control, PyPI.

Awards and Scholarships

- 2021 Phd Completion Scholarship award, University of Pittsburgh.
- 2018-2020 Graduate Student Researcher, supported by NSF, University of Pittsburgh.
- 2017 Arts and science graduate fellowship, University of Pittsburgh.
- 2015 Qualified UGC-CSIR National Eligibility Test (NET) and IIT - GATE in Mathematics as an undergraduate.
- 2015 Summer research intern fellowship, NNMCB, Indian Institute of Science, Bengaluru, India.
- 2014 Merit Certificate for Academic Excellence in subject of Mathematics, Indian Institute of Science Education and Research, India.
- 2011-2016 Inspire Scholarship, Department of Science and Technology (DST), Govt. of India.
- 2011 Top 0.1% Merit certificate for outstanding performance in Physics, national level higher secondary exam, CBSE, India.

Research Talk and Poster presentation.

- June, 2021 *Domain decomposition and partitioning methods for mixed finite element discretizations of the Biot system of poroelasticity*, MS on Advanced solvers for poromechanics at SIAM Computational Geosciences, Milano, Italy.
- Nov, 2019 *Discretization techniques for Biot system of poroelasticity*, talk at Finite Element Circus held at Virginia Tech, Blacksburg, USA.
- April, 2016 *Cauchy equations and solutions*, poster presented at Indian Institute of Science Education and Research, Mohali, India.

Conferences and Workshops

- Nov, 2020 IMA workshop on Optimal Control, Optimal Transport and Data Science. Virtual Workshop — Originally scheduled at University of Minnesota, USA.
- July, 2020 ICML 2020, Thirty-seventh International Conference on Machine Learning, Virtual Conference — Originally scheduled in Vienna, Austria.
- July, 2020 The Second Joint SIAM/CAIMS Annual Meeting(AN20), Virtual Conference — Originally scheduled in Toronto, Ontario, Canada.
- Nov, 2019 Fall 2019 Finite Element Circus, Virginia Tech, Blacksburg, Virginia, USA.
- Fall 2019 Pitt Research Center for Research Computing Cluster Training Workshop, University of Pittsburgh.
- August, 2019 Computational Methods for PDEs Summer School, Colorado State University, Fort Collins, CO.
- August, 2019 Seventh deal.II Users and Developers Workshop, Colorado State University, Fort Collins, CO, USA.

Teaching Experience

- 2016-2021 **Teaching Fellow/ Assistant**, *University of Pittsburgh*.
 - Analytical Geometry and Calculus 1, 2, 3 (three course sequence).
 - Business Calculus.
 - Intro Theoretical Mathematics.
 - Ordinary Differential Equations 1.
- 2017 **Lecturer**, *University of Pittsburgh*.
 Summer - Differential Equations.
- 2015-2016 **Teaching Assistant**, *IISER Mohali, India*
 - Numerical methods in computational chemistry
 - Probability and Statistics.

Leadership and Diversity roles.

- 2020-2021 **Vice President, AWM:** Association for Women in Mathematics, University of Pittsburgh Chapter. <https://www.mathematics.pitt.edu/AWM>.
- 2018-2020 **GSO officer:** Officer at Graduate Student Organization, Dietrich school of arts and sciences, University of Pittsburgh.
- Fall 2017 **Volunteer conductor:** Integration bee contest for high school students held at University of Pittsburgh.
- Spring 2015 **Creator and Coordinator:** Math puzzle race, conducted as part of the annual math fest, IISER Mohali.
- Spring 2014 **Event Coordinator:** Organized math-demos for school students as part of the Indian national science day exhibitions held at IISER Mohali.

Referees

- **Prof. Ivan Yotov :** yotov@math.pitt.edu, Professor and PhD advisor, Department of Mathematics, University of Pittsburgh.
- **Prof. Deepak Mishra :** deepak.mishra@iist.ac.in, Professor and Head, Department of Avionics, Indian Institute of Space Science and Technology.
- **Dr. Suseela Somarajan :** suseela.somarajan@vanderbilt.edu, Research professor at Vanderbilt University Medical Center.

- **Dr. Michel Kern** : michel.kern@inria.fr, Computational Scientist and Researcher, Inria Paris.