Nirmal Jayaprasad Nair

Contact Information

University of Illinois Urbana-Champaign
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Education

University of Illinois at Urbana-Champaign, Urbana, Illinois — 2018 – present
Ph.D., Aerospace Engineering — GPA: 3.96/4.0
Concentration: Computational Science and Engineering

University of Illinois at Urbana-Champaign, Urbana, Illinois — 2016 – 2018
M.S., Aerospace Engineering — GPA: 4.0/4.0

Indian Institute of Technology Gandhinagar, Gujarat, India — 2012 – 2016
B.Tech. (*Honors*), Mechanical Engineering — GPA: 9.24/10.0

Research Experience

Graduate Research Assistant — August 2016 – present
Ph.D. thesis adviser: Prof. Andres Goza, UIUC — September 2018 – present
Data-driven flow field estimation around an airfoil/wing using passively deployed flaps.

- Passively deployed flaps will be modeled as full-flow field estimating sensors by mapping the motion of flaps to the known flow field data by solving an off-line optimization problem.
- Currently, flow field data for different flap-parameters and flow conditions are being obtained from an in-house parallel CFD solver built using MPI and PETSC.

M.S. thesis adviser: Prof. Maciej Balajewicz, UIUC — August 2016 – August 2018
Data-driven reduced-order modeling of nonlinear fluid flows.

- Developed a novel data-driven model order reduction method for parametric, steady-state fluid flows containing evolving shocks.
- Demonstrated the computational efficiency of the proposed approach on several CFD problems.

Summer Undergraduate Research Fellow — May – July 2015
Adviser: Prof. Austin Minnich, California Institute of Technology

- Designed and fabricated a prototype consisting of thermoelectric generators to power wireless temperature sensors in aircraft.

Summer Research Internship Program — May 2014 – April 2015
Adviser: Prof. Vinod Narayanan, IIT Gandhinagar

- Studied the stability characteristics of axisymmetric thermal boundary layer of various fluids in response to heating and cooling.

Skills

Programming: Matlab, Fortran, C, Python.
High performance computing: PETSC, MPI, OpenMP.
CFD and CAD: Ansys Fluent, Star CCM+, Autodesk Inventor.
Miscellaneous: Latex, Git, Simulink.

Publications

1. N.J. Nair and M. Balajewicz. Transported snapshot model order reduction approach for parametric, steady-state fluid flows containing parameter dependent shocks. *International Journal for Numerical Methods in Engineering*, 2018.
2. N. Jayaprasad, et al. Exploring viscous damping in undergraduate Physics laboratory using electromagnetically coupled oscillators. *arXiv preprint arXiv:1311.7489*, 2013.

Conference Proceedings

1. N.J. Nair and M. Balajewicz. Transported snapshot model order reduction approach for parametric, steady-state fluid flows containing parameter dependent shocks. *SIAM Conference on Computational Science and Engineering*, 2019.
2. N.J. Nair and M. Balajewicz. Physics based interpolation for steady parametric partial differential equations. *Bulletin of the American Physical Society, Division of Fluid Dynamics*, 2017.
3. N.J. Nair and U. Shah. A simple computational tool for studying acoustic waves in nonlinear medium. *ASME 2017 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. American Society of Mechanical Engineers*, 2017.
4. N. Jayaprasad and V. Narayanan. Effect of viscosity stratification on stability of axisymmetric boundary layer. *Bulletin of the American Physical Society, Division of Fluid Dynamics*, 2015.

Honors & Awards

SIAM Student Travel Award, SIAM CSE	2018
Conference Travel Award for Graduate Students, UIUC	2017
MSNDC Student Travel Grant, ASME IDETC	2017
Award for 'Best Performance in the core subjects of Engineering Graphics, Manufacturing and Workshop Practice', IIT Gandhinagar	2016
Summer Undergraduate Research Fellowship, Caltech	2015
Dean's List, IIT Gandhinagar	2013, 2014, 2015
Merit cum Means Scholarship, IIT Gandhinagar	2012, 2013, 2014
Winner of Ricoh Printer Design Challenge, IIT Gandhinagar	2014

Projects

MPI and OpenMP based parallel 2D CFD solver, UIUC — Fall 2018

- Developed a direct parallel solver based on finite difference methods to solve the 2D advection-diffusion equation using MPI and OpenMP.

Passive flow control using vortex generators, UIUC — Fall 2016

- Studied passive flow control using vortex generators to delay shock induced flow separation on an Onera M6 wing in transonic flow regime using Ansys Fluent.

Academic Services and Affications

Reviewer, Journal of Computational Physics	2018–
Reviewer, International Journal for Numerical Methods in Engineering	2018–
Student Member, American Physical Society	2017 – 2018

Teaching

Tutor, IIT Gandhinagar — January – March 2016
ES 212: Momentum, Heat and Mass Transfer
Led revision sessions for sophomore students to clarify doubts and revise difficult concepts under the Peer Assisted Learning (PAL) program.

Teaching Assistant, IIT Gandhinagar — August – November 2013
ES 101: Engineering Graphics
Designed and led lab sessions on using Autodesk Inventor and graded the engineering drawing lab assignments for freshman students.

Leadership

Mentor, Summer Undergraduate Research, UIUC — May – July 2017
Mentored and supervised an undergraduate student on his research project and provided the necessary guidance to maintain progress.

Events Coordinator, Amalthea' 13, IIT Gandhinagar — May – October 2013
Led a team of 21 students to plan and organize various technical events at Amalthea'13 which is the annual technical summit of IIT Gandhinagar.