Curriculum Vitae

Name Deep Ray

Date of Birth 1st July, 1989

Office Address Tata Institute of Fundamental Research
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Education *Ph.D. in Mathematics*, Tata Institute of Fundamental Research (CAM)
- Date: September, 2013 to present
- I am working on analysing high-order entropy stable numerical schemes for compressible flows.
- Advisors: Dr. Praveen Chandrashekar (TIFR CAM) and Prof. Siddhartha Mishra (ETH Zurich and adjunct faculty TIFR CAM)

M.Phil in Mathematics, Tata Institute of Fundamental Research (CAM)
- Date: July, 2012 to September, 2013
- I worked on numerical schemes for the Euler and Navier-Stokes Equations that preserve entropy, kinetic-energy and vorticity. This includes 3D simulations to study turbulent flows. I have also been looking at the optimal control problem for the heat equation.
- Advisor: Dr. Praveen Chandrashekar (TIFR CAM)

M.Sc in Mathematics, Tata Institute of Fundamental Research (CAM)
- Date: August, 2010 to May, 2012
- Score: 82.37 %

B.Sc (Honours) in Mathematics, Hindu College, University of Delhi
- Date: July, 2007 to June, 2010
- Score: 83.89 %

All India Senior School Certificate Examination, Delhi Public School, R.K. Puram, Delhi
- Date: May, 2007
- Score: 93.00 %

All India Secondary School Certificate Examination, Delhi Public School, R.K. Puram, Delhi
- Date: May, 2005
- Score: 89.20 %

Conferences and Workshops

Workshop on Optimization with PDE constraints, TIFR (CAM)
- Date: 25th November -6th December, 2013
- This workshop provided an introduction to topics in optimization of problems governed by partial differential equations including those involving shape optimization problems. Theoretical and numerical aspects of formulating and solving such problems were taught.

Compact course on Discontinuous Galerkin method for time-dependent convection-dominant PDEs, by Prof. Chi-Wang Shu , TIFR (CAM)
- Date: 4th-5th July, 2013
- The lectures introduced DG methods for solving time-dependent convection-dominant partial differential equations, including hyperbolic, convection diffusion, and dispersive wave equations. Stability analysis, error estimates, and efficient implementation issues were discussed.

International Conference on Conservation Laws and Applications, TIFR (CAM)
- Date: 1st 3rd July, 2013

IFCAM Summer School on Numerics and Control of PDEs, IISC, Bangalore
- Date: 22nd July 2nd August 2013
- The summer school had two broad themes, namely optimal control and stabilization of PDEs, and numerical schemes for hyperbolic systems. Each theme had detailed theoretical and numeric sessions.
- Assisted Dr. Praveen C. with the numerical sessions for optimal control, which involved MATLAB coding and ODE-solvers. The models considered were the inverted pendulum, Burgers equation the heat equation in both 1D and 2D setup. Numerical evaluation of feedback control and solving the estimation problem for noisy partial observations were discussed and implemented.

CIMPA Summer Research School on Current Trends in Computational Methods for PDEs, IISC, Bangalore
- Date: 24th June 19 July, 2013

Workshop on Theoretical and Computational Aspects of Nonlinear Waves, NPDE-TCA, IIT-Bombay
- Date: 27th-31th May, 2013

Advanced Workshop on Non-Standard Finite Element Methods, NPDE-TCA, IIT Bombay
- Date: 11th-15th Febraury, 2013
- The workshop was aimed at introducing non-standard finite element methods, providing an overview of the methodologies of discontinuous Galerkin finite element methods and non-conforming methods.

Heterogeneous Parallel Programming, University of Illinois at Urbana-Champaign's Online Coursera offering
- Date: 28th November, 2012 to 28th January, 2013
- The course covered data parallel execution models, locality, parallel algorithm patterns, and scalable programming using joint MPI-CUDA in large scale computing clusters.

14th Annual CFD Symposium, CFD Division - Aeronautical Society of India
- Date: 10th-11th August, 2012

- Presented a paper titled: Kinetic energy preserving and entropy stable finite volume schemes for compressible Euler and Navier-Stokes equations

Instructional Workshop on FEM, TIFR (CAM)
- Date: 2nd-13th July, 2012
- The workshop covered theoretical aspects of FEM and gave the participants hands-on experience in using FENICS (FEM software)

Data Assimilation Research Program, TIFR (CAM)
- Date: 4th-23rd July, 2011
- The workshop covered the theory of mathematical and statistical methods for assimilation, nonlinear dynamics, data assimilation for nonlinear systems and applications to atmospheric, oceanic problems. The participants were given the opportunity to write codes for various data assimilation methods and test their performance in several test scenarios.

Visiting Students Research Programme, TIFR Mumbai
- Date: 15th June, 2009 to 10th July, 2009
- Summer course in Complex Analysis under the guidance of a research professor.

Publications

- *Entropy stable schemes for compressible Euler equations*, P. Chandrashekarappa and D. Ray; to appear in the International Journal of Numerical Analysis and Modeling (Series B)

Additional Activities

- Teaching Assistant for the Numerical Analysis Course (August - December, 2013)
- Participation with Souvik Roy in *Join the spirit: Find me if you can*, a competition organized by EADS.

  - Cleared the first phase, which required the developed a code for human detection. The code uses the theory of locally normalized Histograms of Gradients (HOG), proposed by N. Dalal and W. J. Triggs. The code is also capable of capturing moving people in videos. The basic algorithm is available in the C opencv library.

  - Currently working on the second and final phase, which requires teams to suggest an algorithm to compare two images containing human figures and assess whether both images contain the same person, within acceptable confidence levels.

- Teaching Assistant for the Numerical Analysis Course (August - December, 2012)

Computer Skills

Languages:	C++, Fortran, MATLAB, Python
Proramming Software:	FENICS, Deal-II
Visualisation Software:	Tecplot, Paraview, Gnuplot, VisIt, Gmsh

Languages English, Hindi, Bengali