

KAUSHIK G KULKARNI

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EDUCATION

- Aug '17 – *Present* Ph.D. student in Computer Science
University of Illinois at Urbana-Champaign, Urbana, IL
Adviser: Prof. Andreas Klöckner
- Aug '13 – May '17 Bachelor of Technology in Mechanical Engineering
Indian Institute of Technology, Bombay
Adviser: Prof. Shiva Gopalakrishnan

EXPERIENCE

- Dec '18 – *Present* Graduate Research Assistant
Computer Science Dept., UIUC
- Aug '18 – Dec '18 Teaching Assistant for Numerical Analysis
Computer Science Dept., UIUC
- Dec '17 – Aug '18 Graduate Research Assistant
Computer Science Dept., UIUC
- Aug '17 – Dec '17 Teaching Assistant for Numerical Methods
Computer Science Dept., UIUC
- Jan '17 – May '17 Teaching Assistant for Introduction to Numerical Analysis
Mathematics Dept., IITB
- May '16 – July '16 Software Engineering Intern
Morgan Stanley Strats and Modelling, Mumbai

PUBLICATIONS

- [1] A. Bhati, R. Sawanni, K. Kulkarni, and R. Bhardwaj, “Role of skin friction drag during flow-induced reconfiguration of a flexible thin plate,” *Journal of Fluids and Structures*, vol. 77, pp. 134–150, 2018.

TALKS

- [1] K. Kulkarni and A. Klöckner, “Transformation-based code optimization for finite element methods,” ser. Minisymposium on Performance Portability through Source-to-source code translation, SIAM Conference on Computational Science and Engineering, 2019.

AWARDS AND ACHIEVEMENTS

2019	Travel Award for SIAM Conference on Computational Science and Engineering(Spokane, WA)
2016	Undergraduate Research Award(URA01) by Indian Institute of Technology, Bombay
2013	All India Rank of <i>341</i> (top 0.01%) in the Joint Entrance Examination - Mains out of 1.5 million students
2013	All India Rank of <i>419</i> (top 0.3%)in the Joint Entrance Examination - Advanced out of 0.15 million students
2013	<i>Kishore Vaigyanik Protsahan Yojana</i> Fellowship Award
2013	Certificate of Merit for being among the State Top 1% in National Standard examination in Physics and Chemistry

RESEARCH

Finite Element Assembly on GPUs

Advised by Prof. Andreas Klöckner, UIUC

We are looking at optimization transformations in Finite Element Assembly for the GPU backend.

Abstractions for High Performance Computing

Advised by Prof. Andreas Klöckner, UIUC

For the integration of `Firedrake`¹ with `Loopy`² we extended `Loopy` by adding a function interface to it, which supports the kernel calling mechanism within the package.

Solving Eikonal Equations on Unstructured Grids

Advised by Prof. S Baskar, IIT Bombay

Characteristic Fast Marching Method is widely used in solving the Eikonal equations, however previous work had been only formulated for structured grids. We developed a solver that extended the algorithm for unstructured grids as well. Used the solver to solve known problems in literature with skew grids so that the activity of the solution could be efficiently observed in the region of activity.

Link: <https://github.com/kaushikcfdeikonal-unstructured>

Discontinuous Galerkin Framework for Hyperbolic PDEs

Advised by Prof. Shiva Gopalakrishnan, IIT Bombay

We developed a C++ library for solving Hyperbolic Equations through Discontinuous Galerkin ("DG") methods on structured grids. Performed a series of convergence tests to verify that the framework satisfied *hp*-convergence. Eventually, used the framework to simulate problems in Fluid Dynamics like the dam-break problem using high order DG elements.

Link: <https://github.com/kaushikcfdeDiscontinuous-Galerkin>

Flow Induced Reconfiguration of Aquatic Vegetation

Advised by Prof. Rajneesh Bharadwaj, IIT Bombay

Corrected the existing models for Fluid Structure Interaction for a Flexible plate by including the Skin friction coefficient in the computations. Implemented a "*Predictor-Corrector*" based Finite Difference scheme for the computation of coefficient of drag on the plate.

Link: <https://arxiv.org/abs/1712.00441>

¹<https://www.firedrakeproject.org/>

²<https://documen.tician.de/loopy/>

Last updated on February 26, 2019