Kumar Saurabh

Member Technical Staff at SankhyaSutra Labs

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Education

- **Indian Institute of Technology Madras** — Chennai, India
  M.Tech Industrial Mathematics and Scientific Computing — *2014 - 2016*
  - DAAD Exchange Student at RWTH Aachen, Germany
  - Graduated with DGPA 9.50 (Class Rank 1)
  - Thesis: *Analysis and Implementation of Asynchronous Finite Difference Scheme for Advection Diffusion Equation.*
- **Indian Institute of Technology (BHU)** — Varanasi, India
  B.Tech Chemical Engineering — *2010 - 2014*
  - Graduated with First Class with Honours, DGPA 8.31

Publications

- Purva Goel, **Kumar Saurabh**, Veena Patil-Shinde and Sanjeev Tambe. *"Prediction of API Gravity of Crude Oils using SARA Analysis: Computational Intelligence based Models."* Society of Petroleum Engineering.
- **Kumar Saurabh**. *"Implementation of Asynchronous Scheme on Parallel Frameworks using MPI."* 18^{th} AeSI Annual CFD Symposium, NAL Bangalore, 2016.

Work Experience

SankhyaSutra Labs Pvt. Ltd — Bengaluru, India
Member Technical Staff — *June, 2016 - Present*

- RANS Simulations for Flow Past an Aircraft
  - Used $k-\omega$ SST model to perform the simulations.
  - Computed the forces and moments on the aircraft and Hinge Moments as well.
  - Performed analysis of CFD data to suggest design optimization.
- Develop In-house General Purpose parallel DSMC code
  - Used BCC Grid for efficient sampling of particles during collision.
  - Validated the code with standard test cases such as Thermal Creep, Shock Tubes, etc.

Research Projects

- **Asynchronous Finite Difference Scheme for Partial Difference Equations**
  Guide: Prof. Dr. Martin Frank, Math CCES, RWTH Aachen — *Oct., 2015 - June, 2016*
  - Conceptualized a parallel second Order Accurate Asynchronous Tolerant (AT) scheme for Advection Diffusion Equation.
  - Observed a greater speed up when the processor is distributed across the nodes as compared to same within the same for memory intensive codes.
  - MPI Put/Get performs better than MPI ISend/IRecv in terms of statistical delay.

- **Artificial Intelligence formalisms for Modelling of Chemical Systems**
  Guide: Dr. Sanjeev Tambe, National Chemical Lab, Pune, India *May, 2013 - July, 2013*
  - Worked on Estimation of API Gravity based on SARA fraction of oil.
  - Implemented Genetic Programming (GP), Artificial Neural Network (ANN) and Support Vector Regression (SVR) techniques for modelling the API Gravity.
  - Steiger Z-test was performed which suggested that correlation coefficient of these new model are significantly different from existing modified FB-model model.
  - RapidMiner package was used for the study.

Mini Projects

- **Non-linear Partial Difference Equation Solver**
  Guide: Dr. S. Sundar, Dept. of Mathematics, IIT Madras *Winter 2014*
  - Implemented the Fast Iterative Krylov Subspace Method along with Pre-conditioners in C++ to solve the system of equation AX = B.
  - Outer Iteration was performed using Newton - Raphson Method.
- **Mesh Free Solution to the Flow Problem**
  Guide: Dr. S. Sundar, Dept. of Mathematics, IIT Madras *Winter 2014*
  - Solved the 2D Poisson problem and 1D shock-tube problem using Finite PointSet Method (FPM).
- **Computational Fluid Dynamics**
  Guide: Dr. K. Arul Prakash, Dept. of Applied Mechanics, IIT Madras *Summer 2014*
  - Applied Finite Difference and Finite Volume Discretization for solving PDEs.
  - Implemented Stream Vorticity Approach to simulate the Channel Flow.
  - Developed a Matlab code on Volume of Fluids (VOF) Method to track the deforming interface.
- **PDEs based Image Filters**
  Guide: Dr. S. Sundar, Dept. of Mathematics, IIT Madras *Summer 2014*
  - Implemented the Perona-Malik, and Edge Enhanced Diffusion Model in Matlab as a part of Course Project “Mathematical Modelling in Industry”.
  - Developed an algorithm to automatize the value of contrast parameter in Perona-Malik Model.

Awards, Grants & Honours

DAAD Scholarship at RWTH Aachen . . . . . Sept. 2015 - March 2016
Prof. Helmut Neunzert Endowment Prize for best Academic Record in M.Tech 2016
Institute Merit Prize for best academic performance in 1^{st} year of M. Tech 2016
Successful completion of Textbook companion Programme funded by FOSSEE project 2012
Second Prize in Line Following Robot Competition 2011

Skills

- Numerical Methods: FVM, FEM, IsoGeometric Analysis, FPM, FDM, DSMC.
- Languages (Compiled): C++, C, Java
- Languages (Interpreted): Matlab, Python, Scilab.
- Softwares: Fluent, OpenFoam, Salome, Gmsh.
- Libraries: MPI, OpenMP, deal.II
- Visualisation Tools: Visit, ParaView.
- OS: Linux, Windows