Sushrut Kumar

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Interests

Fluid Mechanics, Computational Fluid Dynamics, Scientific Computing, Data Driven Modeling

Education

Delhi Technological University, Delhi, India 2016 – present
Bachelors of Technology, Mechanical Engineering CGPA: Overall - 8.4/10, Major - 8.8/10

Mount Carmel School, Delhi, India 2014 – 2016
12^{th} Grade, CBSE AISSCE - Science 94.2 %

Publications

1. **Kumar, S.**, Gupta, P., and Singh, R. K., "A Natural Evolution Based Numerical Optimisation Framework to Develop and Enhance Airfoil-Slat Arrangement." Proceedings of the ASME 2019 International Mechanical Engineering Congress and Exposition, 2019 https://doi.org/10.1115/IMECE2019-10846
2. **Kumar, S.**, Gupta, P., and Singh, R. K., "Metaheuristic Optimization of Dual-Element Vertical Axis Wind Turbine Using Genetic Algorithm." Proceedings of the ASME 2019 Gas Turbine India Conference. 2019. https://doi.org/10.1115/GTINDIA2019-2490
3. **Kumar, S.**, Suri, U., Sachdeva, P., and Singh, R. K., "Investigation of Conduit Flow Past Corrugated Structures Using Large Eddy Simulations." Proceedings of the ASME 2019 International Mechanical Engineering Congress and Exposition, 2019 https://doi.org/10.1115/IMECE2019-11273
4. Arora, B. B., Suri, U., Garg, U., Das, S., and **Kumar, S.**, "Computational Evaluation of a Novel Aerodynamic Road Vehicle Design and Drag Reduction Using Vortex Generators." Proceedings of the ASME 2019 International Mechanical Engineering Congress and Exposition, 2019. https://doi.org/10.1115/IMECE2019-11319
5. Kashyap V.,**Kumar S.**, Jajal N. A., Mathur M., and Singh R. K., "Parametric Analysis of Smartphone Camera for a Low Cost Particle Image Velocimetry System." arXiv:2002.01061v1 [eess.IV]
6. Basu M.,**Kumar S.**, Gupta P., and Singh R. K., "A Quantitative Analysis of Machine Learning based Regressors for Pressure Reconstruction in Particle Image Velocimetry Applications.", ASME Fluid Engineering Division Summer Meeting 2020 (Paper Accepted)

Papers under Preparation

1. **Kumar S.**, Gupta P., Singh R. K., "Metaheuristic Multi Dimensional Enhancement of Multi Element Airfoils using Invasive Weed Optimisation"

Presentations

1. **Kumar S.**, Gupta P., Singh R. K., "Enhancement of Slat Airfoil Configuration using Invasive Weed Optimization Framework coupled with Artificial Neural Networks", 72^{nd} Annual APS Division of Fluid Dynamics Meeting, 2019.
2. Basu M., Sharma T., **Kumar S.**, Singh R.K., "Evaluation of Pressure Field from PIV Data using Machine Learning", ASME International Mechanical Engineering Congress and Exposition, 2019.
3. Kashyap V., **Kumar S.**, Jajal Amit N. A., Mathur M., Singh R. K., "Design and Development of a Smartphone-Based Particle Image Velocimetry System", 71^{st} Annual APS Division of Fluid Dynamics Meeting, 2018.

Research Experience

1. **Fluid Mechanics Group - Delhi Technological University**
   Undergraduate Student Researcher Aug 2017 - present
   Supervisor : Prof. Raj Kumar Singh
   - Developing a Data Augmented Aerodynamic Shape Optimisation framework using Genetic Algorithms by performing fluid force prediction using Convolutional Neural Networks.
   - Performed a quantitative analysis to different machine leaning based regression model for pressure reconstruction.
   - Investigated conduit flow past corrugated structures using Large Eddy Simulations.

- Developed a Genetic Algorithms based Aerodynamic Shape Optimisation framework to optimise Leading edge slats, Multi Element Airfoils, Multi Element VAWTs using OpenFOAM and Python.
- Designed and developed a Smartphone based Particle Image Velocimetry system under $300.

2. **Microfluidics Laboratory - Indian Institute of Technology, Kharagpur**
   Summer Research Fellow May 2019 - July 2019
   Supervisor : Prof. Suman Chakraborty
   - Developed a numerical model using Multi Particle Collision Dynamics to simulate and study locomotion of soft matters (specifically microsquirmers) in a viscous fluid.
   - Used Python for coding the mathematical model and the performance was accelerated by compiling the code using LLVM compiler and incorporating CUDA.
   - Developed model validated by qualitatively matching the obtained flow fields of shear driven flows, pressure driven flows and flow field around a squirmers with literature data.

3. **Computational Fluid Dynamics Lab - Delhi Technological University**
   Undergraduate Student Researcher Jan 2017 - Feb 2018
   Supervisor : Prof. B.B Arora
   - Designed and developed a novel aerodynamic road vehicle and reduced drag using passive vortex generator.
   - Industrial Consultancy Project - Numerical analysis of Balawala Pump House, Public Health Engineering Department, Jaipur, India using ANSYS Fluent.
   - Developed a MATLAB code for 1D Navier Stokes solution of subsonic-supersonic nozzle flow using MacCormack method.
   - Coded a Finite Difference Solver in MATLAB to solve Unsteady and Steady Heat Conduction equation

4. **Defence Research and Development Organisation - Ministry of Defence, Govt of India**
   Research Intern - Center for Fire, Explosive and Environment Safety May 2018 - June 2018
   Supervisor : Mr. Pankaj Kumar Sharma, Scientist - E
   - Worked on computational investigation of shockwave propagation in Shocktubes.
   - CFD Simulations were performed using ANSYS Fluent and the results (Pressure, Temperature & Mach Number) were validated experimentally.

5. **Team Unmanned Aerial Systems - Delhi Technological University**
   Aerodynamicist Oct 2016 - Oct 2017
   Supervisor : Prof. Vikas Rastogi
   - Responsible for Designing and performing Aerodynamic analysis of new prototypes.
   - Designed and fabricated
     - Avniel, team's airframe for SAE Aero Design Challenge 2017
     - Lazarus, team's airframe for SUAS AUVSI 2017
     - Xarush, team's drone for DRDO ARDB FLYTRON: UAV Design and Flying Competition

Awards & Recognitions

1. **Jawaharlal Nehru Centre for Advanced Scientific Research, Research Fellowship for Students**
   Awarded to 19 meritorious students nationally from engineering science.
   Offered Renewed for session 2020 for good performance.

2. **Delhi Technological University Travel Grant Award**
   Among the few bachelors, masters and doctoral students to receive grant for attending international conferences - ASME IMECE 2019 (Salt Lake City, USA) and APS DFD 2019 (Seattle, USA).

3. **TEQIP - III, Ministry of Human Resource Development, Govt. of India Travel Grant**
   Awarded travel grant to attend ASME GTIndia 2019 Conference at IIT Madras, India.

4. **SAE India Southern Section Aero Design Challenge 2017**
   First Prize Overall

5. **DRDO ARDB FLYTRON: UAV Design and Flying Competition**
   Third Prize

Technical Skills

1. **CFD Codes**: ANSYS Fluent, OpenFOAM, XFLR5
2. **Programming and Scripting Languages**: C/C++, MATLAB, Python, CUDA, TensorFlow (Keras), LaTeX
3. **CAD Packages** : SolidWorks, AutoCAD
4. **PIV Image Processing Packages** : OpenPIV, PIVlab