

Seeking doctorate position to continue my quest in the world of multi-phase flows

Research Interests

- Two-phase flow**
 - Liquid jets & their interactions
 - Computational multi-fluid dynamics
 - Droplets & bubbles dynamics
- Fire**
 - Compartmental fire
- Liquid Sheets (curtains) formation & stability
- Interface reconstruction
- Boiling heat transfer
- Fire propagation and soot flow

Education

2013
2018

Integrated Dual Degree

**B.Tech (Mechanical Engineering)
& M.Tech (Thermal Engineering)**

Indian Institute of Technology Roorkee, Uttarakhand, India
Senior year student with CGPA: **8.98/10**

2013

High School, Central Board of Secondary Education, India

2013 **AISSE**, Graduated with **96.4%** marks

2011 **AISSE**, Graduated with CGPA of **10/10**

Research Experience

2016

Research Intern

May - July **Fluid Mechanics & Acoustics Laboratory - UMR 5509**, *Université Claude Bernard Lyon1*, France
Supervisors: **Prof. J. John Soundar**, **Prof. Jean-Philippe Matas**, **Prof. Mickaël Bourgoïn**

Project: **Numerical investigation of the Landau film entrainment and rotary entrainment**

- Understanding of the classical Landau-Levich film entrainment problem.
- Studied the film characteristics using the perturbation theory.
- Conducted numerical simulations to understand the assumptions taken in the analytical analysis.
- Established the groundwork for numerical simulation of rotary entrainment using Gerris.

2014

Research Scholar

Two-phase and microfluidics group, *Indian Institute of Technology Roorkee*, Uttarakhand, India
Supervisor: **Prof. Arup Kumar Das**, Department of Mechanical and Industrial Engineering, IIT Roorkee

Thesis: Understanding of mutual interactions between liquid jets: Entrainment and sheet formation.

Two-phase flow

2015

Bubble entrainment by plunging liquid jets on pool

- Conducted a series of experiments and full scaled Direct Numerical Simulations (DNS) using Gerris to show a one-to-one correspondence between the two.
- Captured the instance of pinch-off of first annular bubble to mark the entrainment inception using high-speed camera operated at 2800 frames per second.
- Studied the asymmetry arising in the inception stage and bubble cluster due to inclined jet impingement.
- Studied the interaction between bubble clusters formed by impact of two liquid jets onto pool surface.

2016

Collision of liquid jets

- Conducted full-scaled numerical simulations using Gerris, to explore the physics of liquid jet collision.
- Characterized the resultant liquid sheet using the dimensionless parameters.
- Developed an understanding of the kinematics of the fluid parcels inside the liquid sheet.
- Established an analogy between impact of liquid jets with colliding train of fluid quanta.
- Conducted experimental investigation to characterize different regimes of liquid jets impingement.

- Investigated the formation of finger-like projections as a result of Plateau-Rayleigh instability.
- Studied effects of inertia induced asymmetries in the collision of liquid jets through detailed experiments and analogy of inelastic collision of fluid quanta.
- Developed an in-house post-processing code using the *gfs2oogl* library and MATLAB.

2016

Multi-scale simulations

- Working on coupling of the Volume of Fluid (VOF) - Lagrangian Point Particle (LPP) methodology.
- Used a hybrid method to study multi-scale phenomena, like jet atomization & bubble bursting.
- Characterized atomization by collision of liquid jets: a result of Kelvin-Helmholtz instability.
- Future endeavor: incorporation of a novel conversion criterion, whereby a finite sized droplet or smaller fluid parcel is converted into multiple particles instead of one as in traditional LPP.

2016

Numerical simulation of the drainage of kitchen sink

- Carried out full-scaled simulations to model the gravity assisted drainage of reservoir.
- Studied the mutual interplay of body forces and surface forces on the drainage of reservoir.
- Future endeavor: Simulation of emptying of partially filled bottles using Gerris.

2017

Phase change heat transfer

- Understanding of the phase-change model incorporated in [LAMMPS-SPH multiphase](#) solver.
- Investigating preferential bubble pinch-off from staggered cylindrical arrangement.
- Future endeavor: simulation of nucleate boiling with dynamic contact angle.

Fire Dynamics

2014

Study of flame propagation

- Conducted three-dimensional Large Eddy Simulations (LES) using Fire Dynamics Simulator.
- Investigated compartmental fire in presence of furniture in single and multi-storeyed buildings.
- Calculated Available Safe Evacuation Time (ASET) in case of fire hazard.
- Simulated fire inside real-life modeled railway compartments to establish critical spots.
- Studied fire propagation behavior in presence of patterned flammable obstructions.
- Investigated the effects of wind flow over fire spread in typical arrangement of bushes.

Technical Skills

CFD: Gerris, LAMMPS-SPH, Fire Dynamics Simulator, Paris Simulator, OpenFOAM, ANSYS-Fluent, Basilisk C

Lab based: LabView: Voltage & current module, Conductivity & optical probes, High speed camera imaging & image processing

Languages: C, C++, MATLAB, Python, \LaTeX

Others: Octave, SolidWorks, AutoCAD

Research Publications

To access the full-texts, please visit [my web page](#).

2017

Sanjay, V and Das, A. K. "On air entrainment in a water pool by impingement of a jet". In: *AIChE J.* 63.11, pp. 5169–5181. ISSN: 1547-5905. DOI: 10.1002/aic.15828.

2017

Sanjay, V and Das, A. K. "Formation of Liquid Chain by Collision of Two Laminar Jets". In: *Physics of Fluids (Under Review)*.

2017

Sanjay, V and Das, A. K. "Numerical Assessment of Hazard in Compartmental Fire Having Steady Heat Release Rate from the Source". In: *Building Simulation*. DOI: 10.1007/s12273-017-0411-y.

2017

Jain, A., **Sanjay, V**, and Das, A. K. "Consequences of inclined and dual jet impingement in stagnant liquid and stratified layers". In: *AIChE J. (Under Review)*.

2017

Soni, A., **Sanjay, V**, and Das, A. K. "On the mutual interactions of liquid jets". In: *Working Paper*.

2017

Rathia, S. K., **Sanjay, V**, and Das, A. K. "Investigation of the fire propagation across the patterned obstructions with single and two point ignitions". In: *Working Paper*.

Scholastic Awards and Achievements

2017

All India Rank 2988, Graduate Aptitude Test in Engineering, among 190648 candidates.

2015

Summer Undergraduate Research Award, Indian Institute of Technology Roorkee.

Awarded summer fellowship for two months long research project.

2013

All India Rank 1512, JEE Advanced, India, in top 1% of the total appearing students.

2013

All India Rank 765, JEE Mains, India, Percentile score of 99.8%.

Relevant Course Work

MIN-527 Computational Fluid Dynamics

MIN-521 Advanced Fluid Mechanics

MIN-536 Convective Heat and Mass Transfer

IMA-301 Advanced Engineering Mathematics

MA-001 Mathematics - I

MIN-511A Modelling & Simulations

MIN-522 Advanced Heat Transfer

NPTEL Two-phase flow & Heat Transfer

MA-004 Numerical Methods

PH-001 Mechanics

Extra-Curricular

Teaching Assistant (TA)

2017

Engineering Drawing (MIN-108)

- Conducting practical classes in the Autumn semester of 2017-18.

Mentor

2015

2016

Mechanical and Industrial Engineering Students' Society, IIT Roorkee

- Demonstrated advanced image processing techniques using MATLAB.

2015

2017

Academic Reinforcement Program, IIT Roorkee

- Taught Mechanics (PHN-001) and Mathematics (MAN-001) to the freshmen batch in the weekend classes.

2016

2017

Student Mentorship Program, IIT Roorkee

- Guided freshmen year students through the first year of college life.

Mechanical & Industrial Engineering Students' Society, IIT Roorkee

2014

President

- Joined as **Executive Member** in 2014-15 and served as **Joint Secretary** in the year 2015-16.
- Organized departmental social events and vocational workshops.

National Service Scheme, IIT Roorkee

2013

2014

Volunteer

- Participation in street plays on campus and villages nearby for awareness on socio-political issues.

Peer-Reviewed Conference Proceedings

To access the full-texts, please visit [my web page](#).

2017

Sanjay, V, Darshan, M. B., Kumar, P., and Das, A. K. "Spatial preference of film growth in boiling and localized suppression of bubble release". In: *Paper ID: IHMT-2017-09-1283, 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference*.

2017

Soni, A., **Sanjay, V**, and Das, A. K. "Fingering instability of liquid sheet formation by oblique collision of jets". In: *Paper ID: IHMT-2017-13-0806, 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference*.

2017

Soni, A., **Sanjay, V**, and Das, A. K. "Consequences of interaction between asymmetric liquid jets". In: *Paper ID: 64, 44th National Conference on Fluid Mechanics and Fluid Power*.

2017

Jain, A., **Sanjay, V**, and Das, A. K. "Asymmetry in air entrainment inside liquid pool due to impingement of an inclined jet". In: *Paper ID: IHMTC2017-13-0828; 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference*.

2017

Jain, A., **Sanjay, V**, and Das, A. K. "Interaction of bubble clusters formed due to adjacent impingement of liquid jets in a pool". In: *Paper ID: 68, 44th National Conference on Fluid Mechanics and Fluid Power*.

2017

Rathia, S. K., **Sanjay, V**, and Das, A. K. "Study of fire propagation in the presence of patterned flammable obstructions". In: *Paper ID: IHMTC2017-04-0814, 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference*.

2017

Rathia, S. K., **Sanjay, V**, and Das, A. K. "Extent of fire spread during interaction of two ignition points". In: *Paper ID: 65; 44th National Conference on Fluid Mechanics and Fluid Power*.

2016

Sanjay, V and Das, A. K. "On the gas-liquid entrainment by impingement of liquid jet onto a pool". In: *Reference #50, 9th International Conference on Multiphase Flow*.

2016

Agarwal, A., Sarda, M., Kaushik, J., **Sanjay, V**, and Das, A. K. "Investigation of flame and soot Propagation in non-air conditioned railway locomotives". In: *International Journal of Computer, Electrical, Automation, Control and Information Engineering* 10.9, pp. 1433–1441.

2016

Kaushik, J., Agarwal, A., Sarda, M., **Sanjay, V**, and Das, A. K. "Study of fire propagation and soot flow in a pantry car of railway locomotive". In: *International Journal of Mechanical, Aerospace, Industrial, Mechatronic and Manufacturing Engineering* 10.9, pp. 1617–1622.

2016

Sarda, M., Agarwal, A., Kaushik, J., **Sanjay, V**, and Das, A. K. "Numerical simulations of fire in typical air conditioned railway coach". In: *International Journal of Computer, Electrical, Automation, Control and Information Engineering* 10.9, pp. 1520–1527.

2016

Sanjay, V and Das, A. K. "On the numerical simulations of kitchen sink vortex". In: *Paper ID: 217, 6th International and 43rd National Conference on Fluid Mechanics and Fluid Power*.

2016

Datta, S., **Sanjay, V**, Kumar, P., and Das, A. K. "Investigation of jet atomization - a multi-scale approach". In: *Paper ID: 218, 6th International and 43rd National Conference on Fluid Mechanics and Fluid Power*.

2016

Aggarwal, A., **Sanjay, V**, Kumar, P., and Das, A. K. "Generation of a liquid sheet by an oblique impingement of interacting jets: a numerical investigation". In: *Paper ID: 267, Proceedings of CHEMCON*.

2015

Sanjay, V and Das, A. K. "Bubble life cycle during entrainment by Jet impingement in liquid pool". In: *ID FM-052, Proceedings of CHEMCON*.

2015

Sanjay, V and Das, A. K. "Building fire safety: numerical simulation and evacuation planning". In: *Proceedings of 14th International Conference of the International Building Performance Simulation Association*, pp. 897–904.

References

Prof. Arup Kumar Das

Assistant Professor
Department of Mechanical & Industrial Engineering
Indian Institute of Technology Roorkee
✉ akdasfme@iitr.ac.in
☎ (+91)-1332-284802

Prof. Krishna M. Singh

Associate Professor
Department of Mechanical & Industrial Engineering
Indian Institute of Technology Roorkee
✉ singhfme@iitr.ac.in
☎ (+91)-1332-285414

Prof. J. John Soundar Jerome

Associate Professor
Fluid Mechanics & Acoustics Laboratory
Université Claude Bernard, Lyon, France
✉ john-soundar@univ-lyon1.fr
☎ (+33)-472431444

Prof. Jean-Philippe Matas

Professor
Fluid Mechanics & Acoustics Laboratory
Université Claude Bernard, Lyon, France
✉ jean-Philippe.Matas@univ-lyon1.fr
☎ (+33)-476825046