Vatsal Sanjay

B.Tech, M.Tech

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On a quest in the world of multi-phase flows

Updated On: June 9, 2018

Research Interests

Fluid
- Liquid - Liquid Encapsulation
- Liquid Jets & their Interactions
- Computational Fluid Dynamics
- Droplets & Bubbles Dynamics
- Molecular Dynamics Simulations
- Liquid Sheets: Formation & Stability
- Interface Reconstruction
- Boiling Heat Transfer

Fire
- Compartmental Fire
- Fire Propagation and Soot Flow

Education

2018–Present **Ph.D. (Fluid Dynamics)**.
Physics of Fluids, University of Twente (Starting in July 2018)

Focus on: Molecular Dynamics Simulations, Liquid - Liquid Encapsulation, Three Fluid Numerical Simulations

2013–2018 **B.Tech (Mechanical Engineering) & M.Tech (Thermal Engineering)**.
Two-Phase Flow & Instability Lab, Indian Institute of Technology Roorkee.

Focus on: Liquid Jet Dynamics, Formation & Stability of Liquid Chain, Multiscale Numerical Simulations, Heat Transfer in VOF, Flame Dynamics

Graduated: First Division with Distinction (CGPA: *9.10/10*)

2013 **AISSCE**, *High School*, Graduated with *96.4%* marks.

2011 **AISSE**, *Secondary School*, Graduated with CGPA of *10/10*.

Dissertation (B.Tech & M.Tech)

Title **Understanding of mutual interactions between liquid jets: Entrainment and sheet formation**

Supervisor **Prof. Arup Kumar Das**

I have worked on two major problems: Formation of liquid chain by collision of liquid jets & Air entainment by plunging liquid jet. These interactions are investigated using detailed numerical simulations and in-house experiments. Full text is available at: https://goo.gl/kws3Nf

Professional Positions

May–July, 2016 **Research Intern**, *Fluid Mechanics & Acoustics Laboratory - UMR 5509*.
Université Claude Bernard Lyon1, France

Advisors: **Prof. Jean-Philippe Matas**, **Prof. J. John Soundar Jerome**, **Prof. Mickaël Bourgoin**

2014–2018 **Research Assistant**, *Two-Phase Flow & Instability Lab*.
Indian Institute of Technology Roorkee

Advisor: **Prof. Arup Kumar Das**

Manuscripts in Preparation or Under Review

To access the full-texts, please visit **my web page**.

[1] Jain, A., **Sanjay, V**, and Das, A. K. "Consequences of inclined and dual jet impingement in stagnant liquid and stratified layers". In: *Chemical Engineering Science* (2018).

[2] 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: *Fire Technology Journal* (2018).

[3] Soni, A., **Sanjay, V**, and Das, A. K. "Formation of fluid structures due to jet-jet and jet-sheet interactions". In: *AIChE Journal* (2018).

[4] **Sanjay, V**, Kumar, P., and Das, A. K. "A Heat Transfer Coupled Two-Phase Flow Solver in Basilisk C: Implementation, Validation and Case Studies". In: *Computers & Fluids* (2018).

Research Publications

To access the full-texts, please visit **my web page**.

[1] **Sanjay, V** and Das, A. K. "Numerical Assessment of Hazard in Compartmental Fire Having Steady Heat Release Rate from the Source". In: *Building Simulation* 11.3 (2018), pp. 613–624. DOI: 10.1007/s12273-017-0411-y.

[2] **Sanjay, V** and Das, A. K. "Formation of Liquid Chain by Collision of Two Laminar Jets". In: *Physics of Fluids* 29.11 (2017), p. 112101. DOI: 10.1063/1.4998288.

[3] **Sanjay, V** and Das, A. K. "On air entrainment in a water pool by impingement of a jet". In: *AIChE J.* 63.11 (2017), pp. 5169–5181. ISSN: 1547-5905. DOI: 10.1002/aic.15828.

Scholastic Awards and Achievements

2017 **All India Rank 2988**, *Graduate Aptitute 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%..

Technical Skills

CFD: Gerris, Basilisk C, LAMMPS-SPH & MD, PARIS Simulator, Fire Dynamics Simulator, OpenFOAM, ANSYS-Fluent

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

Invited Presentations

Interactions of Liquid Jets

Jan, 2018 ○ Understanding of Mutual Interactions between Liquid Jets: Sheet Formation
- Physics of Fluids, University of Twente, Enschede, the Netherlands.

Mar, 2017 ○ On interaction between interfaces: Dynamic–Dynamic & Dynamic–Static
- Cognizance Technical Festival, Indian Institute of Technology Roorkee.

Jul, 2016 ○ On the air entrainment in a water pool by impingement of jet
- Fluid Mechanics and Acoustics Laboratory, Lyon, France

MATLAB

2014-2016 ○ Importance of MATLAB in Engineering Applications
- MIESS, Indian Institute of Technology Roorkee.

2015–2017 ○ A lecture on Image Analysis Using MATLAB
- MIESS, Indian Institute of Technology Roorkee.

Contributed Conference Presentations

To access the full-texts, please visit **my web page**.

[1] 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.

[2] 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.

[3] 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*. 2017.

[4] 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.

[5] 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.

[6] **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: IHMTC-2017-09-1283, 24th National and 2nd International ISHMT-ASTFE Heat and Mass Transfer Conference*. 2017.

[7] 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 (2016), pp. 1433–1441.

[8] 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*. 2016.

[9] 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.

[10] 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 (2016), pp. 1617–1622.

[11] 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 (2016), pp. 1520–1527.

[12] **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.

[13] **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.

[14] **Sanjay, V** and Das, A. K. "Bubble life cycle during entrainment by Jet impingment in liquid pool". In: *ID FM-052, Proceedings of CHEMCON*. 2015.

[15] **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*. 2015, pp. 897–904.