

## Dr. Shantanu Shahane

Postdoctoral Research Associate, Mechanical Science and Engineering,  
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### Research Interests

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- Computational fluid dynamics and heat transfer
- Uncertainty quantification, sensitivity analysis and numerical design optimization
- Machine learning applied to engineering problems

### Education

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**University of Illinois at Urbana–Champaign (UIUC)** Aug. 2015 – Aug. 2019

- Ph.D., Mechanical Science and Engineering
- Thesis: Numerical Simulations of Die Casting with Uncertainty Quantification and Optimization using Neural Networks
- Overall GPA: 3.93/4

**Indian Institute of Technology Bombay (IIT Bombay)** July 2010 – July 2015

- M.Tech., Computer Integrated Manufacturing and B.Tech., Mechanical Engineering
- Masters thesis: Process Modeling of Wire Electrical Discharge Machining
- Minor in Computer Science & Engineering
- Overall GPA: 9.23/10

### Key Research Projects

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**Numerical Model for Frost Growth** Aug. 2019 – Present  
*Adviser: Sophie Wang* UIUC

- Computational modeling of fluid flow and heat transfer for growth of frost on surfaces
- Developed a finite volume based software for solution of the momentum and energy equations formulated as mixture model
- Simulated frost growth on various heat exchanger surfaces under different environmental conditions

**Modeling of Heat and Mass Transfer during Thermal Desalination** Aug. 2019 – Present  
*Advisers: Sophie Wang and Tony Jacobi* UIUC

- Developed a numerical model to solve conjugate heat transfer problem of seawater falling film over a cylindrical tube
- The model estimates rate of fouling and the amount of fresh water generated by evaporation
- Performance of the system for various tube materials, salt concentrations, input power etc. is analyzed

**Numerical Simulations of Die Casting with Uncertainty Quantification and Optimization using Neural Networks** Aug. 2015 – Aug. 2019  
*Adviser: Surya Pratap Vanka, Shiv Kapoor and Narayana Aluru* Doctoral Dissertation, UIUC

- Computational modeling of fluid flow, heat transfer and solidification for die casting
- Developed a finite volume based software in C++ on unstructured grid with algebraic multigrid and Krylov subspace solvers
- Surrogate modeling with polynomial chaos expansion and neural network
- Design optimization, sensitivity analysis and uncertainty quantification

**Process Modeling of Wire Electrical Discharge Machining** June 2014 – July 2015  
*Adviser: Sanjay S. Pande* Masters Dissertation, IIT Bombay

- Modeled process of Wire–EDM to improve the surface finish and increase the material removal rate
- Developed a three dimensional transient thermal model to correlate process parameters to temperature of the workpiece and hence the material removal rate

## Publications in Peer Reviewed Journals

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Latest manuscripts uploaded on [arXiv](#) and [Google Scholar](#).

1. [S. Shahane](#), N. Aluru, P. Ferreira, S. Kapoor, S. Vanka “Optimization of Solidification in Die Casting using Numerical Simulations and Machine Learning,” *Journal of Manufacturing Processes* 51 (2020): 130-141. ([Paper Link](#))
2. [S. Shahane](#), N. Aluru, S. Vanka “Uncertainty Quantification in Natural Convection using Polynomial Chaos Expansion and Deep Neural Networks,” *International Journal of Heat and Mass Transfer* 139 (2019): 613-631. ([Paper Link](#))
3. [S. Shahane](#), N. Aluru, P. Ferreira, S. Kapoor, S. Vanka “Finite Volume Simulation Framework for Die Casting with Uncertainty Quantification,” *Applied Mathematical Modelling* 74 (2019): 132-150. ([Paper Link](#))
4. [S. Shahane](#), S. Mujumdar, N. Kim, P. Priya, N. Aluru, P. Ferreira, S. Kapoor, S. Vanka “Simulations of Die Casting with Uncertainty Quantification,” *Journal of Manufacturing Science and Engineering* 141.4 (2019). ([Paper Link](#))
5. [S. Shahane](#), S. S. Pande “Development of a thermo-physical model for multi-spark wire EDM process,” *Procedia Manufacturing* 5 (2016): 205-219. ([Paper Link](#)).

## Presentations, Posters and Invited Talks at Conferences

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1. [S. Shahane](#), N. Aluru, S. Kapoor, P. Ferreira, S. Vanka “Virtually-Guided Certification of Die Casting with Uncertainty Quantification and Design Optimization,” North American Die Casting Association Research and Development Committee Meeting, Chicago, Illinois, USA, February 2019.
2. [S. Shahane](#), S. Mujumdar, N. Kim, P. Priya, N. Aluru, S. Kapoor, P. Ferreira, S. Vanka “Virtually-Guided Certification with Uncertainty Quantification Applied to Die Casting,” ASME 2018 Verification and Validation Symposium, Minneapolis, Minnesota, USA, May 2018 ([Paper Link](#)).
3. [S. Shahane](#), S. Mujumdar, N. Kim, P. Priya, N. Aluru, S. Kapoor, P. Ferreira, S. Vanka “Virtually-Guided Certification of Die Cast Manufacturing Processes,” DMDII Moving Manufacturing Left Technology Showcase, Chicago, Illinois, USA, March 2018.
4. [S. Shahane](#), S. Mujumdar, N. Kim, N. Aluru, S. Vanka, S. Kapoor, P. Ferreira, S. Vanka “A Framework for Virtually-Guided Certification of Die Cast Manufacturing Processes,” North American Die Casting Congress and Tabletop, Atlanta, Georgia, USA, September 2017.
5. [S. Shahane](#), T. Jadhav, M. Dhawan, R. Mishra and K. Kharade. “Project Management and Systems Engineering for Student Satellite Project,” 65<sup>th</sup> International Astronautical Congress, Canada, September 2014.
6. [S. Shahane](#), M. Dhawan, T. Jadhav. “Design and Development of an Innovative Method for Tsunami Warning,” International Workshop on Satellite for Disaster Management, IISc, Bangalore, India, April 2014.
7. R. Mishra, [S. Shahane](#), S. Jain, P. Hebbar. “Thermal Designing and Analysis Using ANSYS for Pratham Student Satellite IIT Bombay,” 65<sup>th</sup> International Astronautical Congress, Canada, September 2014.
8. N. Himthani, [S. Shahane](#), S. Mulay, T. Jadhav, A. Kumar, K. Kharade and R. Rawat. “Low Cost Software and Hardware Processes Including On Board Computer In Loop Simulation,” 65<sup>th</sup> International Astronautical Congress, Canada, September 2014.

## Professional Skills

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- **Programming/Scripting Languages and Packages:** C/C++, Python, MATLAB, MPI, CUDA, TensorFlow, Keras,  $\LaTeX$ , GitHub
- **CAD/CAE Softwares:** ANSYS Workbench, ANSYS Fluent, SolidWorks