

## **Kedar Prashant Shete**

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### **SUMMARY**

I am a mechanical engineer researching Latent Thermal Energy Storage Systems, both numerically and experimentally. I conduct experiments in natural convection and phase change using Peltier modules as heat pumps and National Instruments(NI) modules with LabVIEW for the control system and measurement of temperature using thermocouples. I implement Finite Volume Methods(FVM) and Spectral Element Methods (SEM) for my numerical research, using the open-source code NEK5000 and ANSYS Fluent for Computational Fluid Dynamics(CFD). I worked as Senior Mechanical Engineer at Thermax Ltd., where I used standard published transfer correlations for two phase flow and the software HTRI to optimize the performance of air-cooled condensers, resulting in a diversification of company offerings by 10 new designs. I worked as Application Engineer at SKF India Ltd., designing bearing systems for OEM manufacturers. I have successfully led over 30 energy efficiency and retro-commissioning visits with the Industrial Assessment Center (IAC) resulting in savings of over \$1 million annually, for which I routinely calculate thermal loads, suggest improvements to operation of HVAC systems, optimize the operation of chillers, recommend solar + battery storage, etc. Additionally, I am proficient in C, C++, FORTRAN, Python, MATLAB. User of LaTeX and SVN for writing and version control.

### **EDUCATION**

PhD in Mechanical Engineering University of Massachusetts Amherst	Cumulative GPA: 3.822 May 2021 (expected)
MS in Mechanical Engineering University of Massachusetts Amherst	Cumulative GPA: 3.771 September 2019
Bachelor of Engineering in Mechanical Engineering Birla Institute of Technology and Science-Pilani, India	August 2014

### **PUBLICATIONS**

- Passive scalar statistics and intermittency at simultaneously high Reynolds and Schmidt numbers, Kedar Prashant Shete, David J. Boucher, James J. Riley, Steve de Bruyn Kops, submitted to Physics of Fluids
- A First Principles Framework to Predict the Transient Performance of Latent Heat Thermal Energy Storage, Shete, Kedar Prashant, de Bruyn Kops, Steve, Dragoljub (Beka) Kosanovic, submitted to Journal of Energy Storage
- Area of Scalar Isosurfaces in Isotropic Homogeneous Turbulence as a Function of Reynolds and Schmidt Numbers, Shete, Kedar Prashant; de Bruyn Kops, Steve, Journal of Fluid Mechanics, 2019 <https://doi.org/10.1017/jfm.2019.875>.
- Area of Scalar Isosurfaces in Homogeneous Isotropic Turbulence, KP Shete, S De Bruyn Kops - Bulletin of the American Physical Society, 2019, <https://ui.adsabs.harvard.edu/abs/2019APS..DFDH19005S/abstract>.
- K.P. Shete, M. Kalola, Mahesh Dasar, R.S. Patil Effect of Novel Swirling Perforated Distributor on Fluid Dynamic Characteristics of Circulating Fluidized Bed Riser, ASME Power and Energy Conference 2016, June 2016, <https://doi.org/10.1115/POWER2016-59165>.
- K.P. Shete, P. A. Kulkarni, and R.S. Patil, Computational Studies on Effects of Novel Geometries of Distributor Plates on Fluid Dynamics Characteristics

of Circulating Fluidized Bed Riser in 5th International Conference on Fluid Mechanics and Fluid Power (FMFP 2014) (pg-199), 2014,  
[https://kedar-prashant-shete.github.io/FMFP\\_Merged\\_Papers.pdf](https://kedar-prashant-shete.github.io/FMFP_Merged_Papers.pdf).

- P. A. Kulkarni, K.P. Shete, S. Jogdankar, and R.S. Patil, Effect of Barrel Wall Fin of the Cyclone Separator on Fluid Dynamic Characteristics in 5th International Conference on Fluid Mechanics and Fluid Power (FMFP 2014) (pg-103), 2014,  
[https://kedar-prashant-shete.github.io/FMFP\\_Merged\\_Papers.pdf](https://kedar-prashant-shete.github.io/FMFP_Merged_Papers.pdf).

## SKILLS

- **Computational Fluid Dynamics (CFD):** ANSYS Fluent, NEK5000, ICEM CFD, in-house pseudo-spectral DNS code
- **Modeling:** PTC Creo, AutoCAD, ANSYS Workbench and Design Modeler (and the willingness to learn many more !)
- **Languages:** C, C++, MATLAB, Python, Shell Script, LaTeX, FORTRAN
- **Experimental Methods:** Particle Image Thermometry(PIT) and Particle Image Velocimetry(PIV), LabVIEW, Error Analysis, SPICE V3
- **Field Skills:** Fluke Energy Analyser, Boiler Testing, Infrared Imaging and Analysis, HOBO Ware Data Loggers, Industrial Safety
- **Coursework:** Turbulence, Laboratory Techniques in Physics, Advanced Fluid Mechanics, Advanced Numerical Methods, Solidification and Phase Change Heat Transfer, Advanced Thermodynamics, Solar Thermal and Direct Energy Conversion

## RESEARCH EXPERIENCE

### Graduate Research Assistant

Sep 2019 - May 2021

Center for Energy Efficiency and Renewable Energy(CEERE)

University of Massachusetts Amherst

Project: Parametric study of Latent Heat Thermal Energy Storage(LHTES) with emphasis on physics based form for performance correlation

- Awarded the Industrial Assessment Center (IAC) Award for Excellence in Applied Energy Engineering Research 2020 for our project proposal entitled “Design of Latent Thermal Energy Storage Heat Exchangers for Combined Heat and Power Plants”, see <https://iac.university/studentResearchAwards>.
- Successfully predicted experimental measurements in convection and phase change using our Finite Volume Method simulations implemented in ANSYS Fluent and Spectral Element Method simulations in NEK5000(open source code maintained by Argonne National Laboratory).
- Fully automated simulation setup and data-processing using a MATLAB script, see  
<https://kedar-prashant-shete.github.io/posts/2020-04-20-cfdpostp.html>
- Derived a physics based scaling of the charging rate of a LHTES device as a function of Grashof and Prandtl numbers, submitted for publication.
- Designed and built an experimental setup to conduct a precise Particle Image Velocimetry(PIV) study of turbulent natural convection, see  
<https://kedar-prashant-shete.github.io/>

### Graduate Research Assistant

Oct 2016 - Dec 2018

Turbulence Simulation Laboratory

University of Massachusetts Amherst

Project: Isosurface Area in Homogeneous Isotropic Turbulence(HIT) as a function of Reynolds and Schmidt Numbers

- Calculated (for the first time in published literature) the isosurface statistics for 28 different DNS datasets ranging from Taylor Reynolds Number 24 to 633 and Schmidt number 0.1 to 7, obtained a power law scaling with Péclet number, published in Journal of Fluid Mechanics, see <https://doi.org/10.1017/jfm.2019.875>.
- Derived an isosurface area calculation method, based on Federer's Coarea equation.
- Formulated an algorithm to implement method using spectral interpolation (exact) and Monte Carlo integration in DNS datasets
- Wrote efficient, fully parallel code in C++ with OpenMPI and integrated with in-house pseudo-spectral DNS code and used it to compute isosurface statistics on extremely large Direct Numerical Simulation datasets.

#### **Undergraduate Researcher**

Jan 2014 - Aug 2014

Birla Institute of Technology and Science-Pilani, India

Projects: Exploring the effects of novel distributor plate geometries on multiphase flow in Circulating Fluidized Bed (CFB) risers and heat recovery using fins from Cyclone Separators

- Successfully predicted experimental data (published) for transient and steady states in a CFB riser using Finite Volume Method simulations.
- Optimized distributor plate design to minimize pressure drop and maximize mixing of flow in a CFB riser, published in ASME Power and Energy 2016, see <https://doi.org/10.1115/POWER2016-59165>.
- Optimized internal fin pitch and geometry to maximize collection efficiency of cyclone separator while allowing waste heat recovery, presented in FMFP 2014.

## **WORK EXPERIENCE**

#### **Lead Energy Engineer**

Oct 2016 - present

Industrial Assessment Center (IAC)

University of Massachusetts Amherst

Responsibility: Assessing industrial facilities and identifying measures of saving or producing additional energy, estimating expenses for implementation, writing reports in collaboration with IAC team and facility engineering teams. Some typical recommendations include Combined Heat and Power, Variable Speed Drives (VSD/VFD) on pumps/motors, HVAC control algorithms for temperature and humidity to optimize comfort and energy use, Solar PV, Water turbines, Heat recovery from Air Compressors, LED Lighting, Installing Heat Pumps, Chiller setpoint optimization.

- Achieved more than \$1 million annually for customers, through implemented recommendations from visits I conducted. Center wide savings of over \$82 million can be verified at <https://iac.university/center/MA>.
- Saved more than 99 million MMBTU's in energy through implemented recommendations.
- As Lead Student for center, led and conducted over 30 energy assessments
- Presenter for invited talk "Heat Pumps in Water Treatment Plants" for IAC Lead Webinar, see link here  
[https://drive.google.com/file/d/19r00B\\_dmipdTUM8FdPscYnZTTXBFicZX/view?usp=sharing](https://drive.google.com/file/d/19r00B_dmipdTUM8FdPscYnZTTXBFicZX/view?usp=sharing).
- Mentored new students joining the team

#### **Senior Mechanical Engineer**

Mar 2016 - Jul 2016

Thermax Ltd.

Responsibility: Design an air cooled condenser using Heat Transfer Research, Inc. (HTRI) and heat transfer correlations

- Created an alternative design procedure for air cooled condensers using published heat transfer correlations and HTRI software, validated method using site data for 50 different site installations.
- Diversified company offerings in air cooled condensers beyond the range of in-house software to include 10 more designs (3 additional fin pitch and tube inclinations).

### **Application Engineer**

Jun 2014 - Sep 2015

SKF India Ltd.

Responsibility: Design bearing systems for Original Equipment Manufacturers(OEM's)

- Secured achievement award for successful improvement in energy efficiency of Ring Frame Spinning Machines at Arvind Mills, 2014, see <https://kedar-prashant-shete.github.io/photos/SKF%20Certificate.png>.
- Designed bearing systems for crushers, vibrating screens, conveyors, motor and pump systems, transmission boxes, gearboxes
- Reduced customer energy consumption and maintenance costs by installing retrofit (improved) bearing systems in textile, pulp and paper and metals industry
- Solved chronic bearing failure issues by conducting Root Cause Failure Analysis (RCFA)

### **Teaching Assistant**

Jan 2017 - May 2017

University of Massachusetts Amherst

Aerodynamics MIE-440

Responsibility: Taught two guest lectures, Created potential flow method codes in MATLAB to solve flow around bluff bodies and airfoils for Aerodynamics, graded assignments and exams.

### **Teaching Assistant**

Sep 2017 - Dec 2017

University of Massachusetts Amherst

Advanced Fluid Mechanics M&I-607

Responsibility: Prepared solutions, graded assignments and exams

### **Teaching Assistant**

Sep 2018 - Dec 2018

University of Massachusetts Amherst

Introduction to Numerical Methods M&I-597 NM

Responsibility: Prepared solutions, graded assignments and exams

## **INTERNSHIPS**

### **Engineering Design Intern**

Jul 2013 - Dec 2013

Bharat Forge Ltd.

- Designed a fixture for hot fitting of gears onto crankshafts
- Proposed a solution for deburring in crankshaft oil holes which would avoid damage to the surface finish

### **Intern**

May 2012 - Jul 2012

CASPRO Metal Industries

- Proposed a system to manage over 350 heavy patterns and store them. Providing a design for storage rack and selected retrieval cart, obtaining quotes from vendors.