

# Curriculum Vitae/Resume

CURRENT	<b>Ph.D. Pre-Candidate</b> , Mechanical Engineering, CGPA- 4.0/4.0 [Jan'21-Present] University of Michigan- Ann Arbor, Michigan, USA Field of Research- Nanoscale Thermal Transport Advisors- Prof. Pramod Sangi Reddy, Prof. Edgar Meyhofer
UNDERGRAD	<b>B.Tech (with Honors)</b> , Department of Mechanical Engineering, CGPA: 8.58/10 Indian Institute of Technology Bombay (IIT Bombay), Mumbai, India [Jul'14-May'18]
RESEARCH PUBLICATIONS	<b>Journal Papers</b> [1] K. Panda, T. Hirokawa, L. Huang, <i>Design optimization of microchannel heat exchanger headers using experimentally validated multiphase flow CFD simulation</i> , Applied Thermal Engineering 178 (2020) 115585. <b>Conference Papers</b> [2] K. Panda, L. Huang, T. Kamada, R. Hiramatsu, M. Fukuoka, S. Takanezawa, <i>Simulation Study of Water Retention and Drainage on Microchannel Heat Exchanger of Heat Pump Systems</i> , 13 <sup>th</sup> IEA Heat Pump Conference, Jeju, S. Korea, May 2021. [3] K. Panda, T. Hirokawa, C. Zheng, R. Kaji, L. Huang, T. Kamada, <i>Computational Fluid Dynamics Analyses of Multiphase Refrigerant Flow in Microchannel Heat Exchanger Design</i> , 7 <sup>th</sup> Asian Symposium on Computational Heat Transfer and Fluid Flow, Tokyo, Japan, Sep 2019. [4] K. Panda, T. Hirokawa, L. Huang, T. Kamada, <i>A Design Study of Microchannel Heat Exchanger Header using Computational Fluid Dynamics</i> , 9 <sup>th</sup> International Conference on Compressors and Refrigeration, Xi'an, PR China, Jul 2019.
PROFESSIONAL EXPERIENCE	<b>Research &amp; Development Engineer, Daikin Industries Ltd.</b> _____ Technology & Innovation Center, Osaka, Japan Oct'18-Dec'20 Supervisor: Dr. Long Huang <i>Worked as an intern in 2017; Was awarded a pre-placement offer for a full time position. Research on Microchannel Heat Exchangers (MCHX), focusing on issues like refrigerant maldistribution in headers &amp; distributors, water condensation/frosting on fin surfaces, and refrigerant flow boiling/condensation in microchannels.</i> <b>Refrigerant maldistribution in Microchannel Heat Exchangers ([1], [3], [4])</b> <ul style="list-style-type: none"><li>Developed a multiphase flow CFD model using Star-CCM+ to study the two-phase refrigerant distribution in inlet headers of MCHX used in heat pump outdoor units; validated the developed model by performing controlled experiments</li><li>Studied the refrigerant flow behavior in various header designs including a sensitivity study of the effect of multiple header design parameters on the maldistribution</li><li>Working on computational prediction of flow boiling behavior in microchannels</li></ul> <b>Defrosting &amp; Drainage of condensed/frozen water on Heat Exchanger ([2])</b> <ul style="list-style-type: none"><li>Optimized the fin design to enable faster drainage and minimize the retention of condensed water on evaporator units, using experiments and numerical simulations</li><li>Investigated the effect of hydrophilic fin-coating degradation on drainage performance</li><li>Studying defrosting in MCHX used in the heat pump outdoor units in cold climates</li></ul> <b>Automation of CFD Analyses for Component Design</b> <ul style="list-style-type: none"><li>Automated the CFD simulation process used for designing a refrigerant distributor system, by coding in Java; 93% manual work time reduction for component designing</li><li>Developed an Artificial Neural Network model to optimize experiments, and automate the prediction of simulation parameters by using preceding iteration results</li><li>Automation algorithm to be extended to multiple applications at Daikin</li><li>Supervised an intern, who was awarded a pre-placement offer for a full time position</li></ul>

STUDENT TEAM PROJECT **Design & fabrication of an Electric Race Car** Apr'16-Jul'18

**IIT Bombay Racing**, IIT Bombay  
*Faculty Advisor:* Prof. Amber Shrivastava

*Worked in & later led a 3-tier cross-functional team of 60+ students to build an **electric race car** for **Formula Student**, an **international** student design competition organized by the Institution of Mechanical Engineers (IMechE) at **Silverstone, UK***

#### Chief Mechanical Officer

- Led the overall design and manufacturing of the mechanical subsystem with in-depth focus on Chassis & Composites, Powertrain, Thermal Management & Aerodynamics
- Pioneered the development of **India's 1st** additive manufactured titanium-alloy automotive component- a highly loaded structural part in the wheel assembly
- Led the in-house fabrication of a CFRP battery container, able to tolerate 40g-forces
- Supervised the development of an aerodynamics package consisting of front & rear wings, sidepods and side diffusers, made with FRP composites & Aluminium

#### Design Engineer, Li-ion Battery Cooling System

- Designed a cooling system for the Li-ion battery pack of the electric vehicle, using micro-encapsulated Phase Change Material (PCM) and forced convection by air
- Conducted experiments to observe the effect of PCM on Li-ion cells while discharging
- Performed numerical simulations to study temperature distributions in a cell
- Carried out a literature review on the existing Li-ion battery cooling technologies

#### Design Engineer, Cooling System for Motors & Power Converters

- Designed a pumped-water cooling system using a cross-flow heat exchanger for a pair of Brushless DC motors and their power converters used in the electric vehicle
- Developed a porous body-based CFD approach in ANSYS Fluent to analyze air flow across the heat exchanger; validated the model with wind tunnel testing
- Designed the sidepods, achieving a 30% reduction in air-heat exchanger drag force
- Conducted extensive performance testing & reliability validation of cooling system

*The team was conferred with the **Formula Student Award '18** by IMechE (for the **4th consecutive year**), awarded every year to **8 out of around 100** teams participating in Formula Student. The team also secured **2nd position** in electric vehicle design at **Formula Bharat '18** (India's Formula Student event).*

RESEARCH PROJECTS

#### Effect of Non-Uniform Thermal Gradients on Atmospheric Flows

*Guide:* Prof. Sridhar Balasubramanian Jan'16-Apr'17  
*Geophysical & Multiphase Flows Laboratory, IIT Bombay*

*Focused on an experimental investigation of thermal convection in rotating fluids under bi-directional thermal gradients, imitating the dynamics of atmospheric flows.*

- Contributed in conducting experiments; built an electronic mechanism to control the elevation of the laser device for the Particle Image Velocimetry (PIV) setup
- Performed temperature data analysis and correlations to study heat transfer
- Observed and studied the existence of Columnar Convective Plumes and Baroclinic Waves, aiding heat transport in the vertical and radial directions respectively

#### Radiative Heat Exchangers for Condensers in Unitary Air-Conditioners

*Guide:* Prof. Milind Rane Jul'17-May,'18  
*Heat Pump Laboratory, IIT Bombay*

*Aimed at designing radiative heat exchangers for condensers in unitary air conditioners, eliminating the use of thin, fragile fins needed to enhance convective heat transfer.*

- Researched on the design and assembly of radiative heat exchangers to increase durability, serviceability, reliability and coefficient of performance (COP)
- Conducted literature review of spectrally selective radiative materials for emission
- Analytically optimized the heat exchanger layout and dimensions for the application

### Flow Dynamics of Buoyant Jets & Plumes in Linearly Stratified Mediums

Guide: Prof. Sridhar Balasubramanian

Nov'15-Dec'15

*Geophysical and Multiphase Flows Laboratory, IIT Bombay*

*Experimentally studied the dynamics of particle-laden buoyant jets & plumes in linearly stratified mediums, having numerous applications in environmental and industrial flows.*

- Conducted PIV experiments and processed the captured images using MATLAB
- Studied the buoyant plume centerline velocity, maximum height, spread height and spreading radius at varying stratification strengths of the surrounding medium

### ACHIEVEMENTS & AWARDS

- Conferred with the following awards at IIT Bombay:
  - **Institute & Department Technical Citations** (2018) for exemplary role in technical activities and projects, awarded to **0.5%** of students graduating each year, at the institute & the department (mechanical eng.) levels respectively
  - **Institute Technical Color** (2017) for outstanding product development and research as a member of IIT Bombay Racing (an electric race car design team)
  - **Undergraduate Research Award** (2017) for exceptional research work under Prof. Sridhar Balasubramanian, Dept. of Mechanical Engineering, IIT Bombay
- Selected for the **KVPY scholarship** (2014) by the Government of India with an All India Rank **122** among **100,000** candidates (**99.88 percentile**)
- Secured an All India Rank **405** among **150,000** candidates (**99.73 percentile**) in the **Joint Entrance Exam - Advanced** (2014), the national exam for the IITs

### MENTORSHIP & TEACHING

#### Academic Mentor & Cabinet Member (**Academic Mentorship Program**)

*Department of Mechanical Engineering, IIT Bombay*

Apr'16-Apr'18

- Mentored 9 undergraduates (including 3 with backlogs) by one-on-one counselling
- Attended a training for mentoring skills, by the Tata Institute of Social Sciences
- Worked on mentorship policy reforms as a cabinet member in the mentorship team

#### English Language Teaching Assistant

*IIT Bombay*

May'16-Jun'16

- Tutored English & conducted interactive sessions to develop communication skills

### COMPUTER SKILLS

*Computer Aided Design (CAD):*

SolidWorks, AutoCAD, Solid Edge

*Computational Fluid Dynamics (CFD):*

Star-CCM+, ANSYS Fluent

*Programming Languages & Environments:*

C/C++, Java, Python, MATLAB

### EXTRA CURRICULARS

#### Sports

- Represented IIT Bombay in the intra-city **Mumbai Hockey League** ('15-'16)
- Qualified for the Hockey Coaching Camp for **Inter-IIT Sports Meet** ('15)
- Managed and led the **silver medal** winning team in Institute Hockey League ('16)
- Won **1 gold & 2 bronze medals** in Inter-Hostel Hockey tournament ('15,'17-'18)

#### Others

- Recipient of **A-Certificate** in the Indian National Cadet Corps (**NCC**) ('11)
- Qualified for the **National Level** of MaRRS International Spelling Bee, India ('08)
- Awarded **Special Mention** for theatre sets in Performing Arts Festival at IIT('16)