Dr. Darshan Rathod

Email: darshan.rathod1994@gmail.com
Mobile: +91-7042958333, +91-9426946052
Linkedin: www.linkedin.com/in/dev-ddr
Website: https://dev-ddr.github.io

Education

- **Indian Institute of Science** — Bengaluru, India
  PhD + M.Tech (Res), ICER; GPA: 8.6 — *2018 - 2024*

  Advisors: Prof. Saptarshi Basu, Dr. Pratikash Panda

  Thesis title: Design and diagnostics of gas turbine combustor: from high shear injector to full-scale sector of annular combustor

- **Sardar Vallabhbhai National Institute of Technology** — Surat, India
  Bachelor of Technology - Mechanical Engineering; GPA: 8.7 — *2012 - 2016*

Professional Experience

- **Fujitsu Research of India Pvt. Ltd.** — Bengaluru, India
  Senior Researcher, AI security — *Aug 2024 - Present*
  - **Red-teaming** Apply various white-box and black-box methods to identify the vulnerabilities in LLMs.
  - **Defense development** Develop novel strategies to defend against adversarial attacks on LLMs.
  - **Agentic AI** Augment the safety for agentic-AI systems through rigorous red-teaming and defense development.
  - **Mechanistic Interpretability** Understanding how models work internally by examining on various levels from neurons to layers and apply the findings in development of novel defenses.
- **Indian Institute of Science** — Bengaluru, India
  PhD in Gas turbine Combustor flow dynamics and combustion instabilities — *Aug 2018 - July 2024*
  - **DRDO Project** Sole PhD student leading the team of two project-staff in the GTRE, DRDO project on gas turbine combustor research, under the guidance of Prof. Saptarshi Basu and Dr. Pratikash Panda.
  - **Rig Development** Designed and developed a high-pressure (upto 20 bars) and high-mass flow rate (upto 1.5 kg/s) sector rig for gas turbine combustors. The Salient features of rig involves to-the-scale core components of combustor, optical access to primary and exhaust zones, remote rig operation, high-speed data acquisition.
  - **Experimental Diagnostics** Application of advanced diagnostics tools such as high-speed PIV and OH* chemiluminescence for flow and combustion diagnostics in challenging environments of gas turbine combustors.
  - **Data Analysis** Apply advanced data analysis tools like POD, DMD, spectral-POD, recurrence analysis etc. on the experimental data to understand intricate thermo-physical processes undergoing within the combustor.
- **Honda R & D India Pvt. Ltd.** — Gurugram, India
  Research Engineer — *July 2016 - July 2018*
  - **Emission and Performance optimization** Development and testing of IC engine for BS-IV emission norms with optimizing driveability and mileage. Optimizing the fuel supply system considering diverse Indian environment.
  - **Race Engine optimization** Development of race engine specific power (kW/kg) by changing engine parameters like ignition timings, valve timings etc.
  - **Endurance testings** Endurance testing of a specific part or system of vehicle. Specifications testing for new suppliers.
  - **Benchmarking** Characterization of competitors vehicle and engine, Accounting of production errors in development of engine; Market survey for customer feedback on applied vehicle development.
- **Schneider Electric** — Vadodara, India
  Intern — *May 2015 - June 2015*
  - **Tools storage system** Designed and developed tools storage system for improvement in ergonomics of production line staff. The compact Setup could sustain the high loads of tools and parts.
- **Thermal Power Station** — Jamnagar, India
  Intern — *December 2015*
  - Understanding the basic functioning of thermal power plant & various sub sections of plant like boiler, turbine, cooling tower etc.

AI and Datascience Projects

- **SafeQuant:-** As a team, developed a gradient based methods to improve the defense of LLM against adversarial attacks. Methods reduces the ASR from 80∼90% to ∼10%. Lead the team in integration of the method to Fujitsu's guardrail system to be used in production.
- **Agentic AI:-** Leading a team, in development of agentic system which could automatically add novel attacks and defences to Fujitsu's guardrail system, reducing significant manual labour involved in the process.
- **RL based prompt gen** Generating the sequence of prompts in multi-turn conversation which could surreptitiously prompt LLM to generate malicious content.
- **Text-to-KG** Developed a method which could generate knowledge graph (KG) from text description. This pipeline is later used in generating prompts for Red-teaming approach.

- **Gradient based prompt gen** Developed a method which could generate a prompt from random initial tokens for a target response, through loss propagation to the prompt.
- **C1-Terminal** Participated in the C1-terminal competition, wherein the task was to develop a code which can compete against other team's code in a game.
- **I4AM'24 Robotics Challange** Secured 3rd position in the competition, wherein the task was to design a robot given the
- **Experimental control sysntem** Developed using Tkinter, which can control inlet conditions of combustor remotely at high-mass flow rates and high-pressures. Code integrates various hardware like NI cDAQ-9174, ALICAT mass flow controller, arduino and mobile camera for controlling and data acquisition of experimental parameters.
- **Design of smart home system** AI controlled system using ESP-8266 was developed which could switch state with voice commands.
- **Teaching python** Taught Python programming to first year students from Jan-2021 to Dec-2023 at Ramaiah Polytechnic College, Bengaluru India.

Opensource Projects

- **Finmetry** Developed a pipeline for algorithmic trading strategy backtesting. https://github.com/dev-ddr/finmetry.
- **ddr-analysis-tools** Developed codes for experimental data analysis using POOD, sPOD, recurrence analysis, Fourier analsis etc. https://github.com/dev-ddr/ddr-analysis-tools.
- **ddr-davis-data** Developed codes for experimental data analysis using POOD, sPOD, recurrence analysis, Fourier analsis etc. https://github.com/dev-ddr/ddr-analysis-tools.
- **ddr-mfc** Developed a code to control Alicat mass flow controller. https://github.com/dev-ddr/ddr-mfc.

Mechanical Projects

- **Design and manufacturing of setup for visualization of wave motion phenomena** Two bodies which are in-phase, out-of-phase or in resonance can be demonstrated using the setup.
- **Lab plan development** Developed an experimental facility at ICER, IISc for conducting challenging experiments remotely in isolation of experimental rig from user and sensitive equipments.

Fellowships & Awards

- **Fujitsu Grand Award** — Fujitsu, Bengaluru, India
  As a team, developed a method for improving the safegurding of an LLM — *Jun-2025*
- **PMRF** — IISc, Bengaluru, India
  Awarded the prestigious Prime Minister Research Fellowship — *2018-2023*

Publications

- Sindhu Padakandla, Sadbhavana Babar, Darshan D Rathod, Manohar Kaul. "SafeQuant: LLM Safety Analysis via Quantized Gradient Inspection" NAACL-2025. 10.18653/v1/2025.naacl-long.127
- Darshan D Rathod, Sonu Kumar, Swetaprovo Chaudhuri, Pratikash Panda, Saptarshi Basu. "Isothermal Flow Field Characterization of a Full-Scale Sector Combustor At Elevated Pressures" ASME. J. Eng. Gas Turbines Power. April 2025; 147(4): 041002. https://doi.org/10.1115/1.4066540
- Darshan Rathod, Pratikash Panda, Saptarshi Basu. "Insights into the dynamics of full-scale sector combustor isothermal flow field" Exp Fluids 66, 24 (2025). https://doi.org/10.1007/s00348-024-03953-3
- Darshan D Rathod, Thirumalaikumaran SK, Sonu Kumar, Pratikash Panda, Saptarshi Basu. "Effect of Flare Angle in a Counter-Rotating Dual Radial Swirler on the Stability of a Swirl-Stabilized Flame", ASME Turbo Expo 2024. https://doi.org/10.1007/s00348-024-03953-3
- Darshan D. Rathod, Samprada S. Kumbhare, Swetaprovo Chaudhuri, Pratikash Panda, Saptarshi Basu and Dalton Maurya. "Design of an optically accessible single cup sector of a full-scale annular gas turbine combustor," AIAA 2023-1062. AIAA SCITECH 2023 Forum. January 2023. https://doi.org/10.2514/6.2023-1062
- Darshan D. Rathod, Pratikash Panda and Saptarshi Basu. Flow diagnostics in real scale sector of modern annular gas turbine combustor at high Pressures. NAPC 2022, IIT Bombay.
- Kumar S., Rathod D., & Basu S. (2022). Experimental investigation of performance of high-shear atomizer with discrete radial-jet fuel nozzle: Mean and dynamic characteristics. Flow, 2, E31. doi:10.1017/flo.2022.25