Rajat Agrawal | Curriculum Vitae

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As a dedicated and innovative mechanical engineer with a proven track record of translating academic excellence into practical contributions, I bring a wealth of experience and passion for autonomous systems and industrial design to the table. My journey has been a relentless pursuit of excellence, marked by a commitment to learning, innovation, and a deep desire to shape the future of technology.

Technical skills

- **Industrial Software Skills:**
  - **CAD software:** Creo, SolidWorks, AutoCAD Mechanical, SpaceClaim.
  - **Programming Languages:** Python, Arduino, TeX.
  - **Robot software frameworks/platforms:** Robot Operating Systems (ROS), ArduPilot, PX4.
  - **Computer-Aided Engineering (CAE) software:** Ansys Mechanical and Ansys Fluent.
  - **Other software:** MathCAD, MS Office products, etc.
- **Manufacturing Skills:**
  - **3d Printing:** Fused Deposition Modeling(FDM) and Stereolithography (SLA)
  - **Prototyping**
  - **Fabrication Techniques, etc**
- **Socio-Business Skills:** Presentation, collaboration, and teamwork.
- **Additional Skills:** Proficient in generating thorough and meticulously organized drawings and reports, ensuring clarity and precision in technical documentation.

Work Experience

- **Indian Institute of Science Education and Research Bhopal** **Bhopal,India**
  Sr.Project Associate *August 2023–March 2024*
  - Worked on the development of an autonomous river bodyboard with a rudder-controlled navigation system and water-flow propulsion aimed at achieving real-time monitoring of river health and environmental data collection.
  - Successfully designed and developed a drone (UAV) equipped with thermal and multispectral cameras for agricultural applications, specifically targeting precision farming
  - Successfully completed a SERB-funded project entitled "Design and Development of Autonomous Surface Vehicle for Bathymetry Applications" under the supervision of Dr. Sujit P.B.
  - Object Detection and Decision Making on 4-Legged Unitree Go 1 Robot using RGB and Thermal Camera.
  - Successfully designed and developed an autonomous electric rickshaw to promote sustainable and eco-friendly transportation in urban India.

- **Indian Institute of Science Education and Research Bhopal** **Bhopal,India**
  Project Associate–I *August 2021–July 2023*
  - Designed and manufactured precise wafer probes for micro-level examination of flexible integrated circuits with minimal negative impact on the device under test (DUT) by utilizing 3D printing, tungsten pins, and a customized mechanical structure.
  - Worked with the Central Institute of Agriculture Engineering, Bhopal (CIAE) to create an Autonomous Weeder that uses AI, sensors, and cameras to detect and remove weeds from crops without damaging them by employing advanced algorithms and precision tools.
  - Set-up an agile and low-cost indoor autonomous swarm test-bed with multiple quad-copters to facilitate the testing of algorithms for autonomous guidance strategies.
  - Deployed BlueROV2, an underwater Remotely Operated Vehicle (ROV) from Blue Robotics to inspect and monitor ports, harbours and vessels, inspect pipelines, locate underwater targets, and explore the depths of water bodies.
  - Built and improved an autonomous off-road rover named 'Hound' by establishing electrical connections, addressing mechanical issues, and integrating computer vision sensors.

- **Indian Institute of Science Education and Research Bhopal** **Bhopal, India**
  Project Associate–I *December 2020–April 2021*
  - Prototyped a portable low-cost Oxygen Concentrator device as a part of IISER Bhopal's efforts towards handling COVID-19.
  - 3D model optimization and slicing for 3D print production with 3D printer hardware including FDM, SLA technologies.

- **Bharat Heavy Electricals Ltd.** **Haridwar, India**
  Contract Design Engineer *December 2019–December 2020, March 2019–May 2019*

  Worked in association with the Indian Mission Project of "Advanced Ultra Supercritical (AUSC) 800MW Steam Turbine" in the Research and Development group of Steam Turbine Engineering (STE) Department.
  - Carried out Fatigue Analysis (Low Cycle Fatigue) of High Pressure (HP) turbine based on Alloy 625 and GX12 Materials with operating Parameters of 710C Temp. and 300 Bar Pressure in **Ansys Mechanical**.
  - Created the Dimensional Drawings, Main Assembly drawings, Part Drawings and the complete Bill of Materials for Turbine Casings, Pedestals and their assembly components in PTC Creo and Autodesk AutoCAD.
  - Designed 3D CAD digitization of Turbine Casings, Bearings, Pedestals and their assembly components.
  - Carried out Tolerance Analysis of HP turbine Inlet Connection in Ansys Mechanical.

- **Bharat Heavy Electricals Ltd.** **Haridwar, India**
  Graduate Apprentice Trainee *March 2018–Feb 2019*

  Underwent Apprenticeship Training for one year where I was associated with Indian Mission Project of "Advanced Ultra Supercritical (AUSC) 800MW Steam Turbine" in Research and Development group of Steam Turbine Engineering (STE) Department.
  - Carried out Coupled Structural and Thermal FEA in Steady-State and Transient Conditions on Turbine Equipment such as Inner Casing, IP Inlet Connections etc. and to optimize the generated results.
  - Managed all phases of the design process for a multitude of products, components, parts, assemblies and sub-assemblies, including drafting, dimensioning, tolerance, prototyping and documenting results.

- **Vivetto Systems Pvt Ltd.** **Mandsaur, Madhya Pradesh, India**
  Site Engineer *Dec 2016–June 2017*

  Worked with Vivetto Systems Private Limited, Gurgaon as a Site Engineer at NTPC's 250 MW Solar Power Plant.

  - Follow up with Supervisors, check completion work, and timely raise inspections and coordinate with the consultant/client for approval.
  - Before consultant/client inspection, conduct internal inspections for MEP works and report to the concerned project supervisor to rectify works.
  - Responsible for incoming materials inspection along with a client representative.
  - Ensure all logs are updated, daily monitoring the Project Activities.

Publications

- Manav Mishra, Prithvi Poddar, **Rajat Agrawal**, Jingxi Chen, Pratap Tokekar and P.B. Sujit. "Multi-Agent Deep Reinforcement Learning for Persistent Monitoring With Sensing, Communication, and Localization Constraints," published in IEEE Transactions on Automation Science and Engineering. doi: **https://doi.org/10.1109/TASE.2024.3385412**
- P. Anand, P. Niturkar, A. P. Aguiar, **R. Agarwal**, M. Mishra and P. B. Sujit, "Finite-Time Standoff Target Tracking in the Presence of Wind," 2023 European Conference on Mobile Robots (ECMR), Coimbra, Portugal, 2023, pp. 1-6, doi:**10.1109/ECMR59166.2023.10256384**.
- Raghav Thakar, **Rajat Agrawal** and Sujit PB. "A COLREGs-Compliant Conflict Resolution Strategy for Autonomous Surface Vehicles", doi:**10.48550/arXiv.2312.08549**.
- **Rajat Agrawal**, K. Nambiar, B. Chhaglani, M. Chitre and Sujit PB. "OAS-GPUCB: On-the-way Adaptive Sampling Using GPUCB for Bathymetry Mapping". (Submitted in IEEE International Conference on Intelligent Robots and Systems IROS).

Education

- **Dr A.P.J. Abdul Kalam Technical University, Uttar Pradesh** **Mathura, India**
  Bachelor of Technology in Mechanical Engineering , 68.66 % *2012–2016*
- **Amarnath Vidya Ashram Sr. Sec. School** **Mathura, India**
  AISSCE, CBSE, Class XII, 69.16% *2012*
- **St. Dominic's Sr. Sec. School** **Mathura, India**
  AISSE, CBSE, Class X, C.G.P.A 6.6 *2010*

Projects

- **B.Tech Project:** *'Analysis of Advance Aerodynamics Changes (GENERIC BUMP) in Aerospace Industry Using CFD'*

  I was part of a team whose aim was to investigate the effects of the generic bump in a fighter aircraft and its application as a boundary layer diverter (BLD) and compression surface for a Diverterless Supersonic Inlet (DSI). The task was to divert as much of the boundary layer as possible or prevent the boundary layer from entering the inlet of an aircraft by using generic bumps. Properties such as pressure recovery, boundary layer diversion, surface flow, change in Mach number and mass flow are the major parameters that are being analysed.

  Link to the Project Presentation

References

- **Dr. Sujit Pedda Baliyarasimhuni**
  Professor, Department of Electrical Engineering and Computer Science
  Indian Institute of Science Education and Research (IISER), Bhopal, Madhya Pradesh, India
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- **Mr. Brij Bhushan**
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