CURRICULUM VITAE
SANDARBH SINGH
MECHANICAL ENGINEERING

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EDUCATION:
Ph.D in Mechanical Engineering, Purdue University – West Lafayette 2025 - Present
B.Tech in Mechanical Engineering, Indian Institute of Technology (ISM), Dhanbad 2021–2025

RELEVANT COURSES:
Fluid Mechanics, Applied Thermodynamics, Fluid Machines, Heat and Mass Transfer, Fundamentals of Aerodynamics, Fundamentals of Combustion, Advanced Scientific Computing, Fundamentals of Aeroacoustics, Computational Fluid Dynamics and Energy Conversion Equipment.

EXPERIENCE:
Feynman Aerospace, Mumbai **Rocket Design and CFD Intern** May–Aug 2023
- Conducted research and designed single-stage and multi-stage rockets using the open rocket simulator and modeled components in SolidWorks 3D for structural integrity and performance optimization.
- Simulated an F-16 aircraft to analyze aerodynamic factors, including lift coefficient and drag, to improve flight dynamics and performance.
- Performed thermal simulations and Finite Element Analysis (FEA) on individual aircraft components to assess heat tolerance, stress, strain, and structural strength under various conditions.

Fessorpro, Mumbai **Machine Learning Intern** Jun–Aug 2022
- Gained foundational skills in Python programming, covering data types, control structures, functions, and modules. Developed proficiency in data structures (lists, tuples, dictionaries) and file handling for reading and writing data. Built experience with exception handling to create robust code and applied Object-Oriented Programming concepts, including class creation, inheritance, polymorphism, and encapsulation.
- Developed foundational knowledge in Machine Learning, focusing on data preprocessing, feature selection, and model training. Gained experience in applying supervised learning techniques, such as regression and classification, and evaluating model performance using metrics like accuracy and precision. Utilized ML libraries, including sci-kit-learn, to implement and assess basic algorithms.

RELEVANT PROJECTS AND INTERNSHIP:
- **Personal Project**, IIT (ISM) Dhanbad May–Aug 2024
  - Designed and built a venturi-based jet pump to study *Fanno flow* effects (flow with friction) under subsonic conditions.
  - Utilized ammonia injection in the converging section to create a low-pressure zone, enabling flue gas suction and subsequent ejection through a diverging section, achieving pressure recovery.
  - Demonstrated the potential for efficient ammonia decomposition in transport applications by leveraging pressure and velocity changes within the pump.

- **Course Project**, IIT (ISM) Dhanbad Jan–May 2024
  - Simulated an ammonia micro-combustor to analyze the effects of a baffle on combustion characteristics, including maximum temperature distribution, NOx emissions, and separation of high-temperature zones.
  - Examined the impact of varying baffle length, position, geometry, and ammonia reaction mechanisms.
  - The study provided insights into optimizing baffle configurations for improved combustion efficiency and reduced emissions.

- **Internship Project**, Feynman Aerospace May–Aug 2023
    - Designed single-stage and multi-stage rockets, focusing on optimizing aerodynamics, thrust-to-weight ratios, and fuel efficiency to meet project specifications.
    - Conducted comprehensive lift factor analysis on an F-16 aircraft, evaluating aerodynamic performance under various flight conditions.
    - Additionally, performed detailed thermal simulations and Finite Element Analysis (FEA) on critical aircraft components, assessing material stress, thermal gradients, and structural integrity to ensure optimal performance and safety under operational loads.

- **Research Project**, IIT (ISM) Dhanbad May 2023–Oct 2024
    - Researched the use of ammonia as a hydrogen source for energy extraction in jet propulsion systems, utilizing Aspen Plus simulations.
    - Developed a two-stage reactor system consisting of an ammonia decomposer and hydrogen combustor, both modeled as Plug Flow Reactors (PFR).
    - The system involved ammonia vaporization, decomposition to produce a nitrogen-hydrogen mixture, and subsequent combustion with air to form water and nitrogen as flue gas.
    - Analyzed the impact of parameters like pressure ratio, ammonia flow rate, and ammonia-to-air ratio on energy generation. Findings indicated that while aircraft engines operate effectively at lower pressure ratios, marine engines require higher pressure ratios for feasible operation, with increased energy generation at higher ammonia flow rates and pressure ratios.

TECHNICAL CERTIFICATIONS:

- Stanford University, Machine Learning: Regression and Classification, Aug 2022.
- University of Colorado, Introduction to C++ Programming and Unreal, Aug 2022.

PAPERS/PUBLICATIONS:

- Numerical Studies of Hydrogen Combustion in Micro-combustors (Status: Ongoing).
- Design and Analysis of an Ammonia Gas Turbine Propulsion System for Aircraft and Marine Applications (Status: Under review in a reputed journal), Oct 2024.

ACTIVITIES AND AWARDS:

- Managed events like stage play, street play, mono acts, and mime acts at intra- and inter-college events from August 2022–June 2023.
- Former member of Abhay Dramatics Club at the Indian Institute of Technology (ISM), Dhanbad, served the club till June 2023.
- Secured 4th rank amongst 23 IITs in Inter-IIT held in December 2022.
- Participated in a trading event in October 2022 held at IIT (ISM) Dhanbad, called "Tradathon," and secured 57th rank out of 3000 participants.
- Secured an All-India Rank of 7916 in JEE (Advanced) 2021 held in October 2021 and got into an IIT along with being in the top 1% from all over India.
- Participated in the Open CV workshop held by RoboISM, the official robotics society of IIT (ISM) Dhanbad, in May 2022.
- Language: English (Advanced proficiency), and French (Basic-Intermediate).