Prakhar Kumar Jain

Mechanical Engineering
Indian Institute Of Technology,
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Master Of Technology
Specialization: Manufacturing Engineering
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ACADEMIC DETAILS

Examination	University	Institute	Year	CPI/%
Post Graduate Specialization:	*Manufacturing Engineering*			
Post Graduation	IIT Bombay	IIT Bombay	2022	9.06
Post Graduate Specialization:	*Machine Design Engineering*			
Post Graduation	IIT (ISM) Dhanbad	IIT(ISM) Dhanbad	2018	7.5
UnderGraduate Specialization:	*Mechanical Engineering*			
Graduation	RGPV, Bhopal	OIST, Bhopal	2016	7.71
Intermediate	*MPBSE, Bhopal*	DJHSS, Katni	2011	86.4%

TECHNICAL SKILLS

- **Languages:** Python, MATLAB, Fortran, R, C++, Julia
- **Database:** PostgresSQL
- **Python Libraries:** TensorFlow, Pandas, Matplotlib, NumPy, SciPy
- **Simulation:** Abaqus, SolidWorks, ANSYS, HyperMesh
- **Tools:** LaTeX, Gnuplot, RStudio, Atom, jupyter notebook

SCHOLASTIC ACHIEVEMENTS

•Graduated with **honors** in Mechanical Engineering from OIST Bhopal • **Tuition fee waiver student** in undergraduate studies at OIST bhopal • Achieved **99.07 percentile** in GATE 2019 Examination in Mechanical Stream among 167376 students

M.TECH PROJECT AND SEMINAR

- **Modeling of Multi-layer Deposition through Laser Directed Energy Deposition Process** (Jan'20 - Jun'22)
  M.Tech Thesis | *Advisor: Prof. Ramesh Singh* | *IIT Bombay*

Aim	◦ Modeling **physical phenomena** underlying laser DED process to determine quality and integrity of deposition
Objective	◦ Development of a **fully coupled metallurgical and thermomechanical** 3-D finite element model for predicting residual stresses and dilution in multilayer and multi-track laser DED Process ◦ Developing an integrated simulation approach for incorporating melt-pool dynamics and metallo-thermomechanical behavior
Work completed	◦ Modeled laser-powder flow interaction via **Discrete phase modeling** in **Fluent** ◦ Modeled **Melting & solidification** phenomena during laser DED in **Fluent** ◦ Modeled laser moving heat source and multi-layer powder deposition process via **DFLUX subroutine** in conjunction with **Element birth technique** in **ABAQUS®** ◦ Implemented **USDFLD** and **UEXPAN subroutines** to identify phase transformation and thermal history ◦ Implemented **UMAT Subroutine** to calculate the deformation and residual stresses ◦ Analyzed effect of Various **deposition strategies** and **Interpass cooling time** on Residual stress development
Impact	◦ Process parameter space for depositions with favorable attributes, such as compressive residual stresses, sound metallurgical bonding, and acute contact angles of deposition

- **Multi-track Laser Directed Metal Deposition(L-DED)** (Jan'21 - Apr'21)
  Seminar | *Advisor: Prof. Ramesh Singh* | *IIT Bombay*
  - ◦ Studied different approaches of Numerical modeling along with key open issues in Multi-track L-DED process
  - ◦ Studied various experimental techniques to investigate the defects such as Porosity and Surface Roughness

INDUSTRIAL TRAINING

- **Mitutoyo Crysta-Apex S7106 Standard CNC Coordinate Measuring Machine Training** (Feb'21)
  Machine Tool Lab | *Adviser: Prof. Ramesh Singh* | *IIT Bombay*
  - ◦ Trained on **MCOSMOS software** for geometric measurement & **CAT1000P software** for CAD based part programming
  - ◦ Trained on **CAT1000S** for 3D free-form surface evaluation & **GEOPAK software** for probe calibration and part alignment
- **Lean Six Sigma Certification | KPMG | Green belt Programme** (Oct'19)
  - ◦ Training aims at learning ways to improve business productivity by eliminating waste and reducing process variations
  - ◦ Learning usage of **statistical tools** for solving business problems and contributing to organisational goals

KEY COURSE PROJECTS

- **Eigen value analysis of 2D structure with reduced degree of freedom system** (Oct'20 - Nov'20)
  Computational Structural Dynamics | Advisor: Salil Kulkarni | IIT Bombay
  - Implemented a technique to reduce model size generated by the Craig–Bampton method of **component mode synthesis** (CMS) using OCTAVE software
  - Obtained CMS model with a **highly reduced degree of freedom** by truncating CC modes
  - Achieved **99.967%** accurate approximations of the lower natural frequencies in ROM model
- **Finite element analysis of 1D & 2D elastic problems using MATLAB and ABAQUS** (May'20)
  Finite Element and Boundary Element Methods | Guide: Prof. Parag Tandaiya | IIT Bombay
  - Developed a **MATLAB code** for **finite element analysis** of general 1D and 2D linear elastic problems
  - Implemented this code to 3 noded 1D bar elements and 4 noded 2D quadrilateral elements for stress analysis
  - Verified MATLAB results with ABAQUS software and achieved the approximate results
- **Thermal Modeling of laser heat source using Explicit Finite Difference Method**
  Laser Material Processing | Guide: Prof. Deepak marla | IIT Bombay (Oct'20 - Nov'20)
  - Implemented FDM Algorithm to find temperature along depth of material if laser is irradiated on top surface of material
  - Implemented closed-form solution to surface heat flux problem, to evaluate temperature profile along depth over time
- **Thermal Modeling of Thick and Thin Plate with Moving laser heat Source**
  Laser Material Processing | Guide: Prof. Deepak marla | IIT Bombay (Oct'20 - Nov'20)
  - Implemented the solution for Thick Plate with point heat source to find the temperature distribution in plate
  - Implemented the solution for Think Plate with line heat source to find the temperature distribution in plate
- **Multi-view 3D Reconstruction using computer vision techniques for Computer Aided Geometric Design**
  Computer Graphics and Product Modelling | Guide: Prof. S.S. Pande | IIT Bombay (Oct'20 - Nov'20)
  - Implemented Camera Calibration Library in **OpenCV** to correct the distortion in images
  - Implemented calib3d module in OpenCV to create cool **3D effects** from calibrated images

KEY MACHINE LEARNING PROJECTS

- **Quality Prediction in Mining Process Using Machine Learning** (Oct'20 - Nov'20)
  Statistical Machine Learning and Data Mining | Advisor: Prof. Asim Tewari | IIT Bombay
  - Predicted Silica impurity in mining process with $\mathbf{R^2}$ **score of 0.976** using the **Random Forest Regressor**
  - Developed the **frontend** using **Tkinter, Matplotlib and Pyinstaller** to predict amount of silica impurity
- **Convolution neural network model Speed-Up with Sparsity** (Apr'21 - May'21)
  Introduction to Machine Learning | Guide: Prof. Amit Sethi | IIT Bombay
  - Implemented **Keras-surgeon** library & Tensorflow framework for sparsity training on **LeNeT** network
  - Achieved retrained model with **95-96%** Pruning on Dense layer in LeNet Network

KEY COURSES UNDERTAKEN

- Introduction to Machine Learning
- Computational Structural Dynamics
- Computer Graphics and Product Modeling
- Stress Analysis
- Statistical Machine Learning and Data Mining

CERTIFICATION

- Deep Learning Specialization
- Applied Machine Learning in Python
- Python for Everybody Specialization
- Applied Text Mining in Python
- Introduction to Programming with MATLAB
- Getting started with TensorFlow 2

POSITION OF RESPONSIBILITY

- **Research Assistant | Machine Tool Lab | IIT Bombay** (Jul'19 - Present)
  - Facility in charge with the responsibility of operations, maintenance and monitoring of the following equipment of MTL:
    - **Alicona - Focus Variation Microscopy**
    - **Wire Cut EDM**
    - Coordinate Measuring Machine
    - High Speed Micro-Milling Machine
    - Hybrid-Micro EDM Machine
    - **Rapid-I Profilometer**
    - Kuka Robot
    - **Zeta Microscopy**
- **Teaching Assistant | Machine Tool Lab | IIT Bombay** (Jul'19 - Present)
  ME 374-Machining Process Lab | ME 372-Metrology Lab | ME 643-Materials Processing and Simulation Lab
  - Managed a team of **20 TAs** throughout **4 semesters** to conduct lab sessions, report evaluation and viva of UG students
  - Conducted experiments on Machine Alignment Test and Inspection of Screw Thread for UG students
- **Teaching Assistant | ME 423-Machine Design | ME 206-Manufacturing Processes I** (Jan'21-Present)
  - Mentored a **group of 4 students** in Machine Design and Manufacturing Processes course projects
- **Maintenance Secretary | Hostel-14 | IIT Mumbai** (Dec'19-Apr'21)
  - Managed a **2-tier team** responsible for maintenance related activities of Hostel-14 housing **500+ residents**