

# MANOJ MALVIYA

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## EDUCATION

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**MS in Mechanical Engineering — The Pennsylvania State University, USA** Aug 2018 - Aug 2020

GPA: 3.89/4 — Specialized in Computational Design — Engineering Design Award 2019 — [Thesis](#)

**B.Tech in Mechanical Engineering — Indian Institute of Technology Jodhpur, India** July 2014 - May 2018

GPA : 7.85/10 (3.9/4)— Best BTech Thesis Award

## SKILLS

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<b>DL Frameworks</b>	Keras, TensorFlow, PyTorch, scikit-learn, Pandas, NumPy, OpenCV, ImageIO, Pandas
<b>Programming</b>	Python, C++, MATLAB, Octave, LaTeX
<b>Cloud Computing</b>	Google Colab, Jupyter Server, AWS EC2
<b>CAD</b>	CATIA, SolidWorks, PTC Creo, Insight, Blender, Fusion 360, AutoCAD, C4D
<b>CAE</b>	ANSYS Workbench, APDL, Abaqus CAE
<b>Additive Manufacturing</b>	Autodesk NetFabb, nTopology, Geomagic Design X, ATLAS 3D

## WORK EXPERIENCE

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**Pennsylvania State University, PA, USA** Aug 2018 - Aug 2020

*Graduate Research Assistant - Collaborated with faculty to conduct interdisciplinary computational design research*

- Developed a DL based framework to rapidly generate solutions for diverse structure topology optimization problems with varying design space.
  - Developed an efficient program (**2D-TOpt**) to generate diverse and multi-scale training data.
  - Systematically compared different generative models. Achieved high quality solutions using CGAN. [Report](#)
  - Developed a stack-GAN alike architecture with a novel physics based discriminator for higher resolution solutions.
- Devised an experiment to get insights on human's novel-problem solving process using Hidden Markov Model and Markov Chains. Built an in-house **software** for human design data collection. [JOSS](#), [ICED'21](#)
- Developed a novel interdisciplinary methodology for learning Design for AM heuristics from collected eye-tracking and screen-recorded data. Performed data collection, augmentation and implemented *temporal HMM*. [SFF'19](#) , [JMD'20](#)
- Conducted genre analysis for identification of cognitive writing styles using *NLP*, *K-means clustering* and *Markov chain*.
- Developed two novel methods to calculate inter-rater reliability based on image and point cloud comparison. [ASEE](#), [IJQM](#)
- Developed a tool to automate the design process for embedding the objects into Additively manufactured parts. Developed two novel methods: *Shadow Projection* and *Voxel-based uni-directional convexity*. [IDETC 2019](#), [JMD 2020](#)
- Coauthored five academic publications. Presented research results in international conferences, scientific seminars and weekly lab meetings. Conducted workshops on MATLAB, Python, Data Science and Machine Learning for lab.

**Product and Technology Development Center, L&T Powai** May 2017- July 2017

*Summer Intern*

- Worked in a Design Team on a project titled: “ Cockpit and Mechanical Control Mechanism design for ICV ”. Implemented *R.U.L.A* for cockpit design to ensure ergonomics. Designed a worm gear assembly for steering.
- Designed a mechanical toggle linkage based mechanism to transfer motion from cockpit to transmission end. Implemented cable system for brake control system.

**Team Racers IITJ**

Feb 2015 - May 2017

*Design Team Captain, Team Racers IITJ*

Led a team of 25 students for designing and manufacturing All-Terrain Vehicle for SAE BAJA 2016-17. Designed the chassis for ATV putting emphasis on safety, stiffness and ergonomics. Designed and developed a cheaper and durable car seat with jute fibre composite. Ranked 12/300 in overall design event scoring 132/150. [Design Report](#)

## ACADEMIC PROJECTS

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**Classifying prototype images into 3D-Printed and non 3D-Printed:** Implemented a Deep Convolutional Neural Network-based network using TensorFlow for binary classification of prototype images into 3D-Printed and non-3D-printed. Implemented GradCAM for interpreting the developed model.

**Qualitative Analysis of a product perception on Amazon:** Scrapped the latest customer reviews using a python scrapper (SelectorLib) and augmented the data as a structured list of strings using Pandas. Conducted n-gram analysis and topic modelling using the NLTK module.

**Build Orientation Selection Tool for AM** : Developed a build orientation selection tool for Additive Manufacturing that maximizes the minimum factor of safety under prescribed boundary conditions using a novel Machine learning and Bayesian optimization approach. [CAD'20](#)

## OTHER PROJECTS

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**Support less Redesign of toy sterling engine for Metal AM** and manufactured using PBF

**Cub companion**: Developed a Game based on human-centered design principles for pediatric cancer patients.

**Multi Material AM of micro origami flexible hinges**: Investigated the effect of thickness and FGM

**Design of 5 Axis 3D Printer**: Designed a modular attachment to convert 5AXIS CNC to 3D Printer

**Path Planning**: Developed a tool for determining an optimum path between 2 points by avoiding obstacles

## RELEVANT COURSEWORK

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<b>Design &amp; Manufacturing</b>	Additive Manufacturing process, Metal Additive Manufacturing, Mechanics of Solids, Design of Machine elements, Advance Manufacturing, Design for AM, Interaction Design, Topology Optimization.
<b>Mathematics &amp; Programming</b>	Numerical Methods, Probability and Statistics, Engineering Mathematics Engineering Optimization, Data-Driven Design, Structural Optimization, Machine Learning*, Finite Element Analysis*.

## KEY PUBLICATIONS

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- Malviya, M.**, Agrawal, A., Yadav, P., Chang, Y. H., McComb, C. A systematic study of deep generative networks.
- Malviya, M.**, Desai, K. (2020). Build Orientation Optimization for Strength Enhancement of FDM Parts Using Machine Learning based Algorithm. Computer Aided Design and Applications.
- Mehta, P., **Malviya, M.**, McComb, C., Manogharan, G., Berdanier, C. G. P. (2020). Mining Design Heuristics for Additive Manufacturing via Eye-Tracking and Hidden Markov Modelling. ASME. J. Mech. Des.
- Malviya, M.**, Sinha, S., Berdanier, C., and Meisel, N. A. (May 22, 2020). Digital Design Automation to Support In Situ Embedding of Functional Objects in Additive Manufacturing. ASME. J. Mech. Des.
- Malviya, M.**, Berdanier, C. G., Buswell, N. T. Visual and statistical methods to calculate interrater reliability for time-resolved qualitative data: Examples from a screen capture study of engineering writing patterns. ASEE 2019

## ACTIVITIES AND ACHIEVEMENTS

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- Best Graduate Engineering Design** Penn State College of Engineering SP 2019
- Design Head, Team Racers IITJ** Ranked 12th in overall design event scoring 132/150. SAE India-Baja 2017
- Chief Organizer, FRAMED** Coordinated a team of 50 volunteers to organize a national level art exhibition. SP 2017
- Student Guide, Counseling Service** Guided a group of 10 freshers in transiting to college life. SP 2015 - SP 2018
- Captain, Video making club** Coordinated a team of 15 film makers. FA 2015 - SP 2016
- Design Instructor, Automobile Club** Delivered lectures on Automotive design process and CAD. FA 2015 - SP 2016
- Core Member, Team Racers IITJ** Ranked 13th in Virtual presentation round. SAE India-Baja 2016
- Placed among top 1%** of 1.5 million students IIT-JEE 2014
- All India Rank 5th**, National Science Proficiency Test NSPT 2012