

# Aman S Batra

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## SUMMARY

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Research Scholar at Indian Institute of Technology Bombay, pursuing a doctoral program at the Department of Systems and Control Engineering.

## EDUCATION

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Dual Degree (B.Tech. and M. Tech.) in **Mechanical Engineering** Jul 2014 - Jul 2019  
*Indian Institute of Technology, Kharagpur* CPI 8.31/10

## RESEARCH PROJECTS

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**Load Transfer in Lumbar Functional Unit during Physiological Motion** Jul 2018 - Jul 2019

*M. Tech. thesis under the supervision of Prof. Sanjay Gupta*

*Studied the mechanical effects of introduction of porous caged implants on replacing the degenerated inter-vertebral disc during Posterior Lumbar Interbody Fusion (PLIF) surgery.*

- Modeled lumbar spine by stacking CT scan images and processing the stack images to **create a 3D Geometry**
- Designed Pedicle Screws, Porous Titanium cages using CAD and assembled them to the lumbar unit model
- Carried out system level meshing for FEA and analyzed stress under nominally induced **biomechanical loads**
- **Analyzed range of motion** to predict the dynamics post LIF considering the loss in motion and increased stiffness

**Visualization Tool for Path Planning Algorithms** Jul 2017 - Jul 2018

*B. Tech thesis under the supervision of Prof. C S Kumar*

*Designed a software tool to animate path planning algorithms in 2D space. Such a tool can help intuitively understand how these algorithms actually work in a configuration space.*

- Programmed an interactive **visualization tool** to project path planning algorithms in the configuration space
- Implemented **Random Exploring Trees, Probabilistic Road-maps** based planning algorithms
- Added function for drafting obstacles and modified the algorithm to avoid obstacles and return a smooth trajectory
- Used a cascaded algorithm to search the complete space and then find the shortest path between start and end points

**Design of Suspension and Brake Systems for an FSAE car at Team KART** Jul 2014 - Jul 2019

*TeamKART is a student research group which designs, fabricates and tests formula style race cars and competes in national and international events. Suspension and brake subsystem is critical to the stability of the vehicle dynamics. System was optimized for minimum weight to improve control and efficiency.*

- Optimized wheel hub design using FEA considering **fatigue loads** to reduce weight by 10% for same Factor of Safety
- Processed experimental **53000 point** tire data to validate it with Pacejka model and calculate true coefficients
- Created custom calculators to find the loads on suspension control arms; braking force and pedal ratio
- Identified suspension points on vehicle chassis and wheel assembly to optimize camber angle during turning

## WORK EXPERIENCE

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**Scientist/Engineer 'SC', Control Actuation Systems** Jul 2019 - Jan 2022

*Quality Division for Mechanical Systems, VSSC, Trivandrum*

*Worked on the test analysis and quality assessment of control actuation systems for operational and developmental launch vehicles. Participated and generated assessment for various actuator level, system level and vehicle level tests.*

- **Automated data analysis** for electrohydraulic and electromechanical actuation systems used in launch vehicles
- Worked on technology development project, **modeled nonlinear elements** in electromechanical actuators
- Carried out **FMECA and FTA analysis** to assess the failure modes and risks involved in the system
- Studied feasibility of **throttability in generic earth storable liquid rocket engines** during induction project

## Part Allocation Optimization using Genetic Algorithm

May 2018 - Jul 2018

*Bosch Limited, Bengaluru*

*Worked at fuel pump production plant at Bosch, Adugodi as a part of pre-final year industry training. Identified rate determining step in planning and formulated a fitness function for optimization.*

- Standardized the production value stream for runner line of the plunger component of the fuel injection pump plant
- **Programmed a Genetic Algorithm** to automate part allocation for bottleneck processes in elements using VBA
- Identified a **potential 1% increase** in production by sequencing parts to reduce changeover time using GA

## Application of Image Processing Techniques in Agriculture

May 2017 - Jul 2017

*AgNext Technologies Pvt. Ltd.*

- Identified **farm boundaries** in drone/satellite images and calculated NVDI and farm area using image processing
- Coded to return plant count in germination stage and palm oil trees in fully grown state with **91% accuracy**
- Developed a **2D image stitching algorithm** which merged drone images to create high resolution farm maps

## KEY COURSE PROJECT

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### Watt's Linkage Mechanism for Railway Suspension

Jan 2017 - Apr 2017

*Design of Machine Elements, Prof. Sovan Lal Das*

- Developed CAD model of linkages and calculated FOS for linkages under bending, buckling and fatigue loading
- Validated the calculations by simulating motion in MBD software and developed a scaled down prototype
- Selected as one of the best out of 25 project, received funding for fabrication of a 3D printed prototype

## LEADERSHIP

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### Suspension and Brake Team Head

Jul 2016 - Jul 2017

*TeamKART, IIT Kharagpur*

- **Led the team** to design and fabricate the subsystem in compliance with the **178 page competition rulebook**
- Managed a **budget of INR 6,00,000** for procurement, manufacturing; coordinated with vendors for completion
- **Conducted** the Automobile Engineering Workshop for **200 freshers** to introduce them to CAD and FEA
- Led the cost analysis team to prepare and present **BOM and cost report** for the **Formula Bharat Competition**

### Product Design Team Head

Jul 2017 - Jul 2018

*Meghnad Saha Hall of Residence, IIT Kharagpur*

- Conceptualized "*Breath*", an outdoor convection based air filter for reducing pollution, presented it at OpenIIT
- Designed "*KshayVikaar*", a compact biomass based natural gas and electricity generator for inter hall competition

## TECHNICAL SKILLS

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**Programming:** Python, MATLAB, C, HTML, VBScript

**Tools:** Arduino, Solidworks, ANSYS, GIMP, Inkscape

## EXTRA CURRICULAR ACTIVITIES

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**NCC:** Actively participated in weekly drills for 4 semesters and attended the 10 day annual camp

**Chess:** 5<sup>th</sup> at District Championship, Nagpur and 6<sup>th</sup> at Divisions Championship, Vidarbha in 2012