Swapnil Jayant Kumar

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EDUCATION

Georgia Institute of Technology, Atlanta, USA (August '22 - Present)
- Online Masters of Science in Computer Science (OMSCS) | **GPA: 4/4**

Indian Institute of Technology Bombay, Mumbai, India (July '16 - Jul '20)
- Bachelor of Technology in Mechanical Engineering with Honours | **CPI: 8.89/10**
- Minor in Computer Science and Engineering
- Awarded **AA** grade in **21** courses for meritorious performance in a span of **8** semesters

WORK EXPERIENCE

Engineer, Data Science | Vehicle Health Informatics, Cockpit domain (Sept '20 - Present)
Jaguar Land Rover (Technology and Business Services) *Bengaluru, India*

Twitter Social Listening	**Objective:** *Connect engineering teams to the mined customer feedback from Twitter* • Developed **H-Top2Vec** which is an extension the Top2Vec model to perform **hierarchical topic modeling** on text data achieving NMI and **Purity** scores of **0.57** and **0.35**, respectively • Optimized the H-Top2Vec implementation to minimize redundant embedding generation thus, significantly reducing execution time (correlated to FLOPs) by **96.18%** • Implemented **class-based TFIDF** (cTFIDF) to generate the **top words** for topics • Significantly improved the quality of spam filtering pipeline by integrating profanity filter, lexicon based filter, and sentiment analysis into it • Adopted **ONNX** for deploying models to improve speed and resolved the dependency issues of the frameworks in **production** • Created deployment strategies for the project in **Google Cloud** and **Gitlab CI/CD** pipelines • Provided necessary support to the visualization team in flattening the recursive topic tree to a format suitable for import into BigQuery
Audionostics	**Objective:** *Fault diagnoses of vehicle engines using the in-car microphone to reduce warranty costs* • Designed and implemented a novel **Deep Learning** model to spatiotemporally analyze the log-mel **spectrograms** of the monaural microphone **recordings** and predict **engine faults** • Achieved an **accuracy** of **91.80%** and an **F1 score** of **0.736** on the test dataset • Used **Depth-Wise separable** convolutions to achieve **model compression** (approx. **73%** reduction in parameters) and **low-latency** online predictions on the data pipeline • Adopted **MLOPs** for deploying the model and provided the necessary support for integrating it with an **android app** • Defined a **system of JSON** files to label the audio data unifying the **labeling** used by models in the ensemble
Miscellaneous	• Spearheaded the **development** of **Angular**-based front-end of a companywide **web application** used by the 200+ employees to book office spaces, view ongoing projects, apply to them, view other's profile, and update their own • Created a **webpage** to share event updates and status for the JLR campus ambassador program • Contributed to the development of the company's human capital by **interviewing** and **mentoring** the recruits • Awarded **top performer** (5 stars) rating in the company for the year 2021-22

Research Intern | Cyber-Physical Research & Development Department (May '19 - Jul '19)
JFE Steel Corporation *Kawasaki, Tokyo, Japan*
- Developed an **implicit** transient, multi-phase **STAR-CCM+** model to simulate steel refining process in a converter
- Pioneered the **model simplifications** to limit the **convective-courant** number below **1**, resulting in **solutions** with significantly **improved** computational time and accuracy in line with the experimentally observed values
- Researched key **factors** like converter aspect ratio, outlet design parameters, surface tension, rotation rate, threshold angle and their **effects** on **efficiency** and **time** of the process
- Improved converter and outlet design, effecting **60%** reduction in process time & **10%** increment in output efficiency

IITB Mars Rover Team (Dec '17 - Jul '20)

*Part of 30-membered diverse team to participate in **URC**, an international competition organized in Utah, USA*

Leadership	• Co-lead and supervised a team of **30** students in mechanical, electrical and bioscience subdivisions working on the next iteration of a **prototype** Mars **rover**, capable of extra-terrestrial robotics • Secured rank of **31** among 95 participating international teams at **URC 2018, USA** (MDRS, Utah) • Presented the project & explained the attributes to participants in ResTech 2018 and TechConnect
Technical	• Spearheaded the design of an ambitious **4-wheeled dependent suspension system** for the rover to incorporate **control simplicity** in the robust design of **Rocker-Bogie System** • Contrived **Base Rotation Assembly** and optimized design to limit rover's weight under **50 kg** • Developed Universal Robotic Description Format (**URDF**) of the rover to model it in ROS packages • Explored simulation of Rover's **SDF** model on different surfaces created using heightmaps of greyscale images in **Gazebo**, to verify the terrain transversal capabilities and look for possible failures

KEY TECHNICAL PROJECTS

2-Stage Human Activity Recognition | Undergraduate Thesis (Jul '19 - Jul '20)

Guide: Prof. Asim Tewari   *Dept. of Mechanical Engineering, IIT Bombay*

Objective: To achieve Human Activity Recognition in monocular videos using an efficient 2-Stage approach

• Developed a **2-Stage approach** for Human Activity Recognition using **skeletal features** generated by pose estimation model as input to a **recurrent spatio-temporal** classifier
• The model achieved **98.19%** accuracy on **KTH** dataset at a lower computational cost than state-of-the-art methods
• Worked on extending the model for **multiple agents** and explored its applications in **assembly line safety**

Multiphase Modeling of mould filling in Epoxy Resin casting process (Mar '18 - Jul '18)

Guide: Prof. Abhilash Chandy   *Dept. of Mechanical Engineering, IIT Bombay*

Objective: To simulate the process of Resin injection for the casting of an insulation layer on a transformer core

• Involved in the development and meshing of **cast geometries** from raw CAD files of the mould
• Simulated resin flow in **2D** cast geometries on **ANSYS Fluent** using **implicit VOF multiphase criteria**
• Analyzed simulation data to gain useful insights regarding volume fraction and mass flow rate of the resin phase
• The project work was presented in Paper No. 490 of Fluid Mechanics and Fluid Power (FMFP) conference, 2018

Quaternion-based Model for Human Motion | IE643 (Autumn '19)

Course instructor: Prof. P Balamurugan   *Dept. of IEOR, IIT Bombay*

• Addressed the **prediction** and **generation** of **3D human poses** by improving **QuaterNet** (which is a recurrent network that models human motion using Quaternions-based representations of joint angles)
• Adopted a modified architecture inspired by **seq2seq** models to improve **computational efficiency** and reduce training time (by **53.6%**) of QuaterNet, without significant loss in accuracy

TECHNICAL SKILLS

Programming Languages	Python, C++, SQL, JavaScript LaTeX, HTML, CSS
Libraries	Numpy, Pandas, PyTorch, TensorFlow, Spark, Angular, ONNX
Supporting Technologies	Git, Docker, Gitlab CI/CD, Google Cloud Project, ANSYS, STAR-CCM+

KEY CREDITED COURSES

These courses were completed as part of the degree at Indian Institute of Technology Bombay

Computer Science	Data Science	Mechanical Engineering
Operating Systems	Advanced Topics in Deep Learning	Machine Design
High Performance Scientific Computing	Deep Learning - Theory and Practice	Heat Transfer
Data Structures and Algorithms	Engineering Data Mining & Applications	Strength of Materials
System Dynamics: Modeling & Simulation	Introduction to Machine Learning	Fluid Mechanics

CERTIFIED MOOCs

These are certified non-credited Massive Open Online Courses offered by renowned institutions

1. Natural Language Processing (NLP), *offered by* Microsoft, edX, Verified Certificate
2. Introduction to Git and GitHub, *offered by* Google, Coursera, Verified Certificate
3. Agile Software Development, *offered by* University of Minnesota, Coursera, Verified Certificate

REFRENCES

1. **Prof. Asim Tewari**, Department of Mechanical Engineering, IIT Bombay, Email: asim.tewari@iitb.ac.in
2. **Prof. Abhilash Chandy**, Department of Mechanical Engineering, IIT Bombay, Email: achandy@iitb.ac.in
3. **Kishore Karnala**, Software Architect, Jaguar Land Rover, Email: kkarana3@jaguarlandrover.com
4. **Shingo Sato**, JFE Steel Corporation, Email: shing-sato@jfe-steel.co.jp
5. **Prof. Balamurugan Palaniappan**, Department of IEOR, IIT Bombay, balamurugan.palaniappan@iitb.ac.in