

# SHANMUKHA VELLAMCHETI

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## SUMMARY

Doctoral student, currently trying to guide and ground Vision models in open world using common-sense reasoning via LLMs & prior knowledge in order to improve multi-object multi-relation detection and scene understanding. In the last 5 years, gained experience in all the stages of ML pipeline including literature survey, data collection & annotation, data analysis, model development and deployment through research/course work at AU, UCSD & NITRR, multiple internships and full-time roles. Proficient in Python, PyTorch, OpenCV, TensorFlow, Computer Vision and Natural Language Processing. Looking forward to contributing towards the Artificial General Intelligence (AGI) revolution

## EDUCATION

<b>Auburn University (AU), USA</b> <i>PhD in Computer Science and Software Engineering</i> Research areas: Multimodal Computer Vision, Open world scene understanding and even detection, Robotics Coursework: Advanced Topics in Algorithms, Advanced Computer Architecture, Advanced Operating Systems	Jan 2024 - present GPA – 4.0/4.0
<b>University of California San Diego (UCSD), USA</b> <i>Masters in Artificial Intelligence and Robotics</i> Coursework: Computer Vision, Sensing & Estimation, Motion & Planning in Robotics, Visual Learning, Statistical Learning, 3D Computer Vision, Recommendation systems etc.	Apr 2023 GPA – 3.42/4.0
<b>National Institute of Technology Raipur (NITRR), India</b> <i>Bachelors in Computer Science and Engineering</i>	Jul 2020 GPA – 9.09/10

## SKILLS

**Programming:** Python, C++, HTML, MATLAB, Java  
**Machine Learning:** PyTorch, OpenCV, TensorFlow, Huggingface, NumPy, Matplotlib, Scikit-learn, Pandas, OpenAI gym, Surprise, Beautiful soup  
**Data:** SQL, MongoDB, Airflow, Spark, Kafka, Tableau  
**Cloud:** AWS (S3, Redshift, Rekognition, Comprehend, Lambda, App runner), GCP, AutoML, Docker  
**Tools:** Flask, Git, Linux, Django, Isaac Sim

## PUBLICATION

<b>Class Imbalance Deep Learning for Bankruptcy Prediction</b> <i>IEEE International Conference on Power, Control and Computing Technologies (ICPC2T)</i> <ul style="list-style-type: none"><li>Lead the research on this <a href="#">paper</a>, as the first author, where we discussed the effects of highly imbalanced numerical data on Neural Networks and presented solutions to tackle this using sampling techniques like SMOTE</li><li>Improved the AUC-ROC metric by 5%-10% over the previous baseline using our approach</li></ul>	Jan 2020
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## WORK EXPERIENCE

<b>Auburn University</b> <i>Graduate Student researcher</i> <ul style="list-style-type: none"><li>Advised by Dr. Aakur, currently working towards improving the SOTA on open world scene understanding and object relation detection using transformer based scene graph generators in both normal as well as in a zero-shot setting by guiding it using LLMs (GPT, Llama &amp; Claude) &amp; prior knowledge</li><li>Optimized the code and cut its running time from 24hrs to 2hrs times for Steiner graph extraction from ConceptNet by identifying and eliminating bottlenecks using multiprocessing in Python</li></ul>	Jan 2024 - present
<b>Orangewood Labs</b> <i>Computer Vision Intern</i> <ul style="list-style-type: none"><li>Simulated the robot bin picking and object grasping problem using a custom robotic arm on Nvidia Isaac Sim to collect 1000s of images under warehouse setting from multiple custom camera viewpoints and extracted segmentation masks &amp; annotations</li><li>Attached and tested grasp detection models like GraspNet etc. to the front end of Isaac Sim simulation while using 7 different objects</li><li>Devised strategies for prompt engineering LLM models and integrated them as a chatbot into the above robot so that customers can command the robot through remote chat in natural language as sold the product in the name of RoboGPT</li></ul>	Oct 2023-Dec 2023
<b>Advanced Robotics &amp; Control (ARC) lab UCSD</b> <i>Graduate Student Researcher</i>	Feb 2022-Aug 2022

- Participated in the collection of 1000s of suturing images under surgical environments with help of medical experts using RGBD cameras
- Lead the preprocessing of all these images and annotation of a small diverse subsample with precise segmentation masks for quick initial experimentation and further synthetic data generation
- Brainstormed and executed several approaches combining edge detection neural networks like HED, Segmentation neural networks like UNet and our own variant of tangent based local grid search algorithm to improve the current baseline on automatic suture detection and achieved IoU scores ranging from around 0.2 to 0.9

#### **NIT Raipur (NITRR)**

Jan 2021-Jun 2021

##### *Machine Learning Associate*

- Developed a NN architecture with CoAttention mechanism at its core to tackle the problem of Aspect Based Sentiment Analysis (ABSA) and experimented its effectiveness on laptops and restaurant reviews datasets using ELMo embeddings
- Improved the performance on laptop reviews by 5% on baseline accuracy but it dipped by 4% on restaurant reviews
- Analyzed our model on the combined dataset and found that a probable cause for reduced accuracy in restaurant reviews is the excessive use of informal slang words as opposed to technical words in laptop reviews

#### **Omnipresent RobotTech**

Aug 2020-Dec 2020

##### *Computer Vision Engineer*

- Reduced the deployment cost by 50%, by doubling the no. of parallel CCTV streams that can be processed, using a combination of efficient Neural Network models (like YOLO, PeopleNet etc.) for social distancing & mask monitoring
- Ported the entire model codebase from TensorFlow to PyTorch using my proficiency with both the libraries
- Integrated our models with Apache Spark and Kafka to ensure scalability and low latency while processing higher number of parallel streams and to improve the ETL process

#### **Optum Global Solutions (UHG)**

May 2019-Jul 2019

##### *Deep Learning Intern*

- Coordinated with domain experts to understand a large-scale database containing medical jargon to extract important features and use them to predict the probability of insurance claim approval in the Medical Benefit Management System (MBMS) by building and testing multiple ML models in an agile CI/CD life cycle on Jenkins
- Achieved 92% accuracy model after running multiple experiments and exposed it as a REST API using Flask

## **PROJECTS**

### **A Pipeline to Solve Coding Problems from Images with LLM and OCR**

Oct 2023

- Built a pipeline to solve coding problems directly from its corresponding image using Tesseract for performing OCR of the problem text from the input image and python code LLAMA model for regressing the code. The overall accuracy depends on the accuracies of the individual models but at the very least the output can be a great starting point for solving the problem

### **Combined Approach for Pose Detection using DARK with UniPose**

May 2022

- Increased the Percentage of Correct Points (PCK) for our Pose Detection model on Leeds Sports Dataset by 4% after just 20 epochs by combining two different techniques – UniPose and Distribution Aware Keypoint (DARK) representation where the latter will generate refined heatmaps to improve the performance of the former

## **ACHIEVEMENTS & ACTIVITIES**

- Reviewer for CVPR 2025, ACM CODS-COMAD 2024
- Two-time lead TA for COMP 3700 Software Modeling and Design & one time for COMP 6700/5700 Secure Software Process at AU
- One of the only 3 recipients of Education Future scholarship through merit out of 8000 people in 2021
- Played a lead role in planning and executing projects to get to the finals and win out of 100s of teams at multiple hackathons like SKY Hack, Optum Global Hackathon, HCL Machine Learning Hackathon etc. where we worked on ML applications like Chatbots, License plate detector etc.
- Was an active Member of Research and Development Team of Association of Computer Engineers (ACE) where we organized conferences and workshops on latest technologies and trends
- Was member of Unnat Bharat Abhiyaan, which is a government initiative for social cause to help the development of literacy in rural areas