Meghana Rao Somepalli

Machine Learning Engineer
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SKILLS/TECHNOLOGIES

— **Technical**: machine learning, large language models, deep generative models, computer vision, computer graphics, image processing, medical imaging, natural language processing, data science, 3D modelling
— **Languages**: Python, MATLAB, Java, SQL, Bash, C, HTML, CSS, JavaScript, Arduino
— **Platforms/libraries**: LangChain, Hugging Face, TensorFlow/Keras, PyTorch, OpenCV, Linux, Git, Open3D, Trimesh, Blender

EDUCATION

UCL (University College London) **London, UK**
MSc in Computer Graphics, Vision, and Imaging ***(Merit)*** September 2022—September 2023

Amrita Vishwa Vidyapeetham **Bengaluru, India**
BTech in Computer Science Engineering ***(CGPA: 9/10, Distinction)*** July 2018—August 2022
(Awarded a 75%-tuition scholarship)

WORK EXPERIENCE

MeetImmi (side start-up) **London, UK**
Founding ML Engineer January 2024—present

Developing a production-ready **retrieval-augmented generation (RAG)**-based conversational AI assistant that provides personalised immigration advice to empower people to live and work wherever they want.

- Implemented RAG using **LangChain** and **OpenAI's chat models** to provide immigration advice. Responses are backed by relevant immigration policy data scraped from the gov.uk website using **Unstructured** (the data pre-processing library).
- Used **Mistral AI's instruct models** to maintain and update a **knowledge base** for each user based on their chat history to provide tailored responses based on user information like nationality, age, etc.
- Performed evaluation on retrieved documents, model responses, and prompts using the **Ragas framework** and analysed them using **LangSmith**.

Bosch **Bengaluru, India**
Data Scientist January 2022—June 2022

Developed a data pipeline for **predicting battery drainage** in electric vehicles and analysing influential features to analyse the necessary sensors for data collection.

- Modelled the battery drainage of a trip with features like altitude, climate and other road characteristics using sensor and Google Maps data.

ISRO (Indian Space Research Organisation) **Bengaluru, India**
Research Scientist January 2021—March 2021

Analysed and accounted for the **systematic error** in centroiding algorithms like Centre of Mass (CoM) to increase the accuracy of finding the centre of star images.

- Worked on error-predicting algorithms like the **Extreme Learning Machine with Bat algorithm** as an optimiser (BA-ELM), **1D Gaussian Fitting**, and **Fast Gaussian Fitting**; BA-ELM algorithm increased the accuracy of the CoM algorithm by 40%.
- Analysed image smoothing algorithms like **Savitzky-Golay Filters** and their effect on CoM accuracy.
- Evaluated **star tracking** algorithms to predict the centroid locations for faster extraction of stars from an image.

PUBLICATIONS

Implementation of Single Camera Markerless Facial Motion Capture using Blendshapes January 2022
5th International Conference on Computational Systems and Information Technology for Sustainable Solution (CSITSS)
Authors: ***Meghana Rao Somepalli****, M.D. Sai Charan, S Shruthi, Suja Palaniswamy*

- Researched the feasibility of employing a single camera for **real-time facial MOCAP** by driving the weights of Facial Action Coding System (FACS)-based blendshapes using inter-landmark distances by detecting and tracking 68-point facial landmark data using the **Face Alignment Network** model.
- This approach eliminates the need for multiple cameras to obtain depth information, as blendshapes add constraints to the movement of the mesh and avoid unnatural deformation. This work was implemented in **Blender**.

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SELECTED PROJECTS

Q-MoGraph (master's thesis) July 2023—September 2023

Generated a motion sequence of a 3D character following a user-defined path while performing specific actions like "walking" or "ballet" using the motion graph algorithm by Kovar et al. (2002).

- A multimodal generative model (**T2M-GPT—VQ-VAE + Transformer**) was used to learn the quantised representation (codebook) of the **HumanML3D** motion dataset.
- The **codebook indices** were used to construct a motion graph which was connected using two types of edges—motion edges (decoded indices, i.e., motion) and traversal edges that enable smooth transitions between pairs of sampled motions.
- The motion graph algorithm dictates traversal of the graph and generates a new continuous motion along a user-specified path, achieved by selecting motion edges that adhere to the user-specified path.

Iron Overload Estimation January 2023—March 2023

Estimated liver iron content to determine chelating agent dosage for beta thalassemia treatment as a part of coursework for Computational Modelling for Biomedical Imaging.

- Investigated curve-fitting algorithms like the **Alternating Direction Method of Multipliers (ADMM)** and **Levenberg-Marquardt (LM)**—on average ADMM outperformed LM.
- Solved the **ill-posed inverse problem** of finding the original signal intensity $\boldsymbol{a}$ and the inverse of T2* decay $\boldsymbol{r}$ from the T2-weighted MR image.
- Analysing $\boldsymbol{r}$ gives us the extent of iron overload, thereby helping us estimate the dosage of chelating agents.

Segmentation of Prostate Gland January 2023—March 2023

Performed automatic segmentation of the peripheral and transition regions of the prostate gland using T2-weighted MRI scans to speed up prostate cancer detection as a part of Machine Learning in Medical Imaging coursework.

- Explored two architectures: one is a 2D architecture utilising a **ResNeXt50 encoder** and a **DeepLabV3Plus-based decoder**; the other is a 3D version of the **U-Net architecture**. Both were augmented with an auxiliary model that classifies other regions of the prostate gland like bladder, pelvic bone, etc.
- The auxiliary model increased the performance of the baseline model by 30% (decrease in Hausdorff Distance)—as segmenting other regions provides additional contextual information.
- The 2D architecture outperformed the 3D architecture; however, this may be due to a limited data set (while the 2D model treats every slice as a datapoint, the 3D model must treat the whole scan as a datapoint).

PROctor January 2021—May 2021

- Developed an online proctoring system with surveillance features like **face recognition** from a logged database, **real-time object detection**; generated alerts if unauthorised objects like mobile phones or calculators are detected, and **gaze tracking** using blob detection algorithms.
- Monitored active windows and generated an alert if an un-whitelisted window was opened while taking the exam.

CERTIFICATIONS

Building RAG Agents with LLMs by Nvidia

Generative AI with Diffusion Models by Nvidia—Credential ID a_VSYfk8ReKvK7eiIA1xmQ

LangChain for LLM Application Development on DeepLearning.AI

LangChain Chat with Your Data on DeepLearning.AI

Deep Learning Specialisation on Coursera—Credential ID PMKWEPRFKHBT

Machine Learning on Stanford Online—Credential ID U3HZMLEKY9G3

LEADERSHIP EXPERIENCE

UCL AI Society September 2022—September 2023

Tutorials Officer

Delivered lectures to members of the AI Society on various machine learning topics, including data reduction methods such as **PCA and autoencoders, generative models, deep learning, natural language processing, explainable AI, and adversarial attacks**.

ACM Student Chapter at Amrita Vishwa Vidyapeetham July 2020—June 2021

Data Science SIG Mentor

Mentored 20+ students and delivered workshops on deep learning—**convolutional neural network concepts like activation functions, back propagation, gradient descent, etc.**