SANKET DESHPANDE

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EDUCATION

Master of Science, Computer Science -- Georgia State University Aug 2023 – Aug 2025

Bachelor of Science, Computer Science -- Vellore Institute of Technology July 2016 – June 2020

PROFESSIONAL EXPERIENCE

Digital Studio Labs **San Francisco, CA, USA**
Founding ML Engineer *July 2025 - Present*
- Cre8able: Built and launched a multimodal video-editing platform from idea to live beta in 6 weeks. Reduced creator editing workload by 70%, delivering clip generation via Gemini + FFmpeg on FastAPI/S3.
- Designed and deployed context-aware recommendations that combined planning context with chat history, improving adoption of suggested edits by 25%.
- Whisker: Shipped an LLM pet-care assistant in 2 weeks. Built a containerized RAG backend (Postgres + FastAPI) with sub-second response streaming; scaled to 50+ weekly active beta users.

TReNDS **Atlanta, GA, USA**
Machine Learning Researcher *May 2024 - August 2025*
- Built and scaled 3D ML pipelines for cognition prediction on a 12k+ subject, 300GB MRI dataset, turning raw neuroimaging into predictive insights for neuroscientists.
- Designed a custom 3D CNN with Multi-Head Self-Attention + Squeeze-and-Excitation, achieving 0.34 correlation (+15% vs. CNN baselines) and outperforming ViT and Swin Transformer approaches.
- Optimized distributed training with PyTorch DDP on a 4× GPU HPC cluster (SLURM), achieving a 7× training speedup. Ensured reproducibility with YAML configs, checkpoints, WandB, and MLFlow.
- Delivered explainable neuroimaging models using Scikit-learn, SHAP, and GradCAM, producing voxel- and region-level maps that uncovered new brain–behavior pathways.
- Published findings at IEEE ISBI (Texas, 2025) and EMBS (Denmark, 2025), validating the cerebellum's role in cognition and strengthening neuroimaging explainability research.

MORSE Studio **Atlanta, GA, USA**
Computer Vision Engineer *August 2023 - April 2024*
- Designed a mmWave radar perception pipeline, applying Range/Doppler FFT analysis to characterize material signatures; released open-source experiments that advanced radar-based perception.
- Developed a C-based UDP socket tool for TI mmWave radar (IWR16843 + DCA1000), enabling faster data capture and multithreaded radar stream handling — replacing proprietary tools and improving flexibility.
- Prototyped an event-driven imaging system with Luxonis neuromorphic sensors, decoding high-frequency LED signals using SciPy's Lomb–Scargle method and Python concurrency for precise real-time signal demodulation.

Harman International **Bangalore, KA, India**
C++ Engineer I *October 2020 - June 2023*
- Delivered production-grade C++ navigation algorithms for premium automotive OEMs (Mercedes, BMW, Audi), shipping into global vehicles and directly impacting real-time routing performance at scale.
- Engineered and deployed optimized A* navigation systems in modern C++ (C++14), resolving 350+ critical bugs and delivering 10+ major features under Agile/Scrum workflows.
- Reverse-engineered map provider APIs to classify ambiguous road link types in dense European urban networks, improving routing accuracy and navigation reliability.
- Implemented cyclic node elimination to optimize the A* search frontier in sparse North American road networks, reducing computational latency and ECU resource usage.
- Applied advanced object-oriented design, RAII, multithreading, mutex synchronization, and smart pointer–based memory management to meet strict automotive embedded performance requirements.

KPIT **Pune, MH, India**
Computer Vision Intern *May 2018 - July 2018*
- Built a real-time sensor-fusion pipeline (Raspberry Pi, camera, Arduino, CAN) on the car to stream multi-modal data to the cloud, enabling CV training and saving 5 hrs/week
- Developed an offline tracking tool used YOLOv2 for frame-by-frame detection, integrating it with KCF and Kalman Filter trackers for car/pedestrian labeling, thereby eliminating manual annotation and saving 2 hrs/dataset

PUBLICATIONS

Fronto-Thalamo-Cerebellar Circuitry in Predicting Cognition and Behavior of ABCD Adolescents
ISBI 2025 (1-page abstract) **[View]**   EMBS 2025 (4-page paper) **[View]**

PROJECTS

Multi Agent Debate for Movie Consensus
- Implemented a multi-agent debate framework where LLM agents with distinct personas engaged in adversarial yet cooperative dialogue to refine reasoning chains and reach a consensus recommendation.
- Adopted an LLM-as-Judge evaluation loop that performed verbalized self-critique and argument scoring, yielding a significant improvement in coherence and factual alignment over single-agent baselines.
- Engineered RAG pipeline with ChromaDB vector search and Gemini 1.5 Flash for personalized recommendations, combining semantic retrieval with LLM reasoning for context-aware movie suggestions
- *Link to Project*

Visual Py-SLAM Toolkit
- Developed a fully end-to-end modular SLAM pipeline from raw video frames to trajectory visualization, providing a comprehensive educational framework for Computer Vision students and researchers to understand, experiment with, and extend core SLAM components without handling complex integration challenges.
- Implemented technical components including ORB feature detection/matching, essential matrix decomposition, RANSAC-based outlier rejection, and scale initialization to accurately estimate camera trajectories with robust performance on challenging indoor sequences
- *Link to Project*

Statistical Machine Learning for Fronto-Cerebellar Circuitry in Cognitive Prediction
- Neuroimaging Processing: Preprocessed sMRI and dMRI data from the ABCD dataset (N=10,000) using SPM12, DARTEL, and FSL. Extracted GMV and FA features, reducing preprocessing time by 20% through pipeline optimization.
- Predictive Modeling: Built Bayesian Ridge Regression, SVR, and Neural Networks for cognitive score prediction. Bayesian optimization improved SVR r^2 by 15% over default settings.
- Evaluation Metrics: Applied nested 5x5 cross-validation for robust evaluation. Achieved r^2 of 0.065 ± 0.009 for working memory using fronto-cerebellar-thalamo-parietal circuitry, outperforming fronto-parietal models.
- Comparative Insights: Conducted paired t-tests ($p < 0.05$), showing 12% higher correlation in predicting cognition with fronto-cerebellar features, highlighting the cerebellum's role in attention and working memory.
- *Link to Project*

Detection of milli-sized objects mmWave Radar
- Millimeter-Wave Object Detection: Detected millimeter-sized objects using 60 GHz IWR1683ISK FMCW mmWave radar hardware, leveraging MATLAB Radar Toolbox and Python libraries for advanced data processing.
- Precision Experiments: Detected penny-sized objects at a distance of 2m, surpassing the documented maximum range in controlled environments, utilizing MmWave Studio and Lua scripting for precise hardware control.
- Signal Analysis: Analyzed Range and Doppler FFTs to identify detection signatures across 6 materials and 5 distances using advanced signal processing techniques.
- *Link to Project*

Pose-Assisted TrackFormer: Enhanced End-to-End MOT Model
- Enhanced the TrackFormer model, developed by TUM and Facebook, by integrating pose estimation to improve identity consistency and tracking robustness.
- Developed a Pose Encoding Module using pretrained Keypoint R-CNN to extract (17 x 3) pose features (keypoints with spatial and visibility confidence), which were fused with track embeddings via a learnable linear fusion layer.
- Extended the DETR (Detection Transformer)-based architecture to incorporate pose data, optimizing detection, tracking, and association of tracks with Hungarian Matching, enabling robust re-identification even under occlusion.
- Trained on the MOT17 and CrowdHuman datasets using a two-step pipeline, evaluating performance improvements with MOTA and IDF1 metrics
- *Link to Project*

SKILLS

Skills: Python, OpenCV, Pytorch, Tensorflow, Keras, NumPy, Pandas, MATLAB, C/C++, Jupyter, Linux/Unix, Open3D, 3D Reconstruction, SLAM, Object Tracking, Airflow, AWS, Computer Vision, CUDA, Data Analysis, Data Structures & Algorithms, FastAPI, Kafka, Redis, Docker,Data Science, Flask, Git, LLM, Machine Learning, Neural Networks, Scikit-learn, Seaborn, Signal Processing, Radar, AWS Sagemaker