Rakesh Chowdary Machineni

Rakesh Chowdary Machineni | MRakeshC@umich.edu | +1 734.968.9425 | Personal Web

SUMMARY

AI Researcher and Full-Stack Developer with 5+ years of experience specializing in computer vision and multimodal AI solutions. Proven track record publishing in top-tier venues (CVPR, CVIU) and developing/deploying impactful AI solutions across diverse industries, including automotive and retail.

EDUCATION

Masters in Electrical and Computer Engineering (Computer Vision Specialization) 2021 – 2023
University of Michigan **(GPA of 4.0/4.0)** Ann Arbor, Michigan
- Research focused on developing novel learned-based Video, Point Cloud & Image Compression Models

Bachelor of Technology in Electrical Engineering 2015 – 2019
Indian Institute of Technology Tirupati **(CGPA of 8.90/10.0)** Tirupati, India
- Hands on experience with C/C++, Python, OpenCV, ROS, Raspberry Pi, Arduino, Autonomous Bot Perception

PUBLICATIONS & PATENTS

- Bijan Sayyarrodsari, **Rakesh Chowdary Machineni**, Shashank Gupta, Kadir Liano "Systems and Methods for Identifying and Controlling Operational Targets", 2024 (Patent Filed).
- **Rakesh Chowdary Machineni**, Bijan Sayyarrodsari, Kadir Liano "Managing Noise in labels for Machine Vision at low computational cost", 2024 (Patent Filed).
- Bowen Liu, **Rakesh Chowdary Machineni**, Yu Chen, Shiyu Liu, Hun Seok Kim "MMVC: Learned Multi-Mode Video Compression with Block-based Prediction Mode Selection and Density-Adaptive Entropy Coding." in The IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2023.
- **Rakesh Chowdary Machineni,** G. E. Spoorthi, Krishna Sumanth V, Subrahmanyam G, Rama Krishna S. S. G "End-to-end deep learning-based fringe projection framework for 3D profiling of objects." Comput. Vis. Image Underst. 199: 103023 (2020).

PROFESSIONAL SERVICE

- **Reviewer Experience:** WACV 2026, AAAI 2026, CVPR 2026 (Active), BMVC 2025, Information Fusion Journal 2025, Journal of Optics 2025, ICML 2025 Workshops (PUT, LXAI, FMSD), CVPR 2025 Workshop (DemoDiv), ICCV 2025 Workshop (MIRA, LIMIT, MemVis, RIWM), NeurIPS 2025 (LXAI), ICOMP 2025, CSAE 2025.

EXPERIENCE

- **Research Scientist – Computer Vision | Rockwell Automation | Austin, TX** July 2021 – Present
  - Designed **LenzAI**, a closed-loop machine vision AI software enabling seamless industrial operator use for data labeling, model training, performance monitoring, and analytics (including time-series visualization).
  - Advanced AI-driven data labeling platform combining Vision Language Model (Molmo) with SAM (point prompts) for Instance Segmentation, reducing per-image annotation time by **10X**.
  - Developed **a** Model-Health (MH) monitoring system that detected data distribution shifts to trigger an Active Learning strategy, reducing training data needs by **~30%** while maintaining model performance, and alerting industry operators of potentially unreliable inferences (false positives).
  - Developed a novel unsupervised depth-based wrinkle detection system for automotive seat inspection resulting in **83%** precision and **97%** recall (publication underway).
  - Generated heatmaps using depth analysis to visualize wrinkle severity and guide operator during labeling process of seats-wrinkles (patent filed).

- Created a Zone Transformation technique that dynamically adapts analysis (wrinkly) regions to overcome geometric seat misalignments, eliminating manual ironing-bot recalibration.
- Engineered a real-time, video-based AI (CPU/GPU optimized) to perform dynamic state classification (e.g., different fan speeds) and drive automated closed-loop system actuation (patent filed).
- Developed a multimodal approach applying Normalizing Flows (unsupervised) on the joint distribution of raw infrared (IR) data fused with DINO features from RGB images for robust defect detection.
- Generated synthetic defects on tire images using an AdaBLDM-based diffusion model for data augmentation.
- Implementing a Vision Language Model (Molmo type) for automated image quality assessment, providing operators with natural language explanations of image issues.
- Deployed the scalable LenzAI vision system (Docker/Portainer) across **3+** paying customers, processing over 100,000 images monthly with **99.00%** uptime.
- Engineering seamless integration with PLCs (e.g., Rockwell, Siemens) and industrial cameras (e.g., Cognex, Keyence, GenICAM), achieving sub-**50ms** latency in real-time applications.
- **Tools:** Django, React, RTKQuery, Redis, OpenCV, PyTorch, Spark, MLLib, ONNNX, PostgreSQL

- **Graduate Research Assistant | University of Michigan | Ann Arbor, MI** Jan 2022 – April 2023
  - Proposed Multi-Mode Video Compression (MMVC) framework with block-based prediction mode selection and adaptive entropy coding, **CVPR 2023**.
  - Outperformed SOTA learning-based and conventional codecs on popular benchmark datasets in PSNR & MS-SSIM metrics, specifically a **1dB** PSNR and **0.02** MS-SSIM improvement at a very low, **0.1** bit-rate .
  - **Tools:** Qualitative and Quantitative Studies, PyTorch, RAFT, Arithmetic Coding, Quantization, ConvLSTM
- **Computer Vision Engineer | Toshiba Software Pvt | Bangalore, India** July 2019 – July 2021
  - Designed an Item Recognition software for No Touch Checkout, enabling automated billing in grocery stores.
  - Deployed solution achieved a **98%** classification accuracy in real-time speed.
  - **Tools:** Keras, Tensorflow, fine-tuned CNN's, Jupyter, Classical Computer Vision methods, PyQt
- **Undergraduate Research Assistant | VISA Lab | Tirupati, India** Aug 2018 – June 2019
  - A novel end-to-end deep learning model to profile the **3D** shape of objects from deformed fringe patterns, **CVIU 2020**.
  - Reconstructed shaped at **-5dB** SNR with a **0.005** RMSE surpassing traditional approaches by **10** folds.
  - **Tools:** PyTorch, 3D Vision, Optical Metrology, Fringe Projection Profilometry, Cuda

OTHER PROJECTS

- **Stock Predictor:** Built an IR system using query expansion and DistilBERT to predict relevance of text to stock price movements, achieving **0.8593** MSE. (**link**)
- **Vision Transformer & SiamRPN++:** Finetuned ViT for **99.5%** CIFAR-10 and **84.65%** Tiny ImageNet accuracy; implemented SiamRPN++ tracker with **51%** EAO. (**link**)
- **NLP Models:** Developed RNN, LSTM, and attention-based captioning models scoring up to **18.1** BLEU on COCO; built transformer for arithmetic operations. (**link**)
- **Image Generation & Style Transfer:** Implemented GAN variants to generate MNIST-like digits; performed artistic style transfer using content, style, and TV losses. (**link**)
- **Annotation Tool & Grad-CAM:** Designed polygon annotation tool; conducted Grad-CAM analysis on ImageNet-trained ResNet50. (**link**)
- **Object Detection:** Achieved **43.63%**, **35.28%**, **40.51%** mAP on VOC with FCOS, YOLO, and Faster R-CNN; built a simple CLIP-like model for image-text retrieval and ImageNet classification. (**link**)
- **Depth, Panorama, Navigation:** Implemented stereo rectification, ORB/RANSAC panorama stitching, and depth estimation for autonomous systems.