Srikar Mutnuri

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Education

University of Southern California, Los Angeles, USA August 2021-May 2023
Master of Science, Electrical Engineering (GPA: *3.72/4.00*)

- *Relevant Courses*: Advanced Linear Algebra, Graph Signal Processing, Causal Inference, Deep Learning, Medical AI, ML Optimization

GITAM Deemed University, Visakhapatnam, India June 2012-April 2016
Bachelor of Technology, Electronics and Communication Engineering (GPA: *3.80/4.00*)

- *Relevant Courses*: Digital Signal Processing, Communication Systems, Data Structures & Algorithms, VHDL, Control Systems, Antennas & Wave Propagation

Research Experience

Srivastava Group, USC Spring 2023 - Present
Majd Al Aawar, *Srikar Mutnuri*, Mansooreh Montazerin, Ajitesh Srivastava. "Global Prediction of COVID-19 Variant Emergence Using Dynamics-Informed Graph Neural Networks" (arXiv: 2401.03390)

HaRVI Lab, USC Summer 2022 - Present
Yang Chen, *Srikar Mutnuri*, Haylee Mota, Heather Culbertson. "Dense Magnet Array for MR Fluid-Based Fingertip Haptics Interface: Integrating Vibrotactile and Adhesion Feedback" (work-in-progress)

E2S2C Group, USC Fall 2022 - Spring 2023
Yue Hu, Xinan Ye, Yifei Liu, Souvik Kundu, Gourav Datta, *Srikar Mutnuri*, Namo Asavisanu, Nora Ayanian, Konstantinos Psounis, Peter Beerel. "FireFly: A Synthetic Dataset for Ember Detection in Wildfire." 5th Workshop on Artificial Intelligence for Humanitarian Assistance and Disaster Response (ICCVW'23). (arXiv: 2308.03164)

Teaching

- **Graduate Course Producer**, CSCI 526 Advanced Mobile Devices & Games, USC Fall 2022 - Spring 2023
- **Graduate Course Producer**, CSCI 420 Computer Graphics, USC Fall 2022

Professional Experience

University of Southern California May 2022-May 2023
Graduate Research Assistant, Course Producer

- Generated synthetic data using Unreal Engine for ML Inference, built data pipelines using PyTorch improving mAP by ∼8.5% in-the-wild
- Built custom VR scenes using Unity & processed sensor data to map user interactions for haptic feedback through custom wearables
- Developed offline inference module for real-time pose detection on video streams
- Designed course materials, delivered graduate level lectures on integrating game analytics and mentored students on utilizing real-time data to improve game play (Unity WebGL), and on computer graphics (OpenGL)

TCS Interactive, Tata Consultancy Services August 2016-August 2021
Senior Software Engineer - Immersive Technologies

- Designed and optimized ETL pipelines, frameworks, and architectures to accelerate cross-platform game & XR app performance
- Collaborated with TCS Research Labs to conceptualize and build applications for user studies
- Improved data migration speeds by building automated big-data ingestion frameworks on top of Hadoop stack
- Utilized design patterns to architect reusable application modules & templates for games and reduced delivery timelines by over 60%
- Led over 8 project proposal submissions and handled system design to integrate solutions with client infrastructure
- Managed full lifecycle of 10 cross-functional projects using Agile processes to ship high quality apps on schedule.
- Analyzed market trends and interpreted statistical data to define project road-maps, and establish R&D guidelines
- Presented technical game/XR app development capabilities and interactive demos to CXO-level clients

Kodeco (formerly raywenderlich.com) March 2021-December 2021
Unity Tutorial Team Member - Tech Editor

- Served as the tech editor for various tutorials and a book, focusing on improving the overall quality of articles, validating and technically enhancing them
- "Unity Apprentice" book which serves as an introduction to building 3D games using Unity, published March 2022
- "Introduction to Asynchronous Programming in Unity" to show the use of async methods to parallelize in-game tasks, published December 2021
- "Improving Game Visuals with Unity's HDRP" tutorial to teach users about enhancing visuals using the HD render pipeline, published November 2021
- "Using the Terrain Tools in Unity" tutorial, for building immersive scenes using the terrain tools, published October 2021

Academic Projects

Dynamics Informed Graph Neural Networks *Python - PyTorch, PyTorch Geometric*
Research Associate, USC (Srivatsava Group (arXiv: 2401.03390))

- Researching the use of variant dynamics informed GNNs for tracking disease spread and epidemiology
- Working on enhancing the network model and running ablation studies to test various hypotheses

Haptic Wearable Interface *Unity, Quest 2, Python*
Student Researcher, USC (HaRVI Lab (Ongoing))

- Designing custom VR environments using Unity to map user interactions for haptic feedback through custom wearable
- Implemented UDP modules for multi-channel signal transmission to an electromagnetic array via RasPi and HiFiBerry

Synthetic Data Generation for ML Inference *Unreal Engine, C++, Python - PyTorch, pandas, SLURM*
Graduate Student Researcher, USC (E2S2C Lab (arXiv: 2308.03164))

- Built virtual environments using the Niagara system and Blueprints in Unreal to generate synthetic geospatial data
- Developed data processing pipeline for ML inference (segmentation) on the edge using PyTorch

Agent Based Network Models to Predict Influenza-Like-Illnesses *PyTorch Geometric, torchsde*
Student Researcher, USC (Course Project, EE638 Sp23)

- Implemented message passing for agent based network models to capture low level interactions in a population
- Explored the use of stochastic models to predict disease dynamics and forecast spread

Graph Spectral Analysis for Causal Learning *Python - pandas, scikit-learn*
Academic Project, USC (Course Project (ongoing), EE599 Fa22)

- Attempted to identify causal structure using graph spectral analysis
- Analyzed Jordan normal forms to discover equivalence graphs under causal interventions

Point Cloud Denoising using Graph Signal Processing *Python - PyTorch Geometric, scikit-learn*
Academic Project, USC (Course Project, EE599 Sp22)

- Performed spectral analysis to denoise 3D point clouds using Graph Fourier Transforms
- Implemented graph wavelet transforms and diffusion filters to study point cloud structures

Sign Language Recognition through Transfer Learning *Python - PyTorch, MediaPipe, OpenCV*
Academic Project, USC (Course Project, EE541 Sp22)

- Used transfer learning on existing ImageNet architectures to classify static ASL images.
- Developed offline inference module for real-time detection on video streams

Analyzing Traffic and Density Patterns Using Unique Identifiers *MongoDB, Python - PySpark, pandas*
Academic Project, GITAM (Bachelor Thesis)

- Designed a scalable system to identify population density patterns across regions
- Analyzed mobile CDRs using Apache Spark for predicting traffic congestion in networks

Skills

Programming	C#, Python, C++, Java, SQL
XR Tools	Unity, Unreal Engine, ARCore, ARKit, OpenXR, WebRTC, Blender, A-Frame, three.js
ML Frameworks	PyTorch, NumPy, SciPy, pandas, scikit-learn, OpenCV
Others	git, Android Studio, Xcode, AWS, GCP, Terraform, Snowflake, Docker, Jupyter

Awards

- **Most Innovative Usecase Award**, Adobe India Hackathon 2019
- **Innovation Awards of Excellence** (multiple), Tata Consultancy Services 2016 - 2021

Conferences & Societies

Invited Talks

- **PyCon India**, Augmented Reality with Python Oct 2019
- **FOSSASIA Singapore**, Augmented Reality for Mobile Mar 2019

Attended

- **UIST 2023** (San Francisco, CA - Student Volunteer) Oct 2023
- **SIGGRAPH 2023** (Los Angeles, CA) Aug 2023

Membership: ACM (Professional), SIGGRAPH, SIGCHI, IEEE (Student)

Professional Work

AR Digital Twin *Unity, C#, Swift(iOS), Custom SDKs*

Technical Lead, TCS

- Architected a reusable AR template enabling users to visualize, design, and customize digital twin simulations
- Developed networking & data integration connecting digital twins to IoT devices, synchronizing object states
- Implemented core AR capabilities like spatial mapping, and indoor navigation using SLAM and custom SDKs

Custom XR Module Integration *Unity, C#, Cordova(iOS)*

Technical Lead, TCS

- Engineered reusable XR modules for client's enterprise apps and low-code platform.
- Developed performant AR camera, gesture handling, 3D overlays using Unity and Cordova plugins for iOS.
- Created Unity scripts and prefabs that abstracted XR functionality for easy integration in R&D

Mobile 3D Puzzle Game *Unity, Swift, Java*

Game Designer & Lead Backend Developer, TCS *(Cyber Defense Global InfoSec Award winner, 2022)*

- Designed core gameplay systems and mechanics for a 3D point & click adventure game with a UI based story
- Optimized REST API networking calls, and runtime performance for smooth & responsive gameplay on mobile
- Built data binding for UI, custom workflows for SSO, and native mobile apps as wrappers for Unity-as-a-library

AR Retail Companion – Travel Assistant *Unity, C#, ARCore, Java (Android)*

Full-stack Developer, TCS *(Most Innovative Use-case Award Winner, Adobe India Hackathon)*

- Implemented primitive AR-based indoor navigation and mapping to guide users within an airport
- Integrated with Adobe Experience Manager to fetch real-time personalized recommendations and travel data
- Developed Unity components to visualize recommendations and travel information in context through AR overlays.

5G V2X Simulation Module *Unity, c#, Java*

Full-Stack Developer, TCS

- Developed performant traffic simulation in Unity to model vehicle movements and interactions in urban environments for research
- Implemented networking APIs for integration with 5G V2X infrastructure, sensors, and external traffic control systems
- Programmed realistic vehicle AI with collision avoidance, traffic rule following, and navigation behaviors

VR Training App for Quest 2 *Unity, C#, Oculus SDK*

Technical Lead, TCS

- Developed immersive VR app to train HCPs on using a new eye-care product, and raise awareness of various eye disorders
- Implemented custom analytics and data processing modules to track user behavior within the app and suggest corrective measures
- Built and integrated custom CMS and survey components to fetch data from existing training modules

Virtual Human Interface for Support Applications *Unity, Python - TensorFlow, NLTK*

Full Stack Developer, TCS

- Created realistic, customizable virtual human avatar in Unity for conversational AI applications
- Developed backend integrations with Python to connect avatar with multiple chatbot services
- Optimized lip sync, body language animation to improve realism and user engagement