Venkat Suprabath Bitra

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Education

Columbia University, USA **Starting Sep 2024**
Masters of Science in Computer Science

IIIT Bangalore, India **Aug 2019 – Jul 2024**
Integrated Masters of Technology in Computer Science and Engineering *3.85 / 4*

Experience

International Institute of Information Technology Bangalore **Jan 2024 – Jun 2024**
Master's Thesis Project *Bangalore, India*

- Optimized Moving Object Segmentation using an existing model on Two RGB frames and geometric properties of image formation.
- Detailed case studies on different cost maps of the model and identifying the limiting cases and improved the model performance through cost correction as a post-processing step.
- Integrated Panoptic Segmentation along with Optical flow to improve semantic awareness to further improve accuracy of the model.

Statistics and Machine Learning Laboratory, UBC Okanagan Campus **Aug 2023 – Dec 2023**
Research Intern *Kelowna, Canada*

- Performed statistical analysis for unsupervised classification of radiochromic film data for different radiation doses of biomedical samples.
- Identification of a loss function to improve performance of 1D CNN model for data pre-processing of spectroscopic data for biomedical applications.

Adobe Research **May 2023 – Jul 2023**
Research Intern *Bangalore, India*

- Create visually cohesive branded images/designs of a product based on brand references and guidelines.
- Worked on diffusion models and incorporated multimodal constraints in form of text and visual inputs to enhance controlled image generation streamlining design creation.

Multimodal Perception Lab, IIITB **Jan 2023 – May 2023**
Research Intern *Bangalore, India*

- Implemented a novel UV texture map based design for generation and semantic manipulation of virtual human heads in 3D space using GANs.
- Demonstrated strong identity preservation during semantic manipulation of features such as age, gender, and facial hair in different 3D orientations.
- Provided approach is simple and agnostic to 3D components such as lighting and rendering, enabling seamless integration into standard 3D graphics pipelines.

Laser Materials Processing Division, RRCAT **Dec 2022 – Jan 2023**
Research Intern *Indore, India*

- Demonstrated a novel application of TinyML for realization of next-generation offline on-device ML computation for Raman spectrometers.
- Implemented various ML/DL models like PCA-SVM/kNN/LR, CNN, DNN etc. for smartphones to perform Raman spectra analysis for on-site applications.
- Developed Android app for controlling Arduino Mega based linear four axis CNC workstation for different human-free laboratory experiments.

Multimodal Perception Lab, IIITB **May 2022 – Dec 2022**
Research Intern *Bangalore, India*

- Studied GAN based models for style transfer and lip synchronization in audio-video generation.
- Implemented different style transfer and lip synchronization GAN models as reported in the literature and performed testing and comparison on custom datasets.
- Implemented of Computer Graphics integrated GAN models towards quality improvement in semantic manipulation of human faces.

Laser Materials Processing Division, RRCAT **Dec 2021 – Jan 2022**

Research Intern *Indore, India*

- Developed an automated vision based real-time monitoring and Arduino driven control of solvents for a novel chemical process to obtain large area gold nanoparticle films for various applications.
- Performed detailed principal component analysis based ML classification of closely related spectra/signals with various data pre-processing methods.
- Developed a WebApp for automatic processing of multiple UV-Visible spectra to determine kinetics of chemical reactions.

Graphics Visualization Computing Lab, IIITB **May 2021 – Jul 2021**

Research Intern *Bangalore, India*

- Designed programs in R language for preparation of genomic data (DNA methylation features and mRNA genes) for different cancer phenotypes provided in The Cancer Genome Atlas (TCGA) open data repository.
- Extracted significant subspaces from the large-scale genomic feature space for a novel data visualization.
- Incorporated features for RadTrix data visualization tool to show the correlations in the reduced gene space.

Web Science Laboratory, IIITB **Apr 2020 – Jun 2020**

Research Intern *Bangalore, India*

- Developed an interactive simulator using React, ReCharts, Python and Flask that implements an extended SEIR model for estimating epidemic spread and incorporated data of COVID-19 to simulate its spread in various regions.

Projects

Reinforcement Learning based Chatbot | Python, PyTorch, TensorFlow **Jan - May 2023**

- Design two chatbots (Agent A and Agent B) using policy gradient based training strategies so that they can handle natural conversations between them
- Design and implement additional strategies that can further prolong meaningful conversations between Agent A and Agent B.
- Implement training techniques to give two separate personas for Agent A and Agent B.

Abacus based Mental Calculation using Neuromorphic Architecture | Python, Nengo **Aug - Dec 2022**

- Implementation of different abacus based arithmetic operations to mimic mental calculations using Neural Engineering Framework.

Oceanic Data Visualization (Data Visualization Course Project) | Python, Svelte, Flask, D3.js **Aug 2022**

- Designed a web application to visualize various features of Indian Ocean and Arabian Sea during the period of 29 Dec 2003 to 29 Dec 2005.

2048 Playing Agent (Personal Project) | Python, PyTorch, Jupyter **Jun 2022**

- Designed a reinforcement learning agent to play 2048 using different algorithms DQN, PPO, NEAT and Markov Trees.

Visual Programming Language (Programming Languages Course Project) | JavaScript, Blockly **Jan 2022**

- Web based visual programming language to emulate Turtle using Blockly transpiler for equivalent JS code generation.

Image Captioning Tool (Visual Recognition Course Project) | Python, TensorFlow, Jupyter **May 2022**

- A CNN-LSTM network was implemented using InceptionNetv3 as feature extractor to label various images provided in the publically available Flickr8K dataset.

Comprehensive Spectroscopic Data Processing and Visualization Tool | Python, React, ECharts **Mar - May 2022**

- Designed a full-stack novel software tool for comprehensive data analysis of batch Raman spectra with features like background correction, peaks analysis, heatmaps, SNV, PCA-SVM analysis, spectral data libraries etc.
- Utilised React and Apache ECharts for designing frontend and data visualizations of the analysed data provided by backend built using Python and Flask.
- Embedded various machine learning models using Python and scikit-learn for determination of compounds for applications like identifying pesticides.

Auto Rickshaw Detection (Visual Recognition Course Project) | Python, PyTorch, Jupyter **Mar 2022**

- Designed object detection model using YOLOv5 on self curated and labelled set of images of auto rickshaw.

Web Scraping Tool (Personal Project) | Python, Selenium, SQLite **Jan 2022**

- Program to scrape publication DOI and other details from different publisher websites based on user given keywords and record them in a database for ease of querying for researchers.

NLP based Sentiment Analysis (Machine Learning Course Project) | Python, Scikit-Learn, Jupyter **Dec 2021**

- Machine Learning model for multiclass classification of a sentence into six different types of sentimentally hurting classes; hosted as Community Kaggle Competition.

Face Recognition based Security System (Hackathon Project) | PyTorch, Scikit-Learn, OpenCV **Jan 2020**

- Real time image pre-processing and face detection using OpenCV and Python integrated with pretrained Deep Learning model to determine strangers and owners.

Publications

SemUV: Deep Learning based semantic manipulation over UV texture map of virtual human heads **Dec 2024**

Anirban Mukherjee, **Venkat Suprabath Bitra**, Vignesh Bondugula, Tarun Reddy Tallapureddy, Dinesh Babu Jayagopi

9^{th} International Conference on Computer Vision & Image Processing (CVIP 2024)

TinyML-Raman: A Novel IoT Based Field-Deployable Spectra Analysis for Accurate Identification of Pharmaceuticals and Trace Dye-Pesticide Mixtures from Facile SERS method **Aug 2024**

Venkat Suprabath Bitra, Shweta Verma, B. Tirumala Rao

Analytica Chimica Acta, 2024, 343063, ISSN 0003-2670

Optical response of Au films for reproducible Si nano-structuring and its application for efficient micro-drop SERS with portable Raman system **Sep 2023**

Shweta Verma, **Venkat Suprabath Bitra**, R. Singh, B. Tirumala Rao

Materials Chemistry and Physics, Volume 306, 2023, 128058, ISSN 0254-0584

Machine Learning and Convolutional Neural Network based Trace Identification of Pesticides and Dye Mixtures from Raman Spectra **Jan 2023**

Venkat Suprabath Bitra, Shweta Verma, B. Tirumala Rao

6^{th} Joint International Conference on Data Science & Management of Data (CODS-COMAD 2023)

Software for Comprehensive Batch Analysis of Raman/SERS Spectra with Real-time Interactive Visualization and Machine Learning Predictions **Dec 2022**

Venkat Suprabath Bitra

IX International Conference on Perspectives in Vibrational Spectroscopy (ICOPVS-2022)

Indigenous development of automated cost-effective system for SERS measurements with data analysis and compound prediction **Dec 2022**

Shweta Verma, **Venkat Suprabath Bitra**, B. Tirumala Rao

IX International Conference on Perspectives in Vibrational Spectroscopy (ICOPVS-2022)

An Interactive Simulator for COVID-19 Trend Analysis **Jan 2021**

Jayati Deshmukh, Raksha Pavagada Subbanarasimha, Pooja Bassin, **Venkat Suprabath Bitra**, Srinath Srinivasa, and Anupama Sharma

3^{th} Joint International Conference on Data Science & Management of Data (CODS-COMAD 2021)

Mentorship

Linear Algebra (SM 102) **Jan 2024 – May 2024**
Teaching Assistant *IIIT Bangalore*

Digital Design (ESS 102) **Aug 2023 – Dec 2023**
Teaching Assistant *IIIT Bangalore*

Visual Recognition (AI 825) **Jan 2023 – May 2023**
Teaching Assistant *IIIT Bangalore*

Introduction to Machine Learning (AI 511) **Aug 2022 – Dec 2022**
Teaching Assistant *IIIT Bangalore*

Programming in C++ and Java (ESS 201) **Aug 2021 – Dec 2021**
Teaching Assistant *IIIT Bangalore*

Technical Skills

Languages: Python, Java, C, C++, Dart, JavaScript, TyeScript, R, SQL, Verilog, HTML, CSS, MATLAB
Technologies/Frameworks: Nengo, Linux, Git, GitHub, Arduino, Arduino Nano Sense, Raspberry Pi, PyTorch, TensorFlow, Svelte, ReactJS, Redux, Android, NextJS, NodeJS, ExpressJS, D3.js, Jenkins, MongoDB, Flutter, Blockly, LaTeX

Relevant Coursework

Artificial Intelligence and Machine Learning: Machine Learning, Math for Machine Learning, Visual Recognition, Reinforcement Learning, Few-shot Learning, Causal Inference and Learning, Neuromorphic Computing
Computer Science: Topics in Computability and Learning, Data Visualization, Software Testing, Operating Systems, Programming Languages, Software Engineering, Introduction to Automata Theory and Computability, Database Systems, Object Oriented Programming, Design and Analysis of Algorithms, Data Structures and Algorithms, Programming
Electronics and Communication: Signals and Systems, Computer Architecture, Digital Design, Computer Networks
Mathematics and Basic Sciences: Graph Theory, Probability, Statistics, Linear Algebra, Calculus, Real Analysis, Physics, Chemistry
Social Sciences: Software Product Management, Social Complexity and Systems Thinking, History of Ideas, Technical Communication, Economics, English

Achievements

- Graduate Aptitude Test in Engineering (GATE) 2023; All India Rank: 271 GATE Score: 742
- Deans Merit List Year 2019-20, IIITB
- Deans Merit List Year 2020-21, IIITB
- Deans Merit List Year 2021-22, IIITB
- Deans Merit List Year 2022-23, IIITB
- Merit Based Scholarship 2020-21, IIITB
- Merit Based Scholarship 2021-22, IIITB
- Second Prize by Cartesi in ETHIndia 2022 Hackathon
- Second Prize in Team Hackathon Inclusive Stem Confluence 2020

Certifications

- Machine Learning Verzeo (2020)
- NVIDIA DLI: Fundamentals of Deep Learning (2021)
- NVIDIA DLI: Building Transformer-Based Natural Language Processing Applications (2021)
- Crash Course on Python (by Google, Coursera)
- Mathematics for Machine Learning: Linear Algebra (by Imperial College London, Coursera)
- Problem Solving (Basic) by HackerRank
- Java (Basic) by HackerRank