SHAUNAK SRIVASTAVA

Course : **M.Sc. (Hons.)**, Mathematics and **B.E. (Hons.)**, Electronics and Communications Engineering, 2022

Email : shaunak1999@gmail.com / f20171024@goa.bits-pilani.ac.in

Mobile : +1 (412)-723-7123 / +91-81057-08179

CGPA : 7.15

ACADEMIC DETAILS

COURSE	INSTITUTE/COLLEGE	BOARD/UNIVERSITY	SCORE	YEAR
UG	BITS Pilani KK Birla Goa Campus, India	BITS Pilani University	7.15 CGPA	2022

Subjects / Electives	**Mathematics**: - Probability and Statistics, Applied Stochastic Processes, Discrete Mathematics, Linear Algebra, Cryptography, Mathematical Optimization, Numerical Analysis, Graphs & Networks, Deep Learning, Game Theory **Computer Science & Engineering: -** Digital Image Processing, Object Oriented Programming, Data Structures and Algorithms, Algorithms on Graphs, Algorithmic Toolbox, Digital Design, Signals and Systems, Control Systems, Microprocessors and Interfacing, Digital Signal Processing, Computer Architecture
Technical Proficiency	**Programming Languages: -** Python3, C/C++, Java, MATLAB **Frameworks & Libraries: -** PyTorch, TensorFlow, NumPy, OpenCV, Trimesh, ROS, GitHub **Datasets: -** Facescape, BP4D, COCO, KITTI, MOTChallenge, ImageNet

INTERNSHIP / WORK EXPERIENCE

Research Intern, Robotics Institute, Carnegie Mellon University - *Undergraduate Thesis* **Sep 2021 - Present**

Supervisor: Dr. Fernando De La Torre

- Working in 3D vision using Generative Adversarial Networks (GANs) for realistic **3-D Face Synthesis.**
- Involves using 3D Morphable Models (3DMMs), facial meshes, point-clouds and albedo-texture maps, UV position and texture mapping along with 3D rendering.
- Explored Auto-encoders, Variational Autoencoders (VAEs), GANs for non-linear neural generative modelling. This further explores effective Latent-space encoding, Feature Disentanglement and defining task specific Loss Functions for Supervised and Adversarial Training (e.g. Cross Entropy, GAN loss, WGAN-GP).
- Responsibilities also included preparation of Dataset/Data Loader, training & testing scripts along with *Evaluation Metrics* to measure performance.
- Also explored G*PU Parallelism*, optimizing runtime performance for our NVIDIA GPUs running CUDA with *PyTorch*. GPUs hosted on remote servers accessed via SSH.

Project Intern, Carraro India Pvt Ltd. – *Summer Internship* **May 2019 – Jul 2019**

- Researched on Statistical Process Control and its use in optimizing Six Sigma Processes.
- Analyzed manufacturing process data to find erroneous variations using statistical tools.
- Conducted statistical studies to find Process Capability (Cp), Process Capability Index (Cpk).

PROJECTS

Parametric 3D Face Modelling **Sep 2021**

- Created a Parametric 3D face model which is often used to represent 3D meshes as a low-dimensional parameterization.
- Implemented *Principal Component Analysis (PCA)* using scikit-learn to create a Linear Parametric model on a facial mesh dataset which conserves >99% energy.
- The model allowed feature editing by changing values along components and generating random meshes by sampling in the model subspace.
- Experiments helped understand limitations of linearization such as artifacts and mixed features.

Path Planning and Collision Avoidance using Reinforcement Learning Link **Nov 2020 - Dec 2020**

- Created a Reinforcement Learning agent using *NEAT* (Neuro-Evolution of Augmenting Topologies) for environment exploration and collision avoidance. NEAT-python implements an **evolutionary neural network** to perform reinforcement learning.
- NEAT attempts to build an Artificial Neural Network (ANN) by adding and deleting neurons and modifying connections in a stochastic manner and evolving these networks/genomes as they reproduce through the generations.
- Experimented with different environments and reward functions to understand the effect of obstacle layout design on successful path planning and learning speed.
- Used 'pygame' library for creating the game environment.

Multi-Object Tracking Link **Jun 2020 – Aug 2020**

- Designed an algorithm for online Multi-Object Tracking which has been tested on the ***MOT Challenge benchmark*** and the *KITTI dataset*.
- Conducted a literature survey and study of various online tracking algorithms including *SORT* and *DeepSORT*.
- Explored *CNN* and *color histogram-based* feature descriptors for data associations.

- Achieved *77Hz real-time* online tracking on the MOT16 benchmark with comparable accuracy (MOTA) performance to DeepSORT, illustrating improved computational efficiency.
- Worked with algorithms such as Kalman Filters, Hungarian Association Method, Linear Assignment, Feature Extraction and Track Management
- Implemented using Python, NumPy and OpenCV.

Mini-Projects on Deep Learning & Computer Vision **May 2020 – July 2020**

- Trained a Face Recognition model implementing the *Siamese Network* to learn the use of triplet loss/contrastive loss for One-Shot Learning.
- Created a hand-gesture recognition tool for interactive gesture control using *Google's mediapipe* for hand-detection and classical techniques for tracking with *OpenCV*.
- Object detection using YOLO for object detection and classification on COCO dataset.
- Object detection and blurring using *Haar Cascades* for privacy protection using OpenCV.
- Object tracking using Lucas-Kanade Sparse Optical Flow.

Localization and Path Planning for Autonomous Vehicles (Mobile Robotics) **Aug 2018 – Dec 2018**

- The University Rover Challenge (URC) by the Mars Society has an autonomous driving task that requires the rover to autonomously navigate from the given GPS coordinates of the start and end point.
- We created a working simulation which demonstrates autonomous navigation of a vehicle on a path with obstacles.
- Used the **ROS** framework and Python along with *Gazebo* for the simulation environment.
- Used Sensor Fusion of multi modal sensor data, such as 3D depth data from RGB-D sensors, IMU data and GPS data for the simulation.
- Used algorithms like *GMapping* for *SLAM* and *Extended Kalman Filters (EKF)* and *AMCL* for localization.
- Path planning was implemented using *move_base* package.

REASEARCH PAPERS STUDIED / IMPLEMENTED

- *A Generative 3D Facial Model by Adversarial Training.* V.F. Abrevaya et. al. (ICCV 2019)
- *DECA: Learning an Animatable Detailed 3D Face Model from In-The-Wild Images.* Y. Feng et. al. (SIGGRAPH 2021)
- *GIRAFFE: Representing Scenes as Compositional Generative Neural Feature Fields.* M. Niemeyer, A. Geiger. (CVPR 2021)
- *pi-GAN: Periodic Implicit Generative Adversarial Networks for 3D-Aware Image Synthesis.* E. Chan et al. (CVPR 2021)
- *StyleGAN: A Style-Based Generator Architecture for Generative Adversarial Networks.* T. Karras et. al. (NVIDIA 2018)
- *DeepSORT: Simple Online and Realtime Tracking with a Deep Association Metric.* N. Wojke et al. (IEEE ICIP 2017)

CERTIFICATIONS

CERTIFICATION	CERTIFYING AUTHORITY	KEY TOPICS
Deep Learning Specialization	Coursera	Neural Networks, Hyper-parameter Tuning, CNNs, Sequence Models
Algorithmic Toolbox	Coursera	Time Complexity, Greedy Algorithms, Dynamic Programming
Algorithms on Graphs	Coursera	Dijkstra's Algorithm, Bellman-Ford, Kruskal's Algorithm
Data Structures	Coursera	Binary Search Tree, Priority Queue, Hash Table, Stack, List

EXTRA CURRICULAR ACTIVITIES

Acting and Direction

I have been active member for the Mime Club for the last three years and was a Core Member for the 2019-20 team. I was part of 7 productions as an Actor & Director for a crew of 30 members. Apart from these, I have also been part of 2 short film productions.

Event Organization

Worked for the Department of Sponsorship and Marketing to raise funds and manage on fest marketing for our cultural, technical and sports festivals.

Sports and Athletics

Won several accolades in individual events such as sprints and long jump along with several team events like Football, Relay and Kho-Kho.

AWARDS AND RECOGNITIONS

4th State Rank Math Olympiad | Silverzone Foundation

SCHOLARSHIPS

National Talent Search Examination (NTSE) **May 2015**

The National Talent Search Examination (NTSE) is a prestigious award given to students excelling in the studies related to science and encouraging further studies by giving a scholarship. I successfully cleared the NTSE examination at the state level.

COMPETITIONS

Indian Robotics Olympiad **Sep 2013**

Secured Third Position at the regional round and qualified to compete at the National Level.

First Lego League **Jan 2012**
Awarded the ‘Best Design Award’ for our robot.

LANGUAGES KNOWN

English, Hindi