Muhammad Usama

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EDUCATION AND TRAINING

Bachelor of Electrical Engineering

National University of Science and Technology (NUST) [01/09/2019 – Current]

Address: Islamabad (Pakistan)

TECHNICAL SKILLS

Programming and Tools

Programming Languages: Python, C/C++, Matlab, Assembly

Libraries and Frameworks: TensorFlow, Keras, OpenCV, Pandas, Matplotlib, Plotly

Tools: Linux, Carla, PyCharm, Visual Studio, Google Colab, Pix4Dmapper

WORK EXPERIENCE

DAAD Research Fellowship

Robotics Research lab, T.U, Kaiserslautern [01/07/2022 – 01/09/2022]

City: Kaiserslautern

Country: Germany

- Fully funded DAAD research Fellowship at Robotics Research lab, Technical University, Kaiserslautern, Germany via German-Pakistan Research collaboration.
- Working on Computer Vision application in Precision Agriculture using multi-spectral imagery captured through UAV.
- Developed Autonomous pest stress detection algorithm using multi-spectral imagery to find hot spots in large crop areas for automatic spraying at geo-fenced sub-grids through UAVs. (Experience letter)

Research Fellow

MachVIS [01/04/2022 – Current]

City: Islamabad

Country: Pakistan

- Collected novel dataset of different crops of Pakistan using DJI Inspire and Sequoia+ sensor along with SenseCAP IoT sensors.
- Data preprocessing and analysis based on multispectral imagery and time series IoT sensors through computation of Vegetation Indices.
- Multi-modality through fusion of Imagery and respective time series IoT data for detection of pest infestation.

Research Assistant

Signal Processing and Machine Learning (SIGMA) Lab, NUST [01/07/2021 – 01/06/2022]

City: Islamabad

Country: Pakistan

- Completed Deep Learning and Computer Vision Literature with a research focus on Self Driving Cars.
- Working on **Autonomous Mine Detection Drone** using NVIDIA Jetson Nano and SDR for onboard computing of live feedback camera to have Autonomous maneuverability and mine detection using RF transmission and reception frequency difference.

PUBLICATIONS

Analysis of Vegetation Indices in the Cotton Crop in South Asia region using UAV Imagery

[2022]

- N. u. Sabah, M. Usama, Z. Zafar, M. Shahzad, M. M. Fraz and K. Berns, "Analysis of Vegetation Indices in the Cotton Crop in South Asia region using UAV Imagery," 2022 17th International Conference on Emerging Technologies (ICET), Swabi, Pakistan, 2022, pp. 70-75, doi: 10.1109/ICET56601.2022.10004662.

PROJECTS

Detection of pest infestation in crops using drone imagery and A-IoT

- Dataset is being collected using DJI Inspire and Sequoia+ sensor from different crops along with sequential IoT sensors data like temperature, humidity, soil moisture sensors etc.
- Data preprocessing and orthomosaic compilation is done using softwares like Pix4d mapper, Pix4d fields, Webodm etc. NDVI, RVI, SAVI are calculated for initial crop health analysis.
- Imagery will be passed through CNN pipeline for feature extraction and fused with RNN block for integration with IoT sensors sequential data to generate heat map of geo-referenced sub-grids.

Sensor fused autonomous driving

- Dataset is being collected from Carla simulator and data stream pipeline will be through ROS-bridge.
- Camera, Lidar and other sensors data will be communicated through ROS topics and fused for decision making.
- Keras, ROS and Carla will be utilized in project.

Behavioral cloning of Self Driving Car

- Using Udacity's self-driving car simulator, collected real time pictures of left, right and center cameras along with steering angel and velocity. Preprocessed data using Pandas.
- Created network using NVIDIA model having Convolutional, Dense and Dropout layers along with Relu activation function reducing Validation loss to 0.04.
- Keras framework along with Matplotlib, OpenCv, Pandas and NumPy libraries are utilized.

HONOURS AND AWARDS

DAAD Research Exchange

DAAD [13/07/2022]

Research exchange funded by DAAD to Technical University, Kaiserslautern. Funding amount worth of 3000 Euros.

Stipendium Hungaricum Scholarship

Hungary Government [01/03/2020]

Fully funded degree to BME, Budapest, Hungary. Funding amount worth of 50000 Euros by Hungary government.

CERTIFICATIONS

- **Deep Learning Specialization (DeepLearning.ai)**
- **TensorFlow: Advanced technique specialization (DeepLearning.ai)**
- **Complete Self Driving Car (Udemy)**
- **Introduction to Self-Driving Car Engineer Nanodegree (Udacity)**
- **OpenCv: Beginner to Expert (Murtaza Workshop)**
- **Embedded Systems; Shape the World (edX)**