Mark Naeem

Computer Vision Engineer

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Glasgow, UK

A computer vision and robotics research and development engineer with demonstrated hands-on experience in industry and academia. A passionate self-learner with an urge to support open-source and research community through. A recognised team player in startups and prominent open-source projects, excelling in dynamic, self-directed, and challenging environments.

EXPERIENCE

Robotics Software Engineer – Perception

Kingdom Technologies Ltd
January 2022 – Present
Glasgow, UK

Kingdom is an autonomous lawnmower manufacturer for large-scale fields. Working in a small team for a startup, I undertake a diverse range of responsibilities.

- Operating an extensive suite of sensors (LiDAR, stereo cameras, GNSS, IMU) in dynamic, unstructured environments shared with humans.
- Optimising and productising models for real-time, safety-critical tasks on resource-constrained devices.
- Working on state-of-the-art vision models such as 3D object detection/tracking, point cloud segmentation, and dynamic/static obstacle classification.
- Investigating different visual odometry techniques for GNSS-denied environments with limited visual features.
- Leading full-cycle software module development – from business requirement analysis and feature design to the implementation of embedded drivers, high-level interfaces, the creation of unit/integration tests, and maintenance.
- Managing CI/CD pipelines to streamline software deployment across a network of over 50 active assets.
- Built end-to-end MLOps pipelines for the lifecycle of various models, including training, testing, deployment, and performance monitoring.
- Managed to increase fleet autonomy rate to 97% through real-time traversability analysis and ground segmentation.

Machine Learning Research Engineer

Uniparticle
September 2020 – December 2021
Cairo, Egypt

Uniparticle is a software house specialised in large-scale and government projects. I worked on various projects in different areas of machine learning such as machine vision, recommendation systems, and probabilistic modelling.

- Built a complete end-to-end deep learning-based KYC pipeline.
- Published a novel Hidden Markov Model-based technique to analyse assessments results. The technique was validated with a real-life dataset.
- Built BKT-CAT, a Bayesian knowledge tracing computerised adaptive testing system.
- Used knowledge space theory and recommendation systems along with adaptive testing results to build an adaptive learning engine.
- Introduced various probabilistic student modelling and simulation techniques to improve adaptive quizzes quality.
- Improved the performance of an existing adaptive testing simulation algorithm, optimizing it to run 20 times faster.

Machine Vision Teaching Assistant

Ain Shams University
September 2020 – March 2021
Cairo, Egypt

- Tutored and prepared the material for the machine vision recitation and labs.
- The course covered traditional computer vision and modern machine learning-based approaches.

Visiting Researcher

University of Central Lancashire (UCLan)
June 2019 – September 2019
Preston, UK

- The grant goal was to fully design, simulate, and manufacture RHex, an off-road legged mobile platform.
- Leading a team of three researchers.
- Locomotion and gait analysis.
- Design the leg joints velocity profiles and controllers.

PUBLICATIONS

Bayesian Knowledge Tracing for Assessment Results Analysis IEEE

February 2022 Link to the paper

Bayesian Knowledge Tracing, a Hidden Markov model, is utilised to analyse assessment results. The technique was validated with a real-life dataset from the National Coding Competition 2018 records.

Linear Time Invariant State Space System Identification Using Adam Optimization IEEE

February 2020 Link to the paper

A new system identification method is proposed. A state space models numerically is presented with a TensorFlow graph. Adam optimisation is used to optimise the learnable state and input matrices.

PROJECTS

Depth Yolact ROS

A real-time 3D object detection and pointcloud instance segmentation for RGBD images.

IDeepify

Robust deep learning-based KYC product consisting of face recognition and matching, text segmentation, data extraction, OCR, and liveness detection. Synthetic data was used due to the scarcity of labelled data.

Swerve Steering Controller – ROS Controller Package

A real-time 3D object detection and pointcloud instance segmentation for RGBD images.

Deep Computer-Aided Sperm Analysis (CASA)

Faster R-CNN object detection and a modified DeepSORT tracking were used to detect and track human spermatozoa in phase-contrast, dark-field, and bright-field microscopy imaging.

Move Base Sequence – ROS Package

A ROS action server to handle multiple goals and track execution with ROS navigation stack.

D435i Visual-Inertial Odometry and SLAM

D435i camera is solely used to obtain reliable visual-inertial odometry and SLAM.

Autonomous Agricultural Mobile Manipulator For Fruit Picking

ROS-based mobile manipulator for Fruit Picking tasks. A depth camera feed is used to localise fruit in 3D using instance segmentation. The platform is then controlled with ROS Nav Stack and MoveIt.

AWARDS

- Al-Alfi foundation scholarship for outstanding undergraduate students
- Erasmus+ research grant at the University of central Lancashire (UCLan)
- Graduation project grant organised by the University of Lincoln and Ain Shams University
- Best project of the year for design of mechatronic systems course
- 1st place in FSUK18 C&M, honoured by the president in the national youth conference, Egypt

SKILLS

C/C++, Python, Version Control, CI/CD, Linux, RTOS, Embedded Software, Docker, Kubernetes, MATLAB, ROS/ROS2, ADAS, State Estimation, Localisation, SLAM, Visual Odometry, Sensor Fusion, Multi-Sensor Calibration, Motion Planning, CUDA, Reinforcement Learning, Tensorflow, PyTorch, Teamwork, Leadership, Self-discipline, Problem-Solving

EDUCATION

Ain Shams University September 2015– June 2020

B.Sc. in Mechatronics Engineering – Robotics - Class of 2020 Five-year degree

- **GPA:** 3.86/4.00
- Ranked Top 5 - class of 2020 (3rd)
- **Graduation Project:** Autonomous agricultural mobile manipulator for fruit picking – A collaboration between Ain Shams University and University of Lincoln. (project GPA: 4.00/4/00 A+)
- **Activities:**
  - Embedded software engineering team – Ain Shams Racing team (FSUK18) – 1st place Cost & manufacturing.
  - Powertrain and Business teams – Sussex Ain Shams (SAR) Racing team (FSUK19).