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## EDUCATION

09/21-09/22      **University College London, UK**

*MSc Robotics and Computation (Degree: Distinction)*

*Modules: Robotics Control Theory, Robotics Sensing and Manipulation, Robotics System Engineering, Robotics Vision and Navigation, Numerical Optimisation, Machine Vision, Deep Learning, Sensors and Location.*

*Thesis: Reliable Tracking of Edge Features with Temporal Consistency in Endoscopy Videos*

10/18-06/21      **University of Birmingham, UK**

*BSc in Artificial Intelligence and Computer Science (Degree: Distinction)*

*Modules: Foundations in AI, Data Structure, Foundation Java, Mathematics, Logic, Functional Programming, Mathematical Modelling and Decision Making, Security, Software Engineering, System Programming in C/C++, Computer Vision, Human Computer Interaction, Machine Learning and Intelligent Data Analysis, Neural Computation.*

*Thesis: Combining Convolutional Neural Networks with Decision Tree to Address Recycling Problem*

09/17-05/18      **Kaplan-University of Liverpool, UK**

*Foundation in Science and Engineering*

*Modules: Physical Sciences, Algorithms, Programming and Data Representation, Mathematics for Science and Engineering*

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## RESEARCH EXPERIENCE

05/22-09/22      **UCL Dissertation**

**Description:** Proposed a method to improve the temporal consistency of state-of-the-art edge detector and then used an image-warping based technique to extract dense feature points of colonic edges. To train, validate and test, lower-GI videos with clean views of visible colon folds are collected from three

endoscopic datasets. A new metric is introduced to assess the stability of temporal consistency. The edge maps predicted by our fine-tuned model are evaluated quantitatively and qualitatively. The results show stronger temporal consistency, with fewer edges abruptly appearing and disappearing in successive frames. The designed feature matching algorithm outperforms classical methods using ORB and SIFT descriptors in terms of outlier rates and reliability. Final grade is 75 out of 100.

**Duties:**

Data collection and pre-processing;  
 Design the loss function to fine-tune the state-of-the-art Edge detector;  
 Design the metric to evaluate temporal consistency on edges;  
 Design motion tracking based on edges of haustral folds;  
 Evaluation and ablation study;  
 Implemented in Pytorch 1.12.1  
 Thesis writing

**02/22-04/22**

**Optimization solver using Sequential Minimal Optimization**

**Description:** A coursework aims at using Sequential Minimal Optimization (SMO) method to solve the parameters of Support vector machine (SVM) in dual representation. The problem is solved on Breast Cancer Wisconsin dataset with binary labels. The data used is the Breast Cancer Wisconsin dataset. The optimization algorithm is implemented in Python, following the original paper of Platt and the paper of Keerthi. Convergence and convergence rate is studied in the final report.

**Duties:**

Implement dual representation of SVM; implement Platt's and Keerthi's SMO from scratch;  
 learn the parameters of SVM and test the model; evaluate convergence rate of SMO;  
 report the result and prove its convergence;  
 Implemented in Python.

**10/21-05/22**

**Pick and Place Tasks of Robot Arm under ROS Environment**

**Description:** Group works to 1) compute forward and backward kinematics of robot joints; 2) pick and place cubes of different colors in an environment with obstacles; 3) plan trajectory of end effector using path planning algorithms(dijkstra etc.); 4) complete challenging tasks such as stacking cubes of same color and find cube directions.

**Duties:**

Program in Python and C++;  
 Control end effector's position and orientation to scan the environment using RGBD-camera;  
 Perform pick and place tasks;  
 Filter point cloud and cluster using PCL.

**10/21-11/21**

**Drone Simulation**

**Description:** Programming quadcopter simulation tasks using PID control. The coursework includes tasks to control the drone to follow some predefined trajectory in the air and to be stable under certain extreme conditions (wind etc.)

**Duties:**

Programming in MATLAB,

Find its state space representation and linearize the mathematical model,

PID tuning.

11/20-05/21

**Final Year Project in Birmingham**

**Description:** Designed a deep learning model that uses neural network and C4.5 decision tree to deal with a classification task on garbage dataset. The goal of the project is to label different garbage categories into recyclable or non-recyclable.

**Duties:**

Designed structure of the model including neural network, decision tree and other components;

Image data collection and data pre-processing;

Coding, debugging, training and testing the model using Pytorch;

Summarise results;

Literature review and report writing.

01/20-04/20

**Java Team Project**

**Description:** Designed a video game based on JavaFX, which supports hand gesture recognition to control players. The game has multiplayer mode and single-player mode.

**Duties:**

Designed User Interfaces(scenes, buttons and events, media, HP/XP bars etc.);

Worked on Single player mode and database, involving QLearning algorithm to train the computer player.

01/20-04/20

**Principal Component Analysis**

**Description:** Projected high dimension dataset on a low dimensional space by applying PCA. Realized matrix computation and visualization of data distribution by using MATLAB.

**Duties:**

Dataset pre-processing including removing redundant data attributes, normalization and dividing data into training set and test set;

Found the covariance matrix, eigenvectors, and eigenvalues;

Projected training set on the first three principal components;

Plotted data on the three-dimensional space;

Repeated the process for the test set and compared the result.

10/19-12/19

**Software Engineering UML Analysis (Team of seven)**

**Description:** Used UML method to design an app that can handle users' sleep problems and wrote a report which is based on UML diagrams.

**Duties:**

In charge of the non-functional requirements, use case diagram, class diagram including noun/verb analysis and responsibility-driven analysis, sequence diagram, one of the component diagrams and

deployment diagram;

Did the tradeoff of the architecture and designed the prototype of our app.

**01/19-03/19**

**Maze Navigation and Mapping (Team of two)**

**Description:** Developed a program (java, Lejos) that enables the robot to navigate through a random maze and to map the maze as it goes along.

**Duties:**

Built the robot;

Designed a class which stores the maze information (occupied, danger zone and accessible coordinates) using a 2D array;

Designed a class which stores the robot's current position and heading including the getter and setter methods;

Designed a class of depth-first search tree structure. A node of the tree indicates an available position that the robot can traverse;

Designed the main class which is a while loop for the robot to explore the maze and to find a path which can go back to the original position;

Integrated the above classes.

**10/18-12/18**

**Rescue line (Lego EV3, Team of two)**

**Description:** Developed a program (Java, Lejos) that enables the robot to follow a black line. Developed our robot system to make certain actions when it detects signals based on the colour of the tapes.

**Duties:**

Built the robot including wheels, colour sensors and other parts;

Wrote the code which enables robot movement and rotations;

Wrote the code of how the robot follow the black line without exceeding its boundary, which includes the strategy of how the robot travel through curve line and junction;

Wrote the code related to colour sensors and how the robot acts in terms of different colour signals.

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**AWARDS**

International Achievement Bursary (GBP 1,500), School of Computer Science, UoB 2020-2021

International Achievement Bursary (GBP 1,500), School of Computer Science, UoB 2019-2020

International Achievement Bursary (GBP 3,000), School of Computer Science, UoB 2018-2019

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**SKILLS**

Programming: Python, ROS, Java, MATLAB, C++, Haskell

English: fluent

Chinese: native Speaker

Other interests: oil painting and music performance