Youjing Yu

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Education

Trinity College, University of Cambridge *Oct. 2019 – Jun.2023*

ENGINEERING

Course includes Mechanical engineering covering mechanics and vibrations; Structures covering materials and structural mechanics; Mathematical methods covering mathematics and computing; Electrical and information engineering covering physical principles of electronics, analysis of circuits and devices, linear systems, logic circuits and electromagnetics.

First Year Grades: *Unofficial due to COVID-19*; 85% Overall
Second Year Grades: *Unofficial due to COVID-19*; 77% Overall; **Awarded Senior Scholar**
Third Year Grades: 78% Overall; **ranked 19/285** (**top 6%**); **Awarded Senior Scholar**

Coursework

- Lego Mindstorms – in teams of three we designed and built a gear box with an algorithm to change gears and hence change speed when touch. Speed and gear ratio were subsequently calculated. Touch sensors, light sensors and actuators were controlled by programmes running in MATLAB.
- Structural Design Project – in lab groups we designed, built and tested a cantilever structure to carry a minimum load at minimum cost, with simplicity and aesthetics in appearance. Hand calculations were carried out to work out the force distribution and to analyse different materials to use. Gained experience with the use of drills, guillotines and assembling metal parts as well.
- CAD (Solidworks 2018) – produced a model of a single-person gravity-powered rollercoaster. Experience with constructing a structure on CAD, designing and proposing different structures and conducting motion analysis.
- Manual drawing – developed the ability to read, modify and produce engineering drawings by undertaking exercises in the basic principles of projection theory.
- Integrated Electrical Project – designed, built and tested an AM radio. Gained experience using LTspice, multi-meters and Microprocessors.
- Python programming – self-learning Python skills, including basic operators, algorithms, graph sketching, object-oriented design etc. programmed a flood warning system which collects real time data from various monitoring stations.
- Presentation skills – delivered a short talk on prepared topics, wrote laboratory reports and took part in scientific debates.
- Integrated Coursework – designed an experiment to analyse the impact that vertical and horizontal loading has on the shake mode of a three-floor building.
- Device Programming –used the language C++ to program micro-controllers and learned about important concepts in device programming, including memory management, interrupts, and communications with peripherals.
- Mars Lander Project – building a model for a Mars Lander to land on Mars in 9 different situations using the C++ programming language.
- Integrated Design Project – Building a simulated robot that is able to identify and gather different-coloured boxes and move them to a specific area within a time period.
- Software project – successfully implemented a logic simulator which simulates the electrical circuit operations in a computational manner, with available elements such as logic gates and Dtype latch and is available in both English and Chinese. A specification for the language of the system with EBNF language was specified and a GUI was written in OpenGL and wxPython widgets.
- Signal Processing project – Carried out experiments on audio signals with windowing, frequency resolution and noise reduction, as well as probabilistic inference methods using least squares, maximum likelihood and Bayesian techniques. The constant model, the linear trend model, the autoregressive (AR) model and the sinusoidal model will be studied and analysed in detail. The model choice is studied within likelihood and Bayesian probabilistic settings as well. These techniques are applied in audio signals, using models to perform packet loss concealment, interpolation of missing data in audio, and constrained interpolation for clipped and/or heavily quantised signals.

- Currently learning Advanced Plus German (C1-C2 Level).

Hwa Chong Institution, Singapore *Jan. 2017 - Dec. 2018*
Singapore A level Physics (A), Mathematics (A), Chemistry (A), Economics (A), Modern Physics (Distinction)

Anderson Secondary School, Singapore *Jan.2015 – Dec. 2016*
10 Singapore GCEs (All grade A1)

Awards & Prizes

Cambridge University Trinity College Senior Scholar - July 2022;
Trinity College Examination Prize - July 2022;
Trinity College Summer Studentship - Mar 2022;
Cambridge University Trinity College Senior Scholar - July 2021;
Trinity College Examination Prize - July 2021;
Cambridge Trust Overseas Scholarship - Mar 2019;
Trinity College Overseas Bursary - Mar 2019;
Hwa Chong Diploma with Distinction - 2018;
Singapore Science and Engineering Fair Silver Award - March 2018**;**
Singapore Youth Festival Gold Award - May 2017;
American Mathematics Competition Distinction - 2017;
Australian Mathematics Competition High Distinction - 2017;
Euclid Mathematics Contest Distinction - 2017;
Singapore Junior Physics Olympiad Silver Award - Oct 2016;
UNSW English Writing Competition High Distinction - 2016;
UNSW Mathematics Competition High Distinction - 2016;
OAAS Scholarship Award - 2016;
Singapore Youth Festival Gold Award - 2015;
Singapore Mathematical Olympiad Silver Award -2015;

Experience

Research Intern under the Department of Engineering **University of Cambridge**
Student Assistant Researcher Oct.2022-PRESENT

- Joined the Neural Dynamics and Control (NDC) group under Dr Guillaume Hennequin.
- Our task is to implement a webcam-based eye tracker to track the user's eye movements in psychophysical experiments to better understand human thinking when solving challenges.
- Our first step is improve the current algorithm implemented for better accuracy in eye tracking.

Research Intern under the Department of Computer Science **University College London**
Student Assistant Researcher Dec.2021-PRESENT

- Joined the Web Intelligence Research Group under Dr Aldo Lipani. Check out https://wi.cs.ucl.ac.uk/index.php/people/
- Currently working on speech and text-based user confidence and expertise detection and measurement on conversational search systems (CSS) in Natural Language Processing (NLP) using transformer-based multimodal deep neural networks.
- Prepared dataset of user queries from Spotify Podcast, with the use of the word-level transcript to segment out questions.

- Feature extraction on energy entropy, spectral centroids, zero-crossing rate, chroma CQT etc.
- Crowdsourced using Amazon Mturk service to obtain confidence scores based on audio files.
- Trained a text and audio multimodal regression network using pretrained BERT and HuBERT models to predict human confidence scores. Our model showed a human-level performance in confidence score prediction.
- ***Paper under review at EACL***.

Research Intern under the Department of Engineering **University of Cambridge**
Team Leader Jul.2021-Oct 2021

- Successfully developed a web-based interface for Natural Language Processing (NLP) text corpora that enables gender biases to be revealed visually and interactively.
- A Flask-based web framework was created where the user can upload their corpora through inputting plain text, URL or txt files. Two NLP algorithms will run, namely the Bias Score Calculation algorithm based on word embedding and the Sentence Parsing algorithm. Bias scores associated with each token and specific sentence structures are returned to the user. Interactive pivot tables, bar graphs, word clouds, PCA and TSNE graphs are provided for the user to explore and extract information.
- The user is also able to input a natural language sentence using the query algorithm, where a data frame and a bar graph containing the information is returned. A debias function is also available if the user wishes to discard the more extreme sentences and retrieve a less biased file.
- Self-taught web-development skills such as JavaScript, CSS and HTML; self-taught NLP algorithms and parsing techniques.
- GitHub Repo: https://github.com/YoujingYu99/visualising_data_bias
- ***Paper under review at Digital Scholarship in the Humanities***.

MAGIC Research Group under the Department of Engineering **University of Cambridge**
Research Intern Mar.2021- Apr.2021

- Joined a research group under the Managing Air for Inner Greater Cities (MAGIC) under Dr Boies, where the aim is to develop cities with no air pollution and no heat-island effect.
- My job was to identify car plate numbers and hence models from video footage and hence determine the pollution output by the models and the pollution that enters the surrounding buildings. I wrote a machine-learning algorithm for detecting UK car plate numbers from videos using computer vision packages such as OpenCV and Pytesseract. Data cleaning using maximum likelihood mapping and label video frames with car plate numbers.

Spacept project at Hackbridge **University of Cambridge**
Team member Oct.2020-Dec 2020

- The goal of the project is to identify and predict building damage and forest fires from satellite images. We built an ML-Enhanced Computer Vision Change Detector System for Satellite Images Analysis. We wrote a Convolutional Neural Network (CNN) for difference image detection for satellite building, forest fire and oil spill images.
- Solving a social and economic problem with the implementation of Machine Learning.
- Team leader of the unsupervised learning team.
- Exploring various techniques (shallow and deep ML, supervised, semi-supervised and unsupervised models) to determine changes of interest in satellite images.

Citadel Europe Regional Datathon **Online Event**
Team member Oct.2020

- Participated in a one-week datathon challenge.
- Solved a social and economic problem with the implementation of Machine Learning. Performed two strategies, Random Forest and Long Short-Term Memory to predict which tracts will gentrify in the upcoming ten years.
- Performed economic analysis on the given and predicted set of data to derive the population characteristics of gentrified tracts.
- Gained scientific report writing and presentation skills.

Research Group under the Department of Electrical and Electronic Engineering **University of Hong Kong**
Student Assistant researcher *Jul.2020-Sep.2020*

- Did a ten-week internship programme on deep-learning generated holography.
- Our goal is to generated holography images using deep learning techniques. We used TensorFlow to build various neural networks such as convolutional neural networks (CNN), ResNet, Wide ResNet, DenseNet and SqueezeNet. We performed image to image translations with Generative Adversarial Network (GAN) structures on hologram images. We improved the performance of network structures through exploration of a variety of methods.
- Presented a technical report at the end of the internship.
- Gained valuable scientific writing and presentation skills.

Research Group under Dr. Adam Boies **Cambridge**
Research Intern Mar.2020

- Joined a Carbon Nanotube (CNT) characterisation research under Dr. Boies, where I tested and recorded the thermal responses of CNT.
- Passed atomised DNT particles through CNT filters to test and record transmission efficiency.
- Learned basic machine and software manipulation of FLIR camera, neutraliser, electrostatic classifier, condensation particle counter and pressure gauge among other techniques.

Research Group under Dr. Thomas George Thuruthel **Cambridge**
Research Group Member Oct. 2019 - Jan.2020

- Joined a reinforcement learning robotic arm project where we wrote algorithmic solutions for the robotic arm to do basic motions, tracking and finding its way in a maze.
- Learned basic control theory and gained knowledge on machine learning.

3D printing society **Cambridge**
Society Member Jan.2020 - PRESENT

- Currently in a team working on Cambridge University Engineering Department Library Project, where we design tools, toys and decorative items to put in the library.
- Used Solidworks to design and print Luban Ball, a traditional 8-piece Chinese puzzle; Luban Lock, an 8-piece puzzle; a rotational interactive toy and many more.
- Participated in a metal 3D printing workshop at the Institute for Manufacturing to learn basics of metal printing techniques.

DewTouch **Singapore**

Intern *Jun.2018*

- DewTouch is a software company that develops Fleet Management Systems and food Catering Management Systems. Analysed car sales data from excel, presenting results in graphical forms.
- Designed website layout and icons.
- Participated in business negotiations.
- Organised extra-curricular activities.
- This experience taught me the value of teamwork and the importance of good communication skills in business negotiations.

Research Group under the Department of Building **National University of Singapore**

Assistant researcher *Mar.2017-Jan.2018*

- The goal of the project is to produce nano encapsulated organic chemicals for coating. Our team consists of three people and I was the team leader. The coating should ideally be able to self-cleaning (dust-resistant) and thermal insulating. Our Cadmium Orthostannate nanoparticles with 3-(mercaptopropyl)trimethoxysilane suspended in organic solution were shown to have effective thermal insulation abilities, which can save massive amounts of energy if painted on windows.
- Familiarised with the use of common laboratory equipment, including centrifuge, scanning electron microscope and Transmission electron microscopy.
- *Paper accepted in Conference*.
- **Silver Award** at Singapore Science and Engineering Fair.
- Participated in ASTAR Talent Search.
- Gained valuable scientific writing and presentation skills.

Extra-curricular Activities

Trinity College Badminton Club **Trinity College, University of Cambridge**

President Oct.2022 – PRESENT

- President of the Trinity College Badminton Club .
- Overseeing Women's Team, Men's First, Second and Third Team.
- Organise trials and determine members for each team.
- Organise coaching, league matches, cuppers matches, field bulk bookings and social events.
- Organise stash designs and orders.

Trinity College Badminton **Trinity College, University of Cambridge**

Captain Oct.2021 – Jun.2022

- First and second year as Women's First Team(W1) Player.
- Third year and as W1 Team captain.
- Organise trainings and devise a plan to focus on different skills each week.
- Organise inter-collegiate matches , book badminton courts and keep logs of scores.

Trinity College Engineers Society **Trinity College, University of Cambridge**

Events Officer Oct.2020 – April.2021

- Events officer who is responsible for organising events for engineers at Trinity College.
- Organised Pizza Night where engineers across all years come for Pizzas. Minimal socialising was allowed due to COVID situation. All planned in-person events after this, unfortunately, were cancelled due to COVID situation.
- Online social event with Girton College Engineers Society where participants met up and played games online.

Hwa Chong Girls' Tennis Team **Singapore**

Jan.2017 – Dec.2018

- Represented Hwa Chong Junior College in inter-collegiate tennis matches.
- **First Runner-Up** in 2017.
- Second Runner-Up in 2018.

Hwa Chong Junior College Chinese Orchestra **Singapore**

Jan.2017 – June.2017

- Represented Hwa Chong Junior College Chinese Orchestra.
- **Gold Award** at Singapore Youth Festival.

Son-rise Singapore **Singapore**

Jan.2017 – Dec.2018

- Responsible for interacting and playing with an autistic child four hours a week.
- Taught the child basic words and phrases.
- This experience taught me the value of empathy and the importance of always respecting and helping people living on the margins of society, which I am highly grateful for. I have also developed a positive mindset and a passion for serving.

Anderson Secondary School Choir **Singapore**

Jan.2015 – Dec.2016

- Represented Anderson Secondary School Choir
- **Gold Award** at Singapore Youth Festival.

Ground-up Initiative **Singapore**

Jan.2015 – Dec.2016

- Ground-up Initiative is a non-profit community that aims to develop urban sustainability through hands-on education on farming, craftwork and painting. Participated in carpentry, brick-making, seed-sowing, plant-watering and a variety of agricultural activities.
- This experience taught me appreciating nature and the importance of conservation. It also helped me gain some hands-on skills with the use of basic tools.

Additional Skills

IT	Proficient in the use of Microsoft Office; Basic command of SolidWorks; Able to program in Python, MatLab, Javascript, SQL, C++.
Driving	Full clean driving licence (China)
Languages	Fluent Chinese; Advanced German

Personal Website: https://youjingyu99.github.io/

Referees

Professor Per Ola Kristensson
Director of Studies
Department of Engineering

Dr Nicolas Bell
Tutor
Trinity College, Cambridge