ARIANA QUEK YEN PENG

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PERSONAL STATEMENT

I am a Mechanical Engineering graduate, with a keen ambition to pursue a career that exploits the synergy between Material Science and Machine Learning (ML). My interest lies in leveraging ML with Graphical Modeling, to study material systems and develop new methods to characterize and to model material behaviour. I have taken the initiative to broaden my technical skills to include Python, ML applications and visualization techniques for image processing. I have modest ML project experience, on facial keypoint detection using images with faces, an anomaly detector for fraudulent activities, and a multilabel classification model with Natural Language Processing (NLP). My internship and undergraduate research projects utilized computed tomography (CT) image analysis to visualize and analyze the failure of composite materials. My current interest includes the applications of ML and Graph Networks in materials research.

EDUCATION

University of Southampton, UK	September 2015 - July 2019
MEng(Hons) Mechanical Engineering in Aerospace	(First Class Honours)

Queen's Bursary Recipient (2019)
High Achiever Scholarship for the MEng(Hons) Mechanical Engineering Degree (2015)

Elective Modules

Topics of specific interest:
- Design & Computing, Design Search & Optimisation, Fluid Dynamics, Fluid Mechanics, Materials & Structures, FEA in Solid Mechanics, Wing Aerodynamics, Aircraft propulsion

TECHNICAL STRENGTHS

Computer Languages	Python, Matlab
Software & Tools	LaTeX, GitHub, SolidWorks, VGStudio, ImageJ(Fiji)
Machine Learning	Pytorch, TensorFlow

RESEARCH EXPERIENCE

Joint University of Southampton - Mitsubishi Japan Research Internship   June - Aug 2018
Research Title: Novel Investigation of Structural Failure in Stiffened Composites

- Planned and conducted mechanical testing experiments, using a simple test rig to initiate damage on composite parts that were used in failure analysis measurements. Coordinated the CT-scanning of parts before and after every step load.
- Processed images and applied feature extraction techniques to successfully characterize different microstructural features. Rendered 2D and 3D images, and animations to visualize the fracture progression of parts, before and after load.
- Identified features such as voids, porosity, pre-load micro-cracks and separation of fibres and, their location in parts that could have compromised its fracture toughness and facilitated the fracture progression of structural composite.

Group Design Project - University of Southampton   Sep 2018 - May 2019
Research Title: Cryogenic 3D Imaging for Biomedical Research - The Breath of Life

- Worked in a team of five to design, test and build a cryogenic apparatus to support a whole inflated lung for micro-CT imaging. Developed a control and electronics system, coordinated CT-scanning procedures and processed CT images.
- Successfully designed the circuitry and implemented a control algorithm in the control system. The system utilised feedback control, where sensing elements regulate the temperature of the lung specimen by controlling rate of heating elements in a methanol ice bath.

- Rendered high-resolution 2D and 3D images, and animations through image segmentation to produce the microstructural 3D anatomical image of the airways of the lung.

Individual Project - University of Southampton   2017-2018
Research Title: X-ray Tomography Analysis of Failure of Airframe Composites in Mode I Damage Propagation

- Analyzed failures in composite materials to elucidate variations in crack propagation between similar material samples using CT images.
- Processed results of CT images and successfully characterized the microscopic differences between two composite samples through statistical and qualitative analysis.
- Identified correlations between the induction of cracks and the distribution of particles in layers. Different crack behavior was caused by significant particle distribution variations between layers and particle distribution uniformity.

University of Southampton Research Internship   June - Sep 2016
Research Title: Investigation of a Novel Enhanced Palm-Based Biolubricant Production Method

- Worked in a research environment to produce palm-based biolubicant.
- Planned experiment test matrix to produce biolubricant, inventory of lab consumables and the commissioning of the experimental rig and eventual discovery of a potentially new chemical reaction pathway.

PERSONAL PROJECTS

Variational Autoencoder for Anomaly Detection   April - May 2020

- Developed an autonomous method to identify fraudulent credit card activity using a Variational Autoencoder(VAE), with detection based on activity when the reconstruction error rises above a selected threshold.
- An autoencoder was modified into a VAE by encoding the input as a continuous distribution over the latent space with good properties, rather than just a single data point for each data input, thus allowing the generation of new data.

Kaggle Competition: Google Quest Q&A Labelling Challenge   Dec 2019 - Feb 2020

- Worked with a partner to develop a multilabel classification model using BERT, to classify inputs into their respective categories.
- Used NLP techniques such as word lemmatization and stop words removal to transform words into their base form and removes common words.
- Performed feature engineering, model ensembling, and Exploratory Data Analysis to filter duplicates in dataset and address issue of class imbalance.
- Added a custom classifier module in the BERT model architecture and re-trained the model to enable better generalization.

ADDITIONAL EXPERIENCE

Mathematics Home Tutor   July - Sep 2017
Secondary 3 Level

- Focus on explaining complex math concepts in simple layman terms. Developed a structured teaching plan for the duration of teaching.

EXTRA-CURRICULAR

- Represented University of Southampton in Numed Games for Mixed Doubles Badminton and secured 2nd place (2017, 2016)
- Participated in Ultimate Beatdown Malaysia for a Kickboxing match (2017)
- Participated in Muay Thai Championship for a Thai Kickboxing match (2016)