



The Team

THE TEAM PROJECT PROPOSAL

E-Tendance - Facial-recognition based attendance taking system

The Team

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Submitted to:



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Executive Summary

Nanyang Technological University (NTU) constantly seeks opportunities to go green and smart. There are some ongoing concerns with the current attendance-taking method, which is either time consuming, or easily exploited by students with fake attendance. Moreover, the current attendance taking method wastes paper, and requires extra efforts from tutors to contact absentees. To address the current challenges with attendance-taking methods as well as follow the direction and goal of building a smarter eco-campus, The Team would like to propose E-Tendance Online Attendance System.

E-Tendance is a web application that will provide an interface for tutors to take attendance of the students. E-Tendance will capture live feeds of the incoming students, and takes attendance of the students based on face-recognition. Moreover, there will be different email templates setup for tutors to automatically enquire students about the reasons for absenteeism or late shows and notify them about the consequences of continuous absenteeism or late shows, or arrange for make up lessons. These will greatly improve the tutors' efficiency, and saves paper to further promote NTU as an eco-friendly campus.

This proposal serves the purpose of convincing NTU on the value of the project, and embarking on the project with The Team.

Statement of Problem

“As a leading science and technology university engaged in research, education and innovation, NTU is already playing an important role in the development, dissemination and deployment of technologies, such as artificial intelligence, data analytics, and the Internet of Things.” Nanyang Technological University (NTU) puts constant efforts in its digital transformation of the administration, so as to improve staffs’ efficiency and satisfaction.

Moreover, NTU aims “to be the greenest campus in the world”. Its efforts can be observed in many areas: from the partnership with JTC Corporation and the Singapore Economic Development Board for cutting-edge green technologies, to the banning of free plastic bags.

It is evident that NTU is looking for more opportunities for making the campus greener and smarter. One issue the staff generally face is attendance taking. There are the usual two ways of attendance taking: tutors call each respective student’s name and mark attendance, which can be time-consuming. This can also be disrupting the class when teachers have to keep calling students name especially when they are late. The more popular way, students sign in attendance by themselves. This is not a very effective method also attendance can be faked when absent students can ask their friends to mark them present. Furthermore, both require the use of papers, which can be deemed as unnecessary in today’s digital world. In addition it can be cumbersome for tutors to individually email absentees for their reason for absenteeism or to set up make-up lessons. This can be a hassle especially when there are many absentees.

Therefore, in order to alleviate the challenges of the current attendance-taking methods as well as to follow the vision of a smart eco-campus, The Team would like to propose E-Tendance, which is completely paperless and foolproof as attendance is recorded digitally. The Team explores different digital attendance system options, and decides to develop a face-recognition-based attendance taking system and automatically contacts absentees. This system requires minimal hardware, and can easily be implemented in the campus. The application will be designed for the courses that require attendance taking, and the tutors can leverage on the system to collect reasons of absenteeism or late show from students hassle-free.

Objectives

This document, the project proposal, details the objectives of the project E-Tendance, a Web application that leverages on facial recognition for attendance taking. The document will be used to facilitate the collaboration and communication with relevant stakeholders with respect to the project information. This document will also serve the purpose of convincing the relevant stakeholders on the value of the E-Tendance Application.

The design of the facial-recognition attendance taking web application will consist of four design objectives (with point 3 being the most important objective):

1. Provide a function to configure the face-recognition system, based on the attendance taking rules. For example, 3 late shows are equivalent to 1 absenteeism, or late for more than 15 minutes is deemed as absent, etc.
2. Provide a function to set up and customize the database of the students' profiles that are specifically for the course index.
3. Given still or video images of the incoming students, identify or verify one or more persons in the scene using a stored database of the students' faces, and mark attendance in the system.
4. Provide a function to learn the facial features of an unrecognised attendee.
5. Provide a function to automatically email missing students or late students on the consequences, and enquiry of the official reasons for absenteeism.

Technical Approach

Customer Needs

1. Our target audience will be NTU lecturers/tutors/lab supervisors who have the intention to record class attendance.
2. To save the target audiences' time and manual work, the application will feature an intuitive and simple user interface.
3. As the data collected in this application may influence students' grade, the application must also be reliable, secure and unforgettable.
4. The application should be able to capture students' face and record the time automatically in real-time.
5. The application should allow unrecognised attendees to input matriculation number and capture photos of attendees for future recognition.
6. The application should allow the target audience to define the class setting, which includes class time and participants' information.
7. The application should also be fast to prevent frustration and confusion to the user.

Target Specifications

1. The application should take less than 1 second to open.
2. The application should contain two modes: "class setting mode" for the target audience to input the class setting, and "attendance taking mode" for the target audience to use to take attendance.
3. In "class setting mode", the application should take less than 3 seconds to respond to input.
4. In "attendance taking mode", the application should take less than 3 seconds to extract a student's face in real-time.
5. In "attendance taking mode", the application should require less than 5 seconds to identify an extracted face and display the identified information back to the student for confirmation.
6. In "attendance taking mode", the application should record the identified information into database and save it until its date of expiry.
7. In "attendance taking mode", in case that the system does not recognize a student in 5 seconds, the application should allow manual matriculation number input.
8. The application should support caretakers, who may offer their assistance in case of the audience being unable to use some of the application's features.

Technology Consideration

1. The application should be a web application to offer the best user experience for the aforementioned use cases, as web applications are easier for users to interact with when the use cases are attendance taking, which requires multiple users to interact with the same device to ensure authenticity.
2. React.js is used for front-end development. React is a JavaScript library for building user interfaces. The main considerations of using ReactJS is that it's simple and fast. ReactJS uses JSX file which makes the application simple and to code as well as understand and it performs well because it manages a virtual DOM.
3. Node.js is used for back-end development. The main considerations of using Node.js is that it's asynchronous and fast. With the help of Event Loop, it has the best performance at I/O. Being built on Google Chrome's V8 JavaScript Engine, Node.js is super efficient and quick in code execution. Besides, it is also the preferred language for using Amazon's image recognition API.
4. Github is used for version control and the Project Wiki.

System Architecture/Platform

Our web application has a layered system architecture. It should have a presentation layer, an application layer and a data layer.

The presentation layer contains front-end code written in ReactJS. It presents the application's user interface, which includes real-time camera video, real-time attendance taking information in "attendance taking mode" and class setting interface in "class setting mode". It communicates with the application layer by HTTP POST/GET requests.

The application layer does the main data processing and logic handling. This layer contains two parts. 1. APIs interacting with the application's presentation layer. 2. APIs interacting with image recognition APIs.

The data layer is built for interactions with database. It provides methods to store and retrieve data from database.

In real time, video data is passed in through the presentation layer, being processed in the application layer and then stored to the database through the data layer. The processing result will also be returned to user by presenting on the presentation layer.

Project Management

The Gantt Charts in Figure 1 and 2 include the overall timeline of the project and sequence of specific tasks. Individual tasks in each stage of the product development are included with the expected duration, start date and end date.

In the Gantt Chart, the tasks are allocated sequentially under different stages of the project which include Requirements Specification, Design, Implementation, Testing and Deployment.

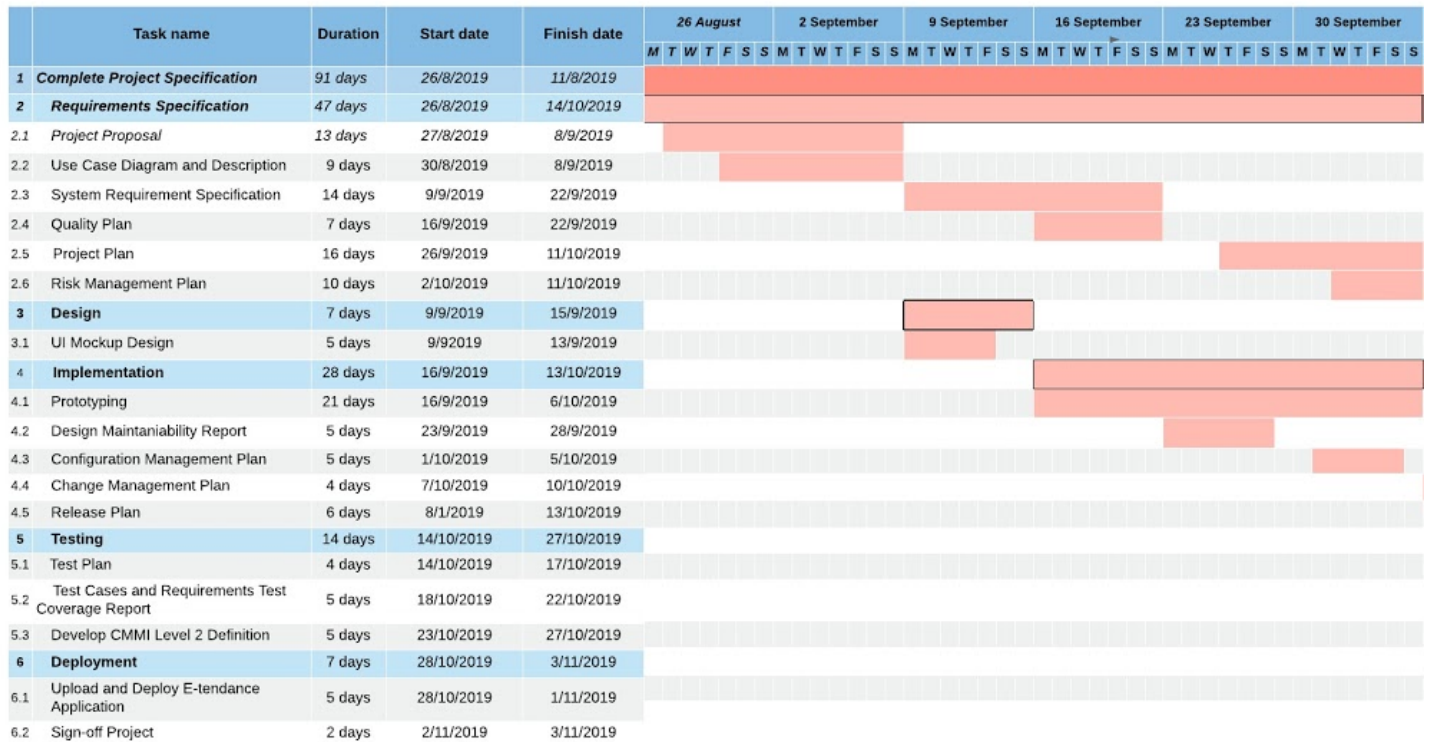


Figure 1: Project Management Gantt Chart from August to September

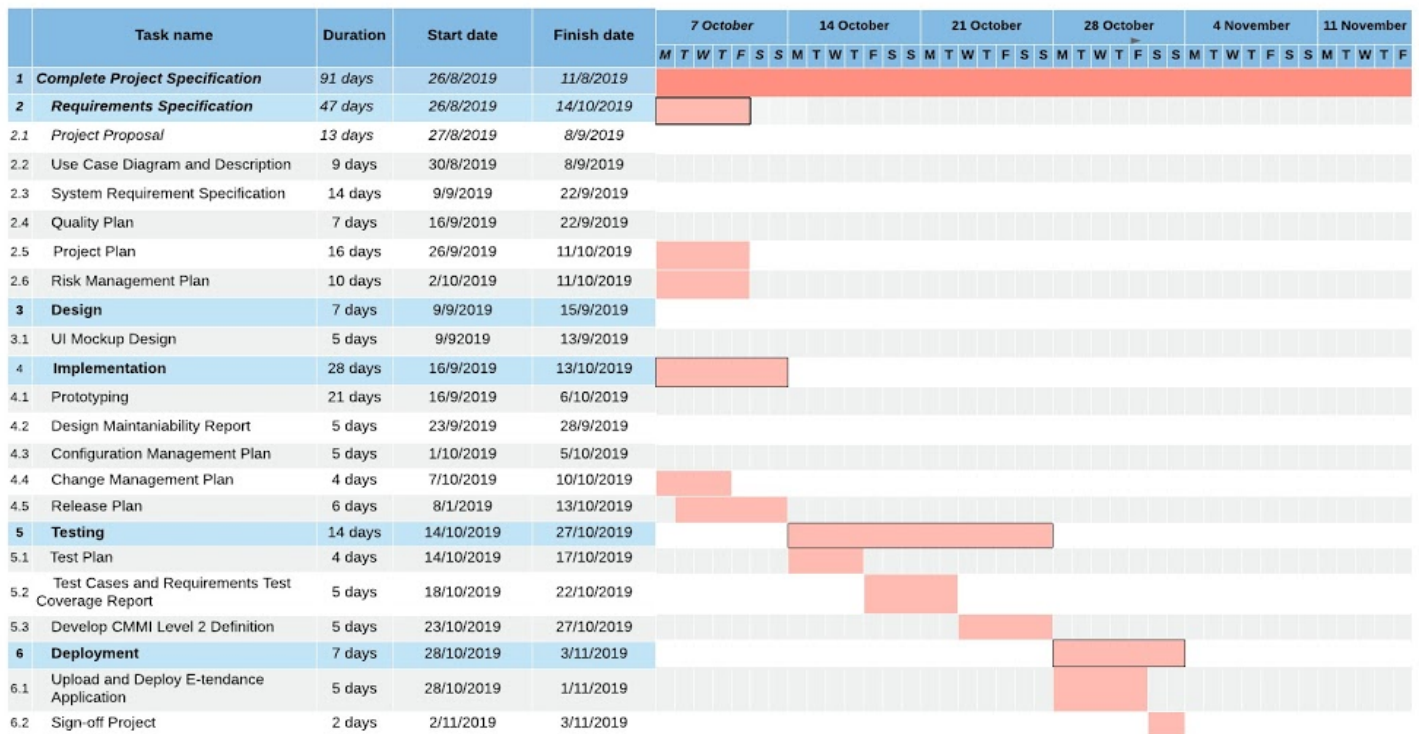


Figure 2 : Project Management Gantt Chart from October to November

Deliverables

1. E-tendance Web Application
2. Design Maintainability Report

Budget

Cost	Rate	Quantity	Total
Salary	SGD 80 / hr	8 hours * 13 weeks = 104 hours	SGD 8320
Logistics			SGD 300
Transport Reimbursement			SGD 600
Total			SGD 9220

Communication and Coordination with Sponsor

We will arrange five meetings with the sponsor, NTU. The project will span a total of 13 weeks. The meeting will be conducted biweekly, starting from 9th August, till 4th November.

NTU and The Team will be corresponding mainly through email and face-to-face discussion. The team leader Simon El Nahas Christensen will be the point of contact. Moreover, NTU can also keep track of the deliverables on The Team's Wiki page.

Team Qualifications

Refer to appendix A

References

(2019, April 4). NTU drives digital transformation of its administration. Retrieved August 31, 2019, from http://news.ntu.edu.sg/pages/newsdetail.aspx?URL=http://news.ntu.edu.sg/news/Pages/Media2019_Apr040405-2029.aspx&Guid=f8fdb0e9-3546-4723-bcbc-69e45946d715&Category=All

(2017, November 24). About EcoCampus - EcoCampus - NTU. Retrieved August 31, 2019, from <https://ecocampus.ntu.edu.sg/Pages/AboutEcoCampus.aspx>

(2014, April 29). NTU aims for a greener campus with EcoCampus initiative Retrieved September 1, 2019, from <https://www.todayonline.com/singapore/ntus-aims-greener-campus-ecocampus-initiative>

(2018, August 27). NTU to ban free plastic bags from Oct 1, Education ... - The Straits Times. Retrieved September 1, 2019, from <https://www.straitstimes.com/singapore/education/ntu-to-ban-free-plastic-bags-from-oct-1>

Appendix A: Résumés of Team Members

The following pages present one-page résumés of the team members for this project.

Shanlan Li

☎ (+65) 92755690 | ✉ melodyli710@gmail.com | 📄 LISH0038 | 🔗 <https://www.linkedin.com/in/shanlan-li-728616136/>

Summary

A final year Computer Science student who has experience in software development, software maintenance and data science with primary programming languages **Java** and **Python**, enthusiastic about problem-solving, seeking for a software engineer or data scientist internship.

Education

Nanyang Technological University, Singapore

B.Eng. Computer Science

- CGPA 4.48 / 5.0
- PRC SM2 Scholarship (NTU Sci & Tech Scholarship), 2015

Singapore

Aug. 2016 - (Graduating in) Jun. 2020

KTH Royal Institute of Technology

Department of Computer Science

- Exchange for one semester

Stockholm, Sweden

Jan. 2019 - May. 2019

Work Experience

Credit Suisse

Summer Technology Analyst Internship

- Full-stack developer in private banking IT team. Front-end developer in a standalone case study project.
- Tech stack: React, Spring boot. Shortened the latency of a back-end call from 10+ seconds to around 3 seconds by threading.

Singapore

Jun. 2019 - Aug. 2019

PayPal

Software Engineer (Back-end) Internship

- Gained Java Spring Boot practices by implementing RESTful APIs and service logic.
- Maintained software services by building automation scripts to generate reports and monitoring dashboard regularly.
- Had practices on Agile software development, aspect-oriented programming, testing and software design patterns.

Singapore

Aug. 2018 - Dec. 2018

Visa Inc.

Software Engineer Internship

- Gained knowledge and practices on Hadoop, Spark, Hive, Java JDBC and Unix commands by building a data porting utility from scratch.
- Had exposure to business logic and system design in the Payments Industry.

Singapore

May. 2018 - Aug. 2018

Coding Project/Hackathon Experience

Google APAC CodeU Program 2019

Built a website – local food lover community website from scratch to production in team of four

- Link: <https://github.com/team-45-su-19/team-45-codeu>

Singapore

May. 2019 - Aug. 2019

Credit Suisse CodeIT Suisse Coding Challenge

6th place out of 30+ teams, solved algorithm and software engineering challenges in team of two

Singapore

Sep. 2018

2018 Facebook Singapore Hackathon

Built a facebook messenger chatbot – event planning /project management helper in team of four

- Link: <https://github.com/Jun0413/Alfred>

Singapore

Sep. 2018

Shopee-IET Machine Learning Competition

5th place out of 47 teams, built and trained deep learning models for image recognition in team of three

- Link: <https://drive.google.com/file/d/1wmcZPKLTHCnctHAWYZErymD1cLJfwOMC/view?usp=sharing>

Singapore

March. 2018

School Project

Software Engineering course project: Web Application using Django

Built an information integration website that enables users to search childcare information based on their preference in team of 5. My focus in the team was back end implementation.

- Link: <https://github.com/Ahrayz/CZ2006>

Singapore

Feb. 2018-Apr.2018

Simon El Nahas Christensen

Curriculum Vitae



Akademivej 100 B121
2800 Kgs. Lyngby
Denmark
M
+45 42 42 77 74
E
simon.el.nahas@gmail.com

Education

Bsc. Softwaretechnology, DTU, Lyngby, GPA 11.2. 2016–Now
Specialised in software development, algorithms, machine learning, artificial intelligence, security and human interaction.

Studentereksamen, Borupgaard Gymnasium STX(High School), Ballerup, GPA 11.0. 2012–2015
Specialising in math, physics and chemistry

Vocational Experience

Chatbot and website development Full-stack, Jan 2019–Now
DTU, Lyngby.

Developed a NLP-chatbot for use in financial company. The solution was using a Node.js backend with request to external mySQL database using REST API to frontend.

iOS Development, Velour Logic, Lyngby. Dec 2017–Now
Several apps developed of different categories in a selfowned company Velour Logic.

ARKit Special Course, DTU, Lyngby. Jun 2018
Implemented Augmented Reality app for use in small and medium size companies.

Technical Teacher, Vesterbro-Ungdomsgård, Sep 2017–Feb 2018
Copenhagen.

Taught 10-13 year olds to program and play with a Arduino robot.

Sales and Support Technician, Sitel, London. Mar 2016–Jul 2016
Worked with IT troubleshooting as a consultant for TDC/Yousee through Sitel.

Costumer and Company Service, Jul 2015–Feb 2016
Topdanmark, Ballerup.

Work with IT-systems and handling of insurance policies.

Service Assistant → Costumer Service, Sep 2012–Sep 2015
Føtex, Lautrupcenteret.

Student job. Promoted through 4 job positions. Developed a serviceminded and solution oriented mindset while gaining experience in conflict management.

Competitions and Prices

Microsoft Hackathon, Winner of Newcomers Price. 2018
Together with my team we developed a AR app, that was able to localise near countries and create an overview of the travel destination.

HARRY CAO NGOC THAI

+65 8406 9335 | ngothaicao@gmail.com | github [@kcatstack](#)

EDUCATION

Nanyang Technological University, Singapore

Aug 2016 – May 2020

B.Eng. Computer Science (Year 4)

- Recipient of Asean Undergraduate Scholarship
- Courses taken: Operating System, Computer Network, Data Structure, Algorithm, Object Oriented Programming, Database, i.e.

PROJECTS AND WORK EXPERIENCE

Rakuten Viki

DevOps Engineer Intern

Dec 2018 – July 2019

- Worked in DevOps team, which is in charge of Infrastructure, Cloud Management, CI/CD, Monitoring, Logging, i.e. supporting 40 million active users
- Provisioned and maintained multiple Kubernetes clusters in GKE using Deployment Manager
- Designed and setup Spinnaker CD with GCP integration to support deployment of more than 30 microservices to Kubernetes
- Managed Consul & Vault ACL for storing/retrieving credentials with team-based access
- Deployed and maintained Prometheus monitoring with Grafana and PagerDuty integrations
- Maintained ELK stack supporting 1.8TB in logging daily from LoadBalancers, Kubernetes, Istio i.e.
- Setup Kafka-Connect to replace LogStash in clients' logs, resulting in logs' size reduced by 50%
- Upgraded Istio service mesh for Kubernetes service discovery, egress control and traffic logging

iOS Developer Intern

Sep 2017 – May 2018

- Adopted new APIs such as Picture in Picture, Today Extension, Spotlight Search or Interactive/Interruptible Animation for Viki iOS app
- Modularized two-languaged code base (Obj-C & Swift) for building tvOS app

Cracking Apmops | Personal Project

Summer 2018 - Present

- Singlehandedly built and operate a web-application contains a Front-end and a Back-end app to serve Apmops takers as an online learning platform
- Integrated Paypal payment and TLS with Amazon Cloudfront certificate for encrypted requests
- Developed full-duplex communication between services using WebSocket protocol
- Languages/Technologies used: Ruby on Rails, React, Redux, Docker, AWS, Heroku

Intellilex | Front-end Developer Intern

May 2017 – August 2017

- Built an enterprise web-application, which is a legal resources management platform
- Languages/Technologies used: React, Redux, ES6, Webpack

SKILLS

- DevOps, Software Engineering, iOS Development
- **Tech Stack:** GCP, Kubernetes, Docker, Linux, Helm, Istio, Prometheus, ELK, Spinnaker, CloudBuild, Consul&Vault, Kafka Connect, NGINX, RabbitMQ, Git, React, Redux, Java, JavaScript, Swift, Ruby

MN SHAANMUGAM

Phone: (+65) 8660 1489 | **E-Mail:** sh44n96@gmail.com

EDUCATION

Nanyang Technological University (NTU), Singapore

AUG 2017 – MAY 2021 (Expected)

- Bachelor of Engineering (Computer Science)

PROJECTS

Multi-Disciplinary Design Project

- Currently building a robotic system that can autonomously explore and traverse an unknown area, avoiding obstacles

Video Game Prototypes

- Used Epic Games' Unreal Engine to develop a few game prototypes using both C++ and the 'Blueprints' system, which is a visual scripting language inside Unreal Engine

Crisis Management System

- Developed a system which provides real-time status updates on a map of Singapore on a web graphical user interface

Software Engineering Project

- Used Android Studio to develop a prototype for an app which displays the real-time availability of carpark slots around Singapore

WORK EXPERIENCE

Republic of Singapore Air Force (RSAF)

FEB 2015 – DEC 2016

Air Defence Weapon Specialist (ADWS)

- Attended Specialist Cadet School (SCS) for 6 months and was promoted to a Third Sergeant (3SG)
- Trained incoming Recruits from Basic Military Training (BMT) on our weapon systems
- Used Microsoft Excel to perform data entry for administrative matters

CO-CURRICULAR ACTIVITIES

NTU Tamil Literary Society (TLS)

- **Member of Publicity (Media) Committee**

AUG 2018 – Present

Edited publicity videos using Adobe Premiere Pro, and explored animations and graphic design using Adobe After Effects

SKILLS

Programming Languages - Proficient in Java, C++ & Python

Software – Adobe After Effects/Premiere Pro/Photoshop/InDesign, Unreal Engine, Autodesk Maya

AKSHAYA MUTHU

Handphone: 8231 7131

Email: akshaya522@gmail.com

Education

2017 - 2021 BE. Computer Science
 Nanyang Technological University

2015 – 2016 GCE 'A' Levels
 Temasek Junior College

Projects

Multi-Disciplinary Project

- Build a robotic system that can autonomously explore and transverse an unknown maze while avoiding obstacles.

Crisis Management System (Software Systems Analysis and Design)

- A web application which provides real-time status updates on crisis occurring in Singapore.

Wheelie Carpark Finder Application (Software Engineering)

- Android Application that displays real-time carpark slot information and directions to carparks.

Work Experience

August 2019 – Current Research Assistant (Programmer)
 Nanyang Business School

Computer Skills

- Proficient in Python, Java, JavaScript and C
- Familiar with ReactJS, Django, Visual Studio, Visual Studio Code, MATLAB, SQL
- Proficient in Microsoft Excel, Word and Power-point

Personal Strengths and Interests

Optimistic Personality, Diplomatic, Team-player, Reading, Dancing and Watching TV Series

Jinpo Zeng

+65 8710 3389 | ze0001po@e.ntu.edu.sg

Education

Nanyang Technological University, Singapore <ul style="list-style-type: none">• Double Degree in Bachelor of Business (Business Analytics) and Bachelor of Engineering (Computing)• Recipient of Nanyang Technological University Science and Engineering Scholarship• Expected First Class Honors in both computing (CGPA: 4.75 / 5.0) and business (CGPA: 4.69 / 5.0)• NBS Dean's List Award in 2017 for outstanding academic performance	Aug 2016 - Jun 2020
GCE 'A' Level, National Junior College, Singapore <ul style="list-style-type: none">• Achieved 5 Distinctions in H2 Physics, H2 Chemistry, H2 Mathematics, H2 Economics and Project Work	Jan 2014 - Nov 2015

INTERNSHIP / WORK EXPERIENCE

Credit Suisse – Summer Analyst (APAC Technology & Change Department) <ul style="list-style-type: none">• Developed Input and Output File Adaptor for Kafka, using Java• Improved UI for CodeIT Suisse challenge, using Vue	Jun 2019 - Aug 2019
Ascendas - Data Scientist Intern <ul style="list-style-type: none">• Scraped relevant data from multiple sources using corresponding APIs or using Python• Cleaned and processed data for analysis, including merging multiple data sources using fuzzy logics• Self-initiated a data visualization project in understanding the expertise of property agents	May 2018 - Aug 2018
Shopee - Cross Border Ecommerce Intern <ul style="list-style-type: none">• Analyzed cross border sales performance and coordinated cross border campaigns• Conducted a category deep dive in Home Appliance and provided recommendations on areas of improvement for sellers, leading to 5% increase in GMV of the category (Home Appliance)• Monitored Paid Ads KPIs and identified seller pain points	Jan 2018 - Apr 2018

CCA

NTU German Society - Chairman of Oktoberfest <ul style="list-style-type: none">• Planned and organized the event for 350 participants; proposed a detailed program flow plan, and assigned tasks to sub-committee members to ensure the event to run smoothly• Liaised with external beer provider (Paulaner Bräuhaus) and established positive relationship with sponsors, guests of honors and external performers	Jul 2017 - Oct 2017
NTU PRC Student Union - Vice-chairman of PRC Inter-University Party <ul style="list-style-type: none">• Displayed creativity and contributed innovative ideas in program planning, resulting in a successful event for 300 participants, who actively participate in the games and interact with each other• Demonstrated leadership and delegated roles according to committee members' strengths and interests	Jan 2017 - Mar 2017

ACHIEVEMENTS AND AWARDS

NTU CZ4045 Natural Language Processing on Amazon Product Reviews (Using Python) <ul style="list-style-type: none">• Customized sentence tokenizer and built word tokenizer with the ability to recognize emoticon tokens• Preprocessed reviews and performed sentiment word detection based on the online review rating on the scale of 1 to 5	Sep 2018 - Nov 2018
NTU BA2407 Analytics Project - Prediction of Employability of Job Seekers (Using Python & R) <ul style="list-style-type: none">• Scraped job titles and job descriptions from Indeed.com• Performed text mining and identified top keywords of required qualifications in IT industries• Developed nnet models in predicting job seekers' chance of employment in each IT industry classification	Jan 2018 - Apr 2018
NTU BA2402 Database Project (Using SQL) <ul style="list-style-type: none">• Identified business problems and proposed a database solution to tackle the problems• Developed a prototype for report generation using SQL	Aug 2017 - Nov 2017
NTU Cross - Cultural Immersion & Consulting Programme <ul style="list-style-type: none">• Analyzed market trends of skincare products and identified seller pain points• Provided insights and suggestions for further improvement on addressing the pain points	Mar 2017

SKILLS/COMPETENCIES AND INTERESTS

Skills	: R, Python, Java, SQL, Excel, Power BI, Tableau, HTML, Javascript
Language Proficiency	: Proficient in Chinese and English, Intermediate in Hokkien and Shanghaiese
Interests	: Basketball, Breakdance, Travel, Table Tennis