StudyHub@NTU

A platform to facilitate the learning-based social connectedness

Submitted to

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# Executive Summary

Because of the hybrid learning mode adopted by NTU, students have less chance to interact and communicate physically. Hence, a learning-based platform to provide virtual connection and information sharing is in great demand. Therefore, StudyHub@NTU, a web-based platform to help students at NTU for easier course information exchange, is proposed. The major functionalities of StudyHub@NTU include course information display, index swapping list, and study-based forum. StudyHub@NTU is a Web application, and therefore it adopts client-server system architecture pattern. The system uses Java Spring Boot as the back-end development framework and Vue.js.

To manage the project, the waterfall development model is used, and there are 4 phases including plan, design & implement, test & refinement, and production & release. The estimated project duration is from 10th Aug, 2021 to 22nd Oct, 2021.

# Statement of Problem

Due to COVID-19 pandemic, most learning activities are conducted online, but the abrupt shift to the online learning is very challenging to students, especially the less experienced student (Bird, Castelmen, & Lohner, 2021). It also eliminates the connection among students in NTU due to less physical interaction. Hence, students may have more difficulty in exchanging course information, sharing questions and opinions about course works and finding teammates.

Even without COVID-19, the course information exchange for NTU students is very inconvenient. To elaborate, it is hard to find students' comments on courses online, and Google sometimes returns outdated information about a course. Swapping index is also frequent during Add/Drop period, but currently there is no platform to publish and share index swapping information, so that a student may need to join in many different group channels or even write email to the whole class of hundreds of students to find other students who want to swap the index too. Meanwhile, many courses on NTULearn do not open discussion broad and students cannot view questions from other students. The lack of an open discussion platform aggravates the social disconnection of online learning. Unable to exchange thoughts and questions among peers, more students may turn to professors for help and wait for days for professors' replies. The current situation is rather inconvenience for both the students and the professors.

Currently, course-related information distributes among different platforms like Reddit and uWave, but the information searching is still very inefficient. It is because these platforms are for general purpose, and there are many irrelevant threads. Hence, it could distract the students who are searching for study-related content.

In one sentence, NTU students do not have a specialized platform that contains accurate and up-to-date course information and provides them with a platform to communicate. This project is initiated by the team from SCSE at NTU, and it aims to build such a platform for NTU students to exchange course-related information with peers in an efficient manner.

# Objectives

Table 1 The objectives and the alignment with the problems

|  |  |
| --- | --- |
| Objective | Alignment with Problems |
| To build a socially connected platform that supports 25,000 active users | Connection with peers decreases due to increase on online study |
| To maintain sites for each currently available NTU UG courses to display information such as students' feedback, index swap and teammates search | Inefficient course information exchange on course registration and participation. |
| To eliminate the academic-irrelevant content by allowing user to report the inappropriate content to admin | Inefficient academic-related searching |
| To ensure the scalability of the system for more storage space | The growth of threads and information |
| To allow users to report the change on courses | The course information is updated each year |

# Technical Approach

## Customer Needs

Customer needs are identified in such ways:

* **Survey from target users**, i.e., current NTU undergraduates
* **Reference from similar products**, e.g., NUSMOD and NTULearn Discussion Board

The needs of customers and the corresponding features are identified according to different stages of customers’ activities when they study for a course. In elaboration, to study a course, the customer usually goes through the following steps:

1. Search courses of interest
2. Register courses
3. Study for courses

During each stage, the customer may have different problems and needs. The detail needs and system features are shown in Figure 1.

Table, website, timeline

Description automatically generated

Figure 1 The example of the students’ needs during different phases when they study for a course, suggested by the green arrow. The last row shows the features corresponding to the needs.

## System Architecture

The system is a web-based application. It follows the client-server architecture pattern. The client system, e.g., Web Client, will query the cloud server for data. Diagram

Description automatically generated

Figure 2 The component diagram of the system architecture

The advantages of client-server architecture include:

* Good Scalability because servers could be distributed
* Common data is available to all clients

Table 2 The description of the components in the system architecture.

|  |  |
| --- | --- |
| Component | Description |
| Account | Basic functions including registration, log-in, log-out and user profile |
| Forum | A system that allows users to post threads, reply. It requires users to log-in. Before the thread is post, it must pass the content check. |
| ContentChecker | A system that forbids illegal and inappropriate content to be published. |
| CourseInformation | A system displaying the course information. |
| Index Swap | Subsystem for users to post and display index swap. It requires users to be logged-in |
| Teammate Search | Subsystem for users to post and display teammate search information, requiring users to be logged in. |
| Feedback & Rate | Subsystem to record and display users’ comments and ratings on courses. Posting information requires users to be logged in. |
| ServerQuery | API to do CRUD operations on database. |
| Server | Deployed server storing data for the system. |

## Technologies Adopted

### Back-end Framework: Spring Boot

Spring Boot is a popular framework to create stand-alone, production-grade and portable Spring based Applications that can run on any platform with JDK installed. Spring has a flexible and comprehensive set of extensions and third-party libraries and can be easily integrated with Spring ecosystem including Spring Data, Spring Security, Spring JDBC, etc. Spring Boot allows easy connection with various database or queue services and hence provide flexibility for choice of database systems. Spring Boot also support Spring Cloud microservices

### Front-end Framework: Vue.js

Vue.js is a popular open-source front-end JavaScript framework, which currently has more than 188k stars on GitHub. It is easy to integrate with other frameworks and projects with simple API and small size. It focuses on the view layer in the MVC model, yet it provides with power features to integrate with the back-end part and create animation. As a progressive framework, Vue.js is also user-friendly for maintenance.

# Project Management

## Phasing

Table 3 The phases and the description

|  |  |
| --- | --- |
| Phase | Description |
| Planning | To complete the project proposal, SRS with use case models, and relevant plans for future development including quality plan, project plan and risk management |
| Design & implement | The phase is divided into 4 sub-phases based on system component. Each sub-phase follows such a procedure: implementation, testing and documentation. |
| Test & Refinement | To conduct an overall testing on the complete system. To fix the bugs if any detected. |
| Production & Release | To deploy the server in production. Publish the documentations online. |

## Timelines with milestones

As shown in Figure 3 and Table 4, the project is divided into various subtasks (as shown in Figure 3 as the blue bars) among which there are dependencies (as indicated by the arrow in Figure 3). Some tasks could be combined, as shown in the green bar in Figure 3.

Graphical user interface, application, table, Excel

Description automatically generated

Figure 3 the project Gantt chart

Table 4 milestones with expected completion dates

|  |  |
| --- | --- |
| Milestone | Expected Completion Date |
| Complete project plans | 3-Sep-21 |
| Implementation of Account System | 10-Sep-21 |
| Implementation of Forum | 24-Sep-21 |
| Implementation of Course Information (including swap index and form a team) | 10-Oct-21 |
| Integration test & Refinement | 15-Oct-21 |
| Production & Release | 22-Oct-21 |

## Responsibility of Team Members

Table 5

|  |  |
| --- | --- |
| Name | Role |
| GE ZHUOYAN | QA Manager, Back-end Developer |
| LI PINGRUI | QA Engineer, Back-end Developer |
| TAN BOON PING | Lead Developer, Front-end Developer |
| TANG YUTING | Product Manager (PM), Front-end Developer |
| WANG BINLI | QA Engineer, Front-end Developer |
| WANG YING | Release Manager & Engineer, Back-end Developer |

There are 6 people in the team, and each member takes up 2 roles as shown in Table 5.

Before the project completes, the team will produce deliverables in different milestones. The detail is shown in the following “deliverables” section.

## Deliverables

Before a phase ends, there could be some deliverables, and the detail is shown as Table 6.

Table 6 the table of deliverables

|  |  |  |
| --- | --- | --- |
| Item | Description | Delivery Date |
| Detailed requirement specifications | Complete user case models and requirement lists | At the end of project planning phase |
| Working prototype | A working web application fulfilling the requirements | At the end of test stage |
| Test plan | The test plan and result for important features | At the end of test stage |
| Code | Source code of system | By the release phase |
| Developer Guide | System architecture and function documentation to facilitate future development | By the end of release phase |
| User Guide | Instructions to help first-time users to start with the web | By the end of release phase |

## Budget

The project’s budget is estimated as suggested by Table 7. The team salary is project-based. The fees of database and cloud server are monthly-based, and our project estimates the usage of these resource for 2 years.

Table 7 The budget detail table



## Communication and Coordination with Sponsor

#### Schedules and Responsibilities

The team holds a weekly regular meeting on Friday, when each member reports the progress including the problems, and new tasks will be assigned to each member. PM should host the meeting and do the meeting summary after the meeting.

The communication between the team and the sponsor is conducted through PM. PM needs to update the teammates with the latest information from the sponsor.

#### Tools

* Group communication tool WeChat and Zoom are used for short progress update and Q&A.
* GitHub is used for coding collaboration.
* Office 365 is used for documentation collaboration.
* Visual Paradigm to model UML and generate code skeleton.

# Team Qualification

* GE ZHUOYAN

Zhuoyan is a 3rd year Computer Science student. She gained experience in software development life cycle in CZ2006 course project. She has experience in mobile App frontend design and development using Flutter and has participated in a computer vision research project.

* LI PINGRUI

Pingrui is a 3rd year Computer Science student. She has experience of backend development with Spring Boot and Node.js as well as RDBMS and NoSQL. She also has project management experience and has worked in teams to for various projects.

* TAN BOON PING

Boon Ping is a 3rd year Computer Science student. Having attained a diploma in Game Development & Technology, he is proficient in object orientated languages such as C++ and Java. Boon Ping also has experience developing software on new technologies such as the Xbox Kinect as well as virtual reality games

* TANG YUTING

Yuting is a 3rd year Computer Science student. She has experience on Android development, Django development, game development as well as research projects on Deep Learning. She has also participated in related course projects like CZ2006 and CZ3003 and was responsible from system design to implementation.

* WANG BINLI

Binli is a 3rd year Computer Science student. She has experience on Android development, concentrate on backend development with Firebase Realtime database and testing. She has experience on UI design for mobile application as well.

* WANG YING

Wang Ying is a 3rd year Computer Science student. She has experience on course projects related to database design, software development life cycle and algorithm analysis. She has also participated in a research project on machine learning.

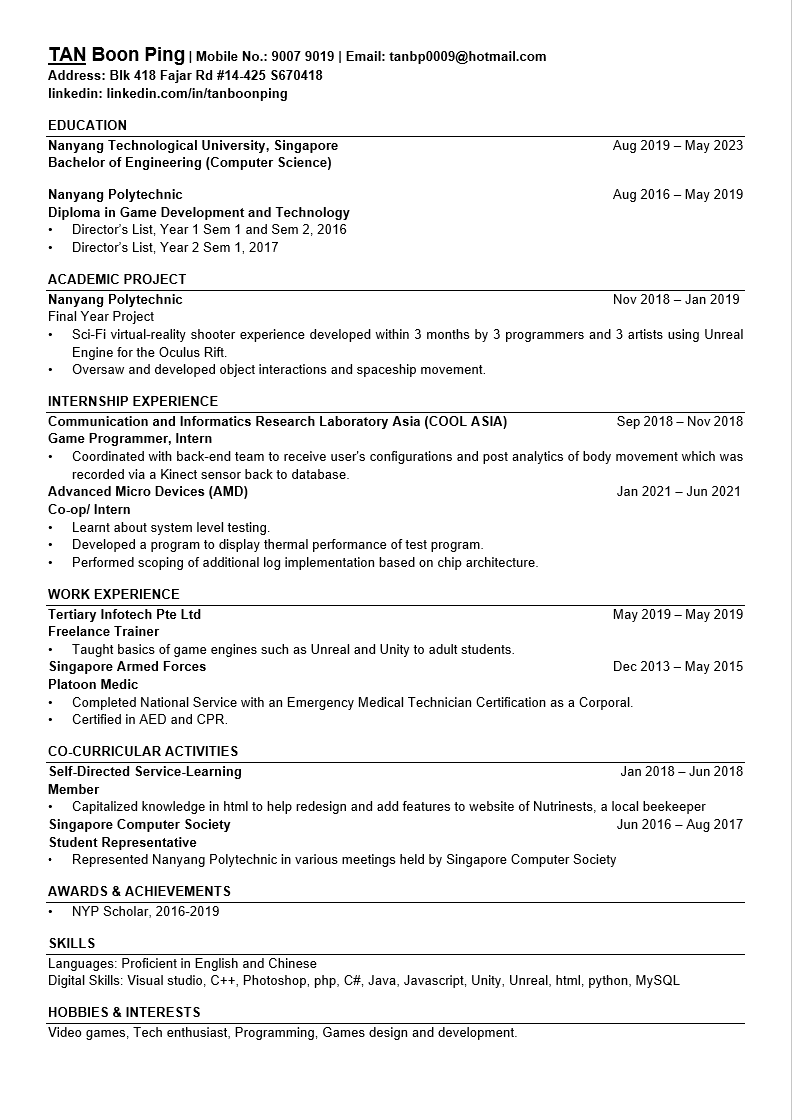
# References

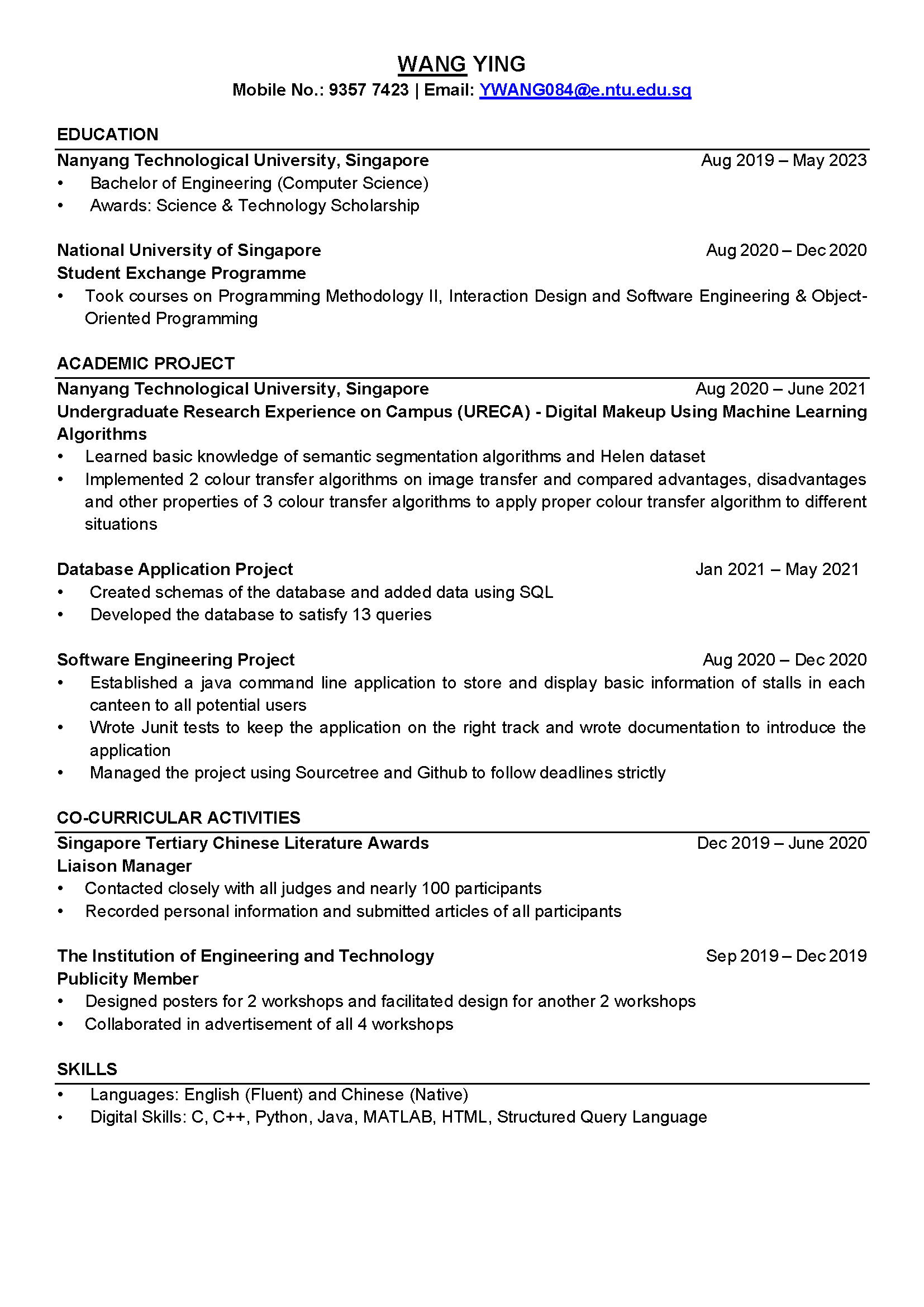
Bird, K. A., Castelmen, B. L., & Lohner, G. (2021). Negative Impacts From the Shift to Online Learning During the COVID-19 Crisis: Evidence from a Statewide Community College System. *EdWorkingPaper*.

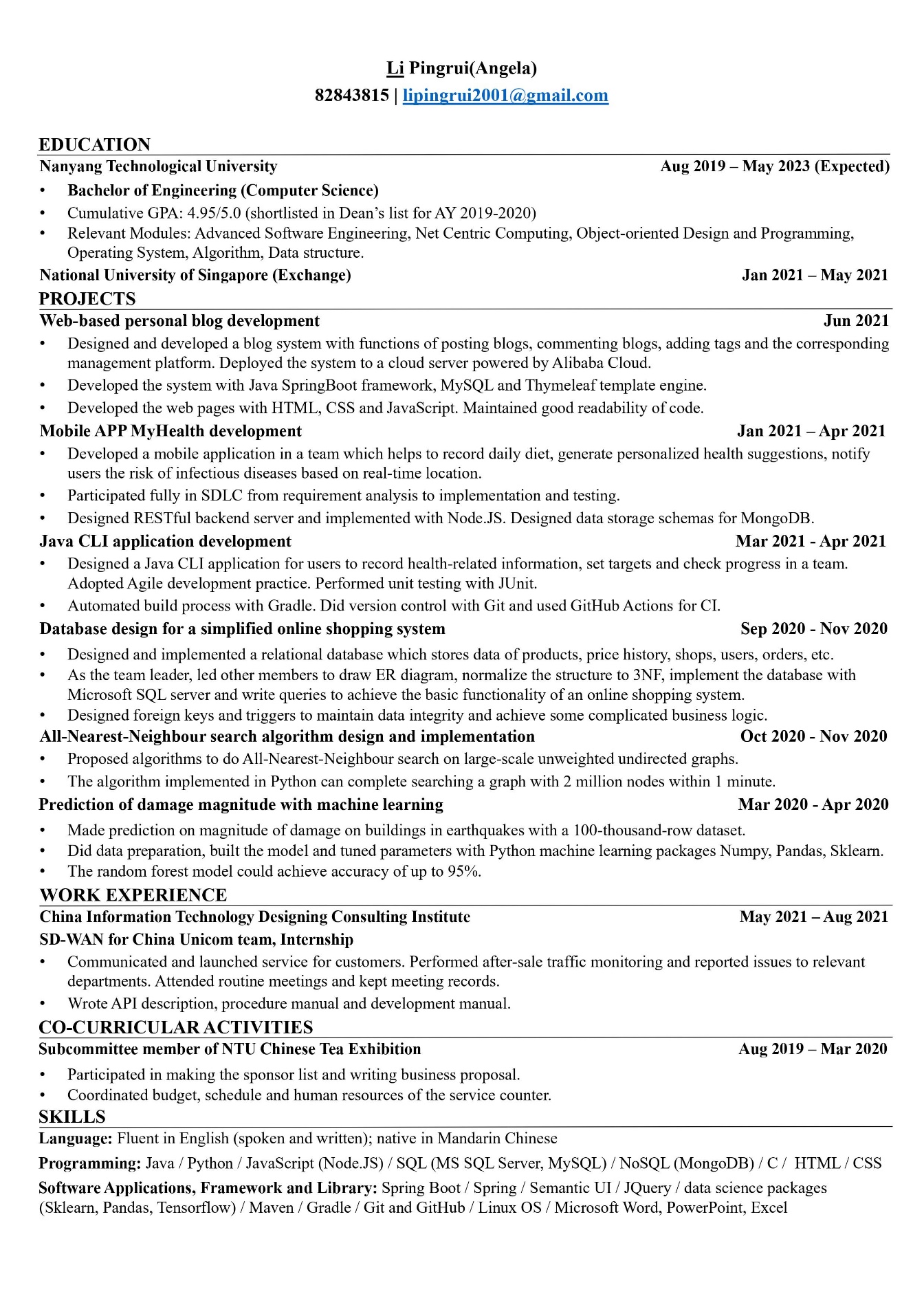
# Appendix: Résumés of team members

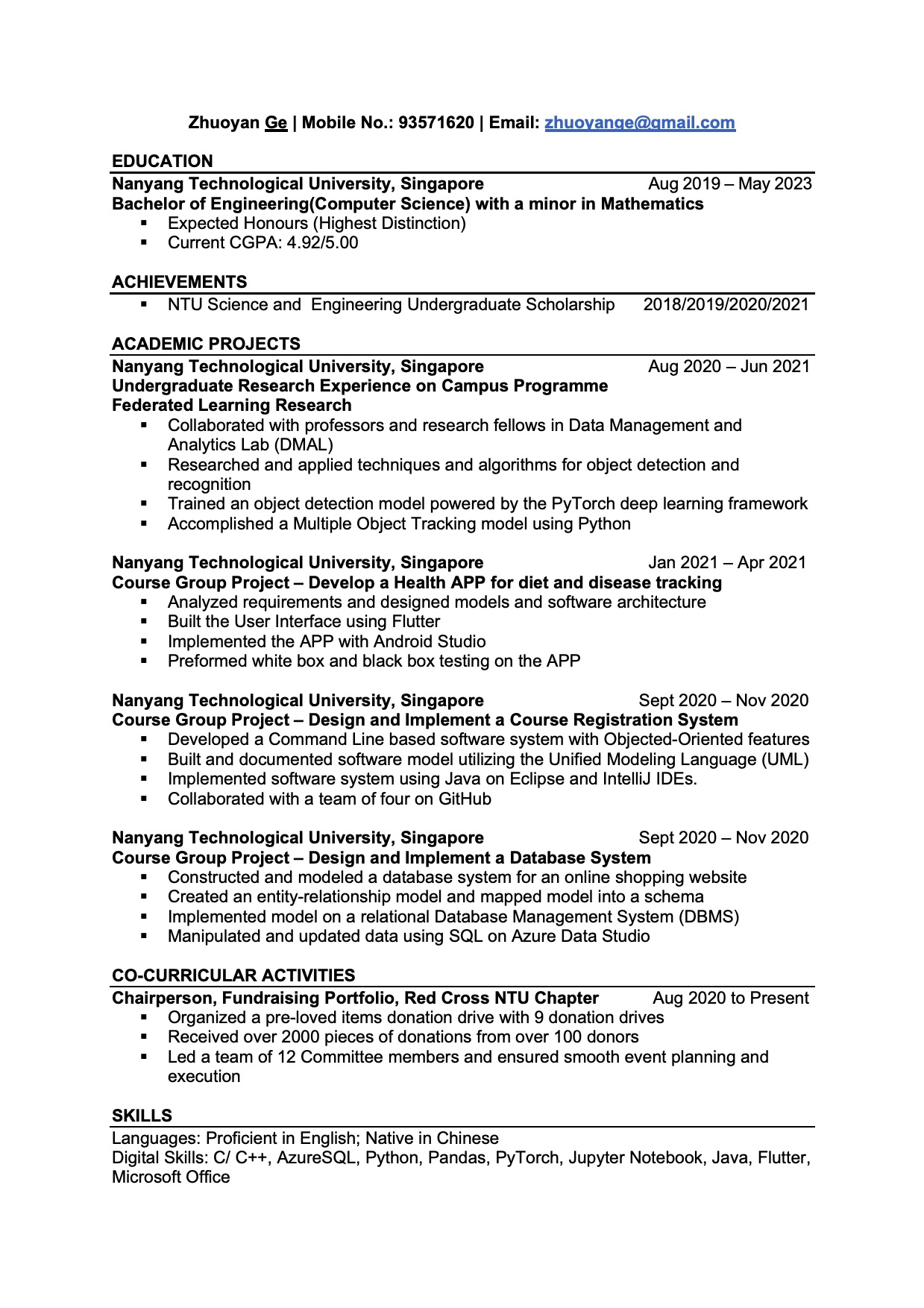
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