

RoomieLah: A Roommate Matching Mobile Application

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Submitted to—

Shi Hanyu

School of Computer Science and Engineering, Nanyang Technological University

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Executive Summary

For university students in Singapore, who choose to stay in university halls or shared apartments, there is no way right now to find a roommate who they are compatible with. Instead, the allocation is completely random leading to unpleasant experiences which have some serious consequences. This problem was extremely crucial to solve, and we thus present - RoomieLah!

RoomieLah is a cross platform mobile application wherein university students could create their account and fill in their roommate preferences and the traits they would be comfortable with, after which the application would dynamically suggest to them other students who they might be compatible with. They would then have an option to chat with the matched user and if needed, connect with them on social media. The larger aim is to create a one-stop solution for university students to find roommates they are compatible with and thereby improving overall living experience.

To ensure the user friendliness keeping in mind the software maintainability and scalability, the application will be developed using Flutter framework which would allow the application to run on Android as well as iOS platforms. We have adopted the Waterfall model for the software development life cycle and propose to build the application using a Client-Server Architecture. Team StrawHats is qualified and experienced enough to build this accessible, scalable, and maintainable application which will be used by university students all across Singapore.

Statement of Problem

Singapore is home to hundreds of thousands of students who are studying in one of the thirty-four universities present. This includes both – local students and international students. Students usually stay in either university halls of residence or co-living apartments. For students living in a double room in university hall or co-living apartments, their roommates are significant to their living experience. This is because they spend a considerable amount of time with them and influence each other's lives strongly – both positively and negatively. This could also result in them affecting each other's mental health.

At present, if a student applies for a double room or a co-living apartment, they end up living with someone random. This leads to a very high chance of two not very compatible students ending up living together which might lead to unpleasant experiences. This could be a result of differences in four variables – personality, values/attitude, religious and socioeconomic background, and living habits. To elaborate, the roommates could have different sleeping patterns which could end up affecting their quality of sleep, or one of them is not considerate about the cleanliness of the room which bothers the other, or one of them is an extrovert who has guests over often resulting in disturbing the other, or in general, one of them doesn't respect the roommate's cultural or socio-economic background.

As a result of differences in some of these variables, conflict may arise which would affect an individual in multiple ways. Firstly, it would negatively affect one's mental health as there is a significant correlation between roommate conflict and stress levels. Secondly an experiment conducted by Dr. J.K. Coleman concludes that a student with a random roommate has a lower GPA than a student with a roommate whom they met online which in turn, is lower than a student with a roommate whom they have a prior relationship with. Also, a study by Michigan State University identified roommate conflicts as one of the major factors for students dropping out of college. Therefore, it is imperative to develop an innovative and effective solution to mitigate this problem as soon as possible.

Team StrawHats consists of seven students, all of whom have faced a similar problem in university. This will be an added advantage to the ample amount of experience the team has in software development, resulting in building of an easily maintainable and user-friendly solution.

Objectives

In this proposal, we put forth the idea of a mobile app called RoomieLah, with the objectives being as follows:

1. **Allowing a user to create a user profile specifying their interests** - The user will be required to use their university account to register their account on the application, and the authentication for the same will be done using the respective university's Single Sign-On (SSO) method to ensure user privacy, and also to ensure that an individual who is not a university student cannot register as a user on the application. After registration, the user will proceed to set up their profile, indicating information about their personality, preferences, interests etc., which will later be used to find suitable matches for possible roommates for the user. This profile can be updated by the user at any time during the usage of the application, and the recommendations by the application will be updated accordingly.
2. **Allowing a user to indicate interest in matching with other recommended users** - The user will be able to view all the recommendations by the application and will then be allowed to swipe right or left on each user to indicate whether they would be interested in potentially matching with that user respectively. If two users swipe right for each other, they are declared a match in the application. There will be no bound on the number of users a particular user is allowed to match with simultaneously.
3. **Allowing a user to chat with another user that they match with** - The application will have a chat feature which will only be activated when there is a successful match between two users. The aim of this feature is to facilitate communication between users interested in learning more about each other, so as to understand if they are compatible roommates and glean essential information that might not be indicated on their user profiles. The users will be able to send text messages and images to each other within the application using this service, thus eliminating the need to switch to any other social media platform or revealing unnecessary personal information to each other. The messages will also be encrypted and will not be able to be accessed via the database of the application, thus ensuring total privacy.

- 4. Allowing a user to connect to matched users on social media-** If the user matches with a profile that has their social media accounts linked to it, the user will be allowed to connect to those accounts via URL provided on the profile's home page. This functionality has been added to facilitate communication between the matched users and to allow them to learn more about each other if they wish to.

Technical Approach

To meet the above objectives, we will develop an algorithm deployed on a mobile application. This will make it easier for customers to access our application on the go, thus increasing the application's engagement and ease of access.

Needs of Customer

To understand the needs of the customer, the team interviewed students of Nanyang Technological University who reside in halls. Additionally, the team also conducted surveys to understand the customer's needs in the form of data. The results of the survey are as follows:

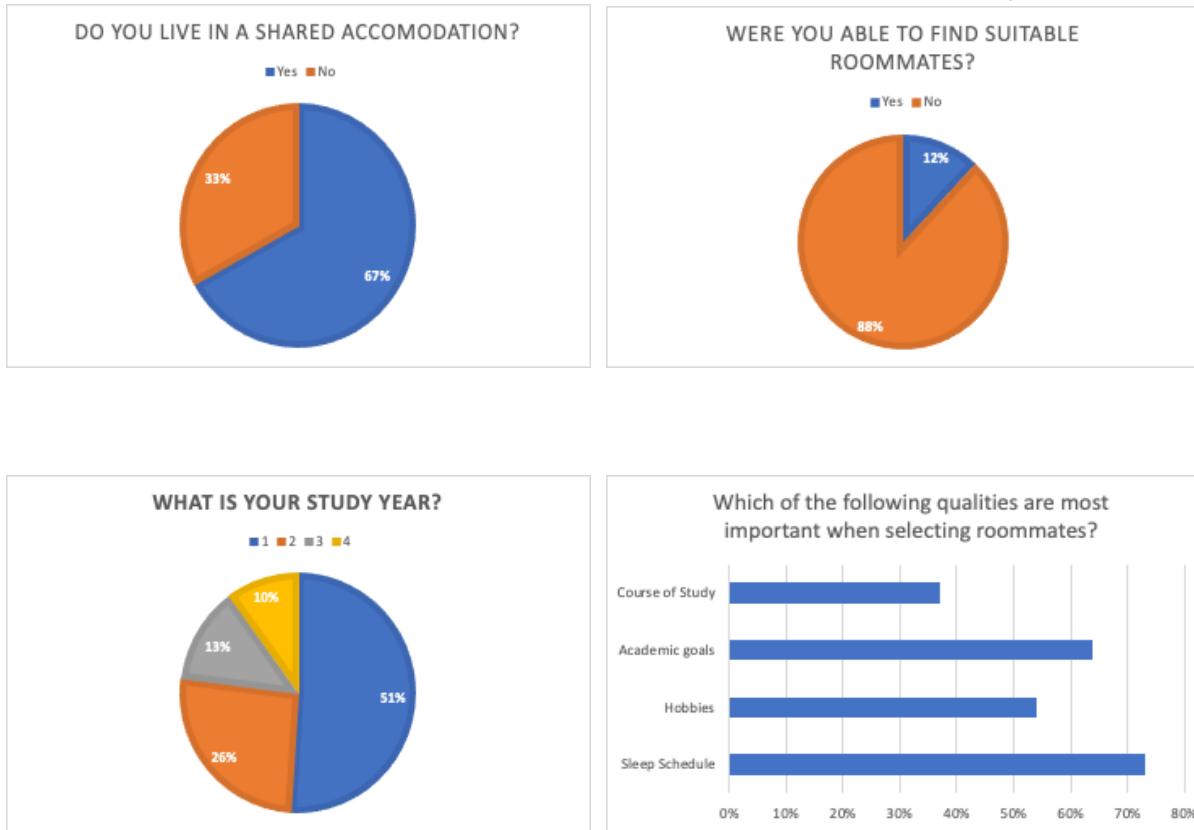


Figure 1: User Survey Results

From the above graphs, it is evident that students are not happy with the existing roommate matching and have certain preferences when it comes to pairing with students.

Students, especially freshmen, find it difficult to meet people before they arrive on campus and thus need a platform to help them initiate conversations and understand the interests and personalities of other students.

Target Specifications

Here you would place paragraphs that explain the ideas or approaches on how you targeted the specifications or how you will target the specifications so that the needs of the customer can be met. Please indent all paragraphs and do not skip a line between paragraphs in the same section or subsection.

The proposed application would first store the background and interests of the user. The user would then be prompted to rank different qualities and traits of an ideal roommate. The list of qualities and traits would include but not be limited to the traits specified by the customer needs. Submitting the preferences would trigger our algorithm which would filter the profiles of suitable matches for our user. The user would then be able to view the profiles and express interest in pairing up as roommates. If the interest is mutual, it will be a match!

The user would be able to connect and chat with the students who are a potential match. Chatting would be allowed through the application without revealing any personal information about the other student. Additionally, the users can choose to share their social media profiles with others. Complying with the Personal Data Protection Act of Singapore, no personal information of the user will be shared with any external party. At any point of time, the user can choose to un-match with a previous match. This application would thus enable first year students to meet students having similar interests before they apply for halls.

Technology Consideration

The technology for the application was decided keeping user convenience and market penetrability prime. As such, a mobile application was unequivocally the choice of all project members with Flutter being the choice of framework to realize our application. The entire tech stack was chosen to allow for simple and seamless integration which translates to a pleasant user experience.

Technology	Description
Flutter	Google's open-source software development kit for multi-platform mobile and web application development written in Dart programming language that helps create an interactive and engaging experience for our users.
Firebase	Google's BaaS (backend-as-a-service) platform that runs the backend for the mobile-based application seamlessly.
Cloud Firestore	Cloud-hosted and scalable NoSQL database which is intuitive and embedded within the backend of the application.

System Architecture/Platform

Platform Services

Platform	Description
Git	VCS (Version Control System) and Source code management
GitHub	code hosting platform for version control and collaboration. Allows project collaborators work together on projects from anywhere.
Visual Paradigm	Visual Paradigm (VP-UML) is a UML CASE Tool supporting UML 2, SysML and Business Process Modeling Notation (BPMN).
Android Studio	IDE used for mobile application development.
Android Emulator	Software imitating Android OS

System Architecture

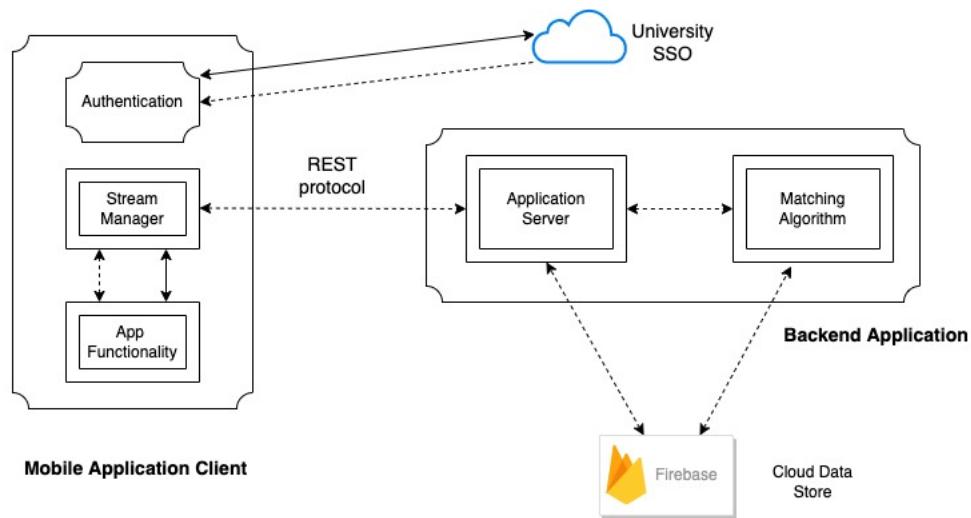


Figure 2: Client - Server System Architecture

Project Management

We have adopted the Waterfall model in our software development life cycle where all activities are carried out sequentially and are dependent on the previous activity. The scope of the project is clearly defined, and the requirements of the system are elicited. A Use case model (diagram and description) is developed to explicate the requirements in detail. The System Architecture for the project is developed once the requirements are clearly defined. Once the project proposal is accepted, a Quality Management Plan is produced to help guide the Program Manager (PM) and project personnel to execute quality management and quality assurance activities for the project. All development activities are commenced only after the Quality Management Plan is produced. A Project plan and Risk Management Plan is developed during the early stages of the implementation phase. A comprehensive Test Plan is produced towards the end of the implementation phase. Testing of each feature is carried out only after the complete implementation of the feature. Testing will be carried out in a bottom-up approach where integration tests and load tests are performed only after the completion of unit tests. A test convergence report is submitted once the system has met all the test requirements. A Change and Configuration Management Plan is developed after the implementation of the system. A Release Plan and Software Maintainability Report is produced after the System has been thoroughly tested. The final application is then deployed after passing Quality assurance and user acceptance tests.

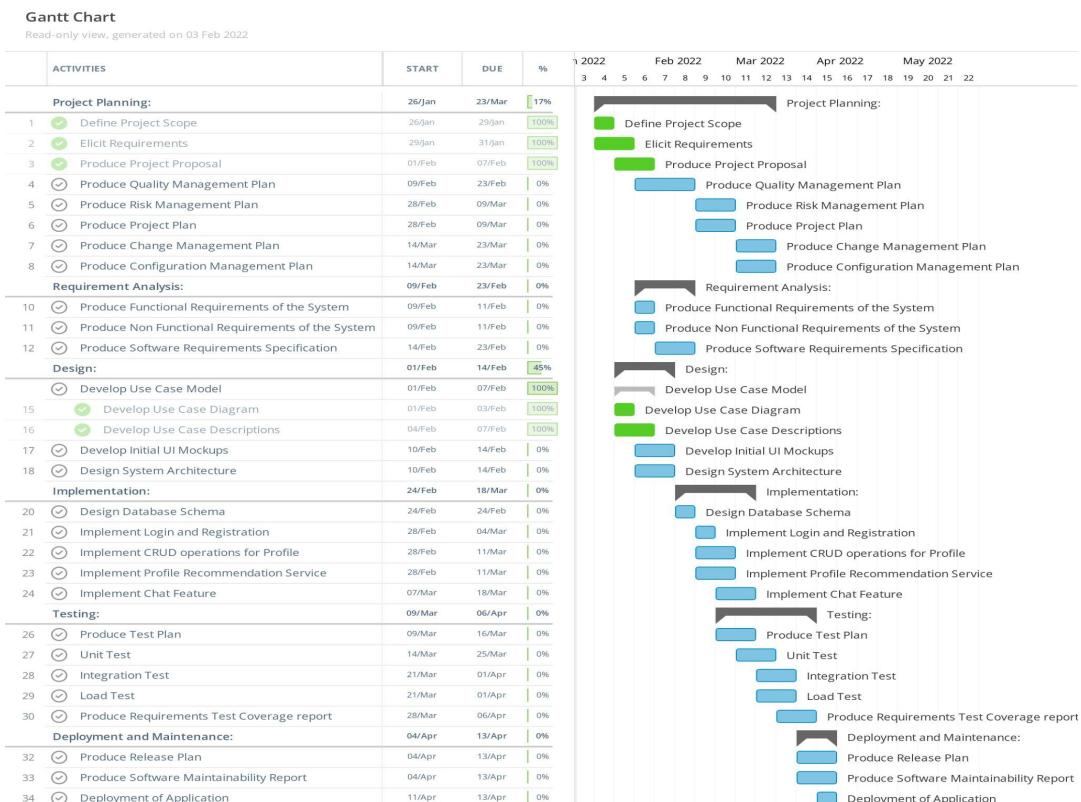


Figure 3: Gantt chart for the project.

Deliverables

The following deliverables will be provided to the customer:

1. **Software Requirements Specification** - Detailed Use Case Model with diagram and description
2. **Technical Prototype (Frontend)** - Cross-platform mobile application (iOS and Android)
3. **Technical Prototype (Backend)** - Deployed application backend
4. **Database** - Cloud configured database on Google Firestore
5. **Source Code** - Source code of application with implementation and test code
6. **Test Procedures** - Description of test plan, test cases and test convergence report
7. **Configuration** - Configuration, Changes, and Release Plan of the software

Budget

With a team of 7 members and a completion time of 5 months, the estimated budget required for this project will be **\$78,237.39**. The amount is inclusive of a 5-month maintenance and support cost after the deployment of the project. In addition, a contingency cost estimated to be 10% of the Implementation Cost is being accounted for any unforeseen circumstances during the duration of the project.

Ref	Item	Supplier	Quantity	Unit Price	Total
1.	Labor Costs				
1.1	Project manager		1	\$30,000.00	\$30,000.00
1.2	Project team members		7	\$3,000.00	\$21,000.00
2	Hardware Costs				
2.1	Computers	Dell	4	\$1,000.00	\$4,000.00
2.2	Computers	Apple	3	\$1,500.00	\$4,500.00
2.3	Printer	HP	1	\$3,000.00	\$3,000.00

3	Software Costs				
3.1	Technology license	Android	1	\$25.00	\$25.00
3.2	Technology license	Apple	1	\$99.99	\$99.99
3.3	Database	Google	1	\$1,500.00	\$1,500.00
4	Workspace and Commutation Costs				
4.1	Office rental	NTU	1	\$6,000.00	\$6,000.00
4.2	Transportation	Taxi	1	\$1,000.00	\$1,000.00
5	Contingency		-	10% of implementation costs	\$7112.4
	TOTAL				\$78,237.39

Table 1: Requested items and funds for initial design.

Communication and Coordination with Sponsor

The Project Manager will be the primary point of contact, who will handle all communication between the sponsor and the development team. There will be bi-weekly update reports sent to the sponsor by the Project Manager via email. There will also be monthly meetings between the Project Manager and the sponsor to discuss any issues or requests that might arise during the span of the project. Individual team members may join the monthly meetings if their specific expertise is deemed to be required.

Due to the sudden tightening up and relaxation of COVID-19 restrictions, the monthly meetings may be in person or online (via Microsoft Teams) depending on the state of things.

The sponsors need to acknowledge the bi-weekly reports and give feedback as soon as possible to ensure that the work's progression aligns itself to the requirement of the sponsor and there is no miscommunication between the two parties.

Team Qualifications

Name	Experience
Arora Srishti (Project Manager)	Srishti has a wealth of experience in managing people and has successfully executed and delivered multiple projects. She has a very good understanding of the entire development process, from the start to the end. All this along with her excellent interpersonal skills, makes her the ideal person to communicate with the key stakeholders to ensure that the product satisfies the requirements of the client.
Pandey Pratyush (Lead Developer)	With a myriad of projects under his belt, there is none better in the team than Pratyush to be the lead developer of this project. His experience in leading various teams will ensure that he is able to effectively split up tasks among team members as well as ensure that the project delivered is of a high quality and is according to the specifications.
Surawar Sanath (Front-end Developer)	Sanath has significant experience in front end technologies and specializes in creating highly intuitive and human centric interfaces.

Rajagopal Mahadevan Iyer (Back-end Developer)	Rajagopal has been involved in multiple projects and has ample experience in backend development. With his knowledge in cyber security, he will be able to minimize the number of vulnerabilities present in the backend and ensure that it is more secure.
Acharya Atul (QA Manager)	Atul has worked in multiple teams and has collaborated with developers of different styles to bring various projects into fruition. His previous experiences will ensure that proper methodologies and accurate quality metrics are implemented to deliver a high-quality product.
Tayal Aks (QA Engineer)	Aks has substantial experience in evaluating the performance of products to improve its efficiency, scalability, and accuracy. He also has experience in writing and enhancing tests including unit tests, integration tests and regression tests. This makes him the perfect team member to take on the role of QA Engineer.
Agarwal Gopal (Release Engineer)	Gopal has been a part of multiple development projects and has even handled deployment of flutter applications during his internship. His prior experiences will help in making sure that there is a smooth deployment and updating of the product.

Conclusion

Roomie Lah will be an application which will help university students in Singapore to connect with each other and find a suitable roommate for their hall accommodation. As evident from the customer needs surveys, majority students were unable to find suitable roommates that match their preferences or living style. Most of them are college freshmen who do not know their batch mates or other students in the university. This helps provide good business justifications for our product as a scalable platform that helps users connect with other university students around Singapore.

Our team comprises highly qualified professionals from diverse backgrounds, sharing similar visions for the product. They can deliver fully tested, production-quality code in a short time span. The team plans to deliver the deployed product within a span of 2 months keeping in mind the probable backlogs. In the end, we envision improving dormitory life across universities in Singapore in the hope to strengthen the prevalent hall culture.

References

1. 9 Typical Roommate Issues. Retrieved from <https://stevebrownapts.com/2018/07/02/research-shows-25-students-experience-college-roommate-problems/>
2. How to be a good roommate. Retrieved from <https://www.thespruce.com/how-to-be-a-good-roommate-1216908>
3. The Rise of Roommate Households, The Atlantic. Retrieved from <https://www.theatlantic.com/family/archive/2018/08/the-strange-unique-intimacy-of-the-roommate-relationship/567296/>
4. Finding The Perfect Room and Roommates. Retrieved from <https://bootcamp.uxdesign.cc/finding-the-perfect-rooms-and-roommates-a-ui-ux-case-study-63ca14666821>

Appendix A: Résumés of Team Members

1. Arora Srishti - Project Manager

Srishti Arora

Undergraduate, Computer Science, Year 3
CGPA: 4.50/5.00

EDUCATION

Nanyang Technological University, Singapore — *Bachelors of Engineering, Computer Science*
JUL 2019 – PRESENT

WORK EXPERIENCE

Research Assistant – Nanyang Technological University
MAY 2020 – JULY 2020

- Monitored a topic discussion at social media to analyse the conflict of opinions using sentiment analysis
- Crawled and labelled data from twitter
- Applied concepts of **neural networks** and **NLP** to predict future public reactions

CO-CURRICULAR ACTIVITIES

Tech Director - IEEE, Nanyang Technological University
AUG 2019 - PRESENT

- Organised a 24 hour Hackathon which involved around **400 participants** from various Universities, schools and polytechnics of Singapore.
- Conducted workshops on Python as a part of IEEElearn Bootcamp, open to all university students willing to code.

Head Girl - St. Francis de Sales School, New Delhi, India
APR 2017 - APR 2018

- Represented **2400 students** spanning over 12 classes
- Organised events both on-campus and off-campus to raise funds for charity
- Pioneered volunteer sessions with an orphanage and a home for destitute

PROJECTS

Seattle AIRBnB Data Analysis— *To find what differentiates hosts from Super-Hosts*

- Analysed numerical and categorical data using **Logistic Regression** and **Random Forest Classifier**
- Analysed textual data (reviews) using **Sentiment Analysis**.

(+65) 82509591

srishtiarora@gmail.com

GitHub username: srishtiil

www.linkedin.com/in/srishti-arora-69485571

SKILLS

- Neural Networks, NLP
- Data Structures and Algorithms
- Programming Lang. : C/C++, Python
- Tools: Numpy, Pandas, Scikit-learn, Matplotlib, Matlab, PyTorch

AWARDS

- First place** - Zonal One Act Play
- Gold medal** - long jump
- Gold medal** - discus throw
- Ms Charming 2019**, Dinner and Dance, School of Computer Science and engineering, Nanyang Technological University

PARTICIPATION

- Open Source Society, NTU
- Machine Learning workshop

VOLUNTEER WORK

- Organised a blood donation camp (2016)
- Conducted eco-club drives (2017)
- Worked for destitute women (2017 & 2018)
- Worked for orphanage (2017 & 2018)

2. Pandey Pratyush - Lead Developer

Pratyush Kumar Pandey

Singapore | pratyush002@e.ntu.edu.sg / pratyushkumarpandey@gmail.com | +65 8898 6075

LinkedIn: linkedin.com/in/pratyush-kumar-pandey-0411 | GitHub: github.com/Pratyush0411

EDUCATION

Nanyang Technological University, Singapore

- Bachelor of Engineering in Computer Science, CGPA: 4.70/5.00

Aug 2019 – Jul 2023 (Expected)

WORK EXPERIENCE

Autodesk – Software Developer Intern

- Improving Autodesk Forge Platform's availability, resiliency, and scalability by deep level analysis on API traffic from latency to error with an eye on future growth pattern to predict the volume and avoid surprising patterns.

Aug 2021 – Dec 2021

A*STAR – Research Intern

- Developed a data science pipeline for extraction, pre-processing, model-training and post-processing on tactile sensor data using libraries such as Rosbag, OpenCV and Pytorch.
- Implemented and improvised deep learning architectures from past research on texture perception and tactile sensing; established baseline results for future research and experiments.

May 2021 – Jul 2021

Energy Research Institute @ NTU – Research Intern

- Analyzed impact of different feature extraction and time-variant data pre-processing methods for multi-variate forecasting analysis on sensor data collected from BlueSG electric cars.
- Automated data cleaning and extraction from backend server for convenient modelling in future.

Apr 2020 – Jul 2020

ACADEMIC PROJECTS

Gamified Education tool

Feb 2021 – Apr 2021

- Developed a desktop game driven by real time analytics using unity and MongoDB to gamify teaching and learning of Software engineering courses in NTU and to make learning more interactive for students.
- Implemented a dashboard for teachers using React.js and Express.js to visualize students' performance statistics.

Glucosis (Diabetes Management App)

Feb 2021 – Apr 2021

- Built a telemedicine mobile application using Flutter and Firebase to help diabetic patients monitor and manage diabetes with features such as Blood glucose level and nutrition monitor, and meal plan recommender.

University Course Registration System

Oct 2020 – Nov 2020

- Designed and implemented boundary, control classes and backend management classes for database files using JAVA, for building a course registration system modelled around the university's existing system.
- Added new features to enhance the security and protection of sensitive user data.

EXTERNAL PROJECTS

Skyway Safe – Brain Hack CODE_EXP

Jun 2021

- Developed a mobile application for easy travel in post COVID world – shares information and latest news about travel restrictions when planning a travel and tracks progress for completing travel pre-requisites.
- Front end was built using React.js and backend was API interface connecting the Firebase database via Express.js.

Deep stylizer

May 2021

- Deployed neural style transfer model (trained on images like mosaic, Udnie and Rain princess using Pytorch) on a web application using React.js for frontend, Flask for backend and Express.js for API proxy.

Elder Assist – SCDF IBM Hackathon

Jun 2020

- Programmed Image recognition model for detecting stove fires and AI model to detect occurrence of a fall using IBM Watson and deep learning frameworks in Python; achieved a validation accuracy of 90% for fall occurrence.
- Deployed these models for real-time detection as an IoT application that provides elderly care and assist.

SKILLS

- | | |
|-------------------------|--|
| ▪ Programming Languages | – Python, JAVA, JavaScript, SQL, Dart, C++, C, HTML/CSS, Octave |
| ▪ Python development | – TensorFlow, Keras, Pandas, Matplotlib, Scikit-Learn, Pytorch, Fast AI, OpenCV |
| ▪ Web/App development | – Express.js, Node.js, Flask, Flutter, Firebase, MongoDB, React.js, Postman |
| ▪ Cloud Computing | – AWS: Lambda, CloudWatch, API Gateway, DynamoDB; Google Cloud: Apigee |
| ▪ Online Certifications | – Neural Networks and Deep Learning (Specialization - Coursera), Vector Calculus for Engineers (Hong Kong University - Coursera) |

3. Surawar Sanath - Front-end Developer

Sanath Sachin Surawar | Mobile No.: +65 9037 1041 | Email: sanath2604@gmail.com

LinkedIn URL: <https://www.linkedin.com/in/sanath-surawar/>

EDUCATION

Nanyang Technological University, Singapore

Bachelor of Engineering (Computer Science) with a Minor in Psychology

Aug 2019 – May 2023

WORK EXPERIENCE

Software Engineer (Machine Learning) Internship | Seagate

Jul 2021 – Dec 2021

- Delved into Privacy-Preserving Machine Learning and its use-case for Seagate's Research Group (SRG) using PySyft and TensorFlowFederated.
- Collaborated and performed extensive software testing (black box, compatibility, GUI) for Seagate's FL platform built with Python, HTML, CSS, JavaScript and Vue.js.
- Conducted user reviews and created detailed wireframes for SRG's research website. Currently working on website creation, platform, and ML testing for Seagate's Federated Analytics project for HDDs.

IT Automation Intern | SLNG

Dec 2020 – Jan 2021

- Automated the integration of process data from OSI PI servers for their Predictive Maintenanceproject.
- Wrote scripts in Python and PowerShell to update manufacturing data in reports and save files that can be accessed by MATLAB on a periodic basis.

Software Intern | Whizz Mobility

July 2020 – Sept 2020

- Evaluated image-based data at an NTU-based autonomous robotic food delivery startup.
- Deployed as data annotator for over a thousand images involved in data pre-processing of the robot's field of vision. Demarcating between important facets like roads and sidewalks to form a training dataset to develop a learning model for the robot to monitor itself and become truly autonomous.

INDUSTRY PROJECTS

IoT Sensor Project | FairPrice Group

Nov 2021 – Dec 2021

- Worked on a project to tackle food wastage in supermarket chains as part of FPG's inaugural Food Innovation Technology Hackathon, which placed in the Top 10 among 75 participating teams across Singapore universities.
- Part of a team that created NutriTion, an IoT-based sensor solution that aimed at effectively determining the spoilage level of fresh produce using gas sensors along with camera-based sensors.
- Responsible for creating the ML model that classified fresh and rotten produce along with creating a dashboard using Python's Streamlit that displayed results from our analysis to inventory managers for effectuating better decisions.

Product Development Project | Dyson

Aug 2021 – Nov 2021

- Worked on a product development project with Dyson mentors and an interdisciplinary engineering team.
- Pitched an e-bike solution prototyped by the team where I worked on creating a mobile-based application to connect the e-bike motor to mobiles using Java.
- Won Award and cash prize for Best Innovator chosen by a panel of judges that included Dyson's R&D Director and NTU's College of Engineering's representative.

Deep Learning Project | SingtelAI

Aug 2020 – Jul 2021

- Developed techniques for semantic summarization of video by deep learning-based methods. Currently researching the applications of Facebook AI Research's PySlowFast repository for understanding video-based datasets for action localization using frameworks like PyTorch, Caffe2 with a GPU-boosted Linux server.
- Primarily using Machine Learning libraries associated with Python.

ACADEMIC PROJECTS

Software Engineering Project

Feb 2021 – May 2021

- Building a mobile-based application on health and fitness employing public datasets from data.gov.sg
- Using Flutter and Dart for the frontend with JavaScript as the backend with RESTful API's.
- Employed state-of-the-art software engineering principles and the software development lifecycle to ensure best performance in the application.

Software Systems Analysis and Design Project

Feb 2021 – May 2021

- Employed in creating a game-based application to gamify the learning experience for software engineering students.
- Developed using Flutter, Dart, and Bonfire with FlameEngine as game engine and Google's Firebase for the backend.
- Completed intricate Software Requirement Specifications and Architecture Designs documentation.

SKILLS

Achievements: Dyson Award for Best Innovator, FPG Hackathon Top 4 Hack, IdeasJam Best Pitch and 2nd Runner-up
Languages: Proficient in English, Hindi, Marathi, Bahasa Indonesia and conversant in French, Malay and Turkish

Core Domain Skills: Python, Java, Flutter, SQL, JavaScript, HTML, CSS.

4. Iyer Rajagopal Mahadevan - Back-end Developer

Rajagopal Mahadevan Iyer

Phone: +65 83745947 | Email: crmiyer@gmail.com

LinkedIn: <https://www.linkedin.com/in/rajagopal-iyer>

EDUCATION

Nanyang Technological University, Singapore
Bachelor of Engineering (Computer Science)
Specialization in Cyber Security

Aug 2018 – May 2022 (Expected)

WORK EXPERIENCE

KPMG Advisory

Cyber Response Intern

June 2021 – Aug 2021

- Designed a framework to provide cyber threat intelligence to clients utilizing the company's current intelligence sources as well as identifying knowledge gaps in those resources and coming up with ways to fill them.
- Analyzed successful and unsuccessful intrusions by targeted threat actors.
- Constructed descriptions of campaigns, actors, and organizations.

Ernst & Young Consulting

Cyber Security Intern (Attack and Penetration Team)

Nov 2020 – May 2021

- Performed website and mobile application Vulnerability Assessment for a top tier global bank.
- Automated various checks in Vulnerability Assessment to eliminate monotonous work so that the team could focus on the more vulnerable functionalities.
- Documented the entire process for easy onboarding of future members of the team.

ACADEMIC RESEARCH PROJECTS

Nanyang Technological University, Singapore

Final Year Project (FYP)

Aug 2021 - Present

Title: "Analysing the cryptographic implementation of applications"

- Analysing the implementation of cryptography in various applications to identify weakness that could be exploited.

Nanyang Technological University, Singapore

Undergraduate Research Experience on Campus(URECA)

Aug 2019 - Jun 2020

Title: "Analysing the security of 7-Zip"

- Evaluated the source code of the 7-Zip software and successfully identified vulnerabilities present which could be used by hackers to gain complete control over the computer.

ACADEMIC PROJECTS

Demonstration of POODLE vulnerability

Oct 2021 – Nov 2021

- Set up a web server that was running TLS 1.2 that was backwards compatible to SSL v3.0.
- Successfully showcased the POODLE attack on this server by obtaining the cipher text through a man-in-middle agent to get the sensitive plain text without having the key.

Autonomous Robot

Aug 2020 - Nov 2020

- Built an autonomous robot that could completely explore a maze, identify images placed in different parts of the maze and also move from one point of the maze to the other in the shortest time.

Parking Availability Tracker

Feb 2020 - Apr 2020

- Created a flutter application to utilize Singapore Government API and Google Maps API to show the real time details including occupancy/availability of all the parking lots present throughout the country.
- The user could search for a parking lot using its name or by taping the pin on the map to view its details.
- The user could also start navigating towards that place using the application.

SKILLS

Programming Skills: C, Java, Python, x86 assembly language, Bash, Dart, JavaScript.

Tools: Burp Suite, Wireshark, TCPDump, Nmap, Snort, IDA and many other commonly used tools

5. Acharya Atul - QA Manager

Acharya ATUL | Mobile No.: 83581893 | Email: ATUL001@e.ntu.edu.sg | GitHub: [Atul-Acharya-17](#)

EDUCATION

Nanyang Technological University, Singapore
Bachelor of Engineering (Computer Science)

Aug 2019 – Present

- Current CGPA: 4.81/5.00
- Study year: 3
- Recipient of NTU Science and Engineering Scholarship

INTERNSHIP EXPERIENCE

SAP ASIA PTE LTD

Aug 2021 – Dec 2021

Machine Learning Engineering, Intern

- Improved the estimation of training time by 80% and made the estimation more flexible to change and deployed for production.
- Worked on basket recommendations by splitting the data into sessions and penalizing items with large difference in timestamps.
- Diversified recommendations by adding noise to the model output and achieved diversification% of 30% while maintain a hit rate of 0.802.
- Currently productionizing and researching on multi-armed bandits for diversification of recommendation.

Trampolene Limited

Aug 2021 – Oct 2021

Fullstack Developer (Software Engineer)

- Developed 'Atlas', a Learning Management System Designed to Support Coaches as well as Special Needs Trainees.
- Coded the backend for the templates and exposed them as routes and integrated with the frontend.
- Developed the frontend for the trainee schedule page and coach schedule page.

PANASONIC R&D Centre

May 2021 – July 2021

Deep Learning and Computer Vision, Intern

- Worked on the Multiple Object Tracking (MOT) Challenge. Reproduced results of the SORT, Deep-SORT and SORT-OH papers.
- Designed and developed an algorithm (SORT re-id) that is robust to the identity swap by utilizing a person re-identification network (OSNET) and the cosine similarity index.
- Extended the SORT re-id algorithm to track objects of more than 1 class.

PROJECTS

URECA Project – Game Control using Thoughts

Aug 2020 – June 2021

- Developed a game using Unity3D, C#, Golang, Firebase and the Emotiv Headset.
- Conducted research about the effect of the game on human attention levels to help people suffering from Attention-Deficit-Hyperactivity Disorder (ADHD).
- Created REST APIs to store the data and analysed the observations.
- Produced a research paper explaining the software architecture of the game and its use in the medical field.

Software Systems Analysis and Design – Gamified Education Tool

Jan 2021 – April 2021

- Developed a system to gamify the learning of software engineering concepts to help students and teachers.
- Created an application using Unity3D, C#, node.js, react.js, and MongoDB. Utilized the client-server architecture, Object Oriented Programming and REST APIs to create the game and webapp.
- Designed analysis models – Data Flow Diagram, ER Diagram, Dialogue Maps, Decision Tables and Trees, CRUDL Matrix. Designed the architecture diagram and component diagrams for the entire system and sub-systems.
- Performed automated testing by writing unit test scripts and integration test scripts with C# and JavaScript.

Software Engineering – Glucosis (Diabetes Management App)

Jan 2021 – April 2021

- Developed a Mobile Application to help patients suffering from diabetes by providing them with insights of their blood glucose and sugar levels and by helping them with their exercise and diet plans.
- Provided doctors a means to examine the patient's glucose, sugar, exercise, and food intake daily.
- Designed various analysis models – Class Diagram, Sequence Diagrams and Dialogue Map for the SRS.
- Utilised the Layered Architecture and Object-Oriented Design to create the application.

SKILLS

Programming: Python, C, C++, C#, Java, JavaScript, SQL, Golang, Dart

Technical Skills: Data Science, Machine Learning, Deep Learning, Data Structures, Algorithms, Game Development, Software Development, Web Development, Mobile App Development, REST APIs

Tools: React.js, Node.js, Unity, Scikit-learn, xgboost, TensorFlow, Pytorch, OpenCV, Microsoft Excel, Flask, Flutter, Firebase, MongoDB, Postman

Interpersonal Skills: Teamwork, Management, Communication, Responsibility

Languages: Proficient in English and Tulu, written proficiency in French

6. Tayal Aks - QA Engineer

Aks Tayal	
+65 90167645 TAYALAKS2001@GMAIL.COM	
EDUCATION	
Nanyang Technological University, Singapore	<i>May 2019-July 2023</i>
- Bachelor of Engineering in Computer Science (Hons.) - CGPA: 4.70/5.00	
WORK EXPERIENCE	
SAP, Singapore- Fullstack Development Intern	<i>Aug - Dec 2021</i>
- Working on the deployment of the ML model for the Business OCR product - Enhancing existing tests including unit tests, integration tests and regression tests on the microservices in the product - Conducting performance evaluation on the system to improve its efficiency, scalability and accuracy - Deploying the system on cloud-based architecture, including SAP's Cloud Foundry and Kubernetes	
KPMG, Singapore- Frontend Development Intern	<i>May - Jul 2021</i>
- Created a component library using React Native to facilitate cross-platform mobile app development at KPMG - Used design tokens from an InVision Design System to get design specifics for the components - Established a conduit between designers and developers to ease handoff of design documents - Used style-dictionary to generate tokens for Android, iOS and CSS to enable versatility in development	
School of Computer Science and Engineering, NTU - Undergraduate Research Intern	<i>Aug 2020 - May 2021</i>
- Developed a web application to deep learning model that analyzes images of construction sites and estimates the time of completion of various construction processes - Used Flask to deploy the model to a server, ReactJS for the frontend of the application and MongoDB to maintain a database of the input images and results produced by the model	
CodingHero Singapore - Software Development intern	<i>June - Aug 2020</i>
- Worked as part of a team implementing software development solutions for various enterprises. - Developed a blog app in Flutter that retrieved data from Cloud Firestore - Performed preprocessing on various Pandas DataFrames to allow further analysis and operations to be performed on the data.	
PROJECTS	
Tweet-Validation	<i>March 2021</i>
- Developed a mobile application to help users check the factual accuracy of a tweet by calculating the extent to which it is supported by articles from reliable news sites. - Used Flutter and Dart to develop the front-end of the application, with Python as the backend and Firebase as the database - Created an API using Flask that took the link of a twitter post as input and returned a correlation score for each news site based on their articles published using a custom Deep Neural Network trained on the FNC-1 dataset	
Timetable Generator	<i>July 2020</i>
- Developed a web app to help NTU students plan semester course-timetables using HTML , CSS , SQLite , Flask and Python . - Extracted the schedule for each course from its web page, which was then stored in a SQLite database. - Displayed all possible timetable options based on the course codes input by the user until the user found one suitable for them, with the option to store up to three desirable timetable choices.	
Airbnb Review Analyzer	<i>April 2020</i>
- Implemented an Airbnb listings' grader in Jupyter notebook using NLTK , through sentiment analysis of guest reviews. - Assigned each review a score from -10 to +10, evaluating its sentiment using the vader library. - Handled reviews in four different languages, displaying the most commonly used positive and negative words in each language using langdetect and wordcloud .	
The-No-Clickbait-Times	<i>March 2020</i>
- Developed a news article summarizing web app using HTML , CSS , JavaScript and Python . - Used pandas and numpy to convert the data into an easily traversable datafram; Scikit-Learn , matplotlib and seaborn to refine the machine learning model; and various natural language processing libraries from the NLTK platform, along with the bert-extractive-summariser , to parse the articles and generate summaries. - Replaced the headline, using word2vec implemented with genism , when comparison with generated summary produced a significant difference.	
AWARDS AND ACHIEVEMENTS	
- Selected as a Peer Tutor for Discrete Mathematics, and Algorithms for fellow NTU students in AY2020-21. - Ranked 5 th out of more than 50 teams in the DotSlash2.0 Hackathon held in Bengaluru, India in March 2020 . - Secured All India Rank 1650 (99.98 percentile) in JEE Advanced , India's most competitive examination for IIT engineering admissions, with over 9 million test-takers in 2019. - Awarded the Gold Medal by Delhi Public School in 2019 for seven consecutive years of academic excellence. - Awarded the prestigious Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship by the Government of India in 2018, presented in recognition of highly motivated students with talent and aptitude for research. - Awarded a Silver Medal in Southeast Asian Mathematical Olympiad - 2017 . - Certificate of Excellence for securing State Rank 18 in SOF National Cyber Olympiad - 2015 .	
TECHNICAL SKILLS	
- Python, C, C++, C#, Java, SQL, HTML, NodeJS, ReactJS, CSS, Flask, Pandas, NLP, NLTK, Machine Learning, Deep Learning, TensorFlow, Keras, Flutter, Dart, Unity, Docker, Kubernetes, React Native	
CO-CURRICULAR ACTIVITIES	
IEEE Society, Nanyang Technological University - Technical Director	
- Organized the society's annual hackathon: INTUiTion. - Conducted periodic workshops to teach basic coding principles to NTU students from various disciplines.	
Physics Club, Delhi Public School Dwarka, India - Co-founder	
- Served as Joint Secretary (2017-18) and Vice-President (2018-19) of the club. - Conducted the club's annual science and math festivals "Ignite and Axiom" from Year 2017 to 2019.	

7. Agarwal Gopal - Release Engineer

GOPAL AGARWAL

HP: +65 81661942 | Email: gopal004@e.ntu.edu.sg

EDUCATION

Nanyang Technological University, Singapore

Aug 2019 – Dec 2023 (Expected)

- Bachelor of Engineering (Computer Science) and Bachelor of Arts (Economics) – CGPA: 4.4/5.0 and 4.55/5.0

WORK EXPERIENCE

Software Engineering Intern, Resync Technologies

Nov 2020 – Apr 2021

- Developed and upgraded the two company mobile applications using Flutter which helps users to monitor real-time energy production/consumption data and view the forecast on industrial sites and smart households.
- Created automated testing and deploying using the Gitlab CI pipeline with Fastlane.
- Resulted in the company raising US\$ 2 Million SERIES A Funding

Data Science Intern, Energy Research Institute @ NTU (ERI@N)

May 2020 – Nov 2020

- Collaborated with Hutchinson to retrieve data from the 50 sensors each installed in over 20 cars.
- Automated and pipelined the process of data retrieval, data manipulation and data cleaning.
- Deployed various machine learning models for timeseries forecasting and compared their performances, namely – CNN model, LSTM model and a hybrid CNN – LSTM model.

Undergraduate Research Assistant, School of Social Sciences, NTU

Aug 2020 – Apr 2021

- Developed a project starting with data mining and web-scraping over a million data points using Python libraries.
- Cleaned and visualised the dataset acquired and used data analysis techniques to gain inferences from the dataset.

Research Intern, Association for Social and Environmental Development

Sept 2017 – Jan 2018

- Worked on a project with University of Kentucky titled ‘Exploring Water Quality in Eastern India and Kentucky.
- Authored a research paper graphing the test results from various sites, stating the cause of such results and reasons for variation from one site to other alongside possible solutions for the poor quality of water.

ACADEMIC PROJECTS

Intellect (Game App and Web App) | Flutter, Dart, ReactJS, NodeJS, Firestore

Feb 2021 – Apr 2021

- Created a mobile game using Flutter for students to gamify their learning experience through the Story Mode, Arcade Mode, Challenge Classmate Mode or Assignment Mode.
- Created a web application using ReactJS, hosted it on NodeJS, for teachers to monitor individual student progress, view class performances using charts and send assignments. Performed load, unit, and integration tests.

Tweet-Validator | Keras, Python, Flutter

March 2021

- Developed a mobile app to help users check reliability of a tweet by calculating the extent to which it is supported by articles from reliable news sites. Used Flutter for frontend, Python for backend and Firebase for DB.
- Created an API using Flask that took the link of a twitter post as input and returned a correlation score for each news site based on their articles published using a custom Deep Neural Network trained on FNC-1 dataset.

Forecasting Singapore's Retail Sales Index | R, ETS, STL, ARIMA, Dynamic Regression

Mar 2021 – May 2021

- Performed timeseries forecasting methods in R to forecast Singapore's RSI, an indicator of country's economy.
- Consisted of data visualisation, fitting it in various models - random walk, exponential smoothing (Holt-Winters, ETS, STL-ETS), and auto-ARIMA - diagnosing their residuals and comparing them.
- Built a regression model for the RSI by researching and extracting appropriate economic indicators to compare.

Timetable Generator | Python, HTML, CSS, Flask, SQLite

Oct 2020 – Nov 2020

- Developed a web-app to help students plan semester timetables using HTML, CSS, SQLite, Flask, Python.
- Extracted course schedule from its web page stored it into the database from where it was queried using APIs.
- Engineered the web-app such that it displays possible timetables of the courses selected with an option to save.

HDBLookUp Mobile App | Python, Flask, MongoDB, Flutter, Dart

Feb 2021 – Apr 2021

- Built a mobile app using Flutter for users to search and view HDBs available in Singapore, present in the MongoDB database, based on user determined criterions and connected the same using Flask server hosted online
- Provided users with intelligent approximated current and future prices (and graphs) of their selected HDB.

SKILLS

- Python, Java, C, HTML, CSS, Javascript, Dart, Flutter, SQL, Flask, Keras, Tensorflow, R, Microsoft Office
- Relevant Courses: Bloomberg Market Concepts, Algorithms, Data Structures, Econometrics, Deep Learning

CO-CURRICULAR ACTIVITIES

Information and Research Officer, IRC, NTU Student Union

Sept 2019 – July 2020

- Designed and conducted a survey with the team on NTU buses of over 2500 students.
- Analysed the data collected using Python and co-authored the final report of the survey.

Social Director, Hall Council, Hall 16, Nanyang Technological University

Sept 2019 – July 2020

- Organised and assisted various events for all 400+ hall residents together with other elected members as a team