NANYANG
research programme

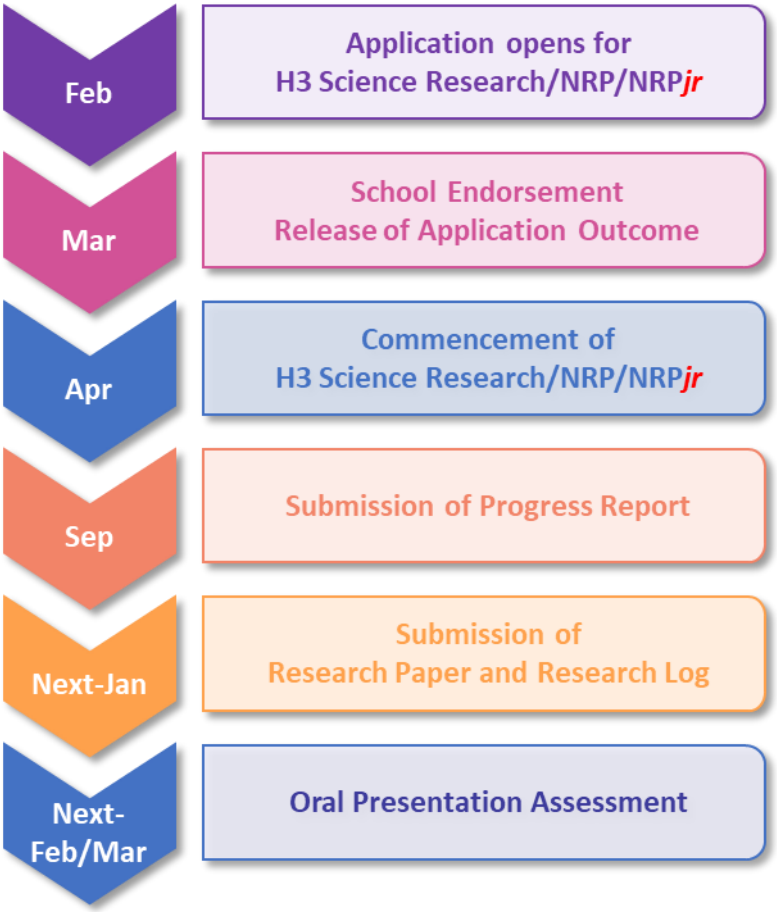

# NRP 2025
# Project Synopses

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

Nanyang Research Programme (NRP) is an enrichment programme offered to JC1 and Year 5 students. It seeks to offer students with a keen interest in and aptitude for research the opportunity to engage in the process of intellectual inquiry by undertaking projects in a real research environment under the supervision of NTU faculty and researchers.

NRP Student Participants will undertake eight months of research activities from April to December, either individually or as a pair, culminating in the submission of a Research Paper in January of the following year and an Oral Presentation Assessment in late February/early March.



| Category | Project Code | Project Title |
|---|---|---|
| Engineering | CCDS01 | Detection of Handwritten Mathematical Expressions via Deep Learning Approaches |
| | CCDS02 | Image Understanding via Semantic Segmentation |
| | CCDS03 | Deep learning based mental health/status interpretation |
| | CCDS04 | AI Agent for Open Source Software Analysis |
| | CCDS05 | Exploring the Creative Frontiers: Large Language Models and Their Applications in Biomedical Science |
| | CCEB01 | Biosensors for the Detection of Molecular and Cellular Targets |
| | CCEB02 | Natural Deep Eutectic Solvents (NADES) as Green Solvents in Pharmaceutical and Food Industries: Are They Truly Green? |
| | CCEB03 | Lifecycle Assessment of Plants-Based Alternatives to Dairy Proteins: Are they really more environmentally friendly? |
| | CCEB04 | Process Simulation |
| | CEE01 | Osmosis-based membrane technology for water purification, desalination and renewable energy harvesting |
| | CEE02 | Machine Learning of Ground Movement due to Tunnelling Operations |
| | EEE01 | Research and development of spectrum-adaptive light |
| | EEE02 | Studies of Gallium Nitride (GaN) based High Electron Mobility Transistors (HEMTs) |
| | EEE03 | Application of deep learning algorithm for orthogonal frequency-division multiplexing systems |
| | EEE04 | Deep learning based algorithm for frequency estimation from noisy signals |
| | EEE05 | Performance study of DVB-T2 system using common simulation platform (CSP) |
| | EEE06 | Performance study of rotated quadrature amplitude modulation (QAM) signals over fading channels |
| | MAE01 | Exploring Airfoil Designs: How Vortex Cavities Improve Flight |
| | NIE05 | Designing an Artificial Intelligence and / or Robotics System for Potential Real-World Applications |
| | NIE12* | Boredom recognition using physiological signals |
| | NIE13* | Automatic recognition of student emotions from facial expressions |

* Project can be offered as H3 Science Research or NRP Enrichment

| Category | Project Code | Project Title |
|---|---|---|
| Sciences | CCEB05 | Development of new programmable RNA editing tools |
| | CCEB06 | Development of new technologies for precision genome engineering |
| | MAE02 | A Fast Way to Compute Matrix Multiplication |
| | NIE03 | Physiological Changes During Aerobic Exercise With Cloth Mask |
| | NIE11 | A historical review of weather and climate datasets |
| | SBS01 | De novo design/engineering of an (template-less) RNA polymerase |
| | SPMS01 | Magnonic Devices |
| | SPMS02 | Nanolithography based on scanning probes |
| | SPMS03 | Optical Lithography |

| Category | Project Code | Project Title |
|---|---|---|
| Business, Humanities, Arts, & Social Sciences | CEE03 | Ship risk prediction in port state control inspection |
| | CRADLE01 | Empowering Microlearning for Singapore's Continuing Education and Training (CET) in the Age of Gen AI |
| | NIE01 | The Neuroscience of Math Learning |
| | NIE02 | Topics in Singapore English |
| | NIE04 | Developing ChatGPT-enabled Chatbot to support students' open inquiry in learning K-12 mathematics |
| | NIE06 | Exploring the Role that Game-Based Worlds and Immersive Environments Potentially Play in Learning |
| | NIE07 | Singapore's linguistic landscape |
| | NIE08 | Topics in Singapore English |
| | NIE09 | Sense of Food Resiliency among Secondary/JC students in Singapore |
| | NIE10 | Literary Theory and Modern Poetry |
| | SoH01 | Understanding language, media and society through data analytics and machine learning |
| | SoH02 | A Sociolinguistic Investigation of French, German, Italian and Spanish in Singapore Shop Signs |
| | SSS01 | Conceptions of World Order in East Asia |
| | SSS02 | Assessing Social Attributes of Faces |

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**ENGINEERING** | **College of Computing and Data Science**

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|---|---|
| **Project Code** | CCDS01 |
| **Project Title** | Detection of Handwritten Mathematical Expressions via Deep Learning Approaches |
| **Description** | Digitizing handwritten mathematical expressions has increased usage in education, engineering, and science. Engineers, researchers and students may need to write many sophisticated mathematical expressions in their reports research papers, etc. in word or Latex. However, it is not an easy job. Having touch-screen devices, they can easily write down those expressions but the recognition is a challenge.<br><br>In this project, the student will study existing machine learning techniques of handwritten mathematical expression recognition. The student will propose an improvement or integrate the existing work into a system. The system will convert the handwritten mathematical expressions into the Latex format seamlessly. The work can be applied to an auto-assessment system for mathematics quizzes. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | - Good at Mathematics and have some basic programming background<br>- Interested in AI and machine learning. |

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**ENGINEERING** | **College of Computing and Data Science**

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|---|---|
| **Project Code** | CCDS02 |
| **Project Title** | Image Understanding via Semantic Segmentation |
| **Description** | Semantic segmentation is the task of classifying each pixel in an image into a predefined category, enabling machines to understand the context and content of a scene. With applications ranging from autonomous vehicles to medical imaging, mastering semantic segmentation is a key milestone in the development of intelligent systems.<br><br>In this project, students will be involved in a thorough investigation into semantic segmentation, its applications, and hands-on experimentation. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Pair |
| **Specific Knowledge** | Good at mathematics and having some knowledge in programming |

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**ENGINEERING** | **College of Computing and Data Science**

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|---|---|
| **Project Code** | CCDS03 |
| **Project Title** | Deep learning based mental health/status interpretation |
| **Description** | To recognize the mental health problems and provide good quality care, early recognition of mental health problems is a crucial stage before an individual suffers some serious consequences (depression or suicidal nature/tendency).<br><br>At present, mental health assessment is performed by healthcare personnel or clinicians and diagnosed based on a person's answers to specific questionnaires formulated for the recognition of specific patterns of feelings or social interactions. There is a need for an automated and effective algorithm which can assess the social media interactions/messages to identify or interpret a person's mental health status.<br><br>The aim is to develop an efficient algorithm which can assess the possible mental status of the person and to predict/interpret the mental health issues that the individual might reach or develop. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Basic knowledge about Python programming or interested in learning Python. |

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**ENGINEERING** | **College of Computing and Data Science**

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|---|---|
| **Project Code** | CCDS04 |
| **Project Title** | AI Agent for Open Source Software Analysis |
| **Description** | This research project aims to develop and evaluate an AI agent designed to enhance the analysis and comprehension of open-source software. The agent will leverage advanced AI techniques, including natural language processing (NLP), machine learning, and code intelligence, to address key challenges in the open-source ecosystem. Its primary functionalities will include automated code review, vulnerability detection, dependency analysis, and contribution recommendations.<br><br>The project will explore how the agent can facilitate:<br>1. Code Understanding: Providing human-like explanations of complex codebases to lower the barrier for contributors.<br>2. Quality Assurance: Automating the detection of bugs, security vulnerabilities, and other quality issues.<br>3. Sustainability: Recommending improvements to architecture and identifying opportunities for modularization and optimization.<br>4. Community Engagement: Helping new contributors onboard efficiently by suggesting tasks matching their expertise and interests.<br><br>The research will focus on evaluating the agent's performance using systematic metrics like precision, recall, and usability, alongside ethical considerations, including bias mitigation and cultural inclusivity in recommendations. The ultimate goal is to create a robust and adaptable tool to support open-source communities, improve software quality, and enhance global collaboration. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | To work on the AI Agent for Open Source Software Analysis project, the student should possess the following knowledge and skills:<br><br>1. Programming Skills<br>- Proficiency in programming languages such as Python and JavaScript.<br>- Familiarity with version control systems like Git and GitHub.<br>2. Software Engineering<br>- Understanding of software development life cycles, software design patterns, and modularization.<br>- Basic knowledge of static and dynamic code analysis tools.<br>3. Machine Learning and AI<br>- Understanding of foundational machine learning concepts (e.g., supervised/unsupervised learning).<br>- Familiarity with NLP techniques for code understanding (e.g., code embeddings, transformer models).<br>4. Open Source Knowledge<br>- Familiarity with open-source software ecosystems and licensing.<br>- Experience contributing to or managing open-source projects is a plus.<br>5. Analytical and Research Skills<br>- Ability to conduct literature reviews and analyze existing methodologies.<br>- Knowledge of evaluation metrics for software tools and ethical considerations in AI. |

Required Software/Programs

The following software/tools will be necessary for the project. These tools are either open-source or should already be accessible through the institution:

1. Development Tools
   - Integrated Development Environments (IDEs): VS Code, PyCharm (Community Edition).
   - Version Control: Git, GitHub/GitLab.
2. Machine Learning Frameworks
   - TensorFlow or PyTorch.
   - Hugging Face Transformers (for NLP tasks).
3. Static Analysis Tools
   - SonarQube, ESLint, or equivalent.
4. Other Tools
   - Docker for containerization.
   - Jupyter Notebook for experimentation and documentation.
   - MATLAB (if advanced modeling or mathematical analysis is required).

These tools should be readily available to students at the university or accessible as free community editions or open-source alternatives.

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**ENGINEERING** | **College of Computing and Data Science**

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| **Project Code** | CCDS05 |
| **Project Title** | Exploring the Creative Frontiers: Large Language Models and Their Applications in Biomedical Science |
| **Description** | The rapid advancement of large language models (LLMs) has sparked significant innovation across various fields, including biomedical research. While these models have the potential to generate creative and insightful content, they also produce outputs that may not always be factually accurate, known as "hallucinations." This poses a challenge in domains where precision is crucial, such as healthcare. This project aims to explore and develop techniques to harness and guide the creative capabilities of LLMs while managing the risks of inaccuracies.<br><br>By studying how LLMs can be creatively applied yet remain accurate in biomedical research, this project addresses a crucial challenge. It seeks to enhance the utility of AI-generated content by developing methods that not only mitigate hallucinations but also promote innovative and reliable applications. This initiative will contribute to more effective and trustworthy AI solutions in biomedical research and healthcare. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Pair |
| **Specific Knowledge** | - Python programming<br>- PyTorch/Tensorflow |

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| ENGINEERING | School of Chemistry, Chemical Engineering and Biotechnology |
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|---|---|
| **Project Code** | CCEB01 |
| **Project Title** | Biosensors for the Detection of Molecular and Cellular Targets |
| **Description** | Increasing understanding of fundamental biology and pathology have identified a broad spectrum of molecular and cellular targets associated with different types of human diseases. There is intense research into the rapid and ultrasensitive detection of these biomarkers for early diagnosis of diseases and monitoring of therapeutic response. Recent developments in bionanotechnology have led to the growing uses of functional nanoparticles with unique optical, electrical, magnetic, and catalytic properties for improved biomarker detection. The nanoparticles in combination of detection platforms such as lateral flow arrays, microarrays, and microfluidics have promoted the performance and applicability of diagnosis technologies to a new level, opening new opportunities in major human diseases, ranging from infectious diseases caused by bacterial and virus pathogens to cancer, cardiovascular, neurodegenerative, and metabolic diseases.<br><br>This project will offer opportunities in learning the basic design principles of biosensors and developing a particular type of biosensors for molecular or cellular targets by designing specific sensing elements for target recognition, functional transducers for sensitive detection of targets of interest based on the detection of optical or spectroscopic signals on in vitro diagnostic detection platform. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Basic understanding of properties of common chemicals. |

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| ENGINEERING | School of Chemistry, Chemical Engineering and Biotechnology |
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| **Project Code** | CCEB02 |
| **Project Title** | Natural Deep Eutectic Solvents (NADES) as Green Solvents in Pharmaceutical and Food Industries: Are They Truly Green? |
| **Description** | NADES has been touted in recent years as the future of solvents in the synthesis and extraction of pharmaceuticals and food ingredients attributed to its environmentally friendly characteristics (e.g., non-toxic, non-flammable, non-volatile). These characteristics minimise the emission of NADES to the environment and its hazards to the ecosystem and human health.<br><br>In this project, we raise the research question of whether considering these characteristics alone is sufficient to call NADES as green solvents. NADES is prepared from ingredients that are not necessarily green. To this end, we will perform Lifecycle Assessment (LCA) from cradle-to-grave (i.e., beginning with resource extraction to the disposal of NADES) to truly quantify the environmental footprints of NADES.<br><br>In this project, you will learn the basics of NADES synthesis, the basics of LCA, and the use of open-source LCA software. This project does NOT involve any wet lab experiments. This project is suitable for students with strong interests in chemistry and sustainability. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Strong foundation in chemistry and mathematics |

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| ENGINEERING | School of Chemistry, Chemical Engineering and Biotechnology |
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| | |
|---|---|
| **Project Code** | CCEB03 |
| **Project Title** | Lifecycle Assessment of Plants-Based Alternatives to Dairy Proteins: Are they really more environmentally friendly? |
| **Description** | In recent years, plants-based alternatives for dairy proteins (e.g., milk, meat) have been marketed to the public as a more environmentally sustainable option for the consumers to address the devastating environmental impacts of animal farms which emit a large amount of green gases. However, exact quantifications of the environmental footprints of these plants-based alternative proteins have rarely been carried out.<br><br>In this project, we will conduct lifecycle assessment (LCA) of plants-based alternative proteins starting from the resource extraction (e.g., soy) to the final product (e.g., plants-based cheese). We will compare the LCA results with that of dairy products (e.g., cow cheese). This project is suitable for students with strong interest in chemistry and food science. This project does not involve any wet lab experiments. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Strong foundation in chemistry and mathematics |

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| ENGINEERING | School of Chemistry, Chemical Engineering and Biotechnology |
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| **Project Code** | CCEB04 |
| **Project Title** | Process Simulation |
| **Description** | Chemical engineering is not just about experiments, but also about playing with simulation software.<br><br>In this project, we shall look into various parts of the chemical plant. We shall employ a modelling platform - a user-friendly and exciting tool - to simulate and understand the different operations of chemical plants.<br><br>The aim of this project is to give students a light appreciation of some core chemical engineering fundamentals with the aid of typically used simulation tools. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Students will be doing modelling |

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**ENGINEERING** | **School of Civil and Environmental Engineering**

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| **Project Code** | CEE01 |
| **Project Title** | Osmosis-based membrane technology for water purification, desalination and renewable energy harvesting |
| **Description** | Osmosis is a natural process in which water molecules from a low concentration solution spontaneously permeate through a semi-permeable membrane into a high concentration solution. Based on the principle of osmosis, different types of membrane technology have been developed such as reverse osmosis (RO) and pressure-retarded osmosis (PRO).<br><br>In RO, a hydraulic pressure, which is higher than the osmotic pressure difference between the high concentration solution and the low concentration solution, is applied in the high concentration solution side. The applied hydraulic pressure can overcome the osmosis and push the water molecules in the high concentration solution reversely permeating through the membrane into the low concentration side. This process has been widely used in seawater desalination and water purification.<br><br>In PRO, the applied hydraulic pressure in the high concentration solution is lower than the osmotic pressure difference between the two solutions. Thus, it cannot overcome osmosis. The water molecules from the low concentration side still transport through the membrane to the high concentration side, but their permeation rate is retarded by the applied hydraulic pressure. PRO can be used to harvest the osmotic energy to generate electricity. Osmotic energy is a new type of renewable energy that originated from the mixing of two solutions with different salinities such as river water mixing with seawater at estuaries.<br><br>In practice, RO and PRO can be designed in different processes. In this project, various parameters on the performance of RO and PRO with different designs will be systematically investigated. These parameters include hydrodynamic conditions (e.g., applied hydraulic pressure and cross-flow velocity), feed solution conditions (e.g., salt concentration/salinity and composition) and membrane properties (e.g., water permeability, salt permeability, salt rejection, structural parameter, surface roughness, charge and hydrophilicity/hydrophobicity). The research will be conducted by lab experiments.<br><br>Students in this project are expected to gain a comprehensive understanding of the principles of osmosis-based membrane processes such as RO and PRO for various applications related to water and energy production. Students will also gain an understanding of the influence of various parameters on the performance of RO and PRO. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Physics, chemistry, mathematics |

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**ENGINEERING** | **School of Civil and Environmental Engineering**

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|---|---|
| **Project Code** | CEE02 |
| **Project Title** | Machine Learning of Ground Movement due to Tunnelling Operations |
| **Description** | Tunnelling has been a common construction technique to explore the underground space. However, the construction activities may induce ground disturbance that threatens the safety and serviceability of above-ground infrastructure. It is imperative to have a robust approach to predict tunnelling-induced ground movements.<br><br>This project aims to develop machine learning methods to predict ground deformation due to tunnelling operations. Data collected from a real tunnel site will be processed and adopted to build a robust machine learning algorithm to estimate ground displacement. The results will provide an effective tool to evaluate tunnelling performance and provide valuable information for engineering risk assessment and management. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | The candidate is expected to have a strong background in mathematics and physics. In addition, the candidate should either possess prior programming experience or demonstrate a strong desire to learn programming languages (e.g., Python). |

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**ENGINEERING** | **School of Electrical and Electronic Engineering**

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| **Project Code** | EEE01 |
| **Project Title** | Research and development of spectrum-adaptive light |
| **Description** | Table lamps currently in the market could have warm or cold white light. Users will choose the one which is suitable for them. However, users typically do not know the scientific reasons for their choice. In fact, our eyes have evolved to adapt to sunlight, which changes from dawn to dusk with various light spectrums from warm to cool white light.<br><br>The project will do research on the sunlight spectrum throughout the day and build the table lamp with a tunable spectrum that can change the spectrum according to the user's need or following the sunlight so that users have a feeling of outdoor light.<br><br>Students will not only learn about the sunlight spectrum but also control the light with a simple microcontroller (Arduino) and coding. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | NIL |

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**ENGINEERING** | **School of Electrical and Electronic Engineering**

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|---|---|
| **Project Code** | EEE02 |
| **Project Title** | Studies of Gallium Nitride (GaN) based High Electron Mobility Transistors (HEMTs) |
| **Description** | Gallium Nitride (GaN) based High-Electron-Mobility Transistors (HEMTs) are very attractive for high-frequency and high-power device applications due to its inherent material properties such as wide band gap with high breakdown voltage and higher saturation velocity. Hence, these transistors are very promising for the important basic building blocks of many applications such as wireless communications, satellite communications and sensors etc.<br><br>In this project, the student will learn the basic operation, characterization techniques and analysis of GaN HEMTs.Hence, the student is required to perform and understand the various measurement techniques such as semiconductor parameter analyzer and pulsed current-voltage system to characterize the fabricated GaN HEMTs. He/She will learn the various key device parameters of GaN HEMTs and optimize them for high-performance device applications. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Basic physics and mathematics. Some microelectronics/semiconductor physics knowledge will be helpful. |

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**ENGINEERING** | **School of Electrical and Electronic Engineering**

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|---|---|
| **Project Code** | EEE03 |
| **Project Title** | Application of deep learning algorithm for orthogonal frequency-division multiplexing systems |
| **Description** | Recently, orthogonal frequency-division multiplexing (OFDM) techniques have been widely used for wireless communication systems, including the fifth-generation (5G) cellular system. To further improve the performance and robustness of the OFDM systems, deep learning based algorithms have been introduced.<br><br>In this project, the student will study and design a deep learning based receiver for OFDM system in an end-to-end approach. We will explore the advantage of the deep learning model to recover the distorted signal. Moreover, the channel state information will not be required as compared with the traditional method.<br><br>Matlab and Python simulations will be conducted to study the performance of the proposed system. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Preferably to have basic programming skills in Matlab and Python, though it is not compulsory, as the student should be able to pick up the skill during the execution of the project. |

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| ENGINEERING | School of Electrical and Electronic Engineering |
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|---|---|
| **Project Code** | EEE04 |
| **Project Title** | Deep learning based algorithm for frequency estimation from noisy signals |
| **Description** | Estimation of the frequency of a noisy modulated signal has been one of the main challenges in the field of signal processing and communications.<br><br>The objective of this project is to investigate the existing techniques for frequency estimation. Following that, a deep learning algorithm will be proposed to estimate the frequency of the modulated signal that is corrupted by Gaussian noise with the advantages of having higher accuracy and faster estimation time. Comparisons between existing frequency estimation methods and the proposed deep learning-based method will be carried out.<br><br>Matlab or Python programming will be used to study the performance of the proposed scheme. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Preferably to have basic programming skills in Matlab and Python, though it is not compulsory, as the student should be able to pick up the skill during the execution of the project. |

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**ENGINEERING** | **School of Electrical and Electronic Engineering**

| | |
|---|---|
| **Project Code** | EEE05 |
| **Project Title** | Performance study of DVB-T2 system using common simulation platform (CSP) |
| **Description** | Recently, the Terrestrial Digital Video Broadcast (DVB-T2) system has widely been deployed worldwide. It has been officially adopted as well in Singapore. The DVB-T2 system can provide much better signal quality.<br><br>The main focus of this project is on the decoding of the DVB-T2 signals under various channel conditions such as additive white Gaussian noise (AWGN) and fading channels. The performance of the algorithms will be studied and verified through the readily available common simulation platform (CSP).<br><br>Matlab simulation will be conducted to study its performance under different scenarios of channel conditions. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Preferably to have basic programming skills in Matlab, though it is not compulsory, as the student should be able to pick up the skill during the execution of the project. |

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| ENGINEERING | School of Electrical and Electronic Engineering |
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| **Project Code** | EEE06 |
| **Project Title** | Performance study of rotated quadrature amplitude modulation (QAM) signals over fading channels |
| **Description** | Recently, rotated quadrature amplitude modulation (QAM) has been widely used in practical wireless systems. One of the important applications is the digital video broadcasting system in Singapore.<br><br>In this project, the objective is to study rotated QAM signals and simulate their bit-error rate (BER) performance over various fading channels. The performance of the algorithms will be analyzed and verified through the commonly available simulation programs from the common simulation platform (CSP).<br><br>Matlab programming will be used for BER simulation. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Preferably to have basic programming skills in Matlab, though it is not compulsory, as the student should be able to pick up the skill during the execution of the project. |

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**ENGINEERING** | **School of Mechanical and Aerospace Engineering**

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|---|---|
| **Project Code** | MAE01 |
| **Project Title** | Exploring Airfoil Designs: How Vortex Cavities Improve Flight |
| **Description** | Have you ever wondered how airplanes stay in the air? The secret lies in the shape of their wings, called airfoils. Airfoils guide air smoothly to create lift (the force that allows planes to fly). In this project, we'll explore a cool design feature called a vortex trapping cavity—a small groove that helps control airflow and reduce drag (air resistance).<br><br>Using computer simulations, we'll model airfoils and observe how air flows around them. You'll get to see how traditional airfoils compare to cavity-enhanced designs in reducing drag and improving lift. By the end, you'll understand how small design changes can make a big difference in performance!<br><br>In this project, you'll learn practical skills, like how engineers use advanced tools to design better planes. Best of all, it's designed to be hands-on and fun. This would hopefully be an exciting introduction to aerodynamics. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | I would highly recommend reading the history of aerodynamics. A good book would be The Enigma of the Aerofoil: Rival Theories in Aerodynamics, 1909-1930 by David Bloor.<br><br>For this project, we will be using ANSYS. The student's version of this software is free and can be readily downloaded. |

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**ENGINEERING** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE05 |
| **Project Title** | Designing an Artificial Intelligence and / or Robotics System for Potential Real-World Applications |
| **Description** | In this project, you will learn how to use open-source hardware (such as Arduino and Raspberry Pi), Artificial Intelligence (AI) computing platforms (such as NVIDIA Jetson) and sensors (such as cameras or microphones) to design and train an AI robot for a real-world application of your choice. You will be supported in your learning by a team of designers and developers who have extensive experience with open-source hardware and software. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Interest in maker culture, artificial intelligence and robotics is a plus. Experience with programming languages such as Python will be helpful though not necessary. |

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**ENGINEERING** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE12 |
| **Project Title** | Boredom recognition using physiological signals |
| **Description** | Boredom recognition using physiological signals is an emerging field that leverages biometric data to identify and quantify states of boredom.<br><br>This study explores the use of various physiological signals, such as heart rate variability (HRV) and electroencephalogram (EEG), to detect boredom in educational contexts.<br><br>By analyzing these signals, we aim to develop a robust model that can accurately recognize boredom when people experience it. The implications of this research are significant for enhancing user experience in educational settings, workplace environments, and entertainment platforms, paving the way for adaptive systems that can respond dynamically to user engagement levels. |
| **Offered As** | H3 Science Research / NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Strong programming skills in either MATLAB or Python. Basic knowledge in machine learning algorithms. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

**ENGINEERING** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE13 |
| **Project Title** | Automatic recognition of student emotions from facial expressions |
| **Description** | Automatic recognition of student emotions from facial expressions is a cutting-edge approach aimed at enhancing educational experiences through real-time emotional feedback.<br><br>This study investigates the use of advanced computer vision and machine learning techniques to analyze facial expressions and accurately identify academic emotions such as boredom, frustration, confusion, etc.<br><br>By integrating emotion recognition systems into educational platforms, we can create adaptive learning environments that respond to students' emotional states, thereby improving engagement and learning outcomes. |
| **Offered As** | H3 Science Research Project / NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Strong programming skills in either MATLAB or Python. Basic knowledge in machine learning algorithms. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

| SCIENCES | School of Chemistry, Chemical Engineering and Biotechnology |
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|---|---|
| **Project Code** | CCEB05 |
| **Project Title** | Development of new programmable RNA editing tools |
| **Description** | The ability to engineer genomes and transcriptomes and living cells lends itself to many biomedical and biotechnological applications. In recent years, CRISPR-Cas has emerged as a powerful system for genome and transcriptome engineering. Briefly, a Cas enzyme is recruited to a target site by a programmable guide RNA. In so doing, it can also bring along an effector domain to modulate the target gene.<br><br>Here, we are interested in developing new Cas13-based technologies to install A-to-I or C-to-U editing events in RNA transcripts. The tools developed may be used as a new therapeutic modality for well-defined genetic diseases and can also be utilized to study RNA editing in various biological contexts. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Knowledge of molecular biology and genetics, past research experience on biology- or biomedical engineering-related topics, willingness to work hard. |

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NANYANG research programme

| SCIENCES | School of Chemistry, Chemical Engineering and Biotechnology |
|---|---|

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|---|---|
| **Project Code** | CCEB06 |
| **Project Title** | Development of new technologies for precision genome engineering |
| **Description** | An ability to introduce precise changes in the genome of a living cell lends itself to many biomedical and biotechnological applications. In recent years, CRISPR-Cas has emerged as a powerful system that enables us to engineer the genome of plants and animals, including humans. However, the efficiency of precision genome engineering remains low in many human cell types.<br><br>In this project, we will explore different strategies to enhance the ability of CRISPR-Cas to install any defined edit in the human genome. If successful, our work will bring CRISPR technologies one step closer to clinical reality as a new form of therapeutics. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Some knowledge of molecular biology and genetics, some research experience on a biology- or biomedical engineering-related project, willingness to work hard. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

| SCIENCES | School of Mechanical and Aerospace Engineering |
|---|---|

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|---|---|
| **Project Code** | MAE02 |
| **Project Title** | A Fast Way to Compute Matrix Multiplication |
| **Description** | Matrix multiplication is a mathematical operation that takes a pair of matrices to generate a new matrix.<br><br>Directly applying the mathematical definition of matrix multiplication gives an algorithm that takes nmp order of time to multiply an n × m matrix by an m × p matrix.<br><br>The goal of this project is to develop a fast way to compute matrix multiplication. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Good at mathematics and Python programming |

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NANYANG research programme

**SCIENCES** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE03 |
| **Project Title** | Physiological Changes During Aerobic Exercise With Cloth Mask |
| **Description** | As Coronavirus Disease 2019 evolves to become an epidemic and the future of mask-wearing activities is unknown, understanding the physiological effect and exercise performance with reusable cloth masks (RCM) is essential.<br><br>It is hypothesized that RCM impedes airflow transmission between the environment and user, hence a negative impact on the ventilatory breakpoint (Vpt) and physiological variables (i.e. blood lactate, heart rate and oxygen consumption). However, the understanding is not concrete and many other studies conducted on surgical masks show conflicting results.<br><br>There are three objectives to the study:<br>1) To investigate the physiological effects of reusable cloth mask (RCM) worn during exercise,<br>2) To investigate the perceived exertion level and perceptual discomfort of RCM during aerobic exercise, and<br>3) to determine the appropriate exercise intensity level while wearing a RCM during exercise for healthy adults.<br><br>The study will look into the physiological makers, perceptual mask discomfort, and rate of perceived exertion during aerobic exercise. The study adopts a randomized crossover counterbalanced experimental design. All participants will be randomly assigned into the experimental (with RCM) or control group (without RCM) and the changeover will take place in the following week. A submaximal graded exercise treadmill protocol will be used to conduct the experiment where the ventilatory breakpoint will be identified. The protocol requires participants to run and rest for four minutes each, on an alternate basis until volitional exhaustion is achieved. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | 1) Communication skills<br>2) Attention to details<br>3) Adhere to protocols and guidelines for safe procedures in the laboratory<br>4) Positive learning attitude and open mind<br>5) Basic understanding of human anatomy, circulatory and respiratory systems, effect of exercise and training |

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NANYANG research programme

**SCIENCES** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE11 |
| **Project Title** | A historical review of weather and climate datasets |
| **Description** | In the era of rapidly advancing information and technology, fueled by breakthroughs in AI, new weather and climate datasets are being generated daily. While some datasets introduce innovative approaches, others enhance existing ones to add value. Despite advancements in computational power and data storage—aligned with Moore's Law—these resources remain finite.<br><br>Currently, no comprehensive study exists that summarizes the historical evolution of weather and climate datasets. Consequently, the ability to project the future trends in data volume, algorithmic development, and associated expenditures remains incomplete. Addressing this gap, this study aims to be the first to undertake such an initiative, laying the foundation for future research in this critical area. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | - Good literature searching skills;<br>- Fundamental Python programming skills for data visualization;<br>- Good English writing skills;<br>- Good communication skills;<br>- Strong interest in scientific research. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

| SCIENCES | School of Biological Sciences |
|---|---|

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|---|---|
| **Project Code** | SBS01 |
| **Project Title** | De novo design/engineering of an (template-less) RNA polymerase |
| **Description** | Currently, long RNA molecules are produced in the laboratory using reverse transcriptase, which requires a DNA template. While short, single-stranded RNAs can be synthesized chemically, this approach is significantly more expensive.<br><br>One of the most sought-after breakthroughs in biotechnology is a purely enzymatic method for generating RNA strands of varying lengths and sequences without relying on DNA templates. Our research group is actively developing and testing novel approaches to achieve this goal.<br><br>We invite interested high school students to join us — whether by contributing ideas during brainstorming sessions or by participating directly in experiments aimed at optimizing our strategies. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Pair |
| **Specific Knowledge** | - Basic knowledge of Biology and Chemistry.<br>- Mathematics H2 or equivalent.<br>- Optional programming experience. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

| SCIENCES | School of Physical and Mathematical Sciences |
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|---|---|
| **Project Code** | SPMS01 |
| **Project Title** | Magnonic Devices |
| **Description** | Magnonics is an interdisciplinary field delving into the intricacies of spin waves, holding significant promise for advanced wave-based computing.<br><br>This project will involve the understanding dynamic behaviour of magnon via numerical modeling, micromagnetic simulation, and if time permits, some experimental validations. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Strong interest in physics and simulation. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

| SCIENCES | School of Physical and Mathematical Sciences |
|---|---|

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|---|---|
| **Project Code** | SPMS02 |
| **Project Title** | Nanolithography based on scanning probes |
| **Description** | In this project, the student will carry out lithography at a sub-micrometer scale using NanoFrazor lithography. In this technique, a heated probe will sublimate a polymer to create patterns at a sub-100 nm level. The students will help to carry out pattern transfer from resist pattern to patterning of films below the pattern. The project will give the students a glimpse of the challenges in creating nanostructures. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Pair |
| **Specific Knowledge** | No special prerequisites. Studying/Studied Chemistry or Physics in JC at H2 level is fine. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

| SCIENCES | School of Physical and Mathematical Sciences |
|---|---|

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|---|---|
| **Project Code** | SPMS03 |
| **Project Title** | Optical Lithography |
| **Description** | In this project, the student will carry out optical lithography to fabricate some devices.<br><br>At first, the students will learn to use KLayout software to design devices. Secondly, they will learn to use spin-coating. Thirdly, they will learn to use the direct laser writer for exposing samples. Then, they will learn to develop the sample.<br><br>Having mastered these four skills related to optical lithography, they will perform various designs of devices. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Pair |
| **Specific Knowledge** | A good aptitude to learn software is essential. No other form of prior knowledge is required. The student may download KLayout and learn to use it. |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **School of Civil and Environmental Engineering**

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|---|---|
| **Project Code** | CEE03 |
| **Project Title** | Ship risk prediction in port state control inspection |
| **Description** | Port state control (PSC) is the ship inspection conducted by port states on foreign visiting ships. It is regarded as an effective way to enhance maritime safety and reduce pollution from vessels to the marine environment. Due to the large number of foreign visiting ships, the scarce inspection resources, and the tight ship schedule, not every ship can be, and should be inspected. Therefore, a critical step to improve the efficiency of PSC inspection is to identify ships with higher risk effectively, and then inspect these identified high-risk ships.<br><br>In this project, students are expected to scan related literature and databases to identify ship risk indicators and filter useful features for ship risk prediction; analyze why and how such features influence ship risk level; develop quantitative models (such as statistical models and/or machine learning models) to predict ship risk level; describe and explain the prediction results; propose ship inspection planning suggestions to the port and management suggestions to ship operators/owners. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | - A basic understanding of data analytics<br>- A basic understanding of Python programming<br>- A basic understanding of the maritime industry would be a plus |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** **CRADLE@NTU**

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|---|---|
| **Project Code** | CRADLE01 |
| **Project Title** | Empowering Microlearning for Singapore's Continuing Education and Training (CET) in the Age of Gen AI |
| **Description** | Our project aims to generate the most comprehensive understanding of what microlearning is from a global perspective including the factors that impact its efficiency, effectiveness, and attractiveness.<br><br>We aim to generate an updated description of Singapore's microlearning landscape including areas for skills development that can be addressed effectively through standalone microlearning initiatives as well as integrating it with traditional learning models. We will also integrate the principles of micro credentials, aiming to enhance the recognition and value of microlearning achievements. Finally, we will develop and evaluate the impact of microlearning intervention for Singapore employers.<br><br>The proposed project will provide both an evidence base that can inform microlearning research and initiatives worldwide, as well as a more granular understanding of how microlearning and micro credentials can be used to best address the current needs of Singaporean adult learners and employers. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | NIL |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE01 |
| **Project Title** | The Neuroscience of Math Learning |
| **Description** | The study of children who consistently attain low achievement scores in mathematics is challenging because there could be many underlying reasons for math struggles which include language difficulties, sensory processing deficits, inappropriate instructions, poor attitude towards mathematics, high anxiety or lack of home support. These factors may be exacerbated if the child has other learning difficulties such as attention deficit/hyperactivity disorder, global developmental delay, or other underlying deficits.<br><br>In this study, we use educational neuroscience methods to investigate if math performance can be predicted using behavioural and neurological data. We will also look into the design of neural-informed games to help students in their math learning. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | - Good understanding of math curriculum<br>- Interest in educational neuroscience<br>- Experience with mathematics games<br>- Experience with statistical methods will be an advantage |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

| | |
|---|---|
| **Project Code** | NIE02 |
| **Project Title** | Topics in Singapore English |
| **Description** | For this project, we will work on natural language data from Colloquial Singapore English (otherwise known as Singlish). Data will either be collected through elicitation/production tasks, designed experiments, or from existing corpora/data sets. Singapore English is a contact variety of English with several unique features.<br><br>The specific aspect of Singapore English, as well as how the data is analysed will depend on the linguistic subfield of your choice: syntax (structure), semantics/pragmatics (meaning), or phonology/phonetics (sound). I am fine with adopting whatever linguistic framework you prefer to use. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | - Native speaker of Singapore English, or have easy access to one.<br>- Good intuition, interest and curiosity in the way language is produced and processed. |

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**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

| | |
|---|---|
| **Project Code** | NIE04 |
| **Project Title** | Developing ChatGPT-enabled Chatbot to support students' open inquiry in learning K-12 mathematics |
| **Description** | Computer-based systems have been enhancing educational instruction for decades. With the rapid advancements in Artificial Intelligence (AI), particularly in the realm of Generative AI (GenAI), we are poised to revolutionize learning experiences. GenAI's capability to engage in natural language conversations and adapt its responses to individual learners offers significant potential for personalized education. While GenAI has been effectively utilized in fields such as medicine and biomedical science, its application in primary-level mathematics education remains limited.<br><br>We invite you to join us in this project focused on developing a ChatGPT-enabled chatbot designed to teach primary-level mathematics within an open inquiry learning framework. This project offers a unique opportunity to explore the integration of advanced technology in educational settings and contribute to innovative teaching methods. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | - Interest in the field of generative artificial intelligence<br>- Basic programming background<br>- Interested in AI and machine learning<br>- Requires knowledge of prompt engineering |

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**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

| | |
|---|---|
| **Project Code** | NIE06 |
| **Project Title** | Exploring the Role that Game-Based Worlds and Immersive Environments Potentially Play in Learning |
| **Description** | Since 2009, lesson units have been carried out in a number of schools with the aim of developing an understanding about how game-based worlds and immersive environments can be leveraged for learning; these lesson units have been used in a variety of subjects, such as Geography, Literature, and Design & Technology.<br><br>If you are interested in thinking about such worlds and environments, and/or about maker culture and open-source hardware/software, with a view to designing more authentic learning experiences, we welcome your participation in this project, which is likely to be sufficiently flexible to support your own particular areas of interest. You will be working as part of a team of designers and software developers as we help build teacher-capacity in curriculum and pedagogy. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | A healthy interest in collaborative learning. Interest in maker culture, game-design and learning through games is a plus. |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

| | |
|---|---|
| **Project Code** | NIE07 |
| **Project Title** | Singapore's linguistic landscape |
| **Description** | The pervasive use of language around us -- on street signs, posters, buildings, shops, government notices, building and shop names --- shows not only the presence of people in that area, but it also reflects the inhabitants' history, culture and identity. A linguistic landscape is understood as a “marker of the geographical territory occupied by a distinctive language community within multilingual states” (Landry & Bourhis, 1997, p. 24). The visibility of certain languages reflects the status and value of those languages in relation to others. Languages in the linguistic landscape not only provide an understanding of the community's ethnic identity, but they also offer some insights into the power dynamics and social hierarchies that exist in multilingual societies. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | An interest in language use. A keen eye for details. If the student is looking at minority languages, some proficiency is useful, but not necessary. |

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**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE08 |
| **Project Title** | English in Singapore |
| **Description** | Any topics related to the use of English in Singapore. We could look at the form (i.e. the structure) of the English language variety/varieties, and/or consider the function of the formal/colloquial varieties of English in Singapore across different domains (home, school, media etc.). |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | A keen interest in language. |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE09 |
| **Project Title** | Sense of Food Resiliency among Secondary/JC students in Singapore |
| **Description** | The COVID-19 pandemic caused many unplanned disruptions of varying magnitudes, worldwide. With the growing global population reaching an estimated 9 billion in 2050, inflation in food costs and decreased food supplies contribute to the decline and urgency in tackling food security.<br><br>In Singapore, 90 percent of our food supplies are imported. The government's Food Resilience (FR) mitigation measures included stockpiling, diversification of food sources and providing funds to support and boost production supplies by local high-tech farmers at the national level2. However, in communities and households, Household FR is defined as a household's ability to withstand stresses in disruptions in food availability often caused by multiple factors such as sudden reductions in food supplies, surges in food prices or massive food contamination.<br><br>Recent spates of panic buying to stock up both essential and non-essential supplies which led to empty supermarket shelves; are tale-tale indicators of low household FR which underpinned an insufficient comprehension about the mitigation efforts to assure and prevent panic, massive hoarding.<br><br>Leveraging on the current situation, it is important to initiate a national initiative to educate and promote greater awareness towards building household FR as a means to cope with such an unplanned crisis and declining food supplies.<br><br>The aim of this project is to measure the level of awareness and preparedness of teenagers in Singapore in handling potential food crises. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | NIL |

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**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **National Institute of Education**

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|---|---|
| **Project Code** | NIE10 |
| **Project Title** | Literary Theory and Modern Poetry |
| **Description** | Literary theory represents a prescient and exciting framework through which to explore modern themes and ideas that poets reflect in their work.<br><br>This research project aims to explore the pertinence of philosophical constructs to modern poetry (from 1900 to the present day). The student will choose a school /branch of literary and critical theory (structuralism, poststructuralism, psychoanalysis etc) and employ its methods to analyze and understand the work of a modern or contemporary poet.<br><br>This project will provide the student with the opportunity to engage in interdisciplinary work, as we will engage in both theoretical exploration and the close analysis of poetry and poetic movements in the 20th and 21st centuries. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | A strong background in Literature at the junior college/IP level is required. |

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NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **School of Humanities**

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|---|---|
| **Project Code** | SoH01 |
| **Project Title** | Understanding language, media and society through data analytics and machine learning |
| **Description** | Data analytics and machine learning algorithms help us discover hidden patterns in 'messy' information, in order to understand our world and make better decisions. They can be applied even to social phenomena like languages, the mass media, and social media, to help us learn about human issues with fresh scientific perspectives. This project will help students acquire basic Python programming and machine learning skills and apply them to self-built social datasets to uncover fascinating insights. It will also encourage students to develop ways to teach these techniques in a creative and interesting manner to fellow students and beginners. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | - Basic statistical knowledge is advantageous but not necessary<br>- Basic programming skills are advantageous but not necessary<br>- Students will use the open-source and free Python programming language |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **School of Humanities**

| | |
|---|---|
| **Project Code** | SoH02 |
| **Project Title** | A Sociolinguistic Investigation of French, German, Italian and Spanish in Singapore Shop Signs |
| **Description** | This study is the first step in investigating the recurrent forms and patterns of French, German, Italian and Spanish as used in commercial shop signs across different business sectors in Singapore. It seeks to uncover the motivations behind the use of French, German, Italian and Spanish here via surveys.<br><br>Apart from the four official languages and their various spoken dialects, Singapore is host to a variety of other minority languages (Gordon 2005). French, German, Italian and Spanish are other cases in point. Apart from its economic value, the popularity of French, German, Italian and Spanish seems to be due to its positive associations with high culture, haute couture and elegant lifestyle. These associations appear to be increasingly exploited in commercial signs across the island. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Pair |
| **Specific Knowledge** | Interest in European languages. |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **School of Social Sciences**

| | |
|---|---|
| **Project Code** | SSS01 |
| **Project Title** | Conceptions of World Order in East Asia |
| **Description** | This project examines the diverse conceptions of international order in East Asia as understood by political elites both historically and contemporaneously. It explores how these conceptions differ from traditional Western perspectives, often rooted in the Westphalian system of sovereign states.<br><br>Through a critical analysis of existing literature, this research aims to identify key themes and debates within East Asian international relations scholarship while adding to discussions on non-Western ideas of order. Particular focus will be paid to Chinese and Japanese conceptions of international order. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual |
| **Specific Knowledge** | Strong reading and writing skills, keen interest in Chinese history and politics. Strong Chinese language competencies. Clear communication and ability to work independently under ambiguity. |

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NANYANG research programme

**BUSINESS, HUMANITIES, ARTS & SOCIAL SCIENCES** | **School of Social Sciences**

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|---|---|
| **Project Code** | SSS02 |
| **Project Title** | Assessing Social Attributes of Faces |
| **Description** | We tend to make inferences about a person's traits or attributes based on the appearance of the face. For example, we judge trustworthiness, attractiveness, dominance or threats, based on the face images, though the accuracy of such judgment is under debate.<br><br>It has been shown that our judgment of trustworthiness can be built within the first 100 ms after seeing the face. There have been extensive studies evaluating such social dimensions of faces. However, there are still open questions remaining to be answered. For example, what are the most important factors in assessing facial attributes? Are there associations among these different attributes? How does the previous exposure to faces of similar or different attributes affect our judgment of subsequently presented faces? Such as, does a happy face appear more trustworthy than a neutral or sad face?<br><br>We will use online surveys and/or psychophysical experiments to address these questions. |
| **Offered As** | NRP Enrichment |
| **Group Size** | Individual / Pair |
| **Specific Knowledge** | Good at math and writing in English. |

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