IRIS@NUS Project List for Jan-May 2027

Faculty	Department	PI Name	PI Webpage	Research Project Title	Project Description	Prerequisite & expectation for the student	Duration of the project	PI's available period
Arts and Social Sciences	Communications and Social Media	Kokil Jaidka	https://smolproject.com/	Making Videos Audible: Warmth, Evidence, and Information Fidelity in AI Narration for Accessible Education	Millions of blind and low-vision learners cannot use textbooks and videos designed for sighted audiences. This project builds and tests AI pipelines that turn visual learning materials into engaging, audiobook-style audio: converting textbook chapters into podcast-style lessons (rewriting formulas, diagrams, and experiments into clear spoken language) and turning video and real-world scenes into narration. The student will help digitize and curate source materials, run and log the AI pipelines (LLM, speech, and text-to-speech tools), and prepare the generated audio for evaluation by educators and visually impaired listeners in India. The project combines hands-on generative AI work with real social impact in accessibility and education.	The student should be comfortable with basic Python and willing to learn to work with AI tools and APIs (prior experience with LLMs or text-to-speech is a requirement). Strong attention to detail is essential, as the work involves careful preparation and quality-checking of text and audio. Reading proficiency in Hindi or another Indian language is an advantage but not required. An interest in accessibility, education, or human-AI interaction is welcome.	2 months	11 Jan - 20 Apr
Arts and Social Sciences	Communications and New Media	Zening Duan	https://discovery.nus.edu.sg/30835-zening-duan	How Generative AI Is Changing Online Information and Public Attention	Curious about how AI is changing the information we see and share online? This project examines how generative AI systems (e.g., ChatGPT and other large language models) are transforming online political information, public attention, and digital communication. Students will contribute to ongoing research by collecting and analyzing large-scale online data, evaluating AI-generated content, and applying computational social science methods to understand how AI shapes information ecosystems. Participants will gain hands-on research experience in Python, data analysis, and reproducible research while working closely with the COMET (Computational Media Ecosystem and Technology) Lab at NUS.	Students with an interest in generative AI, digital media, computational social science, or related fields are encouraged to apply. No advanced technical background is required, although experience with programming or data analysis is a plus. We are looking for curious, motivated students who are eager to learn and contribute to research.	3 months	11 Jan - 7 May
Arts and Social Sciences	Economics	Siddharth Eapen George	https://sites.google.com/view/siddharthgeorge/home	Long-Run Impacts of Diarrhoea Treatment	We use micro data on household consumption and health to examine the long run impacts of oral rehydration therapy programs in the developing world, especially in Bangladesh and India.	Good programming skills (e.g. Stata and R). Strong knowledge of econometrics. Interest and prior coursework in development economics.	2 months	1 Mar - 7 May
Arts and Social Sciences	English, Linguistics and Theatre Studies	Aine Ito	https://aineito.github.io/	Sentence processing in bilinguals	The big goal of this project is to explore why real-time comprehension is more difficult in a non-native language than in a native language. The project explores the role of predictive processing in real-time language comprehension in bilinguals. We conduct eye-tracking and EEG (electroencephalogram) experiments to investigate individual differences in prediction in bilinguals and whether prediction facilitates comprehension.	Students should have taken courses in psycholinguistics or experimental linguistics. They should ideally have some background in experimental design.	3 months	11 Jan - 1 May
Arts and Social Sciences	Psychology	Kean Jia-Jiann Hsu	https://www.keanjhsu.com/	Clarifying the role of basic cognitive processes in depression and anxiety in the real world	Basic cognitive processes like how individuals attend to, process, interpret, and remember emotional and non-emotional information have been suggested to play a role in mental health challenges, particularly depression and anxiety. However, most of our theoretical and empirical understanding of how these basic cognitive processes are associated with depression and anxiety focus on laboratory based assessments of outcomes. Some work has examined how cognition has related to daily or hourly questionnaires individuals fill out as they go through their day. Little work has been done on how these cognitive processes contribute to experiences and behaviors in the real world for individuals with depression and anxiety, such as their social media use or naturalistic experiences of reward. Our lab tackles this topic in a variety of ways, including with studies funded by the National Medical Research Council, the Ministry of Education, and by NUS. Our work aims to address these gaps by conducting systematic reviews/meta-analyses that will help guide future research in this area and by conducting primary data collection to study these risk and maintenance factors. This project is ideal for students who want to understand what real world, experimental approaches look like in clinical psychological science.	Ideally students should have taken courses in Introductory Psychology and on mental health (e.g., Intro to Clinical Psychology, etc). Courses in Cognitive Psychology and experience with data analysis or programming might be helpful, but not necessary.	2 months	11 Jan - 16 Apr
Arts and Social Sciences	Psychology	Shu Qin, Cynthia Siew	https://langcomplab.github.io	The Small World of Singlish Words	The Small World of Singlish Words is our lab's ongoing attempt to collect free associations for uniquely Singaporean words, like shiok, diam, sian, and chope. We hope to collect enough free associations in order to build the first cognitive language network of Singapore English words. Study link: https://singlishwords.nus.edu.sg/	The student should have taken courses in Introductory Psychology, Introductory Statistics and Research Methodology, and Cognitive Psychology. Having skills in programming in R, Python, or Javascript, and/or an interest in learning more about psycholinguistic/linguistic research is preferable. The student is expected to contribute to the project by helping with data collection, data processing/analysis, conducting literature reviews, attending lab meetings, and assisting more senior members of the lab with general research tasks.	2 months	11 Jan - 7 May
Public Policy	Lee Kuan Yew School of Public Policy	Chin-Hao Huang	https://lkyspp.nus.edu.sg/our-people/faculty/chin-hao-huang	Rethinking Asia's Security Resilience in a Changing Regional Order	This project examines how recent shifts in US foreign policy—marked by rising unilateralism, transactionalism, and receding global commitments—are reshaping regional security dynamics and alliance politics in Asia. While the US-led hub-and-spokes alliance system has historically underpinned regional stability, calls for greater burden-sharing are occurring amid intensifying US-China competition and widening uncertainty about US strategic priorities. Drawing on a range of quantitative and qualitative data, the project will measure the emergent divergences between US and Asian security partners' regional threat perceptions and the potential reversal in moral hazard in the security relations. The project will assess the implications these changing developments are having on regional order and stability.	Strong theoretical understanding of IR and security studies, with an empirical focus on Asia/Southeast Asia. Adept skills in quantitative reasoning, data analysis, and qualitative research required.	2 months	11 Jan - 7 May

Computing	Computer Science	Yatao Bian	https://yataobian.com/	Agent–Tool Co-Evolution: Jointly Optimizing LLM Agents and Their Scientific Tools for Molecular Discovery	Modern scientific discovery increasingly relies on LLM-based agents that decompose a goal, plan, and invoke external tools. In the molecular domain, these tools are often specialized learned models (e.g., GNNs for property prediction, neural force fields/MLIPs, docking scorers, or retrosynthesis predictors). The dominant line of "agent optimization" research improves the agent's policy over tool use: which tool to call, when, and with what arguments (prompt optimization, trajectory fine-tuning, RL, tool routing). Namely, the tool is treated as a fixed, frozen black box. This overlooks a key fact: the agent's task performance is fundamentally upper-bounded by the quality of its tools. A miscalibrated or out-of-distribution GNN yields wrong predictions that no amount of better orchestration can repair. Crucially, scientific tools are not static APIs. They are parametric models that can themselves be improved. This project investigates agent–tool co-evolution: a closed loop in which (1) the agent exercises the tool on the tasks it actually cares about, (2) the resulting outcomes generate a learning signal that improves the tool, and (3) the improved tool in turn reshapes how the agent plans and calls it so that agent and tool improve together. The core research challenges are: • Credit assignment: task success is sparse, delayed, and non-differentiable; the agent's discrete decisions break the gradient path to the tool's parameters. • Label-free / cheap learning signals: e.g., cross-tool self-consistency (a fast GNN vs. higher-fidelity DFT/MD on a verified subset), physical/chemical constraints, downstream verification, and uncertainty estimates, turning the loop into a form of active learning. • Targeted adaptation under distribution shift: the agent steers the tool into new regions of chemical space, so the tool must improve exactly there without catastrophic forgetting (full fine-tuning vs. LoRA/adapters vs. test-time adaptation vs. memory/retrieval augmentation). • Stability of the feedback loop: preventing the agent from exploiting tool blind spots, or the tool from overfitting to the agent's query distribution.	Proficient in PyTorch, or similar coding frameworks. Python programming skills or vibe coding. The student(s) will: (a) survey and taxonomize existing agent/tool optimization work, explicitly separating agent-side (tool-calling) optimization from tool-side optimization and identifying where the "tool is frozen" assumption is made; (b) formalize agent–tool co-optimization as a joint objective with explicit signal sources, update operators, and stability considerations; (c) build a prototype on a concrete molecular task (e.g., agent-driven molecular property prediction / lead optimization where a GNN tool is iteratively refined via active-learning labels and self-consistency checks); and (d) evaluate whether co-evolution improves both the tool's accuracy/calibration and the agent's end-task success versus a frozen-tool baseline. The framework is designed to be general (transferable to force fields, docking, retrosynthesis), with molecules as the initial, tractable testbed.	3 months	11 Jan - 7 May
Computing	Computer Science	Umang Mathur	https://www.comp.nus.edu.sg/~umathur/	Compiler support for AnvilHDL	AnvilHDL is a new programming language for writing hardware designs that we are developing in NUS: https://arxiv.org/abs/2503.19447 This project aims to develop compiler support for this language.	Expertise in programming in OCaML, C/C++, Rust, LLVM compiler infrastructure. Experience in writing code in HDL languages like Verilog. Must have taken a basic course in programming languages (design and implementation, semantics etc).	2 months	11 Jan - 7 May
Design and Engineering	Biomedical Engineering	Yiyuan Yang	https://harlonyang.wixsite.com/neurolab	Intelligent Multimodal Electrochemical Sensors for Real-Time Analysis of Organoid Function in High-Throughput Assays	In this project, we aim to develop an intelligent multimodal electrochemical sensing system compatible with conventional cell culture well plates for simultaneous, continuous, real-time, and label-free in situ monitoring of multiple organoids. By integrating artificial intelligence (AI)-driven analytics, this platform will interpret dynamic biosignals to assess both the physiological state of individual organoids and the condition of their microenvironments. This enables real-time adjustments to the culture media tailored to the specific needs of each organoid, ensuring optimal growth conditions and enhancing overall viability. Implementing such a scalable and adaptive system is expected to revolutionize organoid-based research and medical applications, particularly in drug screening and personalized medicine for complex diseases as this system expects to remarkably expands the accessibility of organoids by significantly reducing the costs associated with cultivation.	No prerequisite is required. Previous wet lab experiment experiences and AI analysis skills are more preferred	2 months	11 Jan - 7 May
Design and Engineering	Electrical and Computer Engineering	Mehul Motani	https://cde.nus.edu.sg/ece/staff/mehul-motani/	Generative AI for Healthcare Applications	We want to develop a personalized LLM-powered virtual assistant/chatbot to enhance personal healthcare. By fine-tuning models on specialized and private medical data, the chatbot provides patients and providers with personalized, accurate guidance on symptoms, treatments, and lifestyle choices. This project empowers users with instant access to reliable health information while ensuring transparent and trustworthy operation for clinical stakeholders.	Students should be curious and ready to innovate and get their hands dirty. Prior experience with programming with AI and, in particular, generative AI will be very useful. Project can be 2 or 3 months in duration.	3 months	11 Jan - 7 May
Design and Engineering	Industrial Design	Irmandy Wicaksono	http://irmandyw.com	Functional Textiles for Wearable Tech	The Soft Technologies Lab, led by Assist. Prof. Irmandy Wicaksono at the NUS Design is seeking a part-time student researcher to join ongoing projects in functional textiles and wearables. The lab explores the integration of electronics, sensing, and computation through various textile and garment making techniques, including sewing, embroidery, knitting, and weaving. Responsibilities include prototyping smart materials, soft technologies, textiles, and interactive systems, supporting experiments and user studies, and assisting in documentation and analysis.	Prerequisites: Are creative, driven, and independent. Are interested and experienced in one or more of the followings: material science, fabrication, wearable developments, hardware systems, textiles, UX development, and/or XR programming.	3 months	11 Jan - 7 May
Design and Engineering	Materials Science and Engineering	Yi Wan	http://research.nus.edu.sg/wan-yi/	Machine-Learning-Assisted CVD Growth and Characterization of 2D Materials	This project introduces students to the growth of two-dimensional (2D) semiconductors using chemical vapor deposition (CVD) and the use of automation and machine learning to optimize synthesis. Students will carry out controlled CVD experiments, characterize the resulting materials using optical microscopy and Raman spectroscopy, and build a small dataset linking growth conditions to material quality. Simple machine-learning models will then be applied to identify trends and propose improved growth parameters. The project provides hands-on experience in both experimental 2D materials research and data-driven materials optimization.	Students should have a basic background in materials science, physics, chemistry, or a related engineering discipline. Prior experience in Python programming or data analysis is helpful. The student is expected to be motivated, responsible in following lab safety procedures, and willing to learn both experimental techniques (CVD growth, microscopy, Raman characterization) and basic machine-learning tools. Active engagement, good documentation practices, and consistent weekly updates are expected throughout the project.	2 months	11 Jan - 7 May
Design and Engineering	Materials Science and Engineering	Yan Jing	https://cde.nus.edu.sg/mse/staff/yan-jing/	Electrochemical carbon capture	The project will involve electrochemical flow system assembly, testing, and techno-economic analysis. Removing CO_2 from the atmosphere for the hard-to-abate industries is indispensable to limit global warming to 1.5–2°C above pre-industrial levels. My group is interested in utilizing electro-active materials to selectively capture CO_2 from the air and release pure CO_2 for further sequestration or CO_2 reduction.	The student should have taken courses in applied chemistry.	2 months	1 Feb - 7 May
Design and Engineering	Materials Science and Engineering	Silvija Gradecak-Garaj	silvija.org	Nanostructured materials for the next generation microelectronics, photonics, and optoelectronics	This project focuses on the synthesis, characterisation, and applications of nanostructured materials for the next generation microelectronics, photonics, and optoelectronics. Due to their low dimensionality, nanostructured materials exhibit properties that are distinct from their bulk counterparts. At the same time, the role of defects and interfaces becomes more critical. This project aims to answer how these properties can be controlled through controlled synthesis methods.	Students with a background in materials science, physics, electrical engineering and related fields are welcome to apply.	2 months	11 Jan - 7 May

Medicine	Biochemistry	Ronghui Li	https://medicine.nus.edu.sg/bch/faculty/li-ronghui/	Reversing Cellular Aging Through Synthetic Biology and Functional Genomics	Aging is associated with the loss of cellular identity and function, including a phenomenon known as mesenchymal drift, in which cells progressively adopt an activated mesenchymal-like state. This project aims to identify genetic and chemical interventions that can reverse aging-associated phenotypes and restore healthy cell states. Students will contribute to experiments involving cell culture, synthetic biology, gene perturbation, molecular cloning, chemical screening, and phenotypic characterization using imaging and molecular assays.	Students with a background in biology, biotechnology, bioengineering, biomedical sciences, or related disciplines are encouraged to apply. Prior coursework in cell biology, molecular biology, genetics, or biochemistry is preferred. Previous laboratory experience in mammalian cell culture, molecular cloning, or basic laboratory techniques is advantageous but not required. The student should be highly motivated, willing to learn experimental techniques, and able to work independently as well as within a research team.	2 months	11 Jan - 7 May
Public Health	Saw Swee Hock School of Public Health	Kiesha Prem	https://sph.nus.edu.sg/faculty-directory/prem-kiesha/	Quantifying social mixing for pandemic preparedness in Singapore: behavioural determinants of contact patterns in a national survey	Preparedness for the next respiratory pandemic depends on knowing how a population mixes. Age-structured social contact matrices (which quantify rates of interpersonal contact between demographic groups) are the principal empirical input to the transmission models used to project epidemic trajectories, evaluate physical distancing measures, and prioritise age groups for vaccination. To addresses this gap: a population-based social contact survey comprising a cross-sectional sample (n=5,400) and a longitudinal panel (n=1,000) with repeated diary administration, the first study of its scale in the region. The student will contribute to establishing Singapore's empirical mixing structure and to characterising the behavioural and social determinants that shape it, including household composition and intergenerational contact, employment and schooling status, weekday-weekend and seasonal variation, and heterogeneity by age, educational attainment, and language group. Analyses will extend to the stability of contact behaviour within individuals over repeated observation, an underexamined determinant of how rapidly mixing patterns may shift under outbreak conditions. The concluding component evaluates epidemiological consequences, propagating the estimated matrices through a transmission model to assess how Singapore's mixing structure shapes the transmission potential, projected age-specific attack rates, and the relative impact of age-targeted interventions.	Essential: undergraduate training in psychology or research methods and quantitative analysis, including generalised linear models; working competence in R or Python sufficient for data management, model fitting, and graphical presentation; substantive interest in the social and behavioural determinants of health. Desirable: familiarity with survey methodology and complex sample designs, longitudinal or panel data structures, mixed-effects modelling, or social network approaches to health behaviour. Prior training in epidemiology or mathematical modelling of infectious disease is advantageous but not required. This project is designed for a student in psychology, behavioural science, or a cognate quantitative social science discipline. The requisite epidemiological and modelling background will be provided by the supervisory team; no prior exposure to transmission modelling is assumed, and analytical methods beyond the stated prerequisites will be developed over the course of the attachment. Expectations: substantially independent work under weekly supervision, participation in research group meetings, submission of a written report, and an oral presentation at the conclusion of the attachment.	2 months	1 Feb - 7 May
Public Health	Saw Swee Hock School of Public Health	Kimberly Michele Fornace	https://blog.nus.edu.sg/sphclimate/	Climate change impacts on infectious disease transmission in Southeast Asia	This project will examine environmental risk factors for selected zoonotic and vector-borne diseases in Southeast Asia, with case studies in either Singapore or other countries in ASEAN. Singapore-based opportunities for fieldwork are available or studies can focus on data science approaches with collaborators in the region.	Quantitative data science skills (e.g. use of R and python) and familiarity with spatial data (e.g. use of GIS or similar tools)	2 months	11 Jan - 7 May
Science	Chemistry	Jie Wu	https://www.wujiegroupnus.com/	Development of heterogeneous photocatalysis	In this project we will develop heterogeneous single atom photocatalyst for novel organic synthetic methodology development.	Have done organic synthesis in lab.	3 months	11 Jan - 7 May
Science	Chemistry	Xiaoyan Li	https://www.xiaoyanli-mace.com/	Physics-Guided ML for Cu–Support Catalysts in CO_2RR	The catalytic activity and selectivity of Cu-based systems for electrochemical CO reduction (CORR) are strongly governed by CO adsorption energetics, which are further modulated by nanoparticle size, morphology, and substrate interactions. This project aims to develop a structure-based, physics-informed machine learning (ML) framework to predict CO adsorption energies on Cu nanoparticles supported on diverse oxide, carbon, and metal substrates. We will first perform density functional theory (DFT) calculations to generate a high-quality dataset of adsorption energetics across varied Cu cluster sizes, facets, and supports under realistic electrochemical conditions. The resulting data will train graph neural network (GNN) models capable of learning adsorption energies directly from atomic structures—without relying on electronic descriptors such as d-band centers or charge densities—thereby ensuring broader generalizability. The GNN will encode atomic connectivity, composition, and interfacial geometry to capture effects of charge transfer, strain, and metal–support coupling. Rapid screening of substrate–Cu combinations will identify systems that optimally tune the CO binding strength for enhanced CO-to-C2⁺ conversion, while explainable AI tools, such as SHAP analysis, will reveal the dominant structural features controlling CO adsorption. This physics-guided AI–DFT workflow will accelerate the rational design of stable, high-performance Cu-based electrocatalysts for efficient CO2RR.	Students have the backgrounds of chemistry, mateials, physics, or even computer science	3 months	1 Feb - 7 May
Science	Mathematics	Hung Minh Tan Nguyen	https://tanmnguyen89.github.io/	Trustworthy Angular Steering for Agentic Scientific Large Language Models	This project develops a principled, inference-time control method for large language models (LLMs) that keeps models helpful on scientific tasks while robustly enforcing safety and compliance. The core idea is Angular Steering-a rotation of hidden activations in a 2D plane aligned to a learned “behavior” direction (e.g., refusal or compliance)-which yields smooth, fine-grained behavior control without retraining or loss of general capability. Building on our prior finding that high-dimensional linear structure in LLM representations enables “activation engineering” jailbreaking and that projecting into lower-dimensional subspaces can preserve alignment while reducing exploitability, we will couple Angular Steering with lightweight representation compression to harden safety during agentic use. The application domain is scientific LLMs and agentic AI for science, where domain-specific models, multimodality, and autonomous research agents are rapidly maturing but still face reliability and evaluation challenges.	Linear Algebra, Machine Learning, Python Coding	2 months	11 Jan - 7 May
Design and Engineering	Chemical and Biomolecular Engineering	Yanwei Lum	https://lumyanwei.wixsite.com/lumresearch	Electrochemical CO2 reduction to value-added chemicals	This project will investigate whether subsurface metal doping is a general strategy for improving ethylene electrosynthesis on copper. Building on recent work showing that cobalt dopants alter the rate-determining step and enable efficient CO_2 electrolysis at lower voltages, the student will prepare Cu-based catalysts containing different dopants or cobalt loadings. Catalyst structure and composition will be examined using XRD, SEM–EDS and XPS, followed by electrochemical testing in a gas-diffusion flow cell. Product selectivity, partial current density, onset potential and Tafel slope will be measured to determine how dopant identity influences reaction kinetics. The project aims to identify structure–performance relationships and establish whether the beneficial kinetic effect is unique to cobalt. The student will gain experience in nanomaterial synthesis, electrochemistry, analytical methods and kinetic analysis. A membrane-electrode-assembly test of the best catalyst may be undertaken as an extended objective.	Background in Chemistry or Chemical Engineering.	2 months	11 Jan - 7 May