Building Sustainable
Innovation

CAPSTONE PROPOSAL

2026

Technology

Design

Architecture

Innovation

PREPARED BY:

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DATE OF ISSUE:

December 2025

PROPOSAL VALID UNTIL:

End January 2026

Innovation

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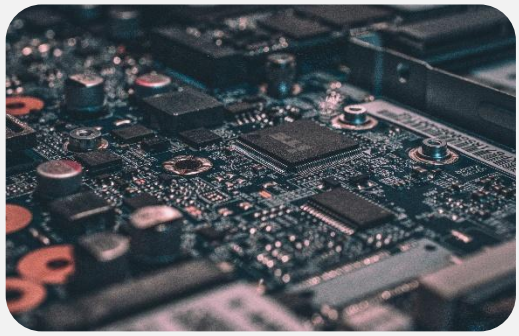
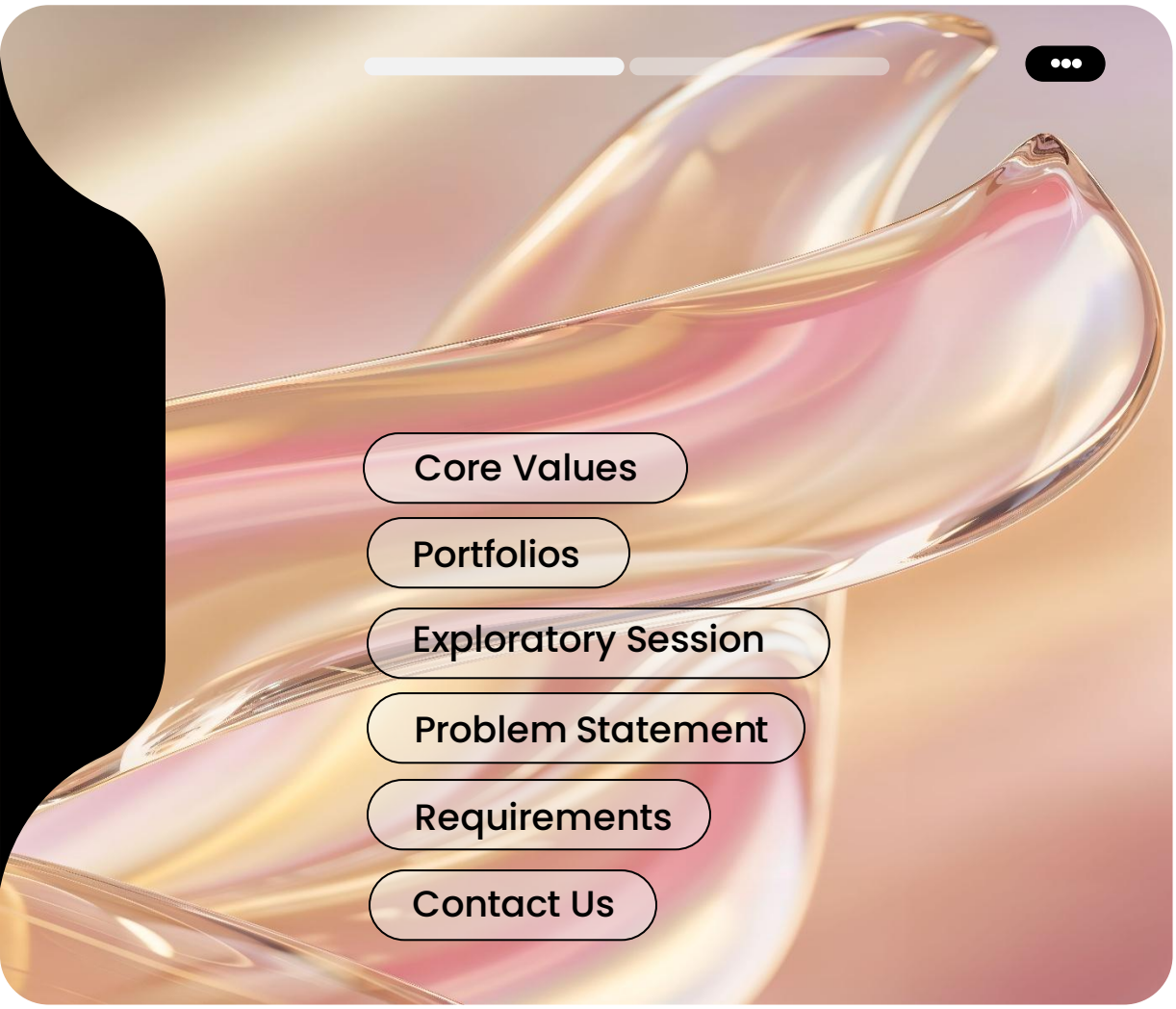


Shaping The Future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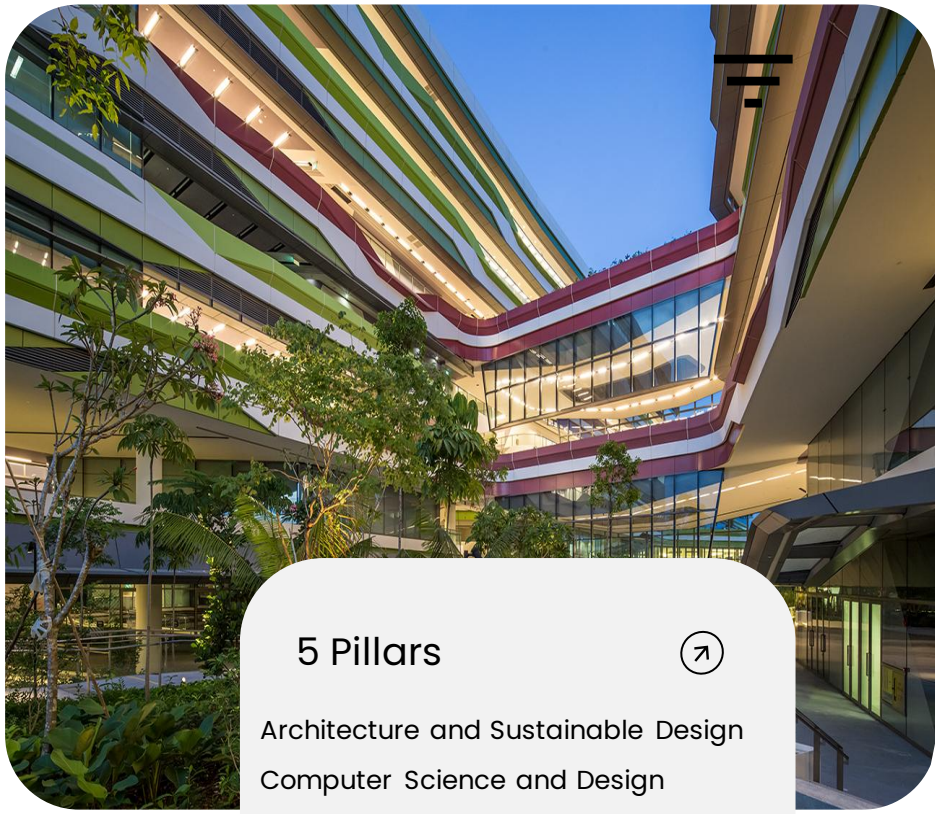
What is SUTD

EXECUTIVE SUMMARY



5 Pillars

Architecture and Sustainable Design

Computer Science and Design

Design and Artificial Intelligence

Engineering Systems and Design

Engineering and Product Design

Singapore University of Technology and Design is the 4th public university in Singapore. We are pioneers of innovation, creators of tomorrow, and architects of change. Focusing strongly on technology and building a strong foundation in design and innovation, we aim to educate technologically grounded leaders who are steeped in the fundamentals of mathematics, science and technology. We aim to create a diverse space that builds the future of tomorrow.

SUTD – Trailblazing a Better World by Design

What is Capstone

The Capstone project is a University-Industry partnership whereby students work in cross-functional teams to solve real-world challenges. Working in teams of 5 to 7 students, these final-year undergraduate students will learn to apply the principles, concepts, techniques that they have learnt to investigate your technical and business challenges.

Building
Sustainable
Innovation

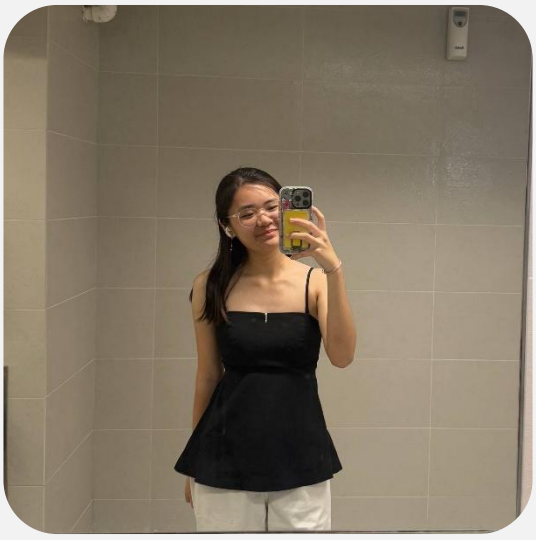
TRUSTED
VALUES

"Design is a funny word. Some people think design means how it looks. But of course, if you dig deeper, it's really how it works."

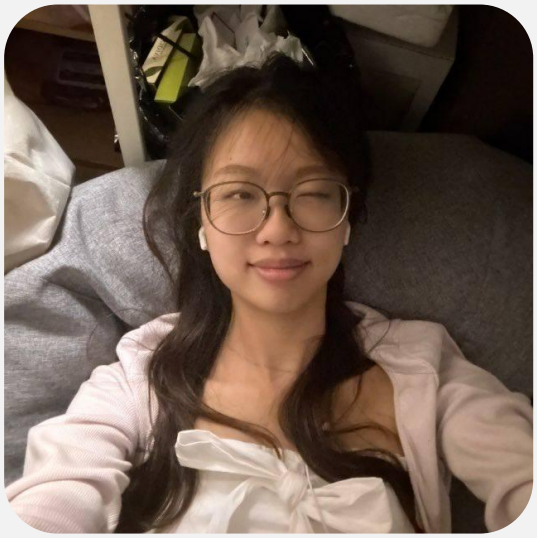
-Steve Jobs

Akash Subramani
EPD

Baddipadige Amith Reddy
CSD



Tan Ya Hui, Berlyn
ESD



Goh Xun Yi Joey
ESD

Leo Nyuk Sze
ASD

Alson Tay
ASD

TEAM PRSM OVERVIEW

About PRSM

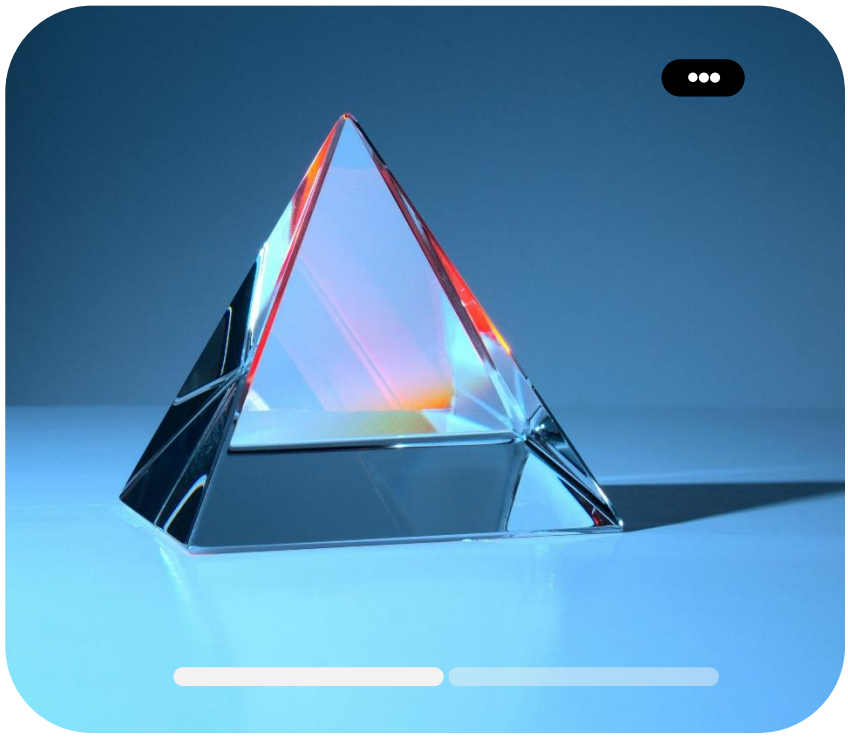
PRSM — pronounced "prism" — embodies the idea of taking a single beam of light and refracting it into countless colours. For us, that light represents a shared vision: to do good for the world, to do no harm, and to bring clarity where things are complex.

Each of us comes from a different discipline, with our own strengths, lenses, and ways of seeing the world. Like a prism, our team turns one idea into many perspectives — engineering precision, design empathy, computational logic, and strategic insight — all converging into solutions that are creative, responsible, and human-cantered.

We see ourselves as a kind of skunkworks: small, agile, and relentlessly inventive. When faced with challenges, we thrive on experimentation, rapid prototyping, and unconventional thinking. We don't just look for answers — we build them, turning ambiguity into opportunity.

PRSM isn't just our name; it's our philosophy. We believe innovation should illuminate, not overwhelm. Our goal is to design and engineer solutions that reflect integrity, imagination, and impact — refracting one shared light into something greater than any single colour alone.

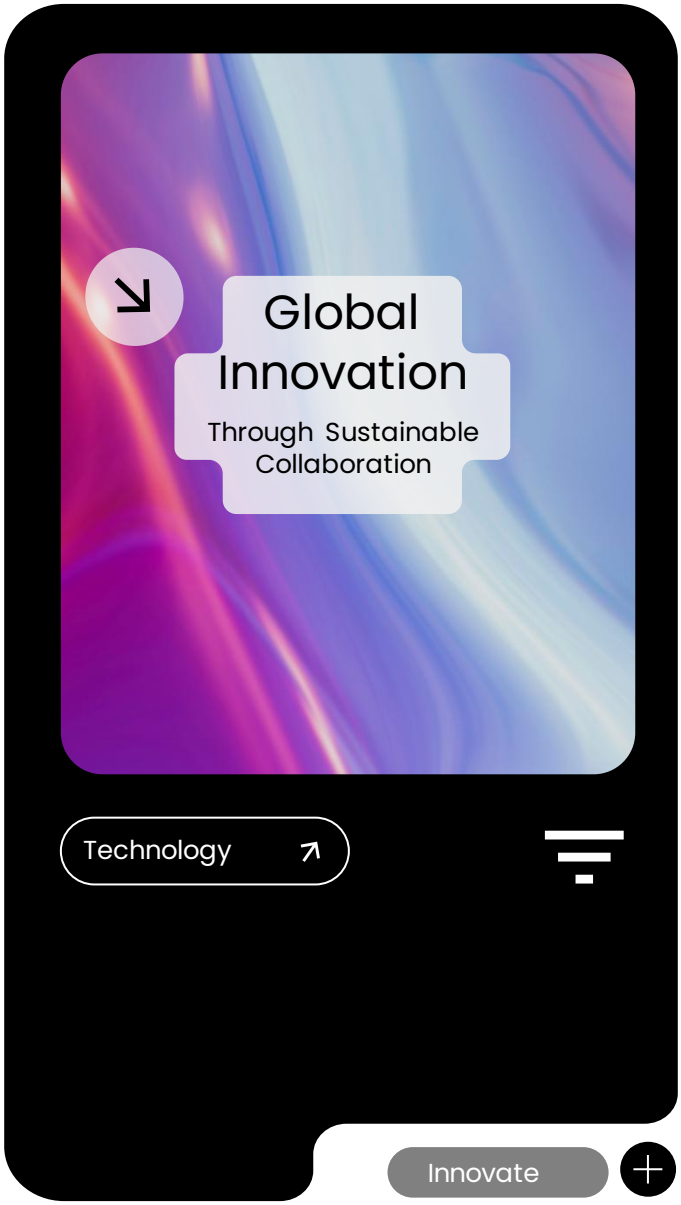
Woo Jon Hou Ainsley
CSD



VISION

Our vision is to become a skunkworks of positive impact — a team that refracts diverse perspectives into breakthrough innovations that are bold, ethical, and transformative.
We strive to shape a future where technology illuminates rather than overwhelms, and where every solution we create uplifts people, communities, and the world.

Building
Sustainable
Innovation



MISSION

At PRSM, our mission is to innovate boldly and build responsibly.
Inspired by skunkworks culture, we move fast, think fearlessly, and combine our diverse disciplines to transform complex challenges into purposeful solutions.
We are driven by a commitment to do good, do no harm, and ensure that every idea we develop makes a meaningful, human-centred impact.

Core Values

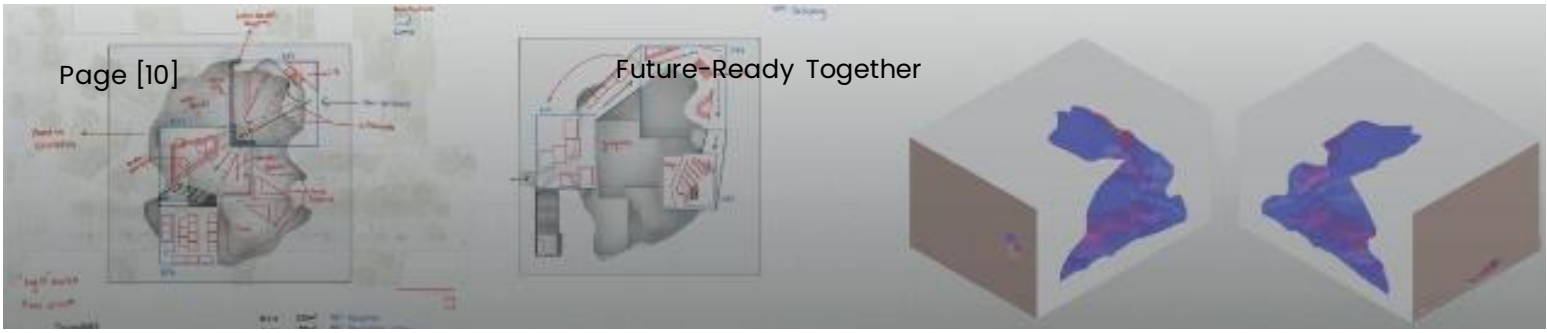
[001] Integrity

[002] Curiosity

[003] Collaboration

[004] Sustainability

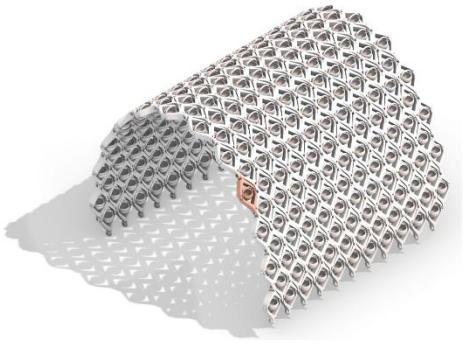
[005] Equity

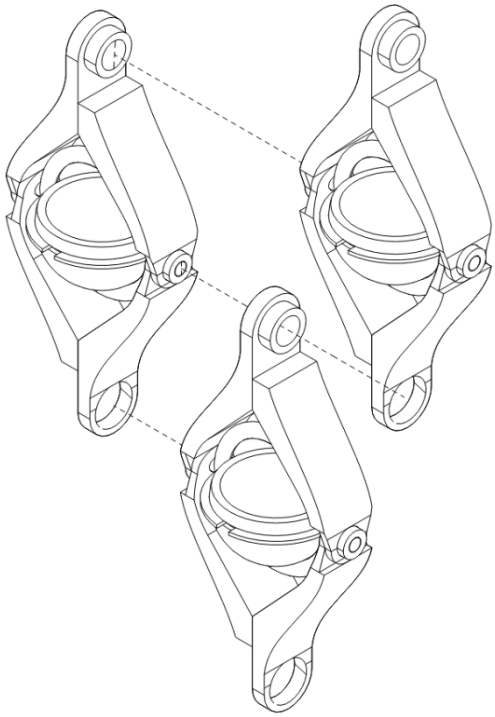


ASD PORTFOLIO

Agriwave

Developed in collaboration with Duana Goh Rui En, Malavika Ramesh, Debbie Della Rosa, and Ong Kian Ler, this project focuses on vertical farming systems that strengthen community food security while supporting mental well-being. Contributions include generating design variations and technical drawings through custom Grasshopper scripts, enabling efficient exploration of scalable, community-friendly farming structures.

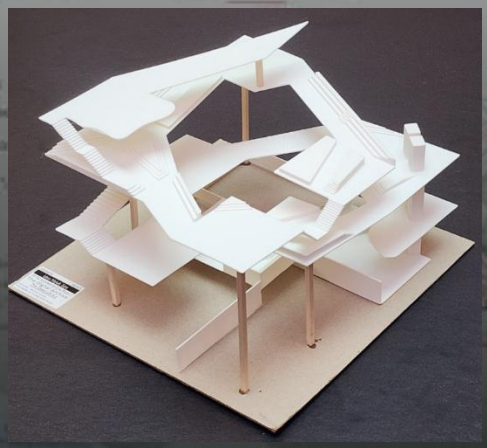




Parametric Bridge

Developed in collaboration with Pauline Raharja, Ethan Thong, Seah Kit Shann, and Joshua Leong, this project explored how structural integrity and architectural aesthetics can be balanced within strict engineering constraints. The bridge had to span at least 3 meters, be supported only at both ends, and withstand a 60 kg load.

The team designed a suspended, geometrically dynamic structure, pushing both form and performance. Contributions included developing a custom Python script and performing structural optimization using Kangaroo and Galapagos in Grasshopper. Karamba was also used to assess member stresses, providing hands-on experience with structural analysis tools. All team members participated in the full fabrication process—from material selection to assembly and load testing—bringing the digital model into a functional physical prototype.



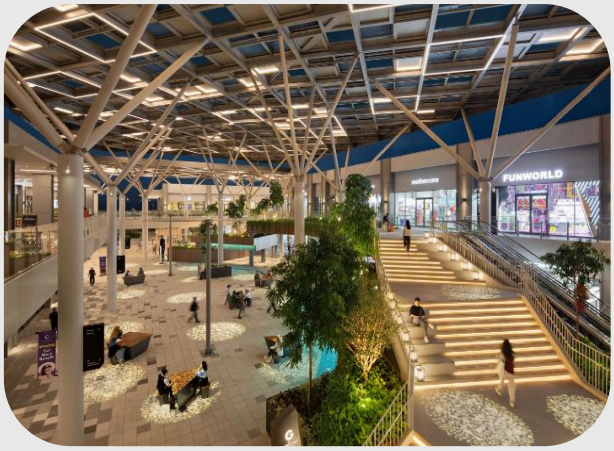
The Deep Library

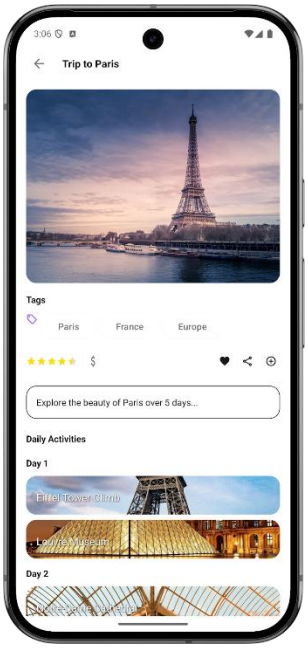
Google it.

For most of us, that has become our immediate, almost subconscious, first step towards finding an answer to any question. As Eric Schimidt and Jared Cohen from Google state, we are beneficiaries of a collective, and relatively recent, endeavour to share human knowledge through virtual means.

The goal is to build a library that will allow for human interaction and to be secluded within and integrated with nature.

We plan to force social interaction throughout the space by encouraging unplanned encounters in places traditionally ignored, such as staircases. This emphasizes the experience of the journey rather than just the destination by creating views and light changes.





WANDR

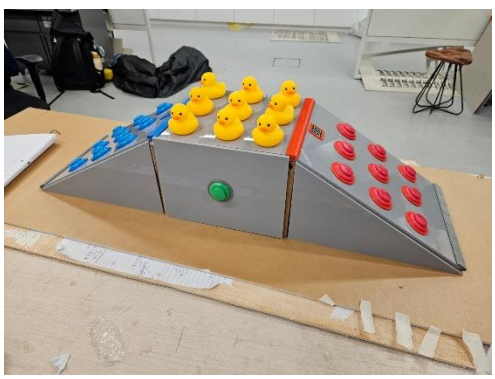
Project Wandr is a comprehensive travel companion that helps users discover, plan, and share their travel experiences. Using AI-powered recommendations and community-driven content, it creates personalized itineraries based on user preferences, budget, and travel style.

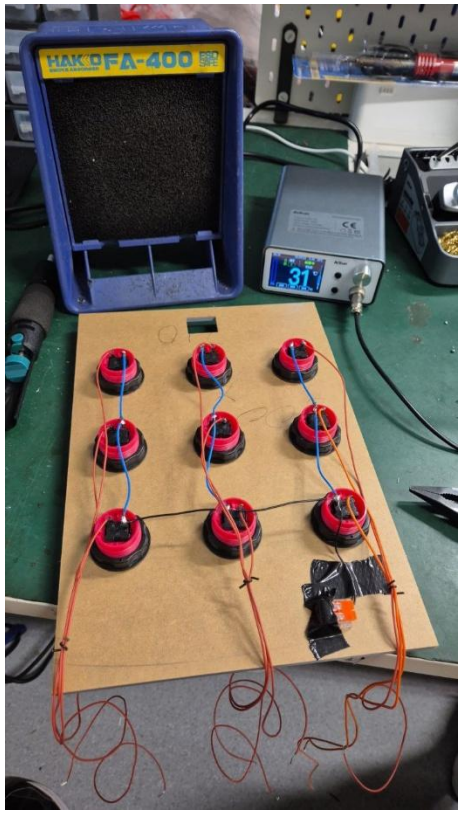
CSD PORTFOLIO

Technology

DUCK DUCK GUESS

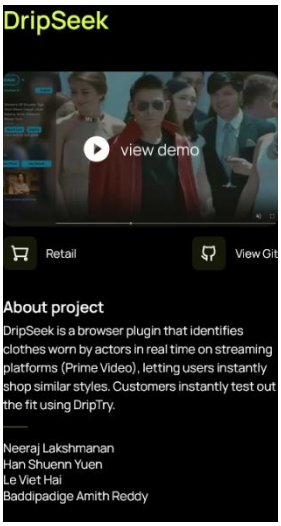
Developed a hardware-based reaction game where ducks light up in sequence, and players must hit them in the correct order. Our team designed and built the entire system from scratch, including the game logic, state machine architecture, and a custom Beta Assembly ALU to drive the game mechanics. The project showcased our understanding of digital design, low-level computation, and hardware–software integration.





IELTS SenseAI

IELTS SenseAI uses advanced Gemini, Heylabs and Elevenlabs to provide personalized and realistic IELTS preparation. The platform analyzes writing samples, provides detailed feedback, and generates practice questions tailored to each student's proficiency level.

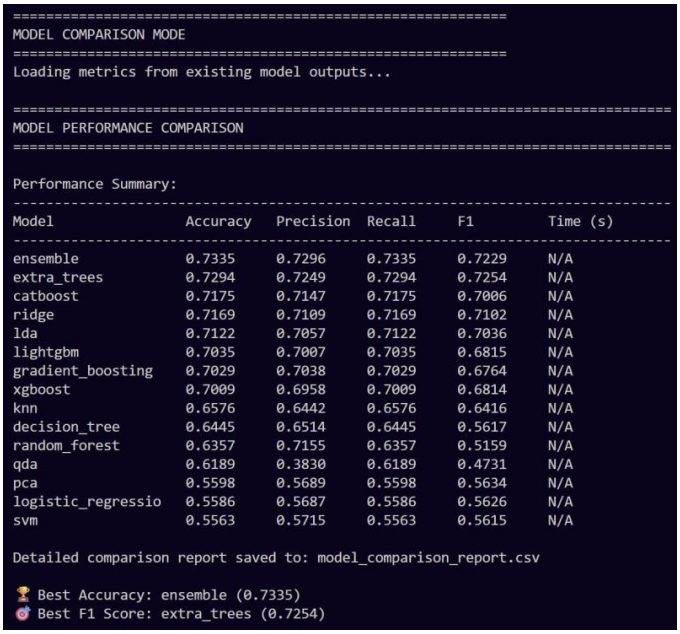


DripSeek

A browser plugin that identifies clothes worn by actors in real time on streaming platforms letting users instantly shop similar styles (agentic computer vision solution).

Shell

Developed a fully functional Unix shell from scratch as part of the Computer System Engineering course. The shell supports core Unix features (process creation, piping, redirection) alongside custom extensions for enhanced usability. This project highlights a strong grasp of process management, system calls, inter-process communication (IPC), and low-level OS concepts.

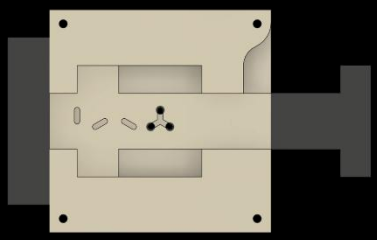


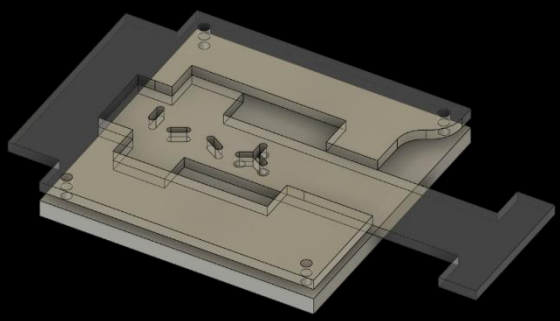
```
============================================================
MODEL COMPARISON MODE
============================================================
Loading metrics from existing model outputs...

================================================================================
MODEL PERFORMANCE COMPARISON
================================================================================

Performance Summary:
--------------------------------------------------------------------------------
Model                Accuracy   Precision  Recall     F1         Time (s)
--------------------------------------------------------------------------------
ensemble             0.7335     0.7296     0.7335     0.7229     N/A
extra_trees          0.7294     0.7249     0.7294     0.7254     N/A
catboost             0.7175     0.7147     0.7175     0.7006     N/A
ridge                0.7169     0.7109     0.7169     0.7102     N/A
lda                  0.7122     0.7057     0.7122     0.7036     N/A
lightgbm             0.7035     0.7007     0.7035     0.6815     N/A
gradient_boosting    0.7029     0.7038     0.7029     0.6764     N/A
xgboost              0.7009     0.6958     0.7009     0.6814     N/A
knn                  0.6576     0.6442     0.6576     0.6416     N/A
decision_tree        0.6445     0.6514     0.6445     0.5617     N/A
random_forest        0.6357     0.7155     0.6357     0.5159     N/A
qda                  0.6189     0.3830     0.6189     0.4731     N/A
pca                  0.5598     0.5689     0.5598     0.5634     N/A
logistic_regressio   0.5586     0.5687     0.5586     0.5626     N/A
svm                  0.5563     0.5715     0.5563     0.5615     N/A

Detailed comparison report saved to: model_comparison_report.csv

🏆 Best Accuracy: ensemble (0.7335)
🎯 Best F1 Score: extra_trees (0.7254)
```

Hate Speech Classifier

A sophisticated Machine Learning Ensemble system designed to identify and classify various forms of hate speech in text content. The model uses transformer-based architecture and was trained on a diverse, multilingual dataset to detect subtle forms of toxicity, bias, and harmful content.

EPD PORTFOLIO



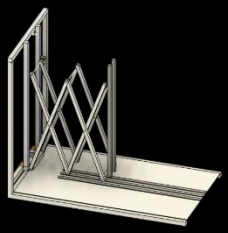


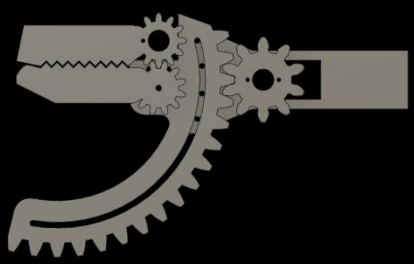
01 Fluid Mechanics Design Project

The team explored a novel way of encoding musical notes using liquid, oil, and air intervals. The mechanical subsystem features custom-designed valves and servo mechanisms that precisely generate fixed fluid and air pulses, enabling the system to “play” notes through controlled flow patterns.

02 Autonomous Mushroom Harvester Project

The project delivers a fully automated mushroom harvester engineered to boost Singapore’s food resilience. Its mechanical systems enable precise growth conditions and gentle, reliable harvesting—turning mushroom farming into a scalable, hands-off process that supports sustainable local food production.



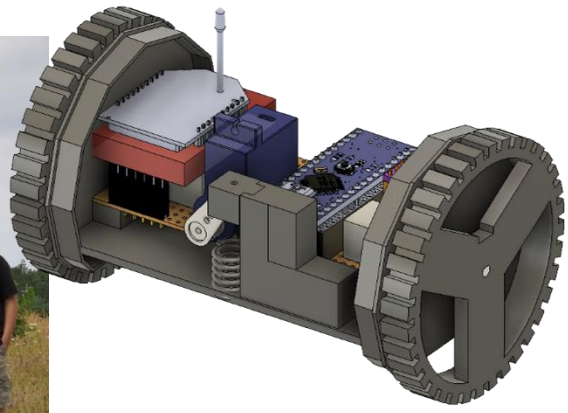


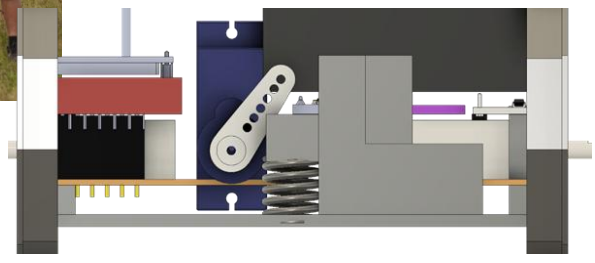
03 Cambodia Trip

The project delivered a solar-powered lighting system for a mobile library in rural Siem Reap, Cambodia. The electrical setup was built using easily sourced local components, with power requirements carefully calculated to meet the villagers' operational needs. The result was a reliable, sustainable lighting solution that supports community learning in remote areas.

04 Berlin Summer Program – Cansat satellite Design

The team designed, built, and launched a fully functional satellite from the ground up. Using Arduino hardware and custom-fabricated circuit boards, they created a compact, efficient platform capable of transmitting telemetry data from orbit—demonstrating end-to-end satellite engineering in a lightweight form factor.





Airplane Seat Configuration Optimisation

- Integer Linear Programming (ILP)
- Team Collaboration
- Optimization Techniques
- Interpreting Data
- Scenario Testing
- Operation Research
- Mathematical Modelling
- Analytical Skills
- Microsoft Word

Profit Maximisation via ILP Modelling

Developed an integer linear programming model to optimise seat configurations for an Airbus A350-900 operating on the London-Delhi route. Our team evaluated space, weight, and demand constraints to maximise overall profitability, refining model parameters and validating results against real-world operational data. The project demonstrated strong application of mathematical modelling, operations research methods, and data-driven scenario analysis.

Adooh Dashboards

- Data Cleaning
- Stakeholder
- Collaboration
- Dashboard Design
- Data Analysis
- Microsoft Excel
- Presentation Design
- Presentation and Communication
- Data Processing
- Data Visualisation
- Microsoft PowerPoint
- Microsoft Word

Collaborated with Digital Content Technologies (DGCT) to develop an interactive dashboard that visualised storage, bandwidth usage, and system performance metrics. Our team performed data cleaning and analysis using MySQL and Excel to identify usage patterns and inefficiencies and applied forecasting methods such as XGBoost and exponential smoothing to project storage growth for capacity planning. The project concluded with a comprehensive presentation and recommendations aimed at improving system scalability and cost efficiency.

Project Babysteps

Developed an interactive sales dashboard with a team of 4 for an industry client (Beauty Mums & Babies) using PowerBI, analyzing over 10000 sales records to identify key trends in sales performance and customer demographics to support targeted marketing strategies.

4th

Place in the competition

Project Sun Bringer:

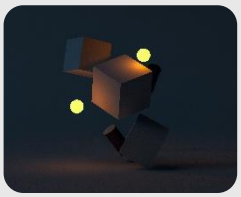
Devised the design of a easily maintainable remote lighting system for pathways, integrating Wi-Fi routers, smart switches, a physical switch at the control station, and a companion app for seamless control by staff, enhancing accessibility to reduce waste of manpower.

Project GrowTrackRun

The team created a gamified running system to boost motivation and social interaction among runners. The setup featured a Light Pacer, checkpoint displays, infrared sensors, a live leaderboard, and a companion app that enhanced safety, engagement, and friendly competition. The app prototype was designed in Figma to bring the full interactive experience to life.

ESD PORTFOLIO

01.

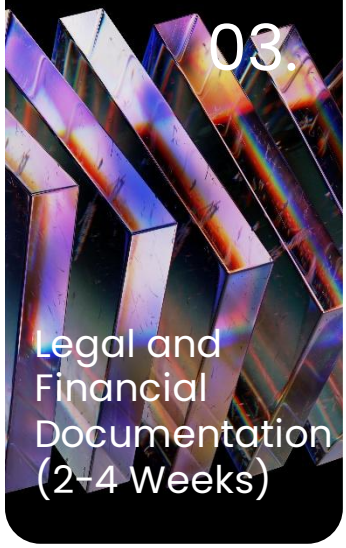


DEC’25 – JAN’26
Initial Exploratory Session (Online or In-Person)

02.

FEB’26 – MAR’26
Joint Needs Assessment and Customization of Proposal

03.



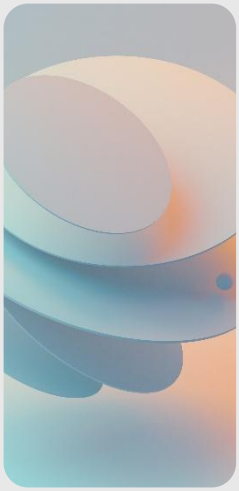
Legal and Financial Documentation (2-4 Weeks)

PARTNERSHIP PROCESS AND TIMELINE

Partnership

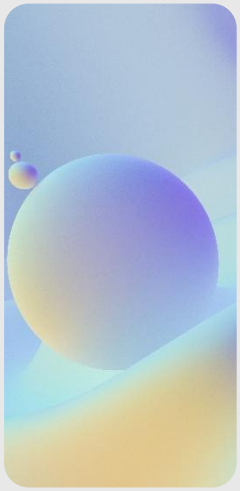
Timeline

04.



APR’26 – JUN’26
Approval process. The project is approved only when both parties have signed the agreement.

05.



SEP’26 – APR’27
CAPSTONE

EXPLORATORY SESSION

Technology

Building
Sustainable
Innovation

Our exploratory session is a fun, easy-going conversation where we get to know your organisation and spot the pain points hiding in plain sight. Online or in person, we show up curious, energetic, and ready to look at your challenges from angles you may not have seen yet.

If we click, we'll help shape your challenge into a clear problem statement and explore how our team can create something impactful together. And if you're looking for ideas, the next page highlights a few topics that spark our excitement. Let's discover possibilities — and maybe a few surprises — side by side.

CONTACT INFORMATION

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woo_ainsley@mymail.sutd.edu.sg

TRACKLESS MRT SINGAPORE

Urban areas need flexible, high-capacity public transport systems that are cheaper and faster to deploy than rail-based MRTs. A trackless MRT offers the opportunity to deliver MRT-level efficiency without the cost, construction delays, or physical track constraints, enabling cities to expand transit coverage rapidly and adapt routes dynamically as demand changes.

Hardware deliverables:

1. On-Vehicle Sensor Suite
2. Vehicle Control Module
3. Connectivity Stack: V2I (Vehicle-to-Infrastructure) and V2V (Vehicle-to-Vehicle) communication
4. Prototype Guidance Markers

Software deliverables:

1. Autonomous Guidance System
2. Fleet Management Dashboard
3. Scheduling & Routing Engine
4. Real-Time Telemetry Pipeline
5. Passenger App Prototype

PROBLEM STATEMENT/ TOPICS

In a future where AGI handles life's busywork, buying and selling physical items shouldn't still rely on humans manually searching, pricing, and listing them. To get there, we need a way for intelligent agents to *see* the real world.

ARTIFICIAL INTELLIGENCE FOR COMMERCE

Technology

This project builds that bridge: AI trading agents paired with recognition-powered smart glasses that instantly identify objects, evaluate their value, and help users buy or sell with zero effort. It's a first step toward a world where your AGI can manage your physical assets as easily as your digital life.

Hardware deliverables:

1. Smart Glasses Prototype
2. On-Device Processing Module
3. Battery & Power Management System
4. Haptic or Visual Feedback Interface
5. Optional Wearable Controller

Software deliverables:

1. AI Object Recognition Engine
2. Market Valuation & Price Prediction Model
3. Personal AI Trading Agent
4. Cross-Platform Marketplace Integrations
   User Dashboard (Web/App)

"The future of AI is in our hands."
-Tim Cook

Building
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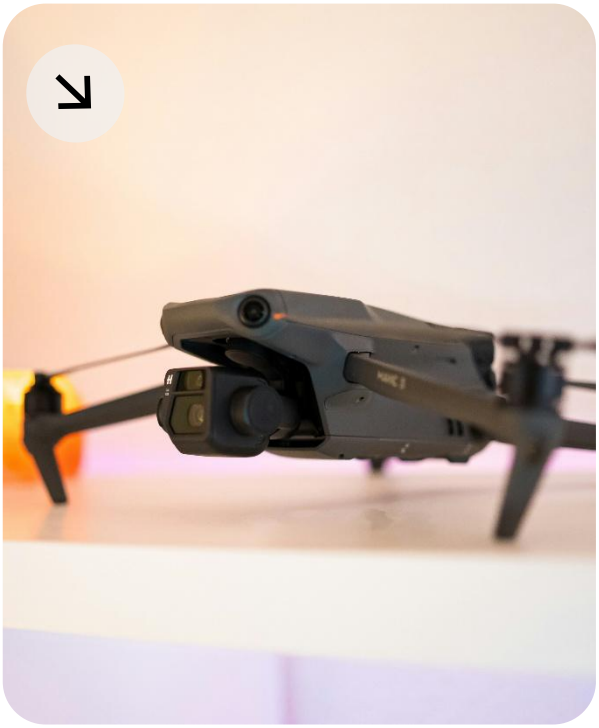
Innovation

DRONE DEPLOYMENT AND OPERATIONS



Technology

As demand for rapid, on-demand delivery grows, drones offer a promising solution. However, safety, reliability, and precise navigation remain major barriers to real-world deployment. Current delivery drones struggle with obstacle avoidance, secure payload handling, and resilient operation in complex urban environments. There is a need for a safer, smarter drone system that can deliver goods autonomously while protecting people, property, and the package itself.

This project aims to create a next-generation “safe delivery drone” that integrates intelligent routing, real-time risk assessment, and robust fail-safes to make autonomous aerial deliveries both practical and trustworthy.

Hardware deliverables:

1. Custom Drone Airframe optimized for stability and safety
2. High-Precision Sensors
3. Secure Payload Compartment
4. Redundant Safety Systems
5. Communication Module
6. Onboard Compute Unit

Software deliverables:

1. Autonomous Navigation System
2. Safety & Risk Assessment Module
3. Delivery Management Platform
4. Secure Payload Verification System
5. Remote Monitoring & Telemetry

REQUIRED BY THE COMPANY

01 Arrange site visits for team to conduct interviews with employees if project requires

02 Digital Brand Asset Packs and Guidelines

03 Commercial licenses for software and specialized tools

04 A mentor

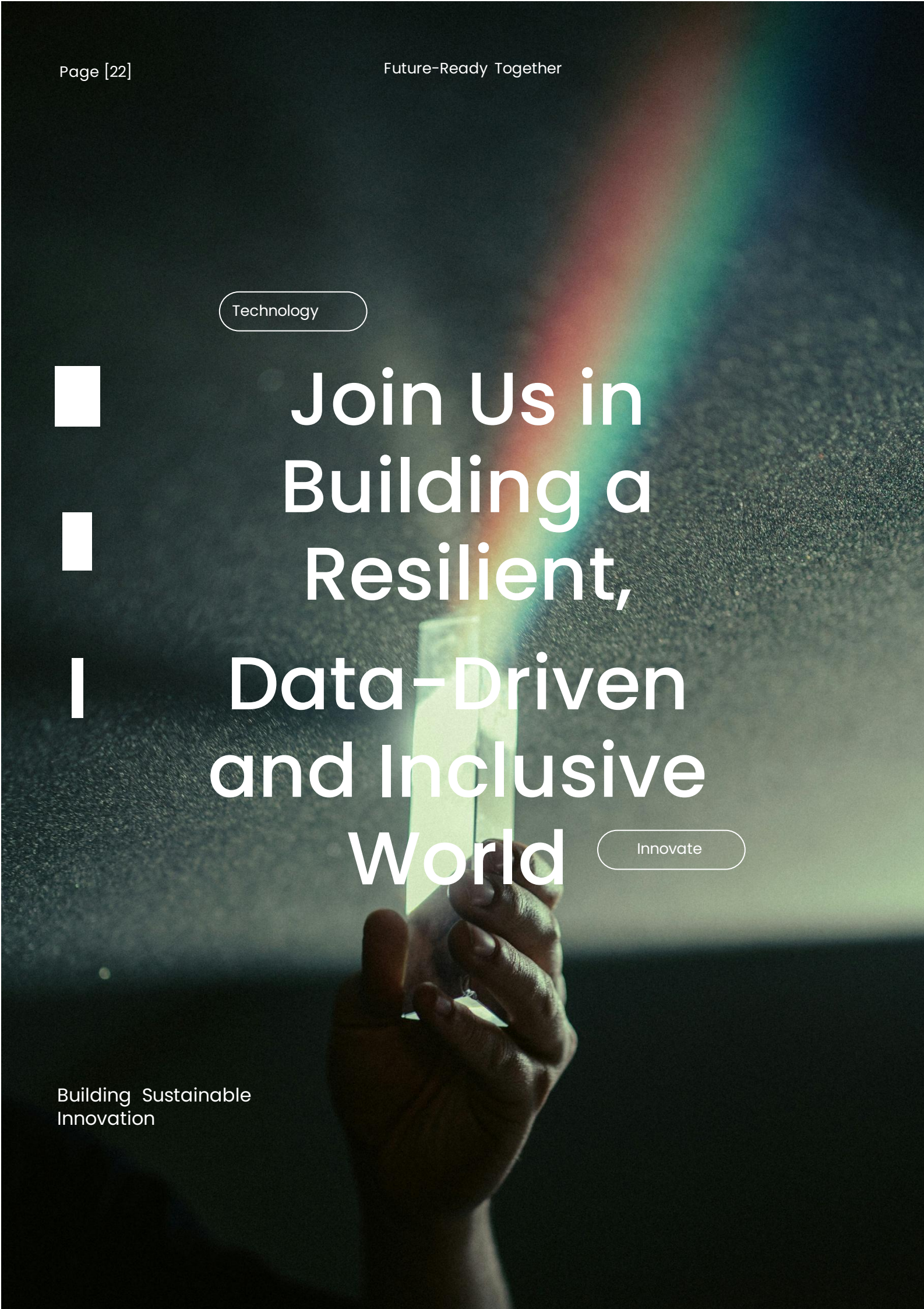
Participation fee

SGD 6000

SUTD will provide up to $4000 for project allowable resources

100%

IP and all generated materials belong to the partner organization



Technology

Join Us in Building a Resilient, Data-Driven and Inclusive World

Innovate

Building Sustainable Innovation

CONTACT INFORMATION

Technology

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"Alone we can do so little; together we can do so much"
- Helen Keller

TEAM PRSM

INNOVATE COLLABORATE SUSTAIN

Global Innovation
Through Sustainable
Collaboration