AI Catalyst Bootcamp (Beginners) - Build Your University Portfolio with AI-Powered Development

www.tinkertanker.com

Prepared for

Intelligent Partners, UAE

www.intelligentpartners.com

Think Education • Think intelligent

1. Executive Summary

This programme is specifically crafted for ambitious, high-achieving students aged 16 to 18 who are complete beginners with no prior coding experience. Their goal is to build an exceptional, varied portfolio of real-world coding projects for competitive university admissions. The programme teaches students how to leverage cutting-edge AI tools as their personal coding co-pilot, dramatically accelerating their learning and empowering them to create impressive, deployable applications from day one.

The emphasis is on hands-on experience with modern AI workflows that boost productivity instantly, giving students a significant competitive edge when applying to elite global universities. Participants will master the art of developing complete web applications, from the user-facing front-end to the powerful back-end, ensuring they ship genuine projects that truly showcase their skills and passion to university admissions committees worldwide.

This approach mirrors our highly successful, intensive coding bootcamp previously delivered to top students from the Indian Institute of Technology (IIT), preparing them for demanding technical roles. By the end of this bootcamp, each student will have developed seven small web projects, but teaching them core web development principles. These tangible, high-impact creations will demonstrably highlight a student's capabilities and dedication, significantly enhancing their university prospects. Through a combination of in-person instruction, guided self-directed virtual development, and personalised mentorship, the programme is committed to empowering students to achieve their academic dreams.

2. Programme Goals

Upon completion of the Tech Catalyst bootcamp, participants will:

- **Acquire Foundational Coding Proficiency:** Develop core skills in web development, including front-end and back-end concepts, specifically tailored for beginners with no prior coding experience.
- **Leverage AI as a Development Tool:** Gain practical experience using cutting-edge AI tools as a coding co-pilot to accelerate learning and enhance productivity in real-world development workflows.
- **Build a Diverse Project Portfolio:** Create a minimum of seven tangible, high-impact web projects that demonstrate core web development principles, showcasing a varied and compelling skillset for university admissions.
- **Master Practical Application Development:** Learn to design, develop, and deploy complete web applications, from user-facing interfaces to powerful back-end functionalities.
- **Gain a Competitive Edge for University Admissions:** Curate a professional project portfolio specifically designed to stand out and significantly strengthen applications to elite global colleges and universities.
- **Benefit from Expert Mentorship:** Receive personalised guidance, technical support, and strategic advice from experienced educators to optimise project quality and academic trajectory.

3. Pedagogical Framework

This programme is meticulously crafted by seasoned computing educators with over 70 years of combined experience. Our team hails from globally renowned institutions such as Stanford, MIT, Cornell, and the University of Pennsylvania. We possess a proven track record across Singapore, India, the UAE, and globally, having taught some of the brightest young minds in technology.

Our pedagogical approach is rooted in constructivism and experiential learning, with a strong emphasis on project-based instruction. We focus on developing practical skills through hands-on development, complemented by theoretical grounding. This ensures students not only understand concepts but can also apply them to create meaningful, impactful projects.

4. Target Audience

This bootcamp is ideal for highly motivated high school students aged 16 to 18 who are eager to build a diverse portfolio for their university applications. No prior technical background is required; we welcome beginners who are keen to learn and create projects that powerfully convey their unique story and aspirations to university admissions committees.

5. Course Outline and Structure

The AI Catalyst Bootcamp spans four weeks. This multi-phase programme offers an intensive two-day foundational course, followed by two weeks of self-directed virtual labs and mini-capstone projects, culminating in a one-week personalised mentorship phase for an advanced capstone project.

		
Phase A: **Foundational Immersion** 2 Full Days; 16 hours - 8 hours/day)	Phase B: **Virtual Labs & Mini-Capstone Projects** 3 Weeks; Approximately 40 hours	[Optional:] Phase C: **Mentorship for Final Capstone Project** 1 Week; 25 hours
This intensive two-day module quickly immerses beginner students in core web development (HTML, CSS, JavaScript). They'll master essential developer tools (VS Code, CLI, Git), learning to leverage AI as a coding assistant for efficient code generation, debugging, and ideation. Incorporating elements from MIT's "Missing Semester," this module builds practical skills, preparing them to create impressive college application portfolios.	Through engaging virtual labs, students' primary objective is to complete seven mini-capstone projects, thereby solidifying skills across web domains. This self-directed, virtual, asynchronous learning offers synchronous support, ensuring practical skill development through hands-on application, complemented by theoretical grounding. This approach ensures students can apply concepts to create meaningful, impactful projects.	This virtual, self-directed programme offers personalised 1:1 mentorship for your mini-project. Rooted in experiential, project-based learning, it provides comprehensive review, code optimisation, and tailored guidance. Our approach, informed by educators from Stanford and MIT, ensures you develop robust practical skills through hands-on creation and theoretical grounding, preparing you for real-world development

Phase A: Foundational Immersion (Week 1)

2 Full Days; 16 hours - 8 hours/day

This intensive two-day module quickly immerses beginner students (aged 16-18) in core web development (HTML, CSS, JavaScript). They'll master developer tools (VS Code, CLI, Git) while learning to leverage AI as a coding assistant for efficient code generation, debugging, and ideation. Incorporating elements from MIT's "Missing Semester" (https://missing.csail.mit.edu/), this module focuses on practical and productive development skills. This preparation will enable participants to build impressive college application portfolios.

Curriculum Verticals:

1. **Introduction to Web Development Fundamentals**

- **Understanding the Web:**
  - Brief overview: How websites work (client-server model, browsers).
  - What is HTML, CSS, JavaScript? (Roles and interactions).
- **HTML Essentials (Structure):**
  - Basic document structure (`<!DOCTYPE>`, `<html>`, `<head>`, `<body>`).
  - Common tags: headings (`<h1>`), paragraphs (`<p>`), links (`<a>`), images (`<img>`), lists (`<ul>`, `<ol>`, `<li>`).
  - Semantic HTML basics (briefly: `header`, `nav`, `main`, `footer`).
- **CSS Essentials (Styling):**
  - Connecting CSS: inline, internal (`<style>`), and external (`<link>`).
  - Basic selectors: element, class, ID.
  - Core properties: `color`, `background-color`, `font-size`, `font-family`.
  - Introduction to the Box Model (margin, border, padding, content).

2. **Developer Tools & AI-Powered Workflow Basics**

- **Optimising the Developer Environment (VS Code):**
  - Introduction to VS Code: interface, settings, useful extensions (e.g., Live Server).
  - Essential shortcuts for efficiency (e.g., `Ctrl/Cmd+S`, `Ctrl/Cmd+X/C/V`, `Ctrl/Cmd+Z/Y`).
  - Introducing AI as a Co-pilot: Briefly explain how AI tools integrate into the editor to assist.
- **Introduction to the Command Line Interface (CLI):**
  - This is part of the Missing Semester curriculum.
  - Why the CLI? (Efficiency, automation).
  - Basic commands: `pwd` (print working directory), `ls` (list contents), `cd` (change directory).

    - Creating and deleting: `mkdir` (make directory), `touch` (create file), `rm` (remove file/directory).
    - Hands-on Exercise: Navigating file systems and basic file operations using the CLI.
- **Version Control with Git:**
    - This is part of the Missing Semester curriculum.
    - What is Git? Why is version control crucial for developers?
    - Initialising a repository (`git init`).
    - Tracking changes: `git status`, `git add`, `git commit`.
- **First Contact with AI for Code (Conceptual & Guided Prompting):**
    - Beyond traditional developer tools, AI code assistants are going to be embedded in the future of development.
    - Explore how AI tools can rapidly prototype boilerplate HTML/CSS sections.
    - Focus on effective prompting: How to ask AI for specific code snippets (e.g., "Give me HTML for a simple navigation bar," "Write CSS to centre this div").

3. Bringing Websites to Life with JavaScript & AI Assistance

- **Introduction to JavaScript:**
    - What JavaScript does (dynamic content, interactivity).
    - Connecting JavaScript: internal (`<script>`), external.
    - The Browser Console: Your first debugging tool (`console.log()`).
- **Core JavaScript Concepts:**
    - Variables (`let`, `const`), data types (numbers, strings, booleans).
    - Basic operators, conditional statements (`if`, `else if`, `else`).
    - Functions: defining and calling simple functions.
    - DOM manipulation basics (selecting elements, changing content/styles, event listeners).
- **AI for JavaScript Assistance:**
    - Demonstrate using AI to generate simple JavaScript functions (e.g., "Write a JavaScript function to change the text of an element when a button is clicked").
    - Focus on AI for Debugging & Explanation: How to paste simple error messages into AI to get potential fixes or explanations for common beginner errors.
    - Hands-on Exercise: Add simple interactivity to their Day 1 webpage, actively using AI for code suggestions and error explanation when encountering issues.

4. Essential Workflows, AI for Efficiency & Project Kick-off

- **Advanced CLI & Workflow Optimisation:**
    - Input/Output Redirection (`>`, `>>`, `<`), Piping (`|`).
    - Brief discussion on how CLI tools are used in more complex projects.
- **Understanding Remote Repositories (GitHub/GitLab) with AI Context:**
    - Conceptual introduction to GitHub/GitLab for sharing work.

    - Briefly discuss how AI tools can assist with commit messages or README file generation (conceptual).
- **AI for Ideation & Project Scoping:**
    - Demonstrate how AI can help brainstorm project ideas or outline steps for a small feature (e.g., "Give me ideas for a simple web project for beginners," "Outline the steps to build a 'to-do list' feature").

Phase B: Virtual Labs & Mini-Capstone Projects (Week 1-3)

3 Weeks; Approximately 40 hours

Through engaging virtual labs, students' primary objective is to complete seven mini projects, thereby solidifying skills across various web domains. This self-directed, virtual, asynchronous learning offers synchronous support, ensuring practical skill development through hands-on application, complemented by theoretical grounding. This approach ensures students can apply concepts to create meaningful, impactful projects.

- **Web Development Projects:** Interactive webpages, dynamic data displays, or simple web applications, such as:
    - Anonymous Opinion Polling Platforms
    - Campus Food Truck Tracker & Pre-Order System
    - Compound Interest Calculator
    - Expense Dashboard
    - Local Service Booking Platform
    - Neighborhood Marketplace
    - Recipe Sharing Community
    - Simple Budget Tracker
    - Simple Colour Palette
    - Simple Local Business Directory
    - Simple Logo Maker
    - Sustainable Shopping Assistant
    - Text-to-Image Generator

- **Asynchronous Support & Optional Technical Office Hours:**
    - **Frequency:** Bi-weekly (during Week 1 - 3).
    - **Format:** 15-minute bookable slots with experienced technical mentors.
    - **Purpose:** Targeted troubleshooting, debugging assistance, and clarification on technical challenges during self-directed project work.

[Optional] Phase C: Mentorship for Final Capstone Project (Week 4)

1 Week; 25 hours

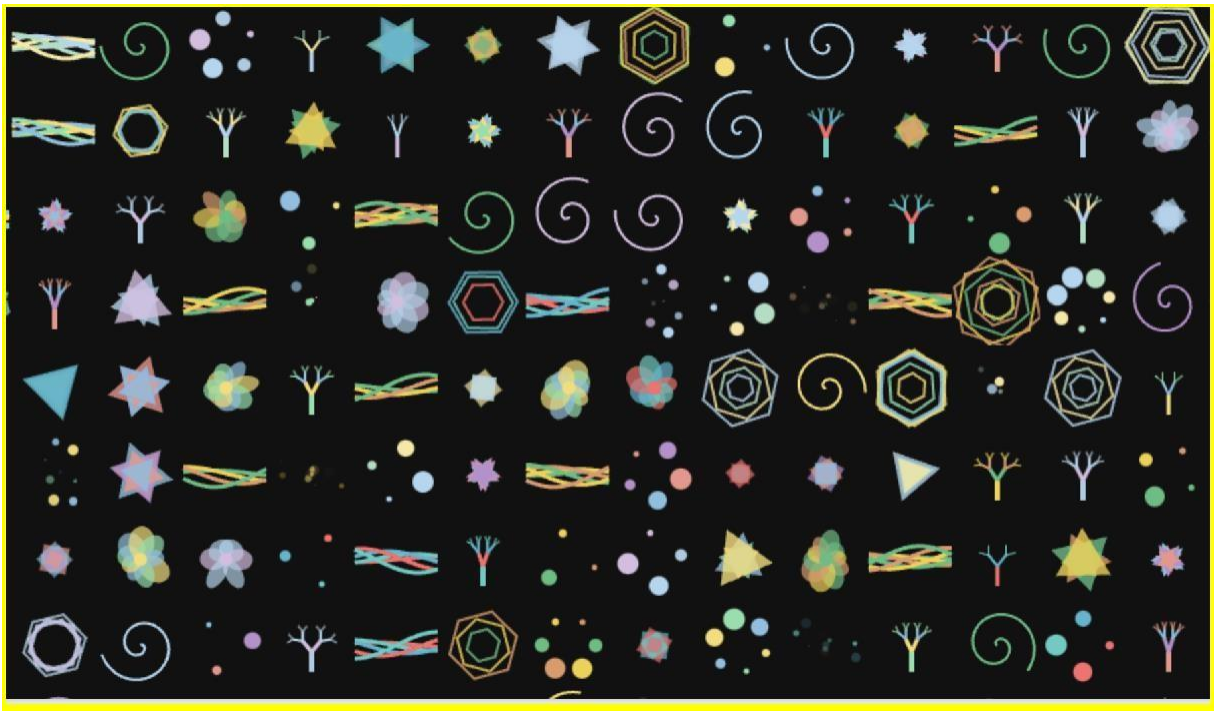
This virtual, self-directed programme extends learning through personalised 1:1 synchronous mentorship, specifically focused on a capstone project. Rooted in constructivism and experiential learning, the emphasis on project-based instruction ensures comprehensive review, code optimisation, and tailored guidance for each student's capstone. While project timelines are student-managed to foster independence and real-world project experience, this process is diligently advised by experienced technical mentors through regular check-ins. This highly effective approach, informed by our educators' backgrounds from prestigious institutions like Stanford and MIT, guarantees students develop robust practical skills through hands-on development, underpinned by solid theoretical grounding.

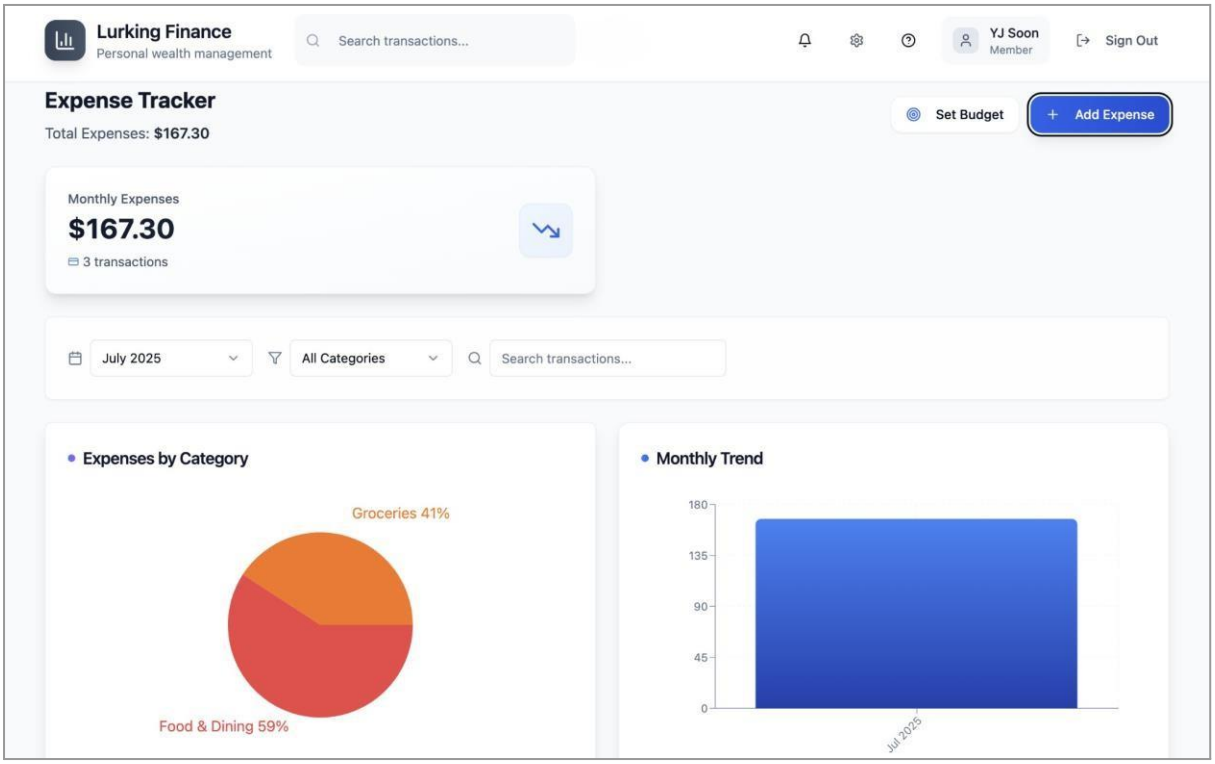
- **Asynchronous Support & Optional Technical Office Hours:**
    - **Frequency:** 2 sessions
    - **Format:** 15-minute bookable slots with experienced technical mentors.
    - **Purpose:** Targeted troubleshooting, debugging assistance, and clarification on technical challenges during self-directed project work.

6. Curriculum Highlights

The bootcamp's project work focuses on students completing seven mini-capstone projects through engaging virtual labs, solidifying their skills across various web domains. Examples include interactive webpages, dynamic data displays, or simple web applications.

- **Simple Project Examples**
    - **Interactive Web Component:** A small, well-documented web application focusing on a specific interactive feature or data display.
    - **Conceptual Game Prototype / Procedural Art:** A basic game mechanic demonstration or a programme generating creative visual outputs.

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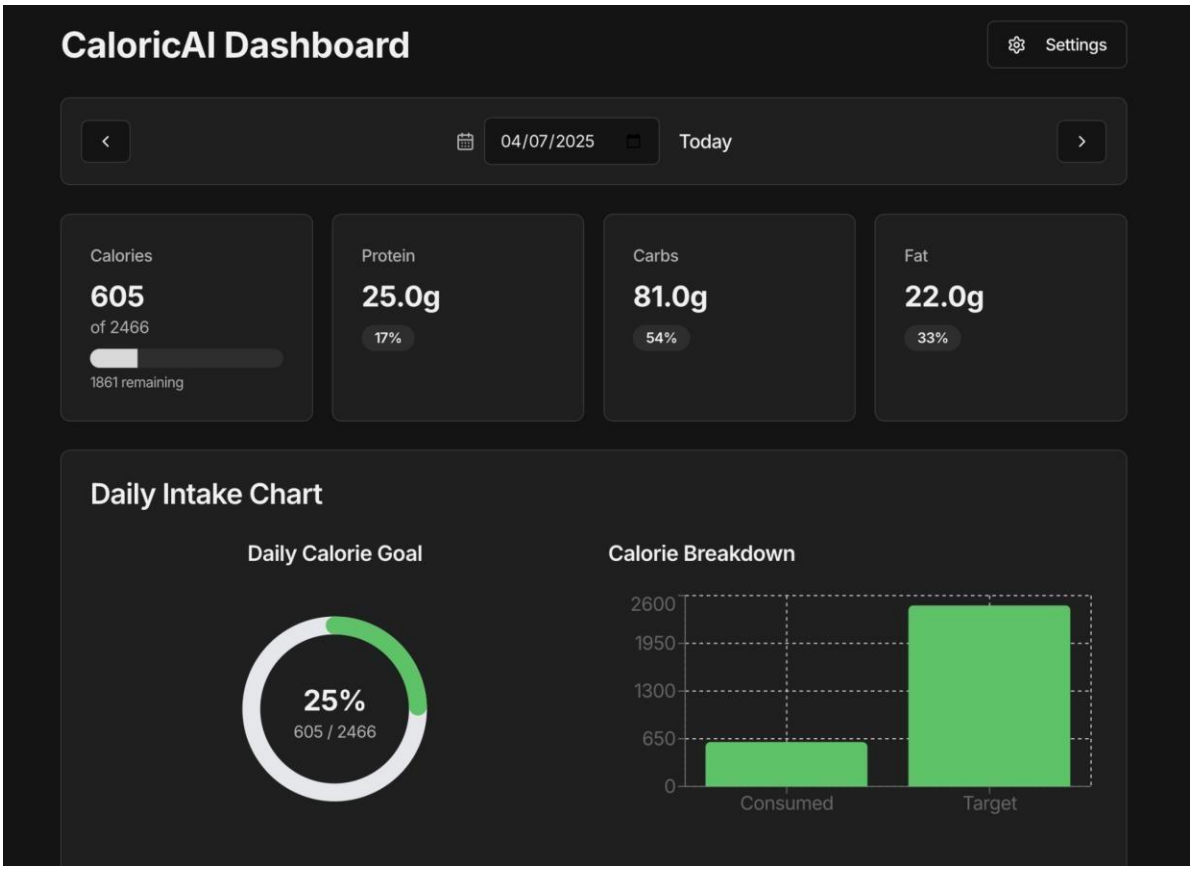
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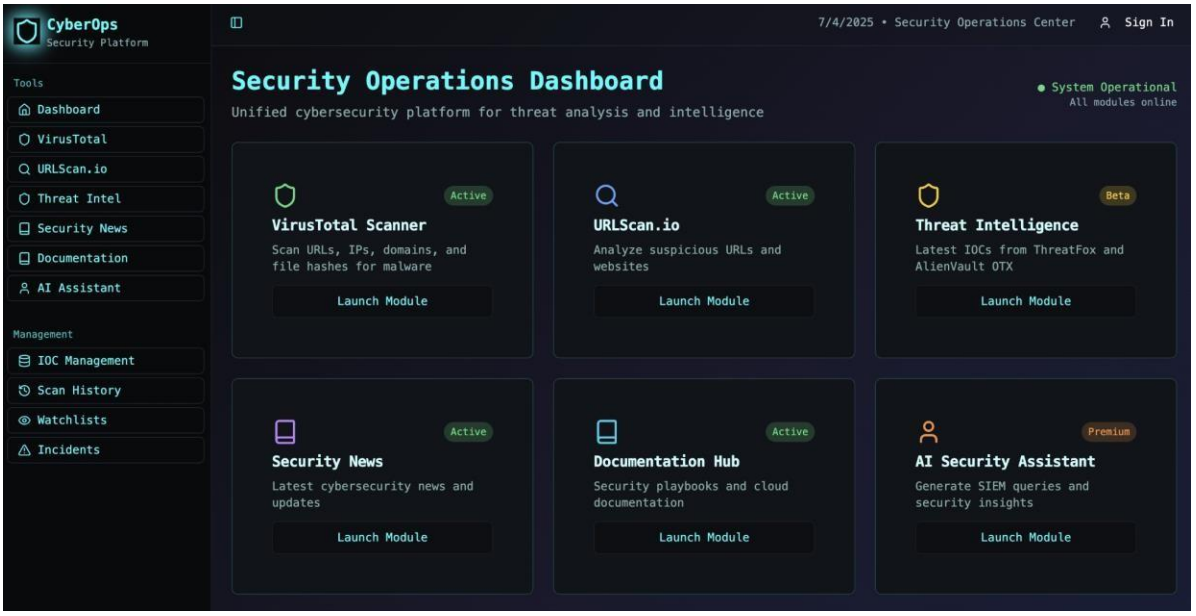
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Launch Module
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Security News
Latest cybersecurity news and updates
Launch Module
Active
Documentation Hub
Security playbooks and cloud documentation
Launch Module
Premium
AI Security Assistant
Generate SIEM queries and security insights
Launch Module

7. Mentorship Model & Mentor's Profile

Our **multi-tiered mentorship model** is designed to provide comprehensive support throughout all phases of the bootcamp.

- **YJ Soon - Lead Technical Expert:** Will deliver foundational lecture, guide core concept immersion and drive programme.
- **Michael Gonsalves - Technical Mentor:** Experienced developer provides hands-on troubleshooting and technical guidance during Phase B office hours, supporting mini-capstone projects.
- **Akmal Abdul Rahman - Portfolio Mentor:** Seasoned educator offers strategic advice on project selection, presentation, and aligning portfolios with university expectations during Phase C 1:1 sessions, focused on the advanced capstone.
- **Continuity:** Each student receives a consistent 1:1 mentor for Phase C, fostering a strong working relationship.

YJ Soon - Lead Technical Expert

Education

National Institute of Education, Singapore, Post-Graduate Diploma in Education
Singapore Government Scholarship

Stanford University BSc Electrical Engineering, awarded with distinction; MSc Electrical Engineering
Singapore Government Scholarship

Qualifications

Apple Consultant (ACN)
App Development with Swift Certified User

Publications

The Tinkeker's Guide to the micro:bit Galaxy (2020)

Expertise

Education Consulting, Computer Science Education, Design Thinking, Project-Based Learning, Web

Summary

A Stanford graduate and former Senior Head at Singapore's Ministry of Education, he pioneered impactful ed-tech programs alongside industry leaders like Apple, Microsoft, Figma, and Unity. His unique blend of academic rigor, leadership, and hands-on technical expertise ensures a cutting-edge, industry-relevant curriculum, precisely cultivating future-ready technical talent for the global market.

Work Experience

Co-founder & Director, Tinkertanker Pte Ltd (Singapore)
2011 - Present

- Pioneered high-impact educational technology programs with global industry leaders (Apple, Microsoft, Figma, Unity), directly applicable to developing cutting-edge student portfolios aligned with top-tier university expectations. This includes strong foundational skills in HTML, CSS, JavaScript, Git, and VS Code optimisation, as well as advanced concepts for web, game, and mobile application development.
- Designed and executed advanced STEM and Design Thinking curricula, fostering critical thinking and problem-solving skills essential for competitive Computer Science programs. This experience will be leveraged to guide participants in creating innovative, compelling projects for their portfolios.
- Empowered educators through professional development, equipping them with cutting-edge STEM methodologies. This translates to an ability to mentor and guide bootcamp participants effectively, ensuring they master technical skills and develop strong, defensible projects.
- Conceived and implemented transformative, multi-year initiatives, ensuring program sustainability and a lasting legacy of educational excellence that directly supports participants' long-term academic and career aspirations.

Programme Director for Advanced Diploma in Mobile & Web App Development
2020 - 2021

Senior Head (Policy & Planning) Higher Education, Ministry of Education (Singapore)

Development, Mobile App Development, Debugging, UI/UX, AR, VR, ML, Storytelling	***2020 – 2021*** **Curriculum Head (IT) and Computing Teacher, Raffles Institution, Ministry of Education (Singapore)** ***2009 – 2011*** **Course Assistant / Section Leader, Stanford University** ***2001 – 2003***

Michael Gonsalves - Technical Mentor

Education

The Wharton School, University of Pennsylvania
BSc in Economics, Cum Laude

Publications

The Tinkeker's Guide to the micro:bit Galaxy (2020)

Expertise

Education Consulting, Computer Science Education, Design Thinking, Project-Based Learning, Web Development, Mobile App Development, Debugging, UI/UX, AR, VR, ML, Storytelling

Summary

Wharton School Cum Laude graduate with proven expertise in guiding students to build elite technical portfolios. Specialises in hands-on troubleshooting and delivering AI, machine learning, Python, and IoT curriculums. A strong track record in elevating programs, empowering thousands to excel in coding and innovation, preparing them for competitive university admissions through practical, portfolio-worthy projects.

Work Experience

Co-founder & Director, Tinkertanker Pte Ltd (Singapore)
2011 - Present

- Expertly guided participants in building compelling technical portfolios: Transformed STEAM education by developing interactive, hands-on curriculums in AI, machine learning, Python, and IoT, directly applicable to mini-capstone projects for top-tier university admissions.
- Provided hands-on troubleshooting and technical guidance: Empowered thousands of students and educators, including those from prestigious institutions, to effectively integrate and apply technologies like Raspberry Pi, micro:bit, Unity, and Scratch in their projects.
- Designed and delivered workshops that significantly boosted participant success in coding competitions, STEM challenges, and real-world innovation projects, crucial for strengthening academic portfolios.
- Inspired students to solve complex challenges with creativity and technical expertise, directly supporting the development of robust, portfolio-worthy applications in web development, mobile, and games/animation.
- Adapted technical mentorship for diverse learners: Led cross-cultural programs, ensuring effective technical guidance and support for multicultural audiences in high-expectation educational environments.

Self-Employed Web Consultant & Digital Marketer (USA)
2007 – 2015

Actuarial Analyst, Towers Perrin Tillinghast (USA)
2006 – 2007

Negotiations Teaching Assistant, The Wharton School (USA)
2005 - 2006.

Research Assistant, Wharton Management Department (USA)
2004 - 2005.

Akmal Abdul Rahman - Portfolio Mentor

Education

National Institute of Education, Singapore, Post-Graduate Diploma in Education
Singapore Government Scholarship

Cornell University BS in Computer Science and Electrical & Computer Engineering (Magna Cum Laude)
Singapore Government Scholarship

Publications

The Tinkeker's Guide to the micro:bit Galaxy (2020)

Expertise

Education Consulting, Computer Science Education, Design Thinking, Project-Based Learning, Web Development, Mobile App Development, Debugging, UI/UX, AR, VR, ML, Storytelling

Summary

A Cornell University Computer Science and ECE Magna Cum Laude graduate, he excels at developing project-based learning in web development, mobile apps, and games/animation, specifically cultivating elite student technical portfolios for Ivy League and premier UK/US CS admissions. Adept at integrating HTML, CSS, JavaScript, Git, VS Code, and "Missing Semester" fundamentals, he has a strong track record of elevating programs that achieve outstanding student outcomes.

Work Experience

Co-founder & Director, Tinkertanker Pte Ltd (Singapore)
2011 - Present

- Pioneered cutting-edge technology and design programs (including elements of HTML, CSS, JavaScript, Git, and VS Code optimization) that align with rigorous academic standards, cultivating student portfolios competitive for top-tier computer science admissions.
- Engineered hands-on, inquiry-driven learning experiences focused on web development, mobile applications, and game/animation projects, enabling participants to build compelling technical portfolios demonstrating advanced problem-solving and creative application of industry-standard tools.
- Delivered impactful professional development, empowering high achieving students to implement "The Missing Semester of CS Education" fundamentals (command-line tools, shell scripting, debugging strategies).
- Demonstrated success in elevating programs within globally competitive, high-expectation environments, specifically preparing students for admission to Ivy League and premier UK/US Computer Science programs.
- Orchestrated collaborative, project-based initiatives that integrated design thinking, engineering principles, and core programming skills, resulting in robust student outcomes and engaging, portfolio-worthy technical projects.

Special Education Officer, Education Programmes Division, Ministry of Education (Singapore)
2009 – 2011

- *Conceptualised and formulated policy that integrates inclusive principles, STEM innovation, and global best practices, aligning with Singapore's national priorities in education.*

Physics & Mathematics Teacher, North View Secondary School, Ministry of Education (Singapore)2006 – 2008

8. Logistics

- **Platform:** Virtual components will utilise a dedicated online learning management system (LMS). This facilitates assignment delivery, resource sharing, and scheduling of office hours/1:1 sessions.
- **Tools:** Students will receive guidance on setting up and utilising free, industry-standard development tools.
- **In-Person Venue for Phase A: TBC**

9. Conclusion

The Tech Catalyst Bootcamp offers a unique and invaluable opportunity for aspiring computing students. It enables them to deepen their technical acumen and strategically position themselves for successful university admissions. By providing a structured yet flexible learning environment, expert mentorship, and a clear focus on the development of high-quality, impactful projects, this bootcamp will serve as a significant stepping stone in their academic and professional journeys. We anticipate empowering the next generation of computing leaders.

About Tinkertanker

Tinkertanker has been building and teaching technology for years. Established in 2010, we are industry practitioners who have developed — and taught — with industry-standard technology such as iOS, Android, Ruby on Rails, Arduino, Raspberry Pi, and micro:bit. We have built web and mobile apps for ourselves and other companies, as well as microcontroller-based art installations for the Singapore Pavilion at the Venice Biennale and various other exhibitions.

As qualified educators, we teach, under our **Tinkercademy** branding, programming (in Python, Unity, Java, Swift, Objective-C, Ruby, JavaScript, and more) and electronics (with micro:bit, Arduino, Raspberry Pi, circuit stickers, littleBits, and more) for IMDA programmes, in schools, for adults, and in our own makerspace. Out of our core training team, half are former teachers, and we bring our experience to bear when designing our coding and microcontroller lessons for teenagers.

Scope of Operations & Expertise

As a technology and education company, most of our activities involve technology education. We acknowledge that with so many different kinds of learners, no one type of teaching style or even syllabus would fit them all. Hence, we teach in a way that maximises understanding for all. We include open-ended and challenging exercises to push the fastest students to their limit, while proactively looking out for students that are struggling to keep up to make sure they don't fall behind. We design our classes to be equitable, rather than just ensuring equal access.

We have successfully delivered a similar iteration of this Tech Catalyst Bootcamp to students at a premier Indian Institute of Technology (IIT) for the past two consecutive summers. This experience affirms our strong position in terms of both expertise and resources, enabling us to provide an exceptional learning experience for these budding talents.

Tinkercademy is recognised by major technology entities for our expertise in tech education — we are partners with Apple, AWS Educate, Figma, the Micro:bit Educational Foundation, Microsoft, Unity — and we are excited to bring our partners' latest and greatest technology offerings to schools and students.

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