

MASTER OF COMPUTING IN APPLIED ARTIFICIAL INTELLIGENCE (MCAAI)

PROGRAMME OVERVIEW

This programme bridges the gap between AI theory and real-world application, enabling professionals from diverse domains to integrate AI responsibly into their workflows and enhance organisational efficiency. Through a rigorous curriculum, participants will gain:

Core foundational knowledge in AI, ensuring a deep understanding of key concepts and methodologies.

Insights into emerging AI technologies, keeping them at the forefront of innovation.

Hands-on experience in AI implementation, empowering them to apply AI effectively and ethically within their respective industries.

Tailored for working professionals with a bachelor's degree in any discipline, the MCAAI programme fosters a future-ready workforce that can navigate and harness AI advancements to accelerate AI-driven transformation across enterprises and public sector organisations in Singapore.

304 – MASTER OF COMPUTING (APPLIED ARTIFICIAL INTELLIGENCE)

List of Courses

Course Group	Course Code	Course Description
Core	CA6000	APPLIED AI PROGRAMMING
Core	CA6001	AI ALGORITHMS FUNDAMENTALS & APPLICATION
Core	CA6002	AI UX & DATA VISUALISATION DESIGN PRINCIPLES
Core	CA6003	BEST PRACTICES IN DATA GOVERNANCE, PREPARATION & ANALYTICS
Prescribed Elective	CA6111	AI ETHICS & GOVERNANCE FUNDAMENTALS
Prescribed Elective	CA6113	RESPONSIBLE GENERATIVE AI & APPLICATIONS
Prescribed Elective	CA6114	ADDRESSING ISSUES IN GENERATIVE AI SYSTEM DESIGN & DEPLOYMENT
Elective	CA6115	AI IN BANKING & FINANCE
Elective	CA6116	AI IN EDUCATION
Elective	CA6117	AI IN HEALTHCARE
Elective	CA6118	AI IN LAW
Elective	CA6119	AI IN MANUFACTURING
Elective	CA6120	AI IN MARKETING
Elective	CA6121	AI IN PROJECT MANAGEMENT
Elective	CA6122	COMPANY-SPONSORED CAPSTONE PROJECT
Elective	CA6123	AGENTIC AI & APPLICATIONS
Elective	CA6124	RECOMMENDATION SYSTEM
Elective	CA6125	LLM & RAG
Elective	CA6126	REINFORCEMENT LEARNING
Elective	CA6127	TRANSFORMER & GENERATIVE ADVERSARIAL NETWORK
Elective	CA6128	DEEP LEARNING & APPLICATIONS
Elective	CA6129	COMPUTER VISION & APPLICATIONS
Elective	CA6130	NLP & APPLICATIONS
Elective	CA6131	EMBEDDED AI & APPLICATIONS

***Note: Not all courses listed in the curriculum will be offered in a trimester.**

Courses offered are subject to availability of instructors and resources.

COURSE CONTENT

CA6000 Applied AI Programming

Applied AI Programming is primarily designed to equip you with the foundation of using Python programming language to develop artificial intelligence applications. This course will first teach you about the basic concepts of python programs development, followed by how it can be used with various packages and AI frameworks that are commonly used to develop AI applications. Through this course, you will develop practical skills through hands-on exercises with Numpy, Pandas, Seaborn, Matplotlib, Scikit-Learn, TensorFlow and PyTorch to develop simple predictive AI and generative AI applications, which you will then use in other courses in the MCAAI programme.

CA6001 AI Algorithms Fundamental & Application

AI Algorithms Fundamentals & Application is designed to equip students with a solid understanding of core artificial intelligence algorithms and their applications in real-world scenarios. Whether you're a working professional or an aspiring AI practitioner looking to build a strong foundation, this course will guide you through essential techniques such as search, optimization, decision-making, and machine learning. Students will develop practical skills through hands-on projects that reflect challenges in industries like finance and technology.

CA6002 AI UX & Data Visualisation Design Principles

This course discusses the principles and value of human-centred AI (HCAI) and its impact on how professionals using AI in various industries consider and identify tasks within work processes for effective AI augmentation or automation. It covers issues related to the design of HCAI user experience designs that imbue trust during user interaction and improve usability, thereby promoting more widespread adoption of AI solutions.

CA6003 Best Practices in Data Governance, Preparation & Analytics

This course aims to equip learners with a comprehensive understanding of the foundational best practices in managing data throughout the AI development lifecycle. It focuses on three critical pillars: data governance, data preparation, and data analytics- recognizing that data is the foundation of everything in AI. Learners will explore key governance principles including data privacy, ethical use, security, and compliance with regulations. The course then delves into practical techniques for preparing data for machine learning, covering processes such as data validation, cleaning, transformation, and enrichment. Finally, it addresses best practices in exploratory data analysis (EDA), highlighting how to identify and mitigate issues such as missing data, outliers, data bias, and statistical fallacies like Simpson's paradox.

CA6111 AI Ethics & Governance Fundamentals

This course introduces AI Ethics and Governance (AIE&G) issues relevant to the many industries that exploit AI solutions. These issues include internal governance structures, level of human involvement in AI decision making, operations management, stakeholder interaction and communication, etc. It gives an overview of the Singapore Computer Society's comprehensive AIE&G Body of Knowledge 1.0 (BoK) document and proposes an AI Governance Framework for organisations that is built on the understanding of well-established guidelines for Responsible AI, best practices in adapting an organisation and the use of tools that can help manage and mitigate AI-related risks. At the end of this course, learners will be able to put into practice appropriate AI governance considerations and processes in designing and deploying AI solutions.

CA6113 Responsible Generative AI & Applications

With the rapid growth in Generative Artificial Intelligence (GAI) technologies, professionals in every industry need a good grasp of what GAI is and how they can exploit it in a responsible and thoughtful manner. This introductory course helps learners understand GAI technology, its capabilities, limitations and applications in various scenarios. More importantly, it highlights new ethical risks associated with the use of GAI, along with risk mitigation strategies and practical approaches in deploying trusted GAI solutions. Exercises in effective prompt engineering techniques will expose learners to the use of GAI tools to generate relevant text and images that are context-appropriate for their needs and that of their organisations.

CA6114 Addressing Issues in Generative AI System Design and Deployment

Employing Generative AI (GAI) solutions responsibly in an enterprise requires addressing many issues at all stages of the endeavour, from design, development, and deployment to post-deployment. This course introduces practical considerations at each of these stages, from deciding to use a GAI solution, to formulating an appropriate GAI system design, and to implementing appropriate GAI governance. This course also covers the security and safety testing issues relevant to GAI systems and their unique vulnerabilities, suggesting practical mitigation strategies for a resilient and responsible GAI deployment.

CA6115 AI in Banking & Finance

This course aims to introduce key AI techniques that are used in the financial sector. These include key financial functionalities in compliance (AML/KYC), algorithmic trading, financial fraud detection, investment management and risk management.

The learning will help learners apply the AI concepts already taught in the core modules including data visualisation principles, and AI algorithm fundamentals.

Key concepts such as supervised, unsupervised learning, deep learning and reinforcement learning shall be covered with some of its applications in finance.

The course also explores latest developments in Agentic AI and LLMs and how they can be used for financial applications.

CA6116 AI in Education

This course introduces you to the transformative potential of artificial intelligence in the field of education. The course will balance technical depth, practical implementation, and pedagogical/ethical understanding. It is oriented toward practitioner understanding and application of various cutting-edge AI solutions in modern learning and assessment designs across general (K-12) and adult learning. You will learn to critically reflect upon and evaluate AI tools in personalised learning, social-emotional learning, knowledge building, and assessment for learning, among others. You will learn to apply important emerging concepts and tools such as generative AI, multimodal AI, AI agents, human-AI synergy for transformative educational experiences.

CA6117 AI in Healthcare

This course aims to equip you with advanced understanding and practical expertise in applying Artificial Intelligence (AI) and machine learning techniques to real-world health and healthcare problems across clinical, community, and home settings. It provides the interdisciplinary foundation, toolkits, and deployment know-how to enable learners to design, implement, and critically evaluate

AI-driven healthcare solutions that enhance patient outcomes, clinical efficiency, and healthcare delivery in modern medical environments.

CA6118 AI in Law

This course aims to introduce students to the emerging legal, ethical, and governance issues associated with the use and deployment of AI systems, including in the law, the legal practice and in the administration of justice. This course provides core legal and policy background for legal work in the AI adoption environment by focusing on the relevant legal and ethical regimes. The course is grounded in the law, but encompasses interdisciplinary perspectives pertinent to the legal, regulatory, ethical and technological issues. The course also introduces students to some core AI tools in the legal field and demonstrate the limitations and risks of the tools, cementing the need for AI deployment to begin from a solid understanding of the AI technology.

CA6119 AI in Manufacturing

The course enables students to apply AI and data science concepts from core modules such as machine learning, data analytics and data visualization to real-world manufacturing systems. Emphasizing practical relevance, the course combines lectures with hands-on tutorials and project-based learning. Students will use Python and machine learning/visualization tools to implement and evaluate algorithms with manufacturing datasets. A group-based project will further allow students to foster teamwork and problem-solving skills. Key AI concepts such as machine learning, data acquisition, and data analytics will be explored within the manufacturing context, alongside core manufacturing applications including predictive maintenance, in-situ quality control, and process optimization. In addition, emerging topics and trends such as AI-driven Digital Twins and Human–AI Collaboration in Manufacturing will be discussed, preparing students for frontier research and advanced industrial practice.

CA6120 AI in Marketing

This course introduces students to the strategic applications of AI in marketing, with a focus on how marketing leaders can leverage AI to improve customer understanding, decision-making, campaign effectiveness, and organizational capability. Rather than emphasizing technical development or hands-on model building, the course adopts a management and business-oriented perspective, equipping students with the conceptual frameworks, case-based insights, and practical vocabulary needed to evaluate and guide AI-enabled marketing transformation. The course is structured around three themes: understanding how AI disrupts traditional marketing logic, examining the organizational, data, and technological foundations required for AI-enabled marketing, and developing strategic approaches for integrating AI into marketing functions, teams, and customer-facing processes. Through industry cases and applied discussions, students will learn how AI can support marketing strategy while also appreciating the associated governance, ethical, and implementation challenges.

CA6121 AI in Project Management

This course aims to introduce concepts in project management with coverage of evolving trends and application of artificial intelligence. The learning helps to apply the Artificial Intelligence (AI) concepts in executing projects which includes design, procurement, and execution phases. This equips the participants to enhance their skill set, improve employability, and career growth. Key concepts such as project integration, scope management, project planning, project budget & cost management,

project procurement, project implementation, project risks, conflicts, communication, and stakeholder management shall be covered.

CA6122 Company-sponsored Capstone Project (Pass/Fail course).

This course aims to bridge the gap between academic learning and real-world industry challenges and provides opportunities for beneficial AI solutions to be developed and deployed in organizations in Singapore. The objectives of such a project are to train students to apply AI solutions in solving real-world industry problems and to improve technical skills, teamwork and problem-solving with AI solutions in a real-world setting.

CA6123 Agentic AI and Applications

Agentic AI systems autonomously make decisions, act, and adapt in dynamic environments. As these AI systems integrate into high-stakes fields like healthcare, financial trading and autonomous transactions, understanding their risks and ethical challenges is critical. This course covers the architecture and key components for building agentic AI frameworks, including hands-on training to use an industry standard for providing context to Large Language Models and agents using Model Context Protocol. It guides learners towards responsible agentic AI design and deployment by grounding the practical expertise acquired with knowledge about the unique risks exposed by agentic AI systems and possible mitigation strategies.

CA6124 Recommendation System

This course aims to introduce the fundamental concepts, algorithms, and practical techniques that are used in recommendation systems. It covers both classical approaches such as collaborative and content-based filtering, and advanced paradigms including deep learning, and large language model (LLM)-enhanced recommenders. The course explores how recommendation systems are designed, evaluated, and deployed across domains such as e-commerce, entertainment, healthcare, and sustainability. The course enables students to apply AI and data science concepts from core modules, such as machine learning, natural language processing, and data visualization, to real-world personalization and decision-support problems. In this practically oriented course, students will use Python to implement and evaluate algorithms on real datasets and present what they have learned.

CA6125 LLM and RAG

The aim of this course is to equip you with both the theoretical foundations and practical skills required to understand, design, and implement systems based on Large Language Models (LLMs) and Retrieval-Augmented Generation (RAG). It enables you to apply knowledge of transformer architectures, retrieval mechanisms to build grounded, context-aware AI applications. This course will provide you with a strong conceptual and practical grounding for developing, evaluating, and responsibly deploying LLM-based systems in research and industry settings, and will serve as a solid preparation for advanced AI courses or careers involving intelligent information retrieval, conversational agents, and enterprise automation.

CA6126 Reinforcement Learning

This course aims to provide you with a comprehensive understanding of Reinforcement Learning (RL), ranging from foundational principles to the latest generative AI applications. Designed for students interested in developing intelligent autonomous systems, you will start by mastering the mathematical frameworks of Markov Decision Processes (MDPs) and classic algorithms. The course then advances to modern Deep Reinforcement Learning, with a special focus on emerging topics such as Generative RL (e.g., Diffusion Policies) and AI Alignment (RLHF). By the end of this course, you will be able to design, implement, and align advanced AI agents, preparing you for future careers in AI research or application development.

CA6127 Transformer and Generative Adversarial Network

This course aims to equip students with both the theoretical foundations and practical skills to design and apply cutting-edge generative models—including Transformers, GANs, Diffusion models, and their extensions—for visual content creation. Students will learn how transformer-based architectures, GANs, and diffusion models enable high-fidelity visual synthesis and other creative AI applications. By completing this course, students will gain valuable expertise in building generative systems for visual content creation. The course prepares learners for roles in research, industry R&D, and creative technology, as well as for further advanced studies in AI-driven content generation.

CA6128 Deep Learning and Applications

In this course, you will bridge the gap between traditional coding and modern AI by learning to implement deep neural networks using PyTorch. Designed specifically for developers with programming experience who want to pivot into AI by leveraging their coding skills, this course guides you through implementing essential architectures like Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), and Transformers. You should take this course to future-proof your skillset, transitioning from traditional software development to the high-demand field of machine learning, where you can apply these cutting-edge tools to solve real-world problems.

CA6129 Computer Vision & Applications

This course introduces the fundamental principles and deep learning techniques that power modern computer vision. It covers key topics such as visual recognition, image segmentation, object detection, and visual generation, explaining how these methods enable machines to analyze, understand, and create visual data. The course also presents real-world applications of computer vision in areas such as robotics, surveillance, healthcare, and content creation, showcasing the broad impact of vision-based AI in today's world.

CA6130 NLP & Applications

Natural language processing (NLP) is a critical skill in today's data-driven world, enabling the analysis of vast amounts of unstructured text. This course introduces foundational NLP concepts, key computational methods, and modern deep learning approaches for language-related tasks. Students will learn classic techniques (e.g., part-of-speech tagging and parsing) and gain experience applying pre-trained language models to real-world problems such as sentiment analysis, machine translation, and question answering. Designed for students from diverse backgrounds—especially those outside computer science, computer engineering, or data science—this course focuses on building an intuitive understanding of how language technologies work and how they shape everyday applications.

CA6131 Embedded AI & Applications

Embedded AI & Application is designed to equip you with the practical knowledges to deploy artificial intelligence to edge devices such as limited resource microcontroller. This course will discuss and consider the various constraints and challenges in deploying ML to edge devices. Students will then be taught on how to implement TinyML (Tiny Machine Learning) applications on microcontroller using the TensorFlow Lite framework.