

## Empowering Business Growth: Exploring Artificial Intelligence and Machine Learning

**Course Coordinator:** Murat Kristal, PhD.

### **Course Overview:**

This comprehensive course offers a deep dive into the dynamic field of Artificial Intelligence (AI) and Machine Learning (ML), focusing on their applications in the business world. Led by a diverse team of experts, the course is designed to equip participants with a thorough understanding of AI fundamentals, machine learning basics, and the transformative impact of generative language models on business strategies. The course not only focuses the mechanics and applications of AI and ML in the business world, but also dives deeper into topics such as data privacy and the impact of regulations around data, ethical use of data in AI models. We finalize the course with a capstone project in which the students will be able to app Through a series of modules, guest lectures, and practical applications, students will explore advanced machine learning techniques, the power of mining data, and the strategic implications of AI in leadership and organizational development.

## OVERALL COURSE SCHEDULE

WEEK	TOPIC (3 hours x 12 weeks)	INSTRUCTOR
1A.		Murat Kristal (Course Director)
1B.	Introduction to AI & Machine Learning - Understanding AI Fundamentals - Machine Learning Basics - Applications of AI in Business	Tarun Rihal
2.	Introduction to AI & Machine Learning - Understanding AI Fundamentals - Machine Learning Basics - Applications of AI in Business	Tarun Rihal
3.	Application of Advanced Machine Learning Techniques - Mining Data and Finding Signals in Noise - Forecasting the Future & Predicting the Unseen - Leveraging Unstructured Data (text mining, OCR, CV, audio, video)	Tarun Rihal
4.	Application of Advanced Machine Learning Techniques - Mining Data and Finding Signals in Noise - Forecasting the Future & Predicting the Unseen - Leveraging Unstructured Data (text mining, OCR, CV, audio, video)	Tarun Rihal
5.	Generative Large Language Models and their Impact on Business - Introduction to Generative Language Models - Multimodal Generative Language Models	Karthik Kuber
6.	Generative Large Language Models and their Impact on Business - Introduction to Generative Language Models - Multimodal Generative Language Models	Karthik Kuber
7.	Guest Lecture – AI applications in Marketing	David Rice
8.	Guest Lecture – AI applications in Finance	Pauline Shum
9.	Guest Lecture – AI applications in Health Care (or AI and Ethics)	Adam Diamant
10.	Leadership in the Age of AI - AI's Impact on Leadership & Organizations - Developing an AI Strategy for Organizations	Victor Garcia
11.	Leadership in the Age of AI - AI's Impact on Leadership & Organizations - Developing an AI Strategy for Organizations	Victor Garcia
12.	Summing Up	Murat Kristal

## LOGISTICAL INFORMATION

### Module 1: Introduction To AI & Machine Learning

Tarun Rihal, MBA

September 13<sup>th</sup>, 2024

In the first week, we delve into the essence and role of Artificial Intelligence systems, exploring their transformation from foundational theories and early experiments to integral elements of modern business frameworks. We'll clarify the terminology, concepts, and ontologies crucial for effective communication in today's AI-centric landscape. Additionally, we will discuss pivotal topics for organizations seeking to adopt or expand their AI presence, offering insights into key considerations and strategies for leveraging AI's full potential.

#### Learning Objectives:

1. **Understand Foundational Concepts:** Gain a comprehensive understanding of the foundational theories, terminology, and ontologies underpinning Artificial Intelligence to effectively communicate within an AI-driven business environment.
2. **Analyze Historical Evolution:** Explore the historical development of AI, from early experiments to its modern applications, to appreciate the technological advancements that shaped current AI trends and practices.
3. **Identify Strategic Applications:** Evaluate key topic areas and strategic considerations for organizations seeking to adopt or expand their AI footprint, enabling participants to make informed decisions about leveraging AI in various business contexts.

### Module 2: Data Science & Machine Learning

Tarun Rihal, MBA

September 20<sup>th</sup>, 2024

In this session, we unravel the intricacies of machine learning, the driving force behind most contemporary AI systems. We'll delve into data science as the bridge connecting classical statistical methods with the world of machine learning. By examining the core mechanics that underpin all machine learning models, we explore their implications for various business applications. Additionally, we will compare different ways to categorize machine learning methods, aligning them with diverse user requirements. Finally, we adopt the perspective of a typical machine learning engineer and work through the process of developing a basic machine learning model for a movie streaming platform.

#### Learning Objectives:

1. **Grasp Machine Learning Fundamentals:** Understand the core mechanics of machine learning models, including their foundational principles and how they apply to diverse business scenarios.
2. **Bridge Data Science and Machine Learning:** Explore the relationship between classical statistical methods and machine learning, recognizing data science as a critical link that unites these fields.
3. **Practical Model Development:** Gain practical experience by working through the development of a basic machine learning model for a movie streaming platform, understanding the typical challenges and decisions faced by machine learning engineers.

## Model 3: Driving Business Value From Machine Learning I: Mining Data & Finding Signals In Noise I

Tarun Rihal, MBA  
September 27<sup>th</sup>, 2024

In Week 3, we focus on understanding how different types of machine learning problems can be translated into practical business applications. We examine the concept of problem classification and explore methods that allow us to either gain new insights from organizational data or address specific questions that aren't directly observable. By examining crucial models through an intuitive, non-mathematical perspective, we establish foundational knowledge of their relevance and application in contemporary business environments.

### Learning Objectives:

1. **Classify Machine Learning Problem Types:** Develop the ability to classify various machine learning problem types, linking each to practical business applications and identifying suitable methods for different challenges.
2. **Explore Data for New Insights:** Learn how to apply exploratory machine learning techniques to uncover hidden patterns and gain valuable insights from organizational data that can inform strategic business decisions.
3. **Apply Non-Observable Models:** Understand how to utilize machine learning models to answer specific questions about phenomena that aren't directly observable, establishing an intuitive grasp of key models and their relevance in contemporary business settings.

## Module 4: Driving Business Value From Machine Learning II: Forecasting The Future And Predicting The Unforeseen

Tarun Rihal, MBA  
October 4<sup>th</sup>, 2024

In Week 4, we build on the concepts introduced in the previous week by diving deeper into the practical considerations of machine learning models in modern business settings. Through real-world business examples and case studies, we demonstrate how theoretical knowledge is put into practice. We discuss how organizations can leverage machine learning to uncover hidden insights and answer challenging questions, ultimately translating data into meaningful business value.

### Learning Objectives:

1. **Evaluate Practical Considerations:** Learn to identify and evaluate the practical considerations of applying machine learning models in business, such as data preparation, model selection, and deployment strategies.
2. **Analyze Real-World Case Studies:** Develop the skills to analyze real-world business case studies, understanding how theoretical machine learning concepts are adapted and utilized to tackle specific organizational challenges.
3. **Leverage Machine Learning for Business Value:** Understand how organizations can strategically leverage machine learning models to uncover hidden insights, resolve complex questions, and transform data into meaningful business value.

## Module 5: Introduction To Generative Language Models

Karthik Kuber, Phd

October 11<sup>th</sup>, 2024

This session will commence with an introduction to machine learning, highlighting neural networks, natural language processing, and the foundational principles of generative language models. We'll delve into various architectures and applications, thoroughly examining what generative AI can and cannot achieve by discussing its capabilities and limitations. Moreover, we'll explore how recent advancements in this field have transformed tasks like text generation, machine translation, and dialogue systems.

### Learning Objectives:

1. **Grasp Core Concepts:** Gain a foundational understanding of generative language models and their underlying principles to build a comprehensive knowledge base.
2. **Assess Capabilities and Limitations:** Cultivate an intuitive understanding of the strengths and limitations of generative AI, enabling informed evaluations of its potential applications.
3. **Analyze Advancements in AI Tasks:** Explore the advancements in machine translation and dialogue systems, understanding how generative AI has significantly enhanced the efficiency and quality of these tasks.

## Module 6: Multimodal Generative Models

Karthik Kuber, Phd.

October 25<sup>th</sup>, 2024

In this session, we'll expand upon foundational knowledge of generative language models by delving into the intricacies of multimodal generative AI. We'll explore techniques for modeling and generating multimodal data like text, images, and audio, which have the potential to enhance human-AI collaboration and creativity. Additionally, we'll discuss crucial topics in this field, including ethics, bias, fairness, and privacy in generative AI, and consider how these issues impact model development and deployment.

### Learning Objectives:

1. **Develop Multimodal Modeling Skills:** Participants will be able to apply techniques for modeling and generating multimodal data such as text, images, and audio to expand the potential of human-AI collaboration and creativity.
2. **Analyze Ethical Implications:** Participants will be able to identify and analyze critical ethical considerations like bias, fairness, and privacy within the context of multimodal generative AI, understanding their implications for model development and deployment.
3. **Enhance Foundational Knowledge:** Participants will deepen their understanding of generative language models by exploring the complexities of multimodal generative AI and how it can revolutionize creative and collaborative applications.

## Module 7: AI Applications In Marketing

**Prof. M. David Rice**  
**November 1<sup>st</sup>, 2024**

This lecture will examine how artificial intelligence can be harnessed to collect and process marketing research data effectively. Prof. Rice will delve into specialized sub-topics such as emotion detection, neuromarketing, health data, AI companions, and brain-computer interfaces, uncovering their unique roles in shaping the future of marketing research. Despite the broad scope, these sub-topics will be cohesively interwoven to provide a comprehensive understanding of AI's transformative potential in this field.

### **Learning Outcomes:**

1. **Understand AI Applications in Marketing Research:** Participants will gain a comprehensive understanding of how AI can be leveraged for collecting and processing marketing research data, including its application in sub-topics such as emotion detection, neuromarketing, health data, and AI companions.
2. **Evaluate Emerging Technologies:** Participants will be able to evaluate emerging technologies like brain-computer interfaces and their potential to revolutionize marketing research, enabling more precise and innovative insights into consumer behavior.
3. **Synthesize Broad Concepts:** Participants will synthesize the various sub-topics into a cohesive understanding of how AI's transformative power will shape the future of marketing research, providing them with a strategic framework for incorporating these innovations into practical research methodologies.

## Module 8: AI & Finance

**Prof. Pauline M P Shum Nolan**  
**November 8<sup>th</sup>, 2024**

In this session, Professor Shum Nolan will discuss innovative trends in applying AI to the financial services industry. The session will highlight examples of how large language models (LLMs) and computer vision are being leveraged for asset management. Participants will explore the broader use cases of AI for financial services, including Retrieval-Augmented Generation (RAG) applications, and gain insights into what AI strategies are most effective in 2024 and which limitations persist. By understanding the evolving landscape, participants will learn how to apply these technologies for strategic advantage while being aware of the current constraints and challenges.

### **Learning Outcomes:**

1. **Identify Applications of LLMs and Computer Vision:** Participants will be able to identify and describe the use of large language models (LLMs) and computer vision in asset management, gaining insight into how these technologies can enhance financial strategies.
2. **Evaluate Retrieval-Augmented Generation (RAG):** Participants will learn to evaluate the practical applications of Retrieval-Augmented Generation (RAG) in financial services, understanding its impact on data retrieval and decision-making processes.
3. **Assess the Effectiveness of AI Strategies in 2024:** Participants will assess which AI applications are currently most effective in finance and recognize the limitations, enabling them to make informed decisions about adopting AI solutions.

## Module 9: AI & Healthcare Applications

Prof. Adam Diamant

November 15<sup>th</sup>, 2024

This session explores how analytics and artificial intelligence (AI) are deployed in the Canadian healthcare sector. We examine various successful AI applications and analyze their analytics pipeline, including how predictions and recommendations translate into action, and AI's influence on healthcare operations management. Ethical considerations regarding AI implementation and the challenges of deploying AI tools within the Canadian health system will also be addressed. Lastly, the session explores AI's potential to address future health challenges.

### Learning Outcomes:

1. **Understand Evolution and Impact:** Familiarize students with the evolution of decision support tools in healthcare, emphasizing the transformative impact of AI and analytics on healthcare delivery.
2. **Analyze Successful Applications:** Examine successful AI applications in healthcare through case studies and examples, providing a comprehensive understanding of their integration, operational challenges, and ethical considerations.
3. **Explore Future Potential:** Investigate the potential of AI tools in facilitating innovative healthcare delivery and management models, addressing future health challenges through adaptable organizational strategies.

## Module 10: AI's Impact On Leadership & Organizations

Victor Garcia, MBA

November 22<sup>nd</sup>, 2024

From a business perspective, this session explores the evolution of Artificial Intelligence, from its inception to current and emerging forms such as Applied AI, Generative AI, and Artificial General Intelligence (AGI). It provides practical insights into the wide-ranging applications across industries, highlighting AI's transformative impacts on modern organizations and the evolving demands on corporate leadership.

Through case studies and interactive discussions, participants—including graduate students and business leaders—will gain comprehensive insights into AI's strategic, operational, and social implications. The session will specifically examine how AI is redefining traditional C-suite roles and responsibilities while also analyzing the significant ethical, environmental, social, and governance (ESG) challenges presented by its integration.

Participants will be equipped with the knowledge and tools necessary to understand AI's development, how to seamlessly incorporate it into organizations, and the vital risk management strategies required to navigate this rapidly evolving technological landscape.

### Learning Objectives:

1. **Explore the Evolution and Applications of AI:** Understand the historical evolution of AI, its current forms, and practical applications through real-world examples across various sectors such as finance, transportation, manufacturing, energy, and defense.

2. **Address Strategic, Ethical, and Operational Challenges:** Identify and address the strategic, ethical, and operational challenges posed by AI, including the demands it places on senior business roles and responsibilities like CEOs, COOs, and CMOs.
3. **Develop Risk Management and Integration Strategies:** Understand frameworks for AI risk management and organizational transformation and formulate strategic recommendations for effective AI adoption and integration.

## Module 11: Developing An AI Strategy For Organizations

**Victor Garcia, MBA**  
**November 29<sup>th</sup>, 2024**

This session empowers participants with the insights and tools necessary to craft and execute a strategic AI plan aligned with their organization's current and future objectives.

Participants will engage in expert-led discussions, interactive case studies, and strategic planning exercises to navigate the complexities of AI adoption. They'll learn to ensure alignment with business goals, evaluate technological demands, assess available technical resources, and analyze workforce capabilities and needs. The program covers:

- Understanding human capital requirements and ethical considerations.
- Differentiating between tactical planning and strategic development.
- Preparing for and managing inevitable organizational change.

This session offers participants a comprehensive blueprint for the strategic adoption of AI. It focuses on maximizing benefits while mitigating risks and addressing ethical concerns.

### **Learning Objectives:**

1. **Design an Effective AI Strategy:** Understand the essential components of a successful AI strategy and identify key organizational areas where AI can deliver significant value.
2. **Evaluate Organizational Readiness and Skill Development:** Learn to assess the organization's preparedness for AI adoption and develop strategies for workforce transformation, including skill development.
3. **Establish an AI Ethics Framework:** Construct a framework to guide ethical decision-making in AI implementation, ensuring alignment with organizational values and societal standards.

## Module 12: Implementing An Effective AI Strategy

**Prof. Murat Kristal**  
**December 6<sup>th</sup>, 2024**

In this capstone session, participants will consolidate the knowledge, strategies, and applications explored throughout the course to design a practical and comprehensive AI implementation plan. Through strategic exercises, and collaborative activities, participants will enhance their skills in crafting, aligning, and executing an AI strategy that addresses their organization's unique challenges and objectives.

This session emphasizes integrating critical components of an AI strategy, such as technical requirements, workforce transformation, and ethical frameworks. We'll explore how to navigate potential barriers to



adoption while ensuring alignment with overall organizational goals. To culminate the learning experience, participants will present their capstone projects, gaining constructive feedback from peers and instructors to refine and elevate their strategic plans.

**Learning Objectives:**

1. **Develop a Comprehensive AI Strategy:** Learn to synthesize the course concepts and strategies into a comprehensive AI implementation plan that aligns with the unique goals and challenges of your organization.
2. **Integrate Key Strategic Components:** Understand how to incorporate essential components of an AI strategy, such as technical requirements, workforce transformation, and ethical frameworks, while maintaining alignment with organizational objectives.
3. **Refine Strategic Plans through Peer Collaboration:** Enhance strategic planning skills by sharing and refining capstone projects through peer and instructor feedback, ensuring the final plans are practical, robust, and tailored to organizational needs.