Driving Innovation with Generative AI

DRIVING INNOVATION WITH GENERATIVE AI SCHEDULE

Getting Started

Start your learning journey by completing an entrance survey and become familiar with the platform and module design.

- **Entrance Survey**
- **Welcome Webinar**
- **Review the Course Guide**
- **Meet the Course Team**
- **Discussion Forum: Introduce Yourself**
- **Review of Software Requirements and Accessibility**
- **Introduction to Generative AI Tools**

WEEK 1 | Generative AI and the AI Landscape | 5 hrs

Take a closer look at the history of AI, discovering how early developments paved the way for the complex systems we use today. By following the timeline of AI's key milestones, you'll learn about foundational moments and explore the core distinctions between Generative AI and machine learning. We will conclude the week by examining the principles of reinforcement learning.

- **Introduction to The AI Landscape**
- **Reading: Timeline of AI Developments**
- **Discussion: Introduction to Artificial Intelligence**
- **AI History**
- **Reading: ELIZA**
- **Decision Making**
- **Reinforcement Learning**

LEARN BY DOING

- **Put into Practice:** AI Decision Making
- **Put into Practice:** Reinforcement Learning
- **Reflection:** The AI Landscape
- **Put into Practice:** Machine Learning Models
- **Reflection:** Machine Learning and Data
- **Put into Practice:** Gen AI in Industry
- **Assignment:** Designing an AI Agent
- **Reflection:** Significant Takeaway This Week

WEEK 2 | Visual Data and Image Outputs | 5-7 hrs

This week you'll learn more about image generative models and explore the three types of image generation models: Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and Diffusion Models. You'll conclude the week with a discussion on how to train and use these models effectively.

- **Introduction to Image Generative Models**
- **What Are Image Generative Models?**
- **Discussion: Generate An Animal**
- **How Do You Train an Image Generator?**

LEARN BY DOING

- **Put into Practice:** Image Landscapes
- **Put into Practice:** Modifying Images
- **Reflection:** Image Generative Models

- **Different Kinds of Models**
- **Introduction to Generative AI Models**
- **Generative Adversarial Networks (GANs)**
- **Diffusion Models**
- **Variational Autoencoders (VAEs)**

LEARN BY DOING

- **Put into Practice:** Your industry and GANs
- **Put into Practice:** GANs vs Diffusion
- **Put into Practice:** VAE Practice
- **Reflection:** GANs, Diffusion Models and VAEs

- **Controlling and Using Models**
- **Steering a Generative Model Toward Your Preferences**
- **Tuning**
- **What Can These Models Be Used For? Translation.**
- **What Can These Models Be Used For? Predictions.**
- **What Can These Models Be Used For? Planning.**

LEARN BY DOING

- **Put into Practice:** Translating Sketches into Reality
- **Put into Practice:** Inpainting - Expanding Picture
- **Reflection:** Translating, Predicting and Planning

- **Drawbacks**
- **Discussion: Copyright Infringement**

LEARN BY DOING

- **Put into Practice:** Deepfakes
- **Put into Practice:** Pause Giant AI Experiments: An Open Letter
- **Assignment:** Rethinking Visuals
- **Peer Review**
- **Reflection:** Significant Takeaway This Week

WEEK 3 | Textual Data and Text Outputs | 5-7 hrs

In week three, you will explore Natural Language Processing (NLP), a branch of artificial intelligence (AI) that focuses on the interaction between computers and human language.

- Introduction to Natural Language Processing (NLP)
- Introduction to Natural Language Processing
- Deep Learning for NLP
- Deep Learning Architectures
- Additional Resources

LEARN BY DOING

- **Put into Practice:** NLP in Your Industry
- **Reflection:** Understanding NLP

- Text Data Preprocessing
- Tokenization and Cleaning Text
- Understanding Word Embeddings
- Transformers for NLP

LEARN BY DOING

- **Put into Practice:** Implementing Tokenization
- **Put into Practice:** Working with Word Embeddings
- **Reflection:** Transformers in NLP

- Language Models and Applications
- Using GPT for Text Generation
- Discussion: Ethical Use of Text Generation
- Text Summarization and Translation

LEARN BY DOING

- **Put into Practice:** Summarizing Text with AI
- **Put into Practice:** Translating Text
- **Reflection:** Applications of Language Models

- Challenges in NLP
- Bias in Language Models
- Handling Ambiguity and Context
- Ensuring Fairness in NLP

LEARN BY DOING

- **Put into Practice:** Identifying Bias in Text Models
- **Reflection:** Ethical Challenges in NLP

- Advanced NLP Techniques
- Fine-Tuning Pre-trained Models
- Using NLP for Sentiment Analysis
- Building Conversational Agents

LEARN BY DOING

- **Put into Practice:** Sentiment Analysis with AI
- **Assignment:** Designing a Chatbot
- **Reflection:** Advanced NLP in Practice

WEEK 4 | Ethics and Governance in AI | 6-8 hrs

In week four, you will dive into the ethical considerations and governance challenges in artificial intelligence. You will explore key ethical principles, understand biases in AI systems, and discuss the importance of AI governance and regulation.

- Introduction to AI Ethics
- Reading: Ethical Principles for AI
- Discussion: Ethics in AI Use Cases
- Bias in AI Systems
- Recognizing and Addressing Bias
- Case Study: AI and Discrimination

LEARN BY DOING

- **Put into Practice:** Evaluating Bias in AI
- **Reflection:** Ethical Bias Considerations

- AI Transparency and Accountability
- Importance of Explainable AI (XAI)
- Reading: Making AI Transparent
- Discussion: Accountability in AI Systems

LEARN BY DOING

- **Put into Practice:** Developing an Explainable AI Approach
- **Reflection:** Explainability in AI

- AI Governance and Regulation
- The Need for AI Governance
- Current AI Regulations Around the World
- Discussion: Regulatory Challenges in AI

LEARN BY DOING

- **Put into Practice:** Drafting AI Governance Guidelines
- **Reflection:** Governance in Practice

- Building Ethical AI Systems
- Best Practices for Ethical AI Design
- Case Study: Building Trustworthy AI

LEARN BY DOING

- **Put into Practice:** Ethical AI Design Framework
- **Assignment:** Developing an AI Code of Ethics
- **Reflection:** Lessons in AI Ethics

WEEK 5 | AI in Practice - Applications and Case Studies | 6-8 hrs

In week five, you will explore how AI is used in real-world applications and examine specific case studies from different industries. You will learn about the impact of AI in healthcare, finance, manufacturing, and other sectors.

- Introduction to AI Applications
- AI in Healthcare
- Case Study: AI in Medical Diagnosis
- AI in Finance
- Case Study: AI in Fraud Detection
- AI in Manufacturing
- Case Study: Predictive Maintenance with AI

LEARN BY DOING

- **Put into Practice:** Identifying AI Use Cases in Your Industry
- **Reflection:** Impact of AI in Industries

- AI in Retail and Marketing
- Personalization with AI
- Case Study: Recommender Systems
- AI in Customer Service
- Chatbots and Virtual Assistants

LEARN BY DOING

- **Put into Practice:** Developing a Recommender System
- **Reflection:** AI in Customer Service

- AI in Autonomous Systems
- Autonomous Vehicles
- Case Study: Self-Driving Cars
- AI in Robotics
- Human-Robot Collaboration

LEARN BY DOING

- **Put into Practice:** Designing a Human-Robot Collaboration System
- **Reflection:** Autonomous Systems in Practice

- AI for Social Good
- AI for Climate Change Mitigation
- Case Study: AI for Environmental Monitoring

LEARN BY DOING

- **Put into Practice:** Exploring AI Solutions for Social Impact
- **Assignment:** AI Application Proposal
- **Reflection:** AI Applications and Social Good

WEEK 6 | Future of AI and Course Wrap-Up | 5-6 hrs

In the final week, you will explore the future of artificial intelligence, considering emerging technologies, trends, and societal impacts. You will also complete the course wrap-up and reflect on your learning journey.

- Emerging AI Technologies
- AI Trends and Innovations
- Discussion: Future AI Predictions
- AI and the Workforce
- Job Displacement and Creation
- Case Study: AI in the Workplace of the Future

LEARN BY DOING

- **Put into Practice:** AI Trend Analysis
- **Reflection:** AI and Workforce Dynamics

- AI and Society
- Ethical Considerations for Future AI
- Discussion: AI and Societal Change
- The Role of Policy in AI Development

LEARN BY DOING

- **Put into Practice:** Designing Ethical AI Policies
- **Reflection:** Policy and Societal Impact

- **AI and Human Collaboration**
- **Human-AI Symbiosis**
- **Case Study: AI-Assisted Creativity**
- **Augmenting Human Capabilities with AI**

LEARN BY DOING

- **Put into Practice:** Designing a Human-AI Collaboration System
- **Reflection:** Human-AI Collaboration

Course Wrap-Up

- **Review of Key Concepts**
- **Course Summary and Next Steps**
- **Final Reflection: Your AI Journey**

LEARN BY DOING

- **Assignment:** Final Project Submission
- **Staff Review:** Final Projects
- **Reflection:** Final Thoughts and Takeaways

Live Webinars

Throughout the course, you will be invited to optional live webinars. These are hosted by the course team at MIT xPRO, the course teaching assistants (TAs), subject matter experts, and MIT professors.

These webinars typically last 45-60 minutes and focus on a course introduction/networking session, a discussion on the future of work, coding, Equitable Design for Autonomous Agents' Personality & Role Design, and a dedicated Q&A session.