

ARTIFICIAL INTELLIGENCE



Artificial intelligence, provides an in-depth exploration of AI concepts, techniques, and tools through hands-on projects and real-world applications. Students will learn the foundational principles of machine learning, deep learning, natural language processing, and computer vision. By engaging in practical exercises and a capstone project, participants will develop the skills necessary to implement AI solutions across various domains.

COURSE OBJECTIVES

1. **Understand AI Fundamentals:** Gain a comprehensive understanding of the key concepts and history of artificial intelligence.
2. **Develop Programming Skills:** Acquire proficiency in Python and relevant libraries for data manipulation and analysis.
3. **Apply Machine Learning Techniques:** Learn to implement and evaluate various machine learning algorithms.
4. **Explore Deep Learning:** Understand the architecture of neural networks and their applications in real-world scenarios.
5. **Investigate NLP and Computer Vision:** Examine methods in natural language processing and image analysis.
6. **Address Ethical Considerations:** Discuss the ethical implications of AI and strategies to mitigate bias.
7. **Complete a Capstone Project:** Synthesize learning by developing an AI project that addresses a specific problem.

LEARNING OUTCOMES

Upon successful completion of the course, students will be able to:

1. **Explain AI Concepts:** Articulate the fundamental concepts and history of artificial intelligence.
2. **Utilize Python for AI:** Demonstrate proficiency in Python programming and data manipulation using libraries such as NumPy and Pandas.
3. **Implement Machine Learning Models:** Apply supervised and unsupervised learning techniques to solve real-world problems.
4. **Build Neural Networks:** Design and implement neural networks using TensorFlow and Keras for various applications.
5. **Conduct NLP Tasks:** Perform text analysis and sentiment classification using natural language processing techniques.
6. **Develop Computer Vision Applications:** Create image classification models using convolutional neural networks.
7. **Evaluate AI Models:** Assess model performance and optimize algorithms through hyperparameter tuning.
8. **Discuss AI Ethics:** Analyze the ethical implications of AI technologies and propose solutions to address bias in AI systems.
9. **Present Capstone Projects:** Effectively communicate project objectives, methodologies, and results through presentations.

COURSE TOPICS

1. Introduction to AI
2. Python for AI
3. Data Preparation
4. Machine Learning Fundamentals
5. Deep Learning Basics
6. Natural Language Processing (NLP)
7. Computer Vision
8. Model Evaluation and Optimization
9. AI Ethics and Bias
10. Capstone Project

COURSE TOPIC

TOPIC 1: Introduction to AI

- Overview of AI and its applications
- History and evolution of AI
- Key concepts: machine learning, deep learning, natural language processing

TOPIC 2: Python for AI

- Introduction to Python programming
- Libraries: NumPy, Pandas, Matplotlib
- Hands-on: Basic data manipulation and visualization

TOPIC 3: Data Preparation

- Data collection and cleaning
- Exploratory data analysis (EDA)
- Hands-on: Preparing datasets for modeling

TOPIC 4: Machine Learning Fundamentals

- Supervised vs. unsupervised learning
- Key algorithms: regression, classification, clustering
- Hands-on: Implementing regression and classification models

TOPIC 5: Deep Learning Basics

- Introduction to neural networks
- Frameworks: TensorFlow and Keras
- Hands-on: Building a simple neural network

TOPIC 6: Natural Language Processing (NLP)

- Introduction to NLP concepts
- Text preprocessing and tokenization
- Hands-on: Sentiment analysis project

TOPIC 7: Computer Vision

- Basics of image processing
- Convolutional Neural Networks (CNNs)
- Hands-on: Building a CNN for image classification

TOPIC 8: Model Evaluation and Optimization

- Metrics for model evaluation
- Hyperparameter tuning techniques
- Hands-on: Improving model performance

TOPIC 9: AI Ethics and Bias

- Understanding ethical considerations in AI
- Addressing bias in AI systems
- Discussion: Real-world implications of AI

TOPIC 10: Capstone Project

- Students select a project based on their interests
- Application of AI techniques learned throughout the course
- Presentation of projects and peer review

Assessment

- TOPICly hands-on assignments
- Mid-term assessment on core concepts
- Final capstone project presentation

Resources

- Recommended readings and online resources
- Access to AI tools and libraries