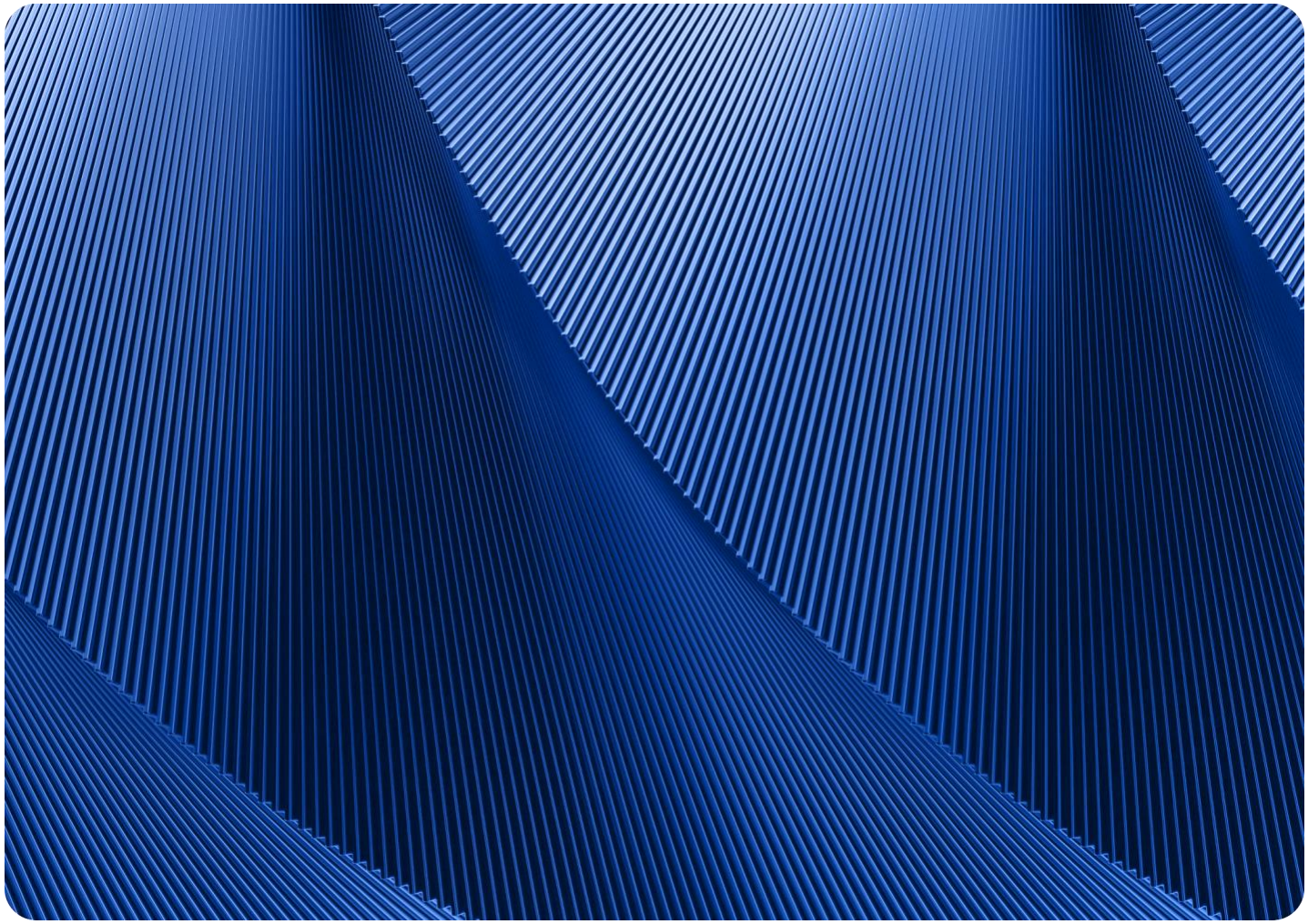
NAAIC

Resource provided by
Miami Dade College

Course Syllabus

Machine Learning Foundations

This introductory course provides hands-on experience with machine learning concepts, techniques, and real-world applications.



NAAIC

Table of Contents

Course Description 3

Course Competencies 4

Instructional Resources 6

Grading Schema 6

Course Outline 7

Course Description

Students are introduced to machine learning concepts and Python applications, including data acquisition, supervised, unsupervised, and reinforced learning. In addition, students will develop and deploy artificial intelligence (AI) models utilizing classification algorithms.

Prerequisites:
Introduction to Artificial Intelligence
Introduction to Python

NAAIC

Course Competencies

Competency 1
The student will demonstrate an appreciation of programming fundamentals as well as popular AI packages by:
a) Recognizing Python libraries such as NumPy, Pandas, Matplotlib and Scikit-Learn b) Differentiating between Python lists and NumPy arrays c) Manipulating data using Python and NumPy functions d) Recognizing Pandas syntax and how to read a csv file in a data frame e) Relating how Matplotlib is visually displayed
Competency 2
The student will apply an Entrepreneurial Mindset, Design, and Systems Thinking to problem-solving and building AI solutions by:
a) Using AI models to solve common industry applications (Predictive Maintenance, Recommendation) b) Describing human-centric design c) Demonstrating the role Design Thinking and AI bias play in AI project building d) Describing a System by its individual and interconnected components e) Applying System Thinking to create a System Map f) Describing the Entrepreneurial Mindset in context of developing AI solutions g) Describing the differences between Supervised, Unsupervised, and Reinforcement Learning h) Executing Supervised, Unsupervised, and Reinforcement Learning techniques to solve a problem
Competency 3
The student will explore acquiring and transforming data from multiple sources and formats, utilizing visualization tools and techniques, and fitting data to models by:
a) Importing data and automating data downloading in Python b) Implementing appropriate visualization tools and best practices c) Comparing errors and outliers d) Investigating and handling erroneous and missing data e) Utilizing percentile ranges, boxplots, and histograms f) Evaluating and interpreting model outputs g) Ideating and solving simple data science problems

Competency 4
The student will explore the concepts of emotional intelligence, AI Ethics, and its implications on AI projects by:
a) Relating the 5 pillars of Social Emotional Skills (SES) b) Describing Emotional Intelligence (EI) c) Stating the difference between Emotional Intelligence and Emotional Quotient d) Describing the need for SES and EI as future job skills for AI building e) Using the 4 steps of developing EI skills f) Using the three characteristics of emotions g) Thinking critically and applying the concept of ethics in determining best practices h) Exploring potential AI project pitfalls and implications for implementing AI solutions in society i) Demonstrating critical thinking and considerations addressing AI Project Pitfalls
Competency 5
The student will develop and deploy AI models by:
a) Discussing problem statements and choosing an adequate focus area and project scope b) Collecting data from multiple sources and types c) Evaluating data for attributes d) Exploring classification algorithms including linear classifiers, support vector machines, quadratic classifiers, kernel estimation (k-nearest neighbor), decision trees, and neural networks e) Selecting a model and evaluating for bias and variance f) Defining, qualifying, and deploying AI models

Instructional Resources

No prescribed textbook is required due to the rapidly evolving nature of machine learning tools, frameworks, and best practices. Instructors will curate up-to-date articles, tutorials, documentation, and other resources available to provide the latest advancements and diverse perspectives. This approach ensures flexibility to tailor content to class needs and incorporate emerging topics and industry practices.

Platforms and Tools:
Kaggle, GitHub, Google Colab, Amazon SageMaker, VS Code, Orange Data Mining

Recommended Reading:

- *Introduction to Machine Learning with Python Textbook*, Andrea C. Muller & Sarah Guido
- *Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems*, Textbook, Geron Aurelien

Grading Schema

Assignment Type	Percentage of Grade
Assignments	20%
Discussions	10%
Projects	50%
Attendance	10%
Quizzes	10%

NAAIC

Course Outline

Week starting on / Module	Module Topic
Week 1	Introduction and Syllabus Overview
Week 2	Introduction to Machine Learning
Week 3	Python and Mathematics
Week 4	Python and Mathematics II
Week 5	Machine Learning Models
Week 6	Probability distributions and supervised learning
Week 7	Project – Building a supervised learning model
Week 8	Unsupervised Learning
Week 9	Building an unsupervised learning model
Week 10	Recommendation systems
Week 11	Reinforcement Learning
Week 12	Neural Networks
Week 13	Deep Learning I
Week 14	Deep learning project
Week 15	Deep Learning II
Week 16	Project presentation