



Course Description

CAI2100C | Machine Learning Foundations | 3.00 credits

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. Prerequisite: CAI1001C and COP1047C.

Course Competencies:

Competency 1: The student will demonstrate an appreciation of programming fundamentals as well as popular AI packages by:

1. Recognizing Python libraries such as NumPy, pandas, matplotlib, and sci-kit-learn
2. Differentiating between Python lists and NumPy arrays
3. Manipulating data using Python and NumPy functions
4. 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:

1. Using AI models to solve typical industry applications (Predictive Maintenance, Recommendation)
2. Describing human-centric design
3. Demonstrating the role Design Thinking and AI bias play in AI project building
4. Describing a System by its individual and interconnected components
5. Applying System Thinking to create a System Map
6. Describing the Entrepreneurial Mindset in the context of developing AI solutions
7. Describing the differences between Supervised, Unsupervised, and Reinforcement Learning
8. 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:

1. Importing data and automating data downloading in Python
2. Implementing appropriate visualization tools and best practices
3. Comparing errors and outliers
4. Investigating and handling erroneous and missing data
5. Utilizing percentile ranges, boxplots, and histograms
6. Evaluating and interpreting model outputs
7. 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:

1. Relating the five pillars of Social Emotional Skills (SES)
2. Describing Emotional Intelligence (EI)
3. Stating the difference between Emotional Intelligence and Emotional Quotient
4. Describing the need for SES and EI as future job skills for AI building
5. Using the four steps of developing EI skills. f) Using the three characteristics of emotions
6. Thinking critically and applying the concept of ethics in determining best practices
7. Exploring potential AI project pitfalls and implications for implementing AI solutions in society
8. Demonstrating critical thinking and considerations addressing AI Project Pitfalls

Competency 5: The student will develop and deploy AI models by:

1. Discussing problem statements and choosing an adequate focus area and project scope

2. Collecting data from multiple sources and types
3. Evaluating data for attributes
4. Exploring classification algorithms, including linear classifiers, support vector machines, quadratic classifiers, kernel estimation (k- nearest neighbor), decision trees, and neural networks
5. Selecting a model and evaluating for bias and variance
6. Defining, qualifying, and deploying AI models

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Demonstrate knowledge of ethical thinking and its application to issues in society
- Use computer and emerging technologies effectively