**COURSE LEARNING OUTCOMES:**

COURSE NUMBER & NAME: CST-238 Machine Learning

LECTURE/LAB HOURS: 2 hours lecture and 2 hours Lab

CREDITS:3 Credits

PREREQUISITES: ENG 097, MAT 144, and CST 206

COURSE DESCRIPTION: This course provides students with an understanding of key concepts and practical applications in the field. It covers essential topics such as supervised and unsupervised learning, data preprocessing, and evaluation metrics. Through hands-on engagement with algorithms like linear regression and decision trees students will gain practical experience. Students will explore intelligent software, algorithmic problem-solving, and the mathematical foundations of machine learning. Emphasizing real-world applications and ethical considerations, this course ensures practical insights for accessible and applicable learning.

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

1. Acquire a comprehensive understanding of fundamental machine learning concepts, distinguishing between various algorithms and types of learning.
2. Apply machine learning algorithms, including linear regression, logistic regression, and decision trees, to solve real-world problems.
3. Demonstrate proficiency in preprocessing datasets, handling missing values, scaling features, and converting categorical data.
4. Evaluate model performance using metrics such as accuracy, precision, recall, and F1 score.
5. Analyze ethical implications and potential biases in machine learning, applying critical thinking to problem-solving.

**COURSE MATERIALS**:

Introduction Machine Learning (Developer Reference) 1st

ISBN:973-0135565667

Publisher: Pearson

**COURSE REQUIREMENTS:** *(e.g., field trips, lab requirements, technology or special equipment requirements, extra expenses)*

* Internet access to login to Canvas LMS
* USB drive or cloud storage, such as Microsoft OneDrive or Google Drive to save all assignments.

Union College of union county, NJ does not discriminate and prohibits discrimination, as required by state and/or federal law, in all programs and activities, including employment and access to its career and technical programs.

**Experiential Learning:**

Students must complete an experiential learning activity that connects course content to career applications. This activity may be a content specific assignment or practical skill that is applied within a course assignment. This assignment supports the general education learning outcomes of scientific/critical thinking and quantitative reasoning; oral and written communication; and information literacy/technological competency.

**Americans with Disabilities Act (ADA):**

Union College offers reasonable accommodations and/or services to persons with disabilities. Any student who has a documented disability and wishes to self-identify should contact the Coordinator of Disability Support Services at (908) 709-7164, or email [disabilitysvc@ucc.edu](mailto:disabilitysvc@ucc.edu). Accommodations are individualized and in accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1992. In order to receive accommodations, students must be registered with Disability Support Services. Students should register with the office as soon as possible. Accommodations are not official until the Faculty Accommodations Alert Form(s) are issued from the student to his/her instructor(s).

**Family Educational Rights and Privacy Act (FERPA):**

The FERPA Statement can be found at <https://www.ucc.edu/admissions/the-family-education-rights-and-privacy-act/>

Union College Mission Statement:  **Transforming Our Community. . . One Student at a Time**

### Course Grades & Grading Policy:

|  |  |
| --- | --- |
| Evaluation Elements for \*\*\*\* Semester | |
| **Evaluation Element** | **Weight** |
| (3) Exams | 30% |
| (1) Final | 20% |
| Group Projects | 25% |
| Writing assignments/Labs | 20% |
| Class attendance & participation | 5% |

EVALUATION METHODS: *(e.g., exams, essays, quizzes, portfolios)*

CLASS SCHEDULE**:**

|  |  |  |
| --- | --- | --- |
| Week | Unit/Content | Learning Activities |
| 1 | Course Introduction  Review Canvas  Machine Learning Overview | Read course syllabus.  Login to Canvas  Chapter 1 How Humans Learn |
| 2 | Intelligent Software | Read Chapter 2 in the book, Intelligent Software, and complete all the assignments described on Canvas |
| 3 & 4 | Mapping Problems and Algorithms | Read Chapter 3, in the Books, Mapping Problems and Algorithms, and complete all assignments described on canvas |
| 5 | Exam 1 | Chapter 1,2, and 3 |
| 5 & 6 | General Steps for a Machine Learning Solution | Read Chapter 4 in the Books, General Steps for a Machine Learning Solution, and complete all assignments described on canvas |
| 7 | The Data Factor | Read Chapter 5 in the Books, The Data Factor, and complete all assignments described on canvas |
| 8 | Math Foundations of Machine Learning | Read Chapter 9 in the Books, Math Foundations of Machine Learning, and complete all assignments described on canvas.  Group Project 2 |
| 8 | Exam 2 | Chapters 4, 5 and 9 |
| 8 & 9 | Metric of Machine Learning | Read Chapter 10 in the Books, Metric of Machine Learning, and complete all assignments described on canvas |
| 9 & 10 | How to make simple Predictions of linear Regression and decisions Trees | Read Chapter 11,12 in the Books, How to make simple Predictions of linear Regression and decisions Trees, and complete all assignments described on canvas |
| 11 | Exam 3 | Chapters10, 11, and 12 |
| 12 &13 | How to make Better ensemble Methods | Read Chapter 13 in the Books, How to make Better ensemble Methods, and complete all assignments described on canvas  Group Project 3 |
| 13 & 14 | Probabilistic Methods: Naïve Bayes  Review | Read Chapter 14 in the Books, Telling the Truth with Data Visualization, and complete all assignments described on canvas  Group Project 3 |
| 15 | Final Exam |  |

SUGGESTED TEACHING METHODOLOGIES: (e.g. group presentations, research paper, lecture)

MAPPING COURSE LEARNING OUTCOMES

to LEARNING ACTIVITIES and EVALUATION METHODS

|  |  |  |
| --- | --- | --- |
| **Course Learning Outcomes (CLOs)** | **Learning Activities** | **Evaluation Methods** |
| Acquire a comprehensive understanding of fundamental machine learning concepts, distinguishing between various algorithms and types of learning. | Assess students' understanding of fundamental machine learning concepts by assigning algorithm implementation projects and algorithm comparison exercises, evaluating their ability to select appropriate algorithms, implement them correctly, and analyze their performance. | Written: Tests, assignments.  Verbal: Discussion/Presentations, case reviews.  Peer Review.  Lab/Coding.  Capstone Project |
| Apply machine learning algorithms, including linear regression, logistic regression, and decision trees, to solve real-world problems. | Evaluate students' ability to apply machine learning algorithms, including linear regression, logistic regression, and decision trees, to real-world problems through project-based assessments and case studies, gauging their proficiency in selecting appropriate algorithms, preprocessing data, training models, and interpreting results. | Written: Tests, assignments.  Verbal: Discussion/Presentations, case reviews.  Peer Review.  Lab/Coding.  Capstone Project |
| Demonstrate proficiency in preprocessing datasets, handling missing values, scaling features, and converting categorical data. | Review students' proficiency in preprocessing datasets, including handling missing values, scaling features, and converting categorical data, through projects, exercises, case studies, and peer review sessions, gauging their ability to apply appropriate techniques effectively. | Written: Tests, assignments.  Verbal: Discussion/Presentations, case reviews.  Peer Review.  Lab/Coding.  Capstone Project |
| Evaluate model performance using metrics such as accuracy, precision, recall, and F1 score. | Appraise students' competence in evaluating model performance using metrics such as accuracy, precision, recall, and F1 score through practical exercises and case studies, gauging their ability to interpret and apply performance metrics effectively. | Written: Tests, assignments.  Verbal: Discussion/Presentations, case reviews.  Peer Review.  Lab/Coding.  Capstone Project |
| Analyze ethical implications and potential biases in machine learning, applying critical thinking to problem-solving. | Assess students' capacity to analyze ethical implications and potential biases in machine learning through projects, case studies, and critical analysis essays, gauging their application of critical thinking skills and problem-solving strategies. | Written: Tests, assignments.  Verbal: Discussion/Presentations, case reviews.  Peer Review.  Lab/Coding.  Capstone Project |

*Please note: all programs must integrate in one or more courses, discipline-specific course learning outcomes that reflect the College learning outcomes of scientific/critical thinking and quantitative reasoning, oral/written communication, and information literacy.*

REVISED: June 2022

**Academic Policies:**

**See College Catalog and Student Handbook for more information on Union College:**

**Grading (click on link below)** <http://onlinecatalog.ucc.edu/content.php?catoid=5&navoid=824&hl=%22plagiarism%22&returnto=search#grading-grading>

**Student Code of Conduct** **(click on link below)**

<https://www.ucc.edu/images/owlsnest/201819-Union-County-College-Student-Handbook.pdf>

**Plagiarism Policies (click on link below)** <http://onlinecatalog.ucc.edu/content.php?catoid=5&navoid=824&hl=%22plagiarism%22&returnto=search#cheating-plagiarism>**.**