Introduction to Machine Learning

Machine Learning for All (Zero Textbook Course)

Institution:	Brooklyn College, City University of New York (CUNY)
Department:	Computer and Information Science
Semester:	Fall 2026 (14-week semester)
Credits:	3
Instructor:	Md Abu Hanif
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Class Time:	TBA
Location:	Brooklyn College, Room TBA
Office Hours:	By appointment (email to schedule)

1. Course Description

This course introduces the core principles and techniques of machine learning, with an emphasis on conceptual understanding, practical implementation, and responsible use. Students will study supervised and unsupervised learning methods, model evaluation, and the role of data in algorithmic decision-making.

The course is taught using **Open Educational Resources (OER)** and emphasizes hands-on learning through open-source software and publicly available datasets. Students will gain experience building, testing, and interpreting machine learning models while reflecting on ethical, social, and interpretive dimensions of machine learning systems.

2. Learning Objectives

By the end of the course, students will be able to:

1. Explain foundational concepts and algorithms in machine learning.
2. Implement machine learning models using Python and open-source libraries.
3. Apply supervised and unsupervised learning techniques to real-world datasets.
4. Evaluate and compare models using appropriate performance metrics.
5. Communicate technical results clearly through code, visualizations, and written analysis.
6. Demonstrate ethical awareness in data selection, model design, and deployment.

3. Prerequisites

- Programming experience in Python (e.g., CISC 1115 or equivalent).
- Linear Algebra is recommended (helpful for deeper understanding, but not strictly required).

Students without the recommended background should consult the instructor early in the semester.

4. Required Course Materials (Zero Textbook Course)

There is **no required commercial textbook**. All required materials are free and openly accessible.

Open Textbooks (Primary)

- *An Introduction to Statistical Learning (ISLP)*: https://www.statlearning.com
- *Dive Into Deep Learning (D2L)*: https://d2l.ai (PDF: https://d2l.ai/d2l-en.pdf)

Recommended (Support & Extension)

- *Mathematics for Machine Learning* (PDF): https://mml-book.github.io/book/mml-book.pdf
- *Probabilistic Machine Learning* (free draft): https://probml.github.io/pml-book/book1.html

Software (Open Source)

- Python: https://www.python.org/downloads/
- NumPy, Pandas, Scikit-learn, Matplotlib
- PyTorch (https://pytorch.org) **or** TensorFlow/Keras (https://www.tensorflow.org)

Datasets (Open)

- UCI ML Repository: https://archive.ics.uci.edu/ml
- OpenML: https://www.openml.org
- NYC Open Data: https://opendata.cityofnewyork.us
- Kaggle Open Datasets (license must be open): https://www.kaggle.com/datasets

5. Course Structure and Expectations

The course combines lectures, coding labs, scaffolded assignments, discussion, and a final project. Students should expect regular work in Jupyter notebooks, careful interpretation of results, and clear documentation of methods and assumptions.

6. Assessment and Grading

Component	Weight
Programming Assignments (4)	30%
Lab Work (6)	20%
Midterm Exam	20%
Final Project & Presentation	25%
Participation & Engagement	5%

Final Project (Capstone)

The final project is an applied machine learning project using an open dataset and a reproducible workflow. Students will submit a GitHub repository with a complete `README.md`, a reproducible notebook, evaluation results, and an ethics statement. Students will also deliver a short presentation (Week 14).

7. Late Work Policy

Assignments submitted up to 48 hours late incur a 10% penalty per day. Work more than 48 hours late is not accepted unless prior arrangements are made. Extensions may be granted for documented circumstances.

8. Collaboration and Use of AI Tools

Discussion and idea-sharing are encouraged. Unless explicitly stated otherwise, submitted code and writing must be your own.

AI tools (e.g., chat-based assistants) may be used for learning support (debugging, clarifying concepts), but students must:

- Understand and be able to explain any submitted work,

- Cite or disclose AI assistance when used,
- Avoid submitting generated solutions as their own.

9. Academic Integrity

Students must follow CUNY academic integrity policies. Open resources do not mean "free to copy without credit." All sources must be cited properly, and submitted work must reflect the student's own understanding and effort.

10. Accessibility and Accommodations

Brooklyn College is committed to providing reasonable accommodations for students with documented disabilities. Students who require accommodations should contact the Center for Student Disability Services and notify the instructor as early as possible.

11. Open Education Statement and License

This course is designated as a **Zero Textbook Course (ZTC)**. All instructional materials are available at no cost and are openly licensed or freely accessible.

12. Schedule Overview (14 Weeks)

A detailed week-by-week plan is available on the course site. Topics include:

- ML fundamentals; data exploration; regression and classification
- Optimization and regularization; trees and ensembles; SVMs
- Clustering and PCA; model evaluation and validation
- Neural networks and deep learning foundations
- Feature engineering; bias, ethics, and fairness
- Final project development and presentations

Note: This syllabus may be adjusted as needed based on class pace. Any updates will be announced on the course site.