

# Syllabus

## SWE 520 Software Engineering for Artificial Intelligence

### Syllabus V 1.0 – BETA

#### Course Information

Investigation of issues relevant to software engineering for systems that use artificial intelligence (AI) techniques such as machine learning or large-scale parallel data processing. Introduction to basic principles of pipelines, emphasizing the coding anti-patterns that developers may encounter when designing and implementing ML pipelines.

Associated Term: Summer 2025

CRN:[31802](#)[Links to an external site.](#)

Campus:Main

Schedule Type: Lecture/Assignments

Instructional Method: Online Asynchronous

Section Number: W1

Subject: Software Engineering

Course Number: 520

Title: Software Engineering for AI-Systems

Credit Hours: 4

Grade Mode: (A-E) course.

#### Instructor Information

Mohamed Wiem Mkaouer

[mmkaouer@umich.edu](mailto:mmkaouer@umich.edu)

Office: 383J

The instructor will try his best to answer questions as soon as possible. The response can be expected within a few hours; however, it can vary depending on the volume of questions and the instructor's determination of the best mode of responding to a student's question (face-to-face, email, Canvas, etc.).

If you need further assistance, please visit the CIS/CSC Support Office in 196 MSB (open Monday-Friday, 8 am – 5 pm).

## **Course Learning Outcomes and Expectations**

**Understanding ML Workflow:** Gain a comprehensive understanding of the end-to-end ML process, from data collection and preprocessing to model deployment and monitoring.

**Model Evaluation:** Develop skills in assessing the performance of ML models using metrics like accuracy, precision, recall, F1-score, and understand concepts such as overfitting and underfitting.

**Hyperparameter Tuning:** Learn methods for optimizing model performance through techniques such as grid search, random search, and more advanced methods like Bayesian optimization.

**Collaboration Techniques:** Develop skills for collaborating on ML projects using tools like Jupyter notebooks and cloud platforms (e.g., Google Colab, AWS, Azure).

**Identifying Code Smells:** Develop the ability to recognize standard code smells in machine learning projects, such as overly complex scripts, hard-coded parameters, and excessive logical branches.

Improving Code Quality: Learn techniques to refactor code to improve readability, maintainability, and scalability, such as modularization and appropriately using functions or classes.

**Course Tentative Schedule** ([Registrar Semester Calendar](#)[Links to an external site.](#))

Tentative Class Schedule	
Week	Topics
W01	Introduction/Course Overview
	Chapter 1. ML Pipelines Fundamentals
W02	Chapter 2. Data Leakage
W03	Chapter 3. ML Deployment
W04	Chapter 4. ML Popular Bugs
W05	Chapter 5. ML Antipatterns
W06	Chapter 6. APIs
W07	Final Project Report Due

### Individual Assignments

This set of assignments will be given throughout the term to reinforce class material and will help students better understand the theoretical part of the course. Every student is required to work individually on the class assignments. No group submission is allowed.

## Project

There will be a project for the course that enforces software engineering practices for AI. The topic can either be proposed by the student, from their own work, research, or proposed by the instructor. The instructor will provide topics for the students (e.g., improve an existing tool, literature review, empirical study between several tools, develop a new metric model, etc.). Each student must develop a preliminary solution and create their final report by the end of the semester:

## Deliverables

All activity submissions are due per the class schedule. All deliverables are through Canvas. If deliverables contain various types of files (documents, source code, videos, etc.) and their upload is tedious, you can use Google Drive to create a submission folder and submit the link as a deliverable. Each student is allowed to be late for submission twice a semester (2 grace periods). The maximum grace period is 24 hours. Late submissions, beyond grace periods, are allowed with a 10% penalty applied to the grade every 24 hours. No individual extensions are permitted to ensure fairness between students. the professor recommends handing in unfinished work for partial credit instead of no submission at all.

## Grade Distribution

Assignments 70%

Project 30%

The following tables will be used to determine your letter grade at the conclusion of the course:

Grade	Range
A+	97 or above

A	93 or Above
A-	90 or Above
B+	87 or Above
B	83 or Above
B-	80 or Above
C+	77 or Above
C	73 or Above
C-	70 or Above
D	60 or Above
F	<60

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### **Meta-Cognition**

In order to facilitate learning, we would like you to assess your mastery of the different topics. We refer to your assessment of your own learning as meta-cognition