UNIVERSITA' DEGLI STUDI DI TRIESTE
DIPARTIMENTO DI INGEGNERIA E ARCHITETTURA
LAUREA MAGISTRALE IN INGEGNERIA INFORMATICA

440MI - DATA-DRIVEN SYSTEMS ENGINEERING
305SM - MACHINE LEARNING OPERATIONS

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Exam

Exam Overview

The exam project must include a machine learning kernel (either online or batch), such as a recommendation system, prediction model, or forecasting module. Each project may include up to five students (suggested 3), each playing a distinct role. Recommended roles include: Project Manager, Data Scientist(s), and Developer(s). Every team must produce and submit three documents that reflect key phases of MLOps and data-driven systems engineering and present the developed project.

Although the project is executed in teams, the final evaluation includes an individual discussion with each student. During this oral assessment:

- One of the three submitted documents (Specification Document, Project Proposal & Development Plan, or Operational Governance & Versioning) will be randomly selected by the instructor.

- The student must demonstrate:

    - Full understanding of the content of the selected document
    - Knowledge of the decisions taken by the team
    - Familiarity with the technical and methodological approaches used
    - Ability to justify choices, alternatives considered, and MLOps reasoning

The student must be able to explain any part of the project, not only the section related to their assigned role. This ensures individual accountability and confirms that each member contributed meaningfully to the collective work.

Document 1 — System Specification Document (SSD)

Purpose: Evaluate the student's ability to analyze a data-driven problem, define system requirements, and design an MLOps architecture.

- Contents:

    - Problem Definition: business problem, ML formulation, KPIs.
    - Data Specification: sources, flow, quality, preprocessing.
    - Functional Requirements.

- Non-Functional Requirements.
- Project Architecture: training, validation, deployment, monitoring.
- Risk Analysis.

Document 2 — Project Proposal & Development Plan

Purpose: Evaluate the team's ability to plan, structure, and manage a complete MLOps development lifecycle, including scheduling, deliverables, and milestones.

- Contents:

  - Project Summary: scope, objectives, relevance.
  - Deliverables: data pipeline, ML kernel, CI/CD, monitoring.
  - Milestones.
  - Work Breakdown Structure (WBS).
  - Gantt-style Schedule / Sprint Plan.
  - Definition of Done (DoD) and Definition of Ready (DoR).
  - Resources & Infrastructure.

Document 3 — Operational Governance & Versioning Document

Purpose: Evaluate the student's understanding of operational governance, version control, model lifecycle management, and monitoring practices.

- Contents:

  - Version Control Strategy: branching, tagging, versioning of code/data/models.
  - CI/CD & Automation.
  - Model Lifecycle Governance: model registry, reproducibility, experiment tracking.
  - Monitoring & Maintenance Plan: drift detection, incident response.