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MSDS 603 MLOps Assignment 1 – Part 2 (2.5%)
Requirements Gathering

In this assignment, you will gather the requirements for building a specific AI/ML-powered product. You will need to identify the business and technical requirements, assess potential risks, propose mitigation strategies, and outline the high-level components needed for successful implementation of the product. You **will not** need to actually build the product.

Learning Objectives

- Apply MLOps principles to a real-world product scenario
- Practice requirements gathering and analysis for ML systems
- Identify potential risks in ML systems and develop mitigation strategies
- Understand the core components required in an ML product pipeline

Scenario

An EdTech company is developing a personalized learning platform for K-12 students. The platform will use machine learning and AI to analyze student performance data from standardized tests and ongoing assessments within the platform to create customized learning pathways for each student. The system should adapt in real-time to student progress, identifying knowledge gaps, recommending appropriate learning activities, and adjusting difficulty levels to maximize learning outcomes while maintaining student engagement. The platform must eventually work across various subjects, but for now we will focus only on ***reading comprehension***. Ideally, it should accommodate different learning styles, comply with educational privacy regulations (like FERPA), and provide actionable insights to teachers and parents through intuitive dashboards.

Requirements

This assignment is done in **two parts**. Part One was already completed in class, and your answers to Part One should be available to you in Gradescope. Complete Part Two below at home and turn in to Canvas. If you did not attend class for Part One, you must accept a zero grade for this assignment since Part Two depends on your answers to Part One.

Part Two

In this part, use ***any resources you want*** (e.g. team members, internet, AI) to help you answer the below questions. Type your answers directly in this word doc.

Question 1: Define an additional two goals for this project.
Increase Student Engagement – Ensure students are not only learning effectively but are also engaged and motivated throughout their personalized learning journey.

Enable Teacher Feedback Loops – Provide timely, actionable insights to teachers that allow them to intervene, adjust curriculum pacing, or provide personalized support.
Question 2: For each additional goal from Question 1; define a metric to measure success of that goal.
Increase Student Engagement:
Metric – Average session duration per student and frequency of logins per week. High engagement would be reflected in longer sessions and consistent weekly use.

Enable Teacher Feedback Loops:
Metric – Time to insight: the average time between a student performance anomaly and teacher dashboard notification. Additionally, track the number of teacher interventions triggered by platform recommendations.
Question 3: Briefly describe data governance considerations for the data sources you previously identified in Part One. Be sure to include data privacy and data quality requirements.

The platform's data—user profiles (test scores, age, name, interests, strengths, and weaknesses), user chats, and teacher curriculum—must comply with FERPA and COPPA regulations. Personally identifiable information should be encrypted and access restricted to authorized users. User chats require anonymization and filtering to protect student privacy. To ensure data quality, all sources must be accurate, timely, and consistently formatted. Validation pipelines should be in place to keep student profiles current, align curriculum data with learning objectives, and clean chat inputs for analysis.
Question 4: Identify an additional two risks associated with this product and the potential impact of each risk.

Algorithmic Bias: If training data reflects existing biases (e.g., socioeconomic, linguistic), the platform may perpetuate or amplify inequities.

Impact: Some students may receive unfair recommendations or lack appropriate support, reinforcing achievement gaps.

Model Drift: As student behavior evolves over time, the ML models may become less effective without retraining.

Impact: Degraded personalization quality, leading to lower learning outcomes and user trust.

Question 5: For each additional risk identified in Question 4; propose a strategy to mitigate the risk.

Algorithmic Bias:

Mitigation: Perform fairness audits during development and post-deployment, use diverse training data, and incorporate bias mitigation techniques such as reweighting or adversarial de-biasing.

Model Drift:

Mitigation: Implement model monitoring to detect shifts in input data distribution or output performance. Schedule periodic model retraining using recent data and enable version control for rollback.

Question 6: Describe, in words, any additional major architectural components needed for this product that you did not already include in Part 1 and how those components interact with each other and with components that you described in Part 1.

Real-Time Inference Engine: This component processes student actions on the platform (e.g., quiz responses, time spent per question) and provides immediate feedback or content recommendations. It interacts with the model serving layer from Part 1 and pulls data from the student activity stream.

Question 7: What other resources did you use to help answer these questions this time?

EdTech privacy guidelines (FERPA/COPPA overview articles)

Google searches for real-time inference and fairness in education ML systems

Claude

Question 8: Reflect on how you answered each question in Part One when you were working solo and compare it to Part Two. For each question 1-6, write down one thing you learned by answering the question again with assistance and resources. For example: "I learned about the existence of metric X, and that the metric I wrote down in Part One is actually not that useful for this problem."

1.) I learned that using an existing large general model is a better use of time than trying to reinvent the wheel.

2.) I learned that implicit feedback can be just as useful if not more useful than survey results.

3.) I learned that user chats can be used to create incredible powerful inferred features about our user (by an LLM with world knowledge).

4.) I learned that protecting the user's privacy in this case would likely require deploying the model on the user's device, or if the model was too large we would neeed to anonymize data before sending it anywhere.

5.) I learned that the model would likely experience constant drift as studnets learn and would need to be constantly retrained.

6.) I learned I need to spend mroe time with architecture lol.

Turning it in

Please type your name at the top of the first page, save as ***pdf***, and submit to Canvas.