CS 846 Software Engineering for Big Data and AI

Streamlining AI: A Review of CI/CD Methodologies in ML Environments

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This project presents a literature review on the current trends, practices, and challenges of CI/CD methods within the ML domain. CI/CD is a method used in software development for integrating and deploying code into production. The motivation behind this project stems from the lack of comprehensive reviews on CI/CD in ML-based applications. The objective of this project is to gather and synthesize current knowledge, identify CI/CD best practices, and bridge the gap between research and practical implementation while providing areas for future research. It aims to conduct a rigorous examination of CI/CD to understand aspects such as its differences from traditional software development while addressing the nuanced challenges that AI/ML development presents.

Strengths

- Highly Relevant Area: Given the increasing emphasis and popularity of AI/ML and its application of CI/CD methodologies, help address an important literature gap in research.
- Clear Methodology: The methodology and approach illustrated are clear, with concise filtering of inclusion and exclusion criteria.
- Comprehensive Study: The scope of the research is comprehensive, as it considers scalability, reproducibility, and best practices, which are all critical components of effective CI/CD in ML.

Weaknesses

- Unclear Impact: The project does not detail how the impact of CI/CD methodologies on ML project success will be measured, which is important for validating the research outcomes.
- Possible ML Variability: Given that most ML projects vary greatly in terms of size, complexity, and resource requirements, and the study is in CI/CD pipelines, the variability could affect the generalizability of its findings.
- Research vs. Industry: The industry usage of CI/CD in ML may differ from that in the research field; as such, the outcomes of the study may only be generalizable to a certain extent.

Suggestions for Potential Improvements

- Include threats to validity, discussing the limitations of the case study, and acknowledging the scope of the research findings.
- Could consider including empirical validation (such as case studies or empirical studies) on the proposed best practices (RQ2). This will help strengthen the impact of the research.
- For RQ1, include a comparison of the various conventional CI/CD methods in assessing their capabilities, providing better analysis and depth of literature reviews.
- For all RQs, include evaluation metrics that are related to CI/CD when answering the RQs (such as model quality, deployment frequency, etc.); this will help establish better reviews.
- Enhance the methodology section to bolster the research's rigor by adding more details that outline the synthesis process.