FINTECH PRACTICUM

STATEMENT OF WORK

Wells Fargo - Explainable Machine Learning

Client:
Wells Fargo

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1 INTRODUCTION

1.1 Firm Overview

Wells Fargo Company (NYSE: WFC) is a leading financial services company with corporate headquarters based in San Francisco. The company has approximately 1.9 trillion in assets and proudly serves one in three U.S. households and more than 10 percent of all middle market companies and small businesses in the U.S. Wells Fargo provides a diversified set of banking investment and mortgage products and services, as well as consumer and commercial finance, through our four reportable operating segments: Consumer Banking and Lending, Commercial Banking, Corporate and Investment Banking, and Wealth and Investment Management.

1.2 Problem Background

Wells Fargo is developing an integrated Python toolbox for interpretable machine learning, PiML (or π-ML, /ˈpaɪˈemˈel/). The toolbox was released in May, 2022 and serves the mission of allowing more non-technical employees inside and outside the company to understand how lending decisions are made.

1.2.1 Relevant Definitions

- Interpretable Machine Learning: A subfield of artificial intelligence and machine learning that aims to make machine learning models more transparent and explainable to human users. This expands beyond the traditional uses of AI/ML that focuses on building accurate prediction making models, but also provides insights into how the predictions were made, so that the decision-making process can be easily understood and scrutinized.

1.3 Project Background

Working on this project is a team of four students attending Claremont McKenna College: Alyssa (Aly) Gallagher, Everett Butler, Jingyi (Jenny) Li, and Reina Bhatkuly.

The team is working under the guidance of faculty advisor Mike Izbicki, Assistant Professor of Computer Science at Claremont McKenna College.

2. PROBLEM STATEMENT

AI/ML models allow for a company to make highly predictive decisions, but lack the ability to easily explain the inner workings of the model. Thus, issues may arise when decisions cannot be explained, particularly in the banking industry where the consequences of AI-based decisions can be significant and decisions must be transparent. To address this problem, the use of interpretable machine learning tools can allow for a company to better understand the machine learning algorithms they use for decision making.

3. OBJECTIVES

3.1 Exploratory Research and Model Review

- Conduct a literature review to understand PiML's foundations and applications
- Gain a solid understanding of the concepts of black box models, model explainability, and variable importance
- Track our own user onboarding experience and note confusions/obstacles to compile feedback for the PiML team

3.2 Supplement Documentation

- Confirm that we understand what the low-code usage example performing on the main PiML page
- Add documentation referencing outside literature to improve a beginner's user onboarding experience on the main page

3.3 Provide an additional case study to improve internal model

- Complete 2-3 performance comparison case studies, at least 1 using data related to financial industry
- Test to see if interpretable model can produce comparable model performance to an open source black box model
    - Hypothesis: Interpretable model can usually as good as black box
    - Identify performance weaknesses of the interpretable model
- Focusing on at least two of the three models
    - EBM: Explainable Boosting Machine (Nori, et al. 2019; Lou, et al. 2013)

- GAMI-Net: Generalized Additive Model with Structured Interactions (Yang, Zhang and Sudjianto, 2021)
- ReLU-DNN: Deep ReLU Networks using Aletheia Unwrapper and Sparsification (Sudjianto, et al. 2020)

4. DELIVERABLES

- A document with a comprehensive list of resources we used to research and understand PiML. This could be added as a reference page within the repository to improve user onboarding.
- 2-3 supplemental case studies that identify performance comparisons

5. TIMELINE

Week 3: SOW
Week 5: Objective 3.1
Week 6: Midterm presentation
Week 9: Objective 3.2
Week 13: Objective 3.3 or 3.4
Week 14: Final Presentation