Project Proposal: Generating FEN Notations from Chess Board Images

Project Overview This project is aimed at developing a deep learning model capable of identifying and classifying positions on a chessboard and translating these positions into Forsyth-Edwards Notation (FEN). By accurately recognizing different chessboard configurations from images, our model will provide valuable insights into game analysis and strategy, further enhancing AI applications in chess.

Problem Selection We selected this problem to explore the intersection of machine learning and game theory, particularly how AI can automate and enhance game analysis in chess. The ability to convert images of chess games directly into FEN notations offers practical applications in digital game analysis, online chess platforms, and educational tools.

Dataset We will use a comprehensive dataset available on Kaggle, consisting of images of chessboards annotated with corresponding FEN notations. This dataset is substantial enough to train deep learning models, including thousands of labeled images that provide a variety of board positions and game stages.

https://www.kaggle.com/datasets/koryakinp/chess-positions

Deep Network and Framework Our approach will involve experimenting with several deep learning models:

- **AlexNet**: For baseline performance measures.
- **EfficientNet**: For its efficiency and effectiveness in handling image data.
- **Vision Transformers (ViT)**: To leverage recent advancements in attention-based models.
- **YOLO (You Only Look Once)**: For real-time object detection, particularly useful in handling images with varied backgrounds and live analysis.

We will implement these models using the PyTorch framework due to its flexibility, ease of use, and strong community support. PyTorch also integrates well with Captum, which we plan to use for model interpretability.

Reference Materials We will rely on academic papers, documentation, and tutorials related to the networks we plan to use. Specifically, we will study current literature on EfficientNet and Vision Transformers to understand their application in image recognition tasks.

Performance Metrics Performance will be judged based on the accuracy of FEN notations generated from the test images. We will also consider the precision and recall of piece

detection on the chessboard, particularly under different lighting and background conditions.

Schedule

- **Week 1-2**: Dataset collection and preprocessing.
- **Week 3-4**: Implementation of baseline model (AlexNet).
- **Week 5-6**: Advanced models implementation (EfficientNet and ViT).
- **Week 7**: Integration with YOLO for object detection.
- **Week 8-9**: Model training and validation.
- **Week 10**: Frontend development using Streamlit.
- **Week 11-12**: Testing and refinement.
- **Week 13**: Final review and presentation preparation.

Conclusion Through this project, we aim to push the boundaries of how AI can interact with and analyze strategic games like chess. By bridging deep learning with game theory, we hope to create a tool that is not only academically interesting but also practical for various applications in the real world.