DEEP LEARNING PROJECT REPORT

**Project Title**: Player Behavior Analysis and Dropout Prediction in Digital Games

Student Name/ Student ID:

**KAĞAN KILIÇ - 47368026556**

**ARDA RENDA - 47206480236**

**FURKAN ÇİMİLİ - 50776079090**

---

**1. Introduction**

In this project, player behavior data in digital games was analyzed to predict player dropout (churn). Real player data obtained from Steam was used to train a deep neural network (DNN) based prediction model. The project aims to provide valuable insights for player retention, marketing strategies, and game design.

**2. Problem Definition**

Player dropout is a major issue in the digital gaming industry. Players may show distinct behavioral patterns before quitting a game. Detecting these behaviors and building a forward-looking prediction model can help game companies take timely action.

**3. Dataset**

Source: Valve SteamCharts

File: Valve\_Player\_Data.csv

Features:

- Month\_Year, - Avg\_players, - Gain, - Percent\_Gain, - Peak\_Players, - Game\_Name, - Date

These features were preprocessed and new features were engineered:

- Gain\_Ratio

- Gain\_Direction

- Volatility

- churn (label)

**4. Data Preprocessing and Feature Engineering**

The dataset was cleaned, infinite/missing values were handled, and new features were created. Features like Gain\_Ratio, Gain\_Direction, and Volatility proved to be highly effective in predicting churn.

**5. Modeling**

Method Used: Deep Neural Networks (DNN)

**Model architecture:**

- Dense(64) + ReLU + Dropout(0.3)

- Dense(32) + ReLU

- Dense(16) + ReLU

- Dense(1) + Sigmoid

The model was trained for 50 epochs and achieved 100% accuracy on the test set.

**6. Results**

Test Accuracy: 100%

Confusion Matrix:

[[512, 0], [0, 520]]

**SHAP Analysis:**

- Most important feature: Gain\_Direction

- Followed by: Gain, Gain\_Ratio, Avg\_players, Peak\_Players, Volatility

- The model’s decision-making process is explained through SHAP visualizations.

**7. Discussion**

The model's success is the result of balanced dataset distribution and meaningful feature engineering. However, to avoid overfitting, extended datasets and cross-validation tests are recommended.

**8. Conclusion and Recommendations**

This project represents a successful application of deep learning in churn prediction. The system can be used by game companies for retention strategies and behavioral monitoring. In the future, larger datasets and in-game interactive behaviors can be incorporated.

**9. References**

- SteamCharts.com

- SHAP Official Documentation

- TensorFlow, scikit-learn, matplotlib

---

**Appendices:**

- Training and validation loss plot

- SHAP summary plot

- Confusion matrix outputs and example rows from prediction results