Predicting Mortgage Rate During Economic Uncertainty

Puja KC
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Problem Statement

- The 30 year mortgage rate is increasing rapidly and potential home buyers are in a confused state of whether to lock the rate now or wait
- All of us are waiting eagerly for interest rate to drop but we don’ t know when?
- To solve this problem I wanted to develop a robust machine learning model to predict mortgage rate

Introduction And Project Overview

Importance of predicting Mortgage Rates:

- Crucial for financial institutions, investors, policymakers, and homebuyers
- Impact of mortgage rate on the economy and individual financial decisions

During economic uncertainty :

- Traditional methods often fail so we need to seek newer alternative
- Need advanced techniques to account for rapid changes and external models

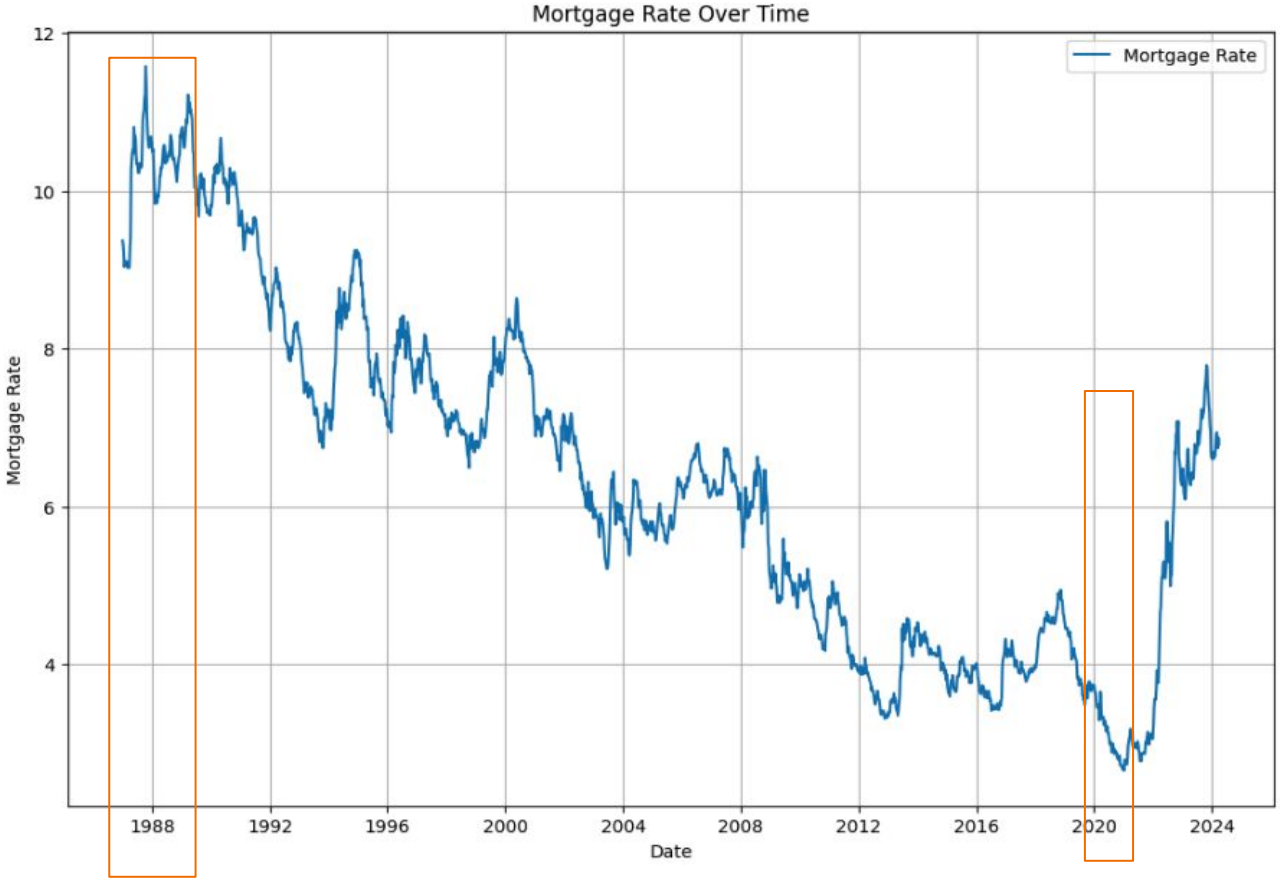
Project Approach

- Develop and compare multiple predictive model
- Sentiment analysis of FOMC meeting minutes to check the impact on mortgage rate

Steps followed

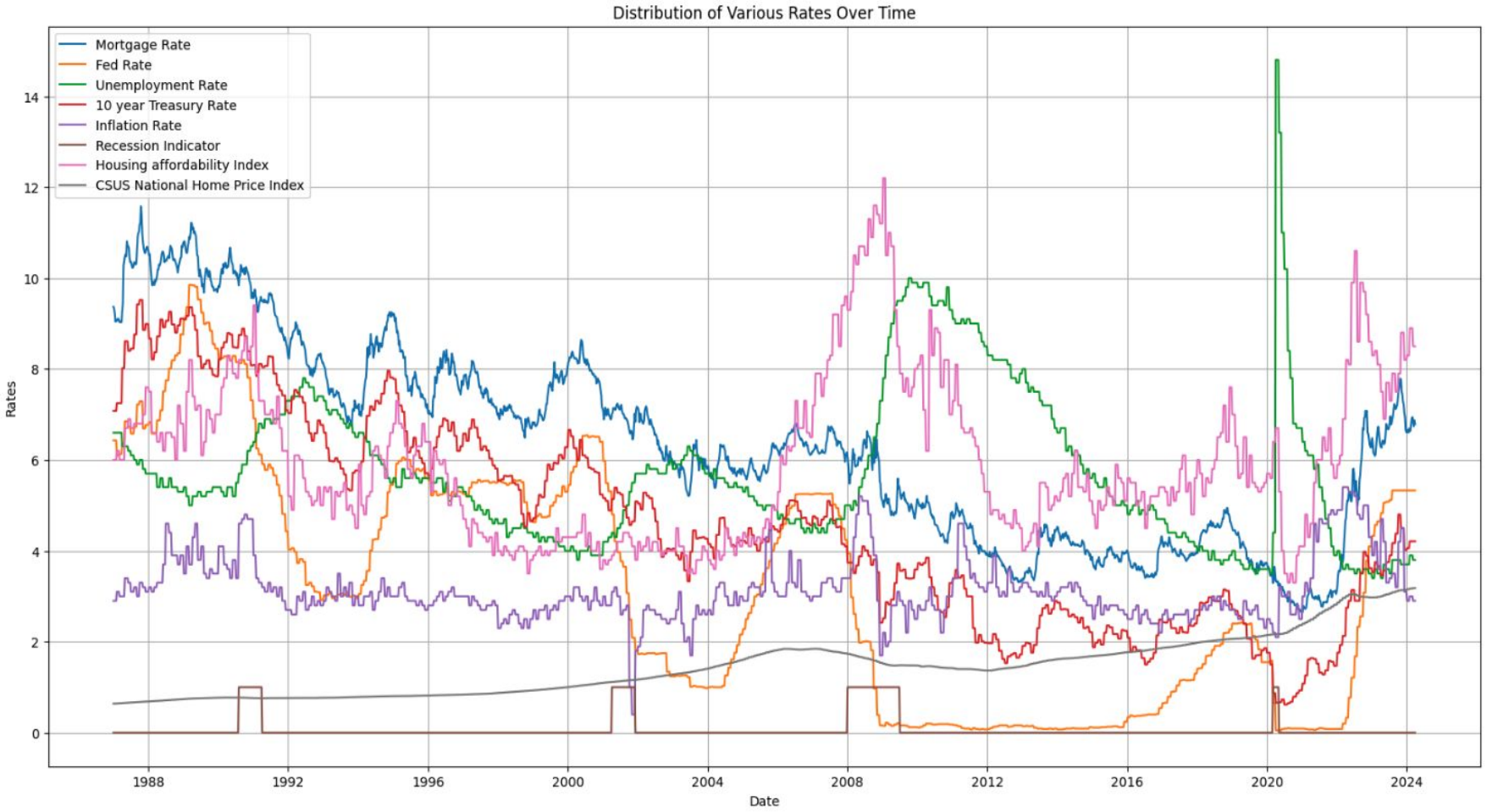
- Data was collected from Federal Reserve Bank of St. Louis and Kaggle
- Data cleaning and EDA
- Preprocessing the data
- Sentiment Analysis of FOMC meeting minutes
- Model Creation And evaluation

Mortgage Rate Over Time



Impact of Recession and Unemployment

10 Year Treasury Rate And Mortgage


Distribution of Various Rates Over Time
Mortgage Rate
Fed Rate
Unemployment Rate
10 year Treasury Rate
Inflation Rate
Recession Indicator
Housing affordability Index
CSUS National Home Price Index
Rates
Date
0
2
4
6
8
10
12
14
1988
1992
1996
2000
2004
2008
2012
2016
2020
2024

Models Created:

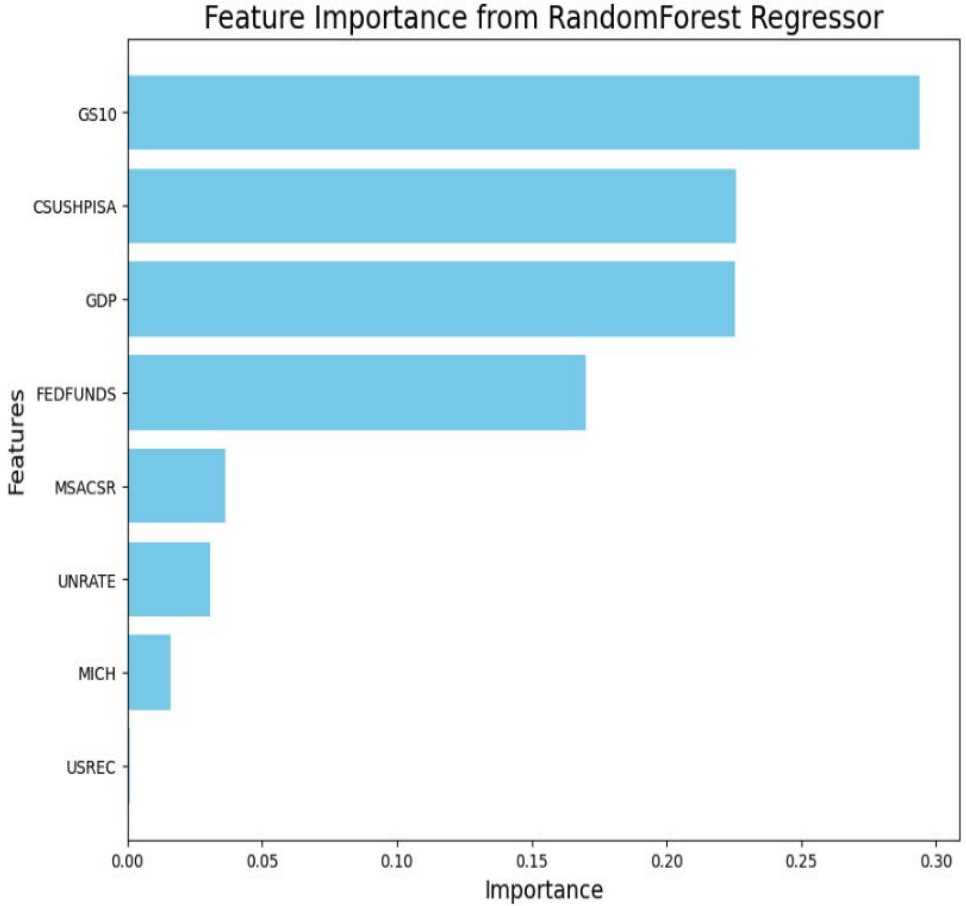
Regression Models:

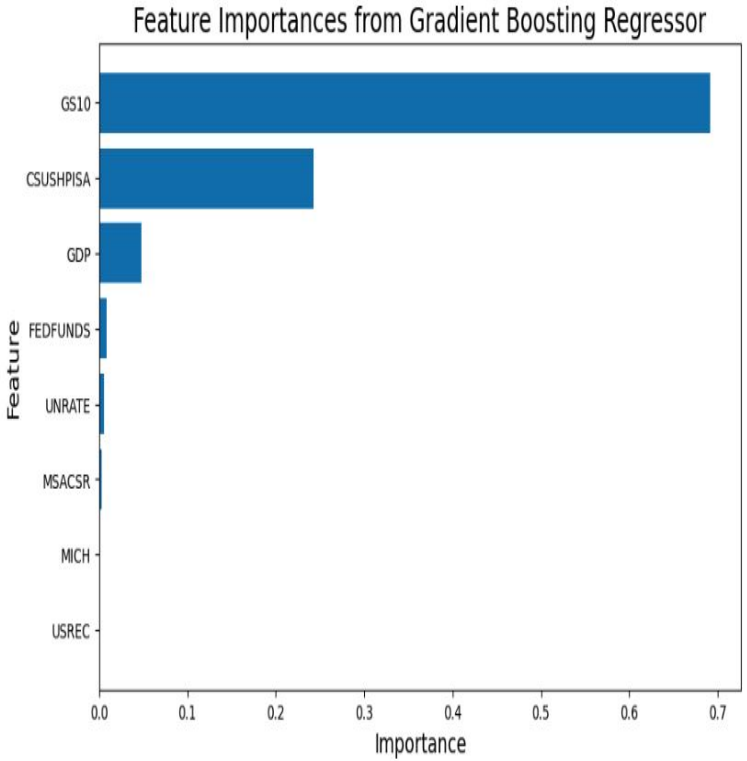
1. Ordinary Linear Regression(OLS)
2. Random Forest Regressor
3. AdaboostRegressor
4. Gradient Boost Regressor

Neural Network Model:

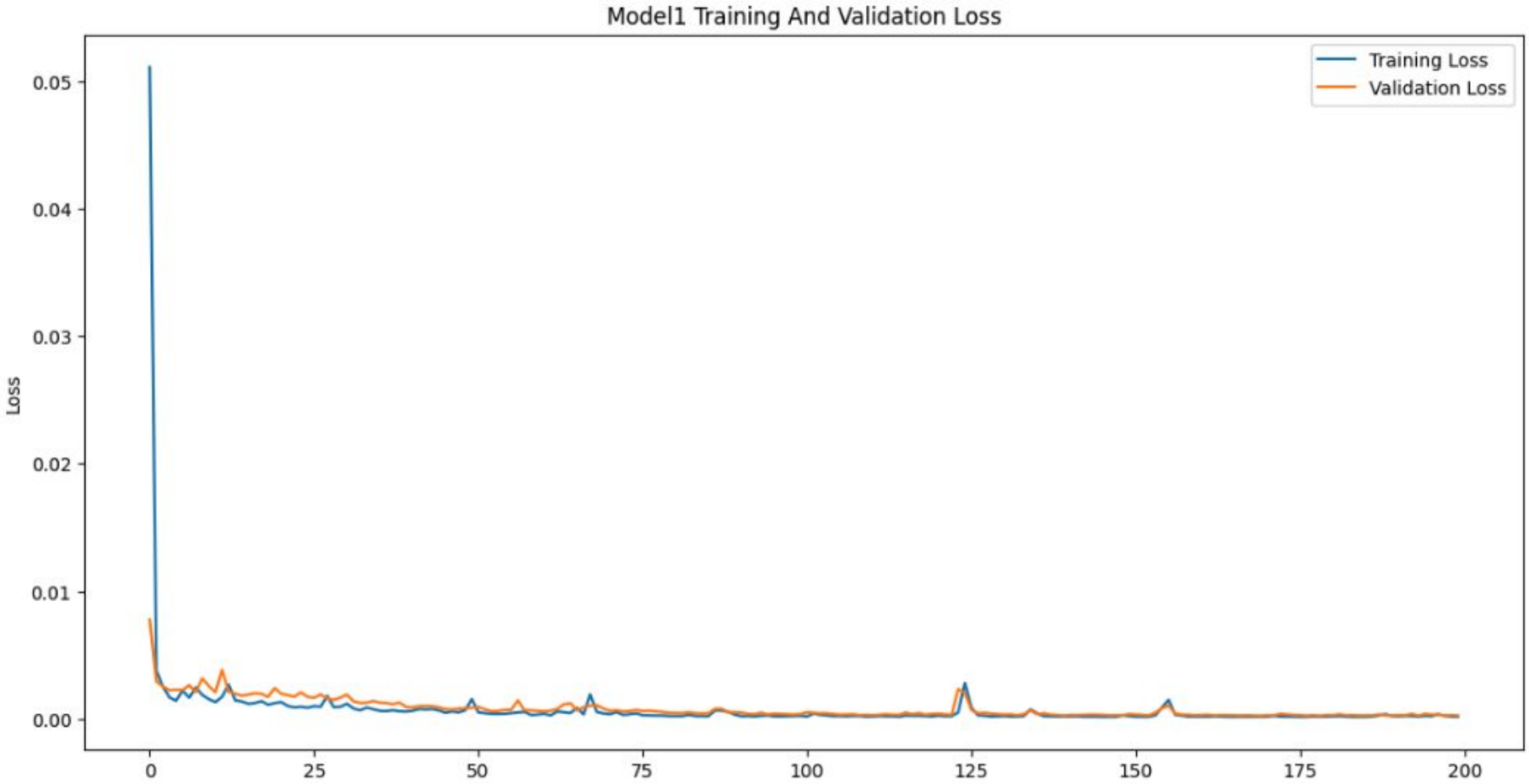
1. Long Short-Term Memory(LSTM)

GB RMSE 0. 1146, Rsquared 0.998 LSTM 0.1294

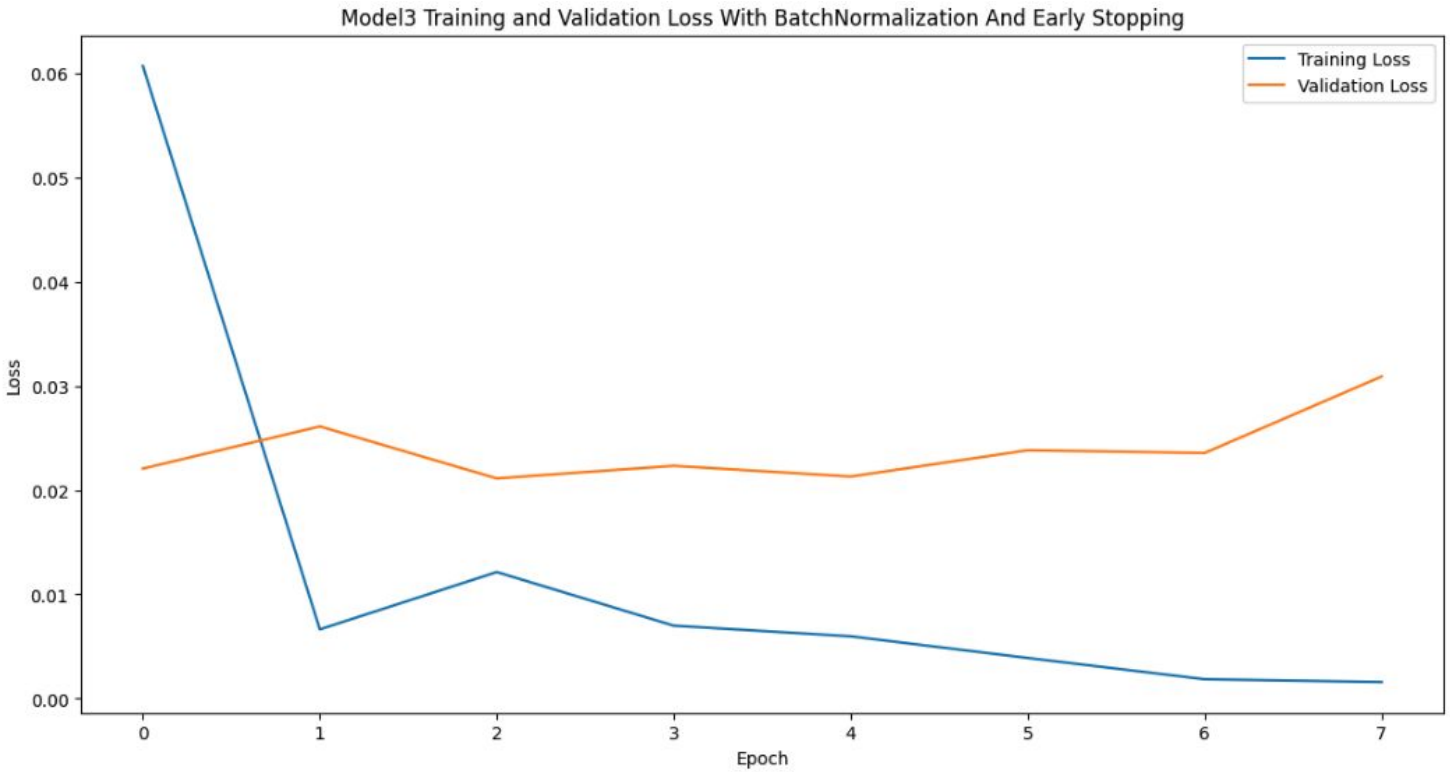

Feature Importance from RandomForest Regressor
GS10
CSUSHPISA
GDP
FEDFUNDS
MSACSR
UNRATE
MICH
USREC
Features
0.00
0.05
0.10
0.15
0.20
0.25
0.30
Importance


Feature Importances from Gradient Boosting Regressor
GS10
CSUSHPISA
GDP
FEDFUNDS
UNRATE
MSACSR
MICH
USREC
Feature
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
Importance

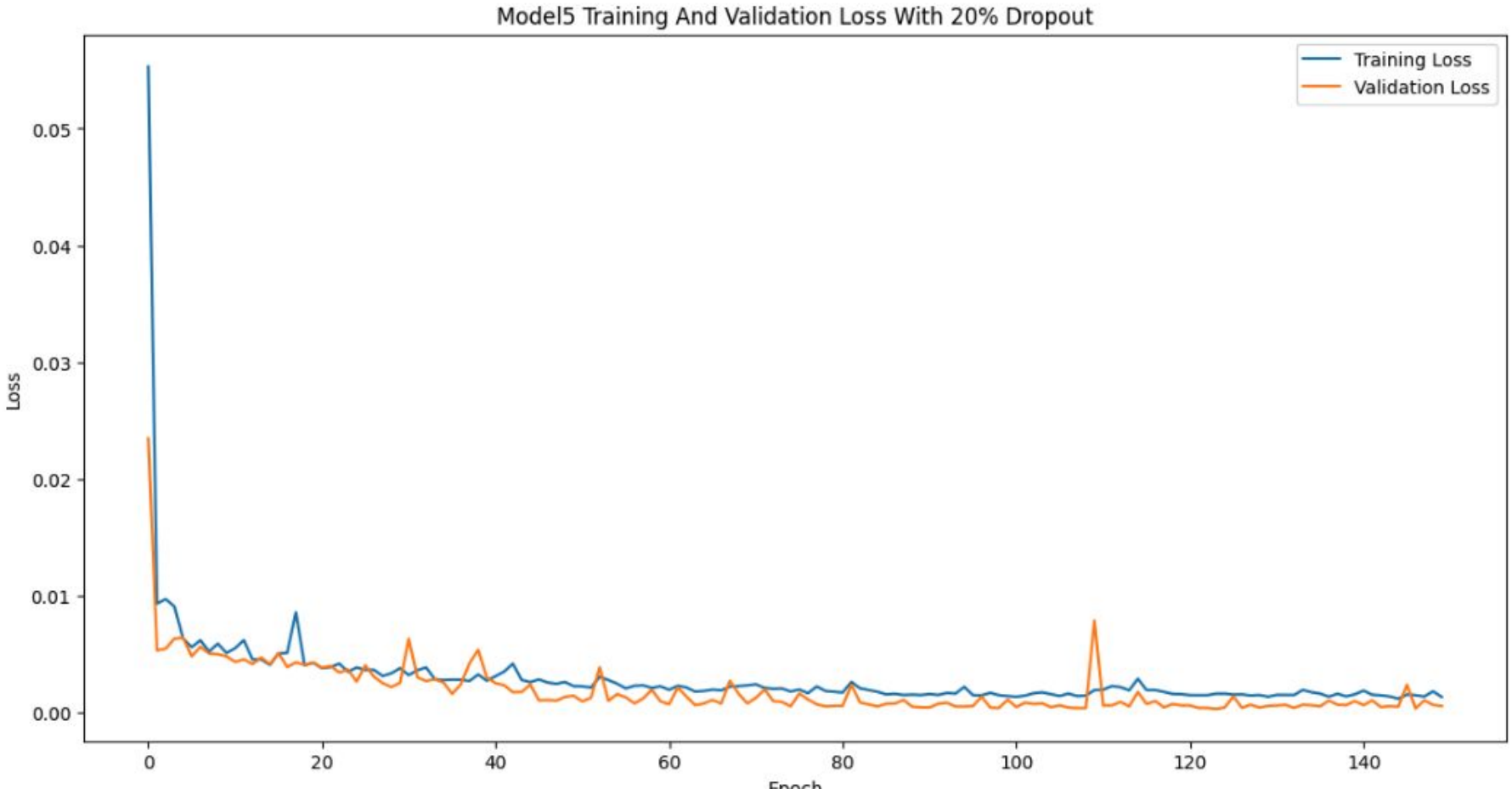
LSTM 1: 128 , LSTM2 :64

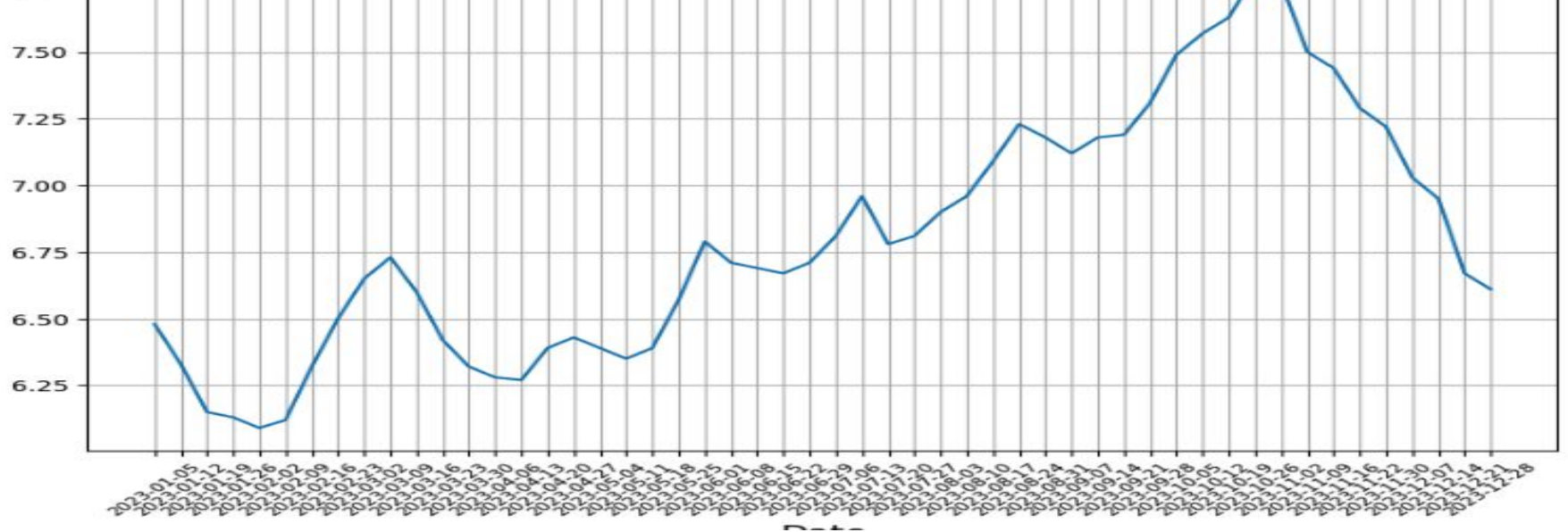


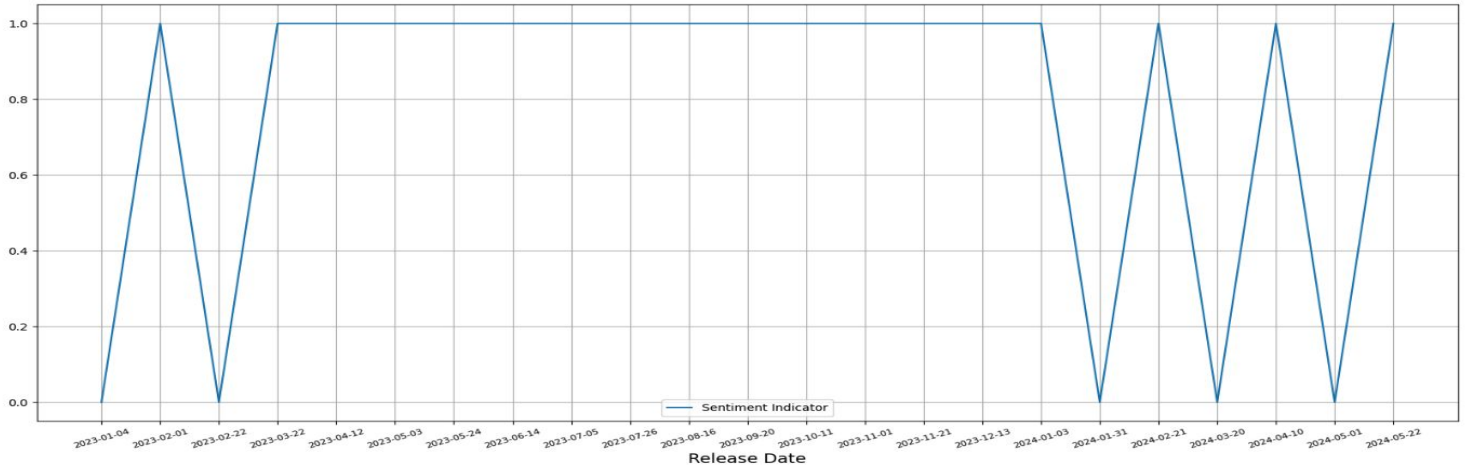
Added Batch Normalization and early stopping



Adding Drop out did not help




7.50
7.25
7.00
6.75
6.50
6.25


1.0
0.8
0.6
0.4
0.2
0.0
Sentiment Indicator
Release Date

Stakeholders Benefited

- Financial Institution: Enhanced rate setting and risk management
- Homebuyers: Accurate Mortgage rate forecasts for better decision-making
- Investors can get improved investment strategies
- Policy Makers: Understanding the impact of economic policies on mortgage rates

Conclusion And Recommendation

- The Gradient boost and LSTM had comparable performance
- More features can be collected to see the impact on Mortgage rate.
- It is possible that external economic factors are important in predictive modeling
- Multivariate LSTM time series model can be created
- Also Sentiments can actually be added into the model in order to get the more accurate prediction

THANK YOU !