**Machine Learning (Tutorial-Based Study)**  
📌 Project Context  
This project was developed as part of my studies in Machine Learning applied to the financial market, based on an online tutorial. The code was implemented, analyzed, and adapted for personal learning purposes, with the goal of understanding in practice:  
• How to apply ML models to financial time series  
• The challenges of predicting asset prices  
• Preprocessing techniques for financial data  
• Comparison between different approaches (Linear Regression vs. Neural Networks)

🔍 Source Material  
The initial code was adapted from the tutorial available at: <https://www.youtube.com/watch?v=BfNdUOnhKEI&t=1742s>

🛠️ Technologies Used  
Python 3  
• Main Libraries:  
• yfinance - Market data collection  
• pandas - Data manipulation  
• scikit-learn - ML models (Linear Regression and MLP)  
• matplotlib - Results visualization

📈 Methodology  
• Data Collection: 5 years of historical data for ITUB3.SA via Yahoo Finance  
• Preprocessing:  
• Calculation of moving averages (5, 14, and 21 days)  
• Data normalization (MinMaxScaler)  
• Modeling:  
• Linear Regression (baseline)  
• MLP Neural Network (Multilayer Perceptron)  
• Validation:  
• Train/test split  
• Metric: Coefficient of Determination (R²)

📊 Results Obtained  
• Model | R² Score | Observations  
• Linear Regression | 99.84% | Best performance  
• Neural Network (MLP) | 94.01% | Sensitive to parameters

💡 Key Learnings  
• Financial time series are challenging due to high volatility  
• Feature Engineering (e.g., moving averages) is crucial for improving predictions  
• Simple models can outperform in certain scenarios  
• The importance of careful validation to avoid overfitting

🚀 Implemented Improvements  
• Added more comprehensive visualizations of results  
• Implemented next-business-day prediction  
• Added robust error handling  
• Detailed code documentation