Architecture Style

Conceptual Architecture

The Conceptual Architecture Design Diagram gives an overview of the components involved in a financial analysis system that uses machine learning for stock prediction. The system includes user interaction, data management, machine learning predictions, and an administrative panel for monitoring and adjustments

Main Components and Their Interactions

1. **User**
   - The system's user interacts with the Frontend, which is the primary interface for requesting information and interacting with stock data.
   - User Requests and Responses are directed through the frontend.
2. **Frontend**
   - The Frontend is responsible for interacting with the User and forwarding the request to the Backend.
3. **Backend**
   - Backend is the core processing component.
   - It handles user requests and responses, manages credentials, and communicates with other system components.
   - The Backend also interacts with the User Manager to retrieve user credentials and information from the Database.
   - The backend manages Email Notifications, which are sent via an SMTP server.
4. **User Manager**
   - The User Manager maintains the user data, including credentials and watchlists.
   - The watchlists are stored in a Database and accessed for tracking stock performance and notifying users.
5. **SMTP Server**
   - Responsible for sending Email Notifications to users based on their preferences (new predictions for stocks)
6. **Database**
   - Stores Users, credentials, and watchlists that the User Manager accesses.
   - Data stored in the database includes the User Watchlist.
7. **ML Module**
   - The Machine Learning Module makes Stock Prediction Analysis.
   - It receives data from the Backend and uses Stock Data obtained from an External Source.
   - ML Predictive Models are continuously trained via an Automated Training Pipeline.
   - The ML Module also uses Cloud Storage to handle stock and model data, making it available for predictions.
8. **Cloud Storage**

  - This is used for storing Stock Raw data and Machine Learning Models (in .pkl) used by the ML Module.

9. **External Source**
   - The External Source provides Stock Data for the ML Module to process.
10. **Admin Panel**
    - The Admin Panel is used by the Admin (with email admin@example.com) to see the Model Performance, perform monitoring, and analyze stock prediction quality.
    - It helps in controlling aspects of the system, such as updating the predictive models.

Execution Architecture

The Execution Diagram shows a functional flow or execution of the overall system

Main Components and Interactions

- GUI (Graphical User Interface) and Admin Panel
  - The GUI represents the front end of the system that the User interacts with.
  - The Admin Panel is used by the Admin for overseeing and maintaining the system.
  - Both communicate via HTTP with the Backend.
- Backend
  - Backend is central in managing user requests and leading communication among components.
  - It sends and receives data from different components to maintain system state.
  - It communicates with the SMTP Server for sending email notifications.
  - It also interfaces with both Database and Cloud Storage to extract and store information.
  - The Backend also plays a role in communicating with the ML Module and other components, ensuring smooth system operation.
- SMTP Server
  - The SMTP Server manages email functionalities, allowing notifications to be sent to users.
  - It receives the data (e.g., email templates) from the Backend.
- Database and Cloud Storage:
  - Database handles persistent user information and other critical data.
  - Cloud Storage stores data that needs to be processed by the ML Module, including raw historical stock data.
- ML Module
  - The ML Module is responsible for executing Stock Prediction Analysis.
  - The predictions are based on data retrieved from Cloud Storage.
  - The ML Module works with the Backend to provide the results to the frontend.
  - It also interfaces with the Training Pipeline for updating the model with new data.
- Training Pipeline

  - The Training Pipeline automatically trains the model using data provided by the External Source.
  - The ML Module uses this trained model to enhance predictions.
- External Source
  - The External Source provides real-time or historical stock data.
  - The data is passed to the Training Pipeline to help update the ML Predictive Models.

Implementation Diagram

- Client Layer
  - Web Browser**:** This is where users interact with the application which is built by: HTML5, CSS, and JavaScript.
- Django Web Server
  - Views **-** Handle incoming HTTP requests and render HTML templates.
  - Models **-** Define the structure of the database using Django's ORM.
  - APIs - Expose RESTful endpoints using Django REST framework for interactions between the frontend and backend.
- Django Application
  - Applications - Different functional components, such as Sentiment Analysis and Stock Prediction, each operating independently.
  - Data Source - Stores and retrieves data from an SQLite database and Wasabi cloud storage.
- Automated Training Pipeline
  - Data Preparation Module **-** Uses Pandas and NumPy for data cleaning and preprocessing.
  - Data Training/Retraining Module: Uses Scikit-learn for machine learning model training.
  - Email Notifications**:** Uses Celery and Redis to manage scheduled tasks and send notifications. Redis will manage the queue of the tasks (sending emails).