# Project Design Phase-II
## Technology Stack (Architecture & Stack)

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|---|---|
| Date | 17 November 2023 |
| Team ID | PNT2022TMID519573 |
| Project Name | Project – Deep Learning Model for Eye Disease Classification |
| Maximum Marks | 4 Marks |

**Technical Architecture:**

**User Interface (UI):**

**The system begins with a user interface that allows users to upload retinal images. This can be a web-based application or a mobile app.**
**Frontend Processing:**

**The frontend processes user interactions and transmits the retinal images to the backend server for analysis.**
**Backend Server:**

**The backend server receives the uploaded images and directs them to the preprocessing module for normalization and enhancement.**
**Preprocessing Module:**

**The preprocessing module prepares the images for the CNN by applying normalization and enhancement techniques, optimizing them for feature extraction.**
**Convolutional Neural Network (CNN):**

**The preprocessed images are fed into the CNN, which extracts relevant features associated with different eye diseases.**
**Interpretability Module:**

**Post-CNN, an interpretability module analyzes the model's decision-making process, providing insights into the factors influencing disease predictions.**
**Prediction Module:**

**The output from the CNN, combined with interpretability insights, is processed in the prediction module to generate a probability distribution for each eye disease class.**
**User Output:**

**The final predictions, along with the associated probability distribution, are presented to the user through the UI. This could include**

**visualizations and explanations to enhance user understanding.**

**This technological architecture ensures a seamless flow from user interaction to disease prediction, utilizing frontend and backend components, preprocessing, a sophisticated CNN, and modules for interpretability and prediction. It's designed for user-friendly interactions and efficient analysis of retinal images for early detection of eye diseases.**
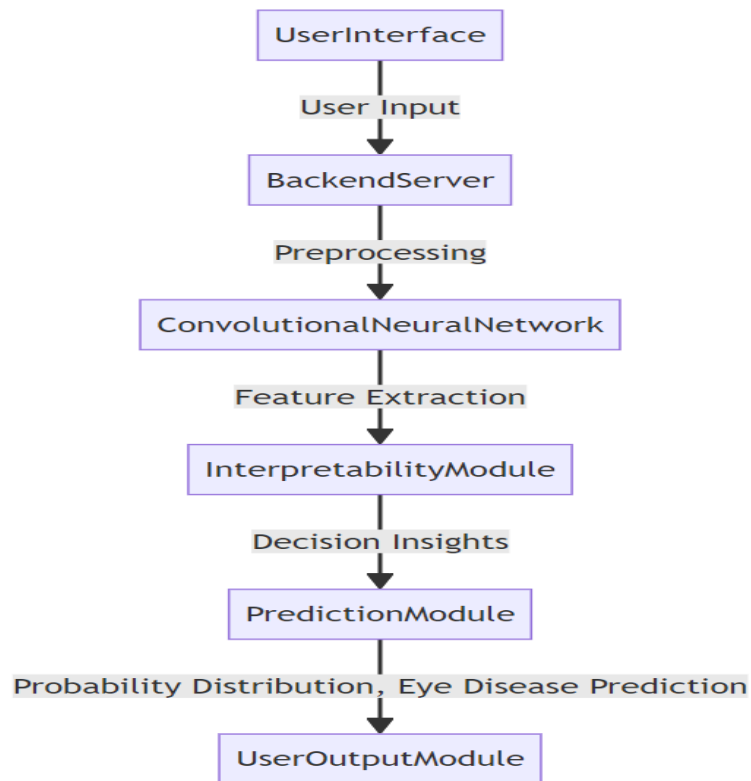
**Diagram for the Architecture :**

```
                    ┌──────────────────────┐
                    │     UserInterface     │
                    └──────────────────────┘
                              │
                         User Input
                              ↓
                    ┌──────────────────────┐
                    │     BackendServer     │
                    └──────────────────────┘
                              │
                        Preprocessing
                              ↓
              ┌──────────────────────────────────┐
              │   ConvolutionalNeuralNetwork      │
              └──────────────────────────────────┘
                              │
                       Feature Extraction
                              ↓
                 ┌────────────────────────────┐
                 │   InterpretabilityModule    │
                 └────────────────────────────┘
                              │
                        Decision Insights
                              ↓
                   ┌──────────────────────┐
                   │    PredictionModule    │
                   └──────────────────────┘
                              │
        Probability Distribution, Eye Disease Prediction
                              ↓
                   ┌──────────────────────┐
                   │    UserOutputModule    │
                   └──────────────────────┘
```

## Table-1:Components&Technologies:

| Component | Technologies/Tools |
|---|---|
| User Interface | Web-based UI or Mobile App |
| Backend Server | Backend Framework (e.g., Flask, Django) |
| Preprocessing Module | Image Processing Libraries (e.g., OpenCV) |
| Convolutional Network | Deep Learning Framework (e.g., TensorFlow, PyTorch) |
| Interpretability Module | Advanced Neural Network Interpretability Techniques |
| Prediction Module | Deep Learning Framework (e.g., TensorFlow, PyTorch) |
| User Output Module | Web-based UI or Mobile App |

**Table-2:Characteristics:**

# Table 2: Characteristics and Descriptions

| Characteristic | Description |
| --- | --- |
| Accuracy | The measure of the model's correctness in predicting eye diseases. Higher is better. |
| Interpretability | The model's ability to provide understandable insights into its decision-making process. |
| Scalability | The model's capability to handle increasing computational loads and diverse datasets. |
| Real-time Inference | The speed at which the model can make predictions, crucial for practical clinical use. |
| Robustness Across Demographics | The model's reliability across diverse populations, considering age, gender, etc. |
| Integration with Healthcare Systems | Seamless integration into existing healthcare workflows and electronic health records. |
| Maintenance and Updates | Ease of updating the model with new data and adapting to evolving medical knowledge. |