1. **Data Preparation (File 1):**
   * Loaded images from the specified dataset directory, divided into "train" and "test" subfolders.
   * Preprocessed images by resizing them to 64x64 pixels and normalizing pixel values.
   * Created arrays (**X\_train**, **X\_test**, **y\_train**, **y\_test**) to store preprocessed data and labels.
   * Saved preprocessed data and labels to NumPy files.
2. **Model Training (File 2):**
   * Loaded preprocessed data and labels.
   * Built a convolutional neural network (CNN) model for eye detection using TensorFlow/Keras.
   * Split the data into training and validation sets.
   * Trained the model for 10 epochs and evaluated its performance on the test set.
   * Saved the trained model to a file (**eye\_detection\_model.h5**).
3. **Image Prediction and Counting (File 3):**
   * Loaded the trained model (**eye\_detection\_model.h5**).
   * Specified a directory containing test images.
   * Processed each image, made predictions, and printed the result (Open Eye or Closed Eye).
   * Counted the number of Open and Closed Eyes in the test images.
   * Printed the counts.
4. **Purpose:**

* The purpose of the system is to track and quantify visitor interactions with artifacts in a museum setting. The primary goal is to provide insights into the popularity and engagement level of specific artifacts by detecting the number of times they are viewed by visitors.

1. **Use Case:**

* In a museum, various artifacts are on display, and the management seeks to understand the level of interest and engagement each artifact generates among visitors. The system utilizes eye detection technology to identify when a visitor is looking at a particular artifact.

1. **Workflow**

* **Eye Detection**: The system uses a trained convolutional neural network (CNN) to detect whether a visitor's eyes are open or closed.
* **Artifact Interaction**: When a visitor looks at an artifact, the system registers this interaction based on the detected eye state.
* **Counting Mechanism**: The system keeps track of the number of times each artifact is viewed by monitoring eye states over time.
* **Data Logging**: Interaction data, including the artifact ID and timestamp, is logged for analysis.

1. **Benefits**

* **Visitor Engagement**: Provides insights into the popularity of artifacts by tracking how often they attract visual attention.
* **Artifact Evaluation**: Enables the museum to assess which artifacts are more captivating to visitors and may require special attention or promotion.
* **Exhibit Optimization**: Informs decisions on exhibit layouts or promotional strategies based on real-time visitor interaction data.

1. **Implementation Considerations**

* **Non-Intrusiveness**: The system operates without requiring active participation from visitors, ensuring a natural museum experience.
* **Privacy**: Emphasizes privacy by focusing on eye detection rather than capturing or storing identifiable visitor information.
* **Real-Time Monitoring**: Allows museum staff to monitor artifact engagement in real time or analyze historical data for trends.

1. **Conclusion**

The system offers a valuable tool for museum management to enhance the overall visitor experience, optimize exhibits, and make data-driven decisions to meet the diverse interests of museum-goers.