

The Superior University

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| Name: Muhammad Bilal Sajid | Roll No: 018 | Course: PAI Lab |
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**Lab 6**

**Face Profiling (with proper measurements of each feature)**

**Advanced Facial Feature Analysis for Personality Prediction**

**1. Introduction**

This document details the implementation of an advanced facial feature analysis system for personality prediction. The system analyzes facial features from uploaded images and predicts personality traits based on the "Big Five" personality model:

* **Openness**
* **Conscientiousness**
* **Extraversion**
* **Agreeableness**
* **Neuroticism**

**2. System Overview**

The system employs computer vision techniques to extract facial measurements and applies a weighted scoring algorithm to predict personality traits. It also considers demographic factors, provides confidence scores, and explains each prediction.

**3. Key Components**

**3.1 Face Detection and Landmark Extraction**

* The system detects faces using **OpenCV's Haar Cascade classifier**.
* It extracts **68 facial landmarks** using **dlib's facial landmark predictor**.
* These landmarks define key facial features such as eyes, nose, mouth, jawline, and eyebrows, allowing precise measurements and analysis.

**3.2 Advanced Facial Measurements**

The system calculates various facial ratios and measurements:

* **Face Width-to-Height Ratio** – Width compared to height.
* **Eye Distance Ratio** – Distance between eyes relative to face width.
* **Mouth Width Ratio** – Width of the mouth relative to face width.
* **Nose Length Ratio** – Length of the nose relative to face height.
* **Jaw Width Ratio** – Jaw width relative to face height.
* **Eye Size Ratio** – Average eye height relative to face height.
* **Lip Fullness** – Lip height relative to mouth width.
* **Forehead Height Ratio** – Estimated forehead height relative to face height.
* **Chin Prominence** – Distance from chin to mouth relative to face height.
* **Facial Symmetry** – A score measuring left-right symmetry.

These measurements are normalized to accommodate variations in image sizes and face proportions.

**3.3 Weighted Scoring System**

* Each personality trait starts with a **neutral baseline score of 0.5**.
* Each facial feature influences multiple traits with different weights.
* Features with stronger research-backed correlations receive higher weights.
* The combined effects of features provide nuanced predictions.

For example, a **wider face** may increase extraversion scores more than other traits, while **larger eyes** may predominantly influence openness and agreeableness.

**3.4 Demographic Considerations**

The system accounts for demographic factors:

* **Age**: Younger individuals tend to score higher on openness and neuroticism, while older individuals often score higher on agreeableness and conscientiousness.
* **Gender**: Women tend to score higher on agreeableness and neuroticism, while men may score slightly higher on extraversion.
* **Ethnicity**: The system includes a framework for cultural variations (currently a placeholder for future research).

These adjustments improve contextual accuracy.

**3.5 Confidence Scores**

Each personality trait prediction is accompanied by a confidence score:

* **Higher** when strong feature indicators are present.
* **Lower** when predictions are closer to neutral.
* **Ranges from 0.1 (low confidence) to 0.9 (high confidence).**

This transparency helps users assess prediction reliability.

**3.6 Explanation System**

The system provides detailed justifications for each personality prediction:

* Which facial features influenced the score.
* The weight contribution of each feature.
* Considered demographic factors.
* Special feature combinations.

For instance, a high **openness score** might be explained by **"Wide-set eyes (+0.15)"** and **"Age factor: Younger individuals score higher on openness"**.

**3.7 Visualization**

* The system generates a **radar chart** for personality traits.
* This provides an intuitive graphical representation of the user's personality profile.

**4. Scientific Context and Limitations**

1. **Limited Research Basis** – Scientific correlations between facial features and personality remain controversial.
2. **Correlation vs. Causation** – Observed correlations do not imply causation.
3. **Individual Variation** – Significant individual differences exist beyond facial features.
4. **Cultural and Contextual Factors** – Personality is shaped by environment, culture, and personal experiences.

This system is intended as a **demonstration of facial analysis techniques** rather than a validated psychological tool.

**5. Implementation Highlights**

**5.1 Feature Combinations**

The system analyzes feature combinations for refined predictions:

* **Wide face + wide jaw** → Higher extraversion & conscientiousness.
* **Large eyes + small mouth** → Higher agreeableness & openness.
* **Long nose + narrow face** → Higher conscientiousness & openness.

**5.2 Facial Symmetry Analysis**

Facial symmetry is determined by:

1. Identifying the **midline of the face** using the nose tip.
2. Measuring **left and right eye deviation** from this midline.
3. Calculating a **symmetry score** based on these deviations.

Higher symmetry is associated with **higher extraversion and conscientiousness** and **lower neuroticism**.

**5.3 Confidence Calculation**

Confidence scores depend on:

* The strength of individual feature indicators.
* Distance of the predicted score from neutral.
* Consistency across multiple feature indicators.
* Considered demographic factors.

