Pipeline

① Load all 600 images in HSV format

Let I_n = nth image in Dataset $\underline{I}$

$$\underline{I} = \{ I_0, I_1, I_2, \ldots, I_{599} \}$$

Each image is size $219 \times 360 \times 3$

② Decompose ~~Image~~ each image I_n in I into hue, saturation, value channels

~~Let h_n = hue saturation, value channel~~

Let h_n = hue channel of nth image in $\underline{I}$

Let S_n = Saturation channel of nth image in $\underline{I}$

Let V_n = value channel of nth image in $\underline{I}$

For each image k in $\underline{I}$, standardize each channel.

1) $h_k / 180$
2) $S_k / 180$
3) $V_k / 180$

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③ For each image K in I, flatten I_K from 219 × 360 × 3 to 657 × 360

Flatten image, vertically stack each channel

$$\begin{bmatrix} h_K \\ s_K \\ v_K \end{bmatrix}$$ for each image K in I

Horizontally stack the image such that final matrix is

$$I = \underbrace{\begin{bmatrix} I_0, I_1, I_2, \ldots, I_{599} \end{bmatrix}}_{216000\ (300 \times 600)} \Bigg\} 219$$

④ For each column C in I, ~~calculate~~

1) Calculate covariance matrix

2) Let $C = \begin{bmatrix} c_0 \\ c_1 \\ \vdots \\ c_{656} \end{bmatrix}$ $\mu_C = \frac{\Sigma C}{657}$

Let $A = C - \mu_C$, the deviation score

3) Compute $\frac{A^T A}{657}$, resulting 657×657 matrix

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4) Calculate eigenvalues and eigenvectors

657 eigenvalues

Let $Av = \lambda v$ where

A = Covariance matrix

v = eigenvector

λ = eigenvalue

$A v = \lambda I_{657} v$

$|A - \lambda I_{657}| = 0$ where C_k is the kth coeffirient

This leads to $C_0\lambda^{657} + C_1\lambda^{656} + \dots + C_{656}\lambda + C_{657} = 0$

Solving for λ leads to 657 eigenvalues and 657 eigenvectors

Order eigenvector based on numeric value of

keep first 6 columns and discard the rest

$\Rightarrow$ Feature Vector $[\quad]_{657\times 6}$

5) Final data set = Feature Vector^T $\times$ C^T

6×657 $\quad 657\times 1$

$= 6\times 1$

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b) Send the Reduced Matrix into Gaussian Matrix Process to predict final value

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