To flatten image, vertically stack each channel

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

(4) For each image K in I, transpose the image, calcalate mean of each column and subtract from original

i.e. calculate deviation score

Let μ_m be the mean of the mth column

$$\begin{bmatrix} I_0^T \\ I_1^T \\ I_2^T \\ I_3^T \\ \vdots \\ I_{599}^T \end{bmatrix} - \begin{bmatrix} \mu_0 & \mu_1 & \cdots & \mu_{599} \end{bmatrix} = a$$

Set resulting score to a

⑤ Calculate $a^T \cdot a$ and divide result by 216000

Result is a 657 × 657 matrix

⑥ Compute Eigen values and Eigen vectors of covariance matrix

Let A be the covariance matrix

V = eigenvector

λ = eigen vector

$AV = \lambda V$

$AV = \lambda I_{657} V$

$|A - \lambda I_{657}| = 0$

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

where C_i is a constant i range from 0 to 657

This leads to 657 possible values for λ

Substitute each individual value back to $AV = \lambda V$ and solve for V

⑦ Order Eigen vectors based on numeric value of corresponding eigen values

Resulting $[v_0, v_1, v_2, \ldots \; v_{656}]$

where λ_b and v_b are the corresponding eigenvalues and eigenvector for the b^{th} largest eigenvalue

Such that $\lambda_0 \geq \lambda_1 \geq \lambda_2 \geq \ldots \geq \lambda_{656}$

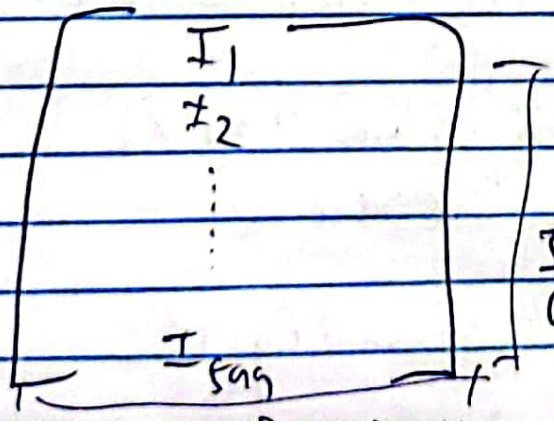
⑧ keep the first 6 eigen vectors and get rid of rest

$FM = [v_0, v_1 \ldots v_5]$ Size = 657×6 = Feature Vector

⑨ Recast original along PCA

~~New Data~~ $FM^T \cdot I$ Size = 6 × 216000

⑩ Recover Original Image and vertically stack



where f_k where k is the k^{th} image in the recovered dataset

(11) Oplorah LIDAR Values

~~Let D_i be the~~ Let D_i be the ith distance in the LIDAR dataset

$$D = [D_0, D_1 \ldots D_{359}]$$

(12) Let Generate 1000 equidistant values between 0 and 360