PRINCIPAL COMPONENT ANALYSIS (PCA) FOR IMAGE COMPRESSION AND EIGENVECTORS

YIWEI YU

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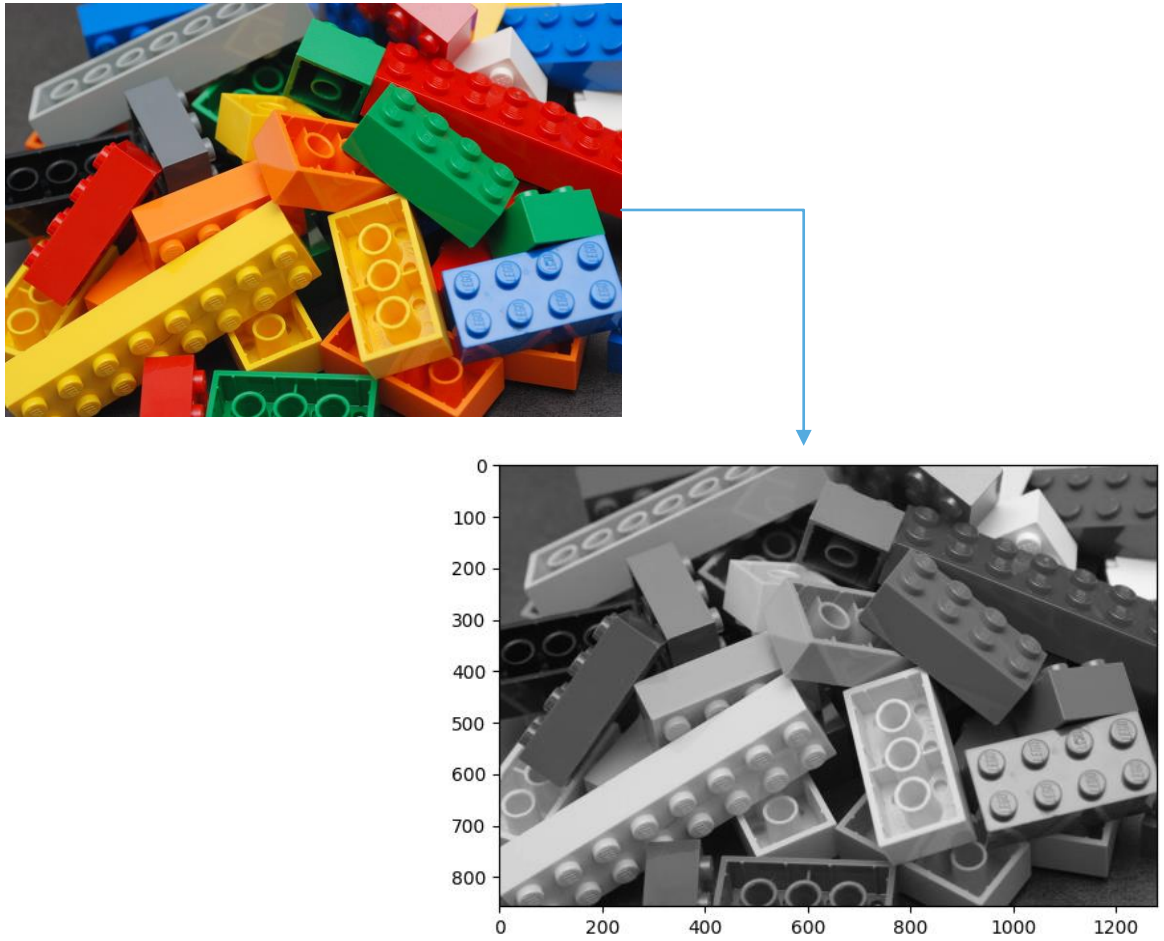
PCA (PRINCIPAL COMPONENT ANALYSIS)

- PCA (Principal Component Analysis) which is a popular unsupervised machine learning algorithm primarily used for dimensionality reduction of large dataset. We can use PCA for dimensionality reduction for images as well.
- We will compress image and extract characteristics of Lego bricks.

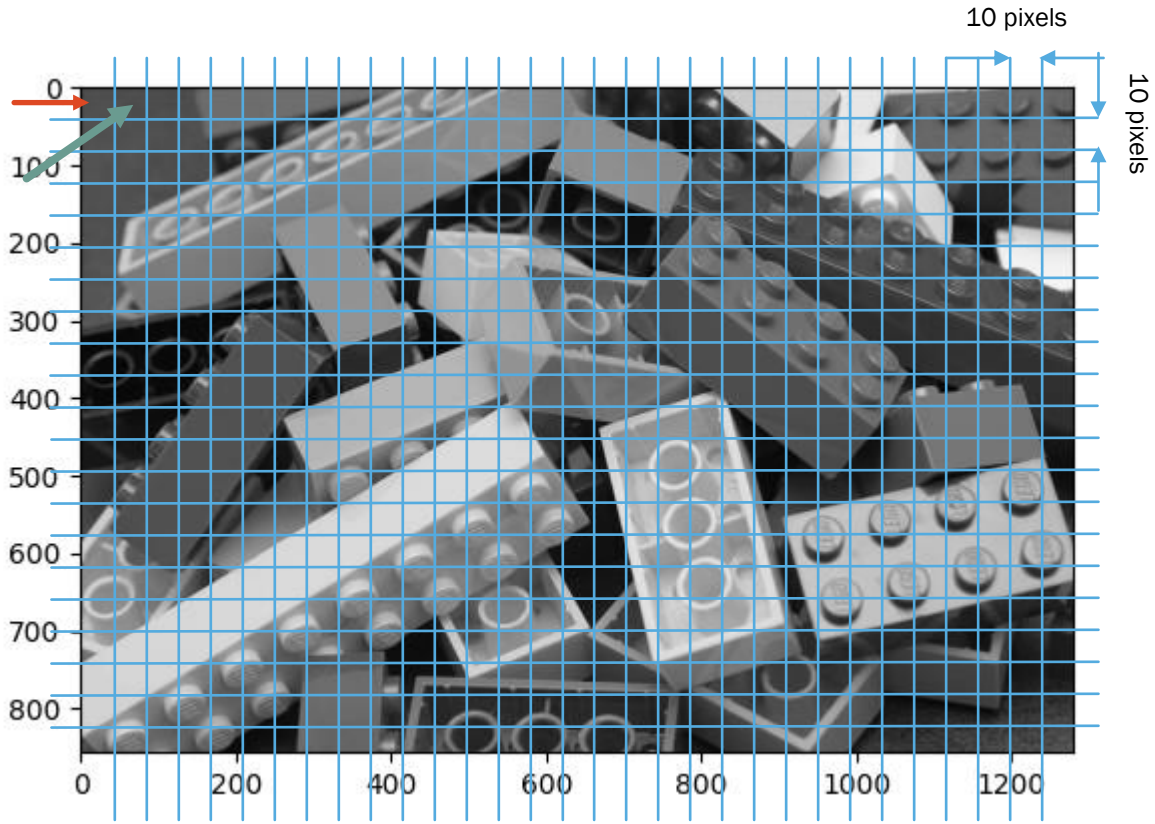
PREPROCESS ON IMAGE

- Pixels are features
- Convert colorful image to gray image – just deal with brightness on image,
- Image source: https://en.wikipedia.org/wiki/File:Lego_Color_Bricks.jpg
- Image shape: (857, 1280) -> (850, 1280): cut few pixels to align size with 10.



BUILD DATASET FROM SINGLE IMAGE

1	2	3	4	..	97	98	99	100
1	2	3	4	..	97	98	99	100

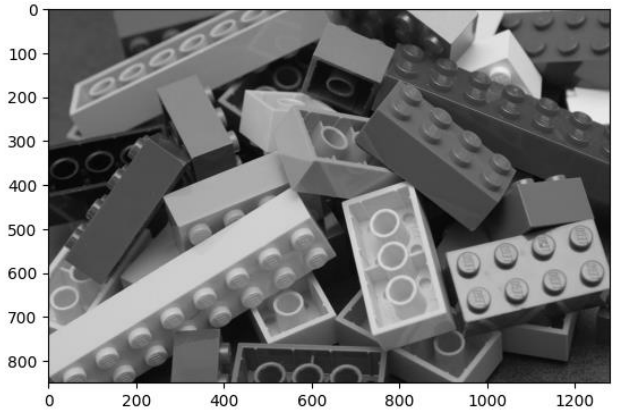


- Split image into 10x10 pixels sections
- We get dataset which size = 10880 (850x1280 / (10x10))
- Each data has 10x10 = 100 features
- Flatten sections to get array which shape = (10880, 100)

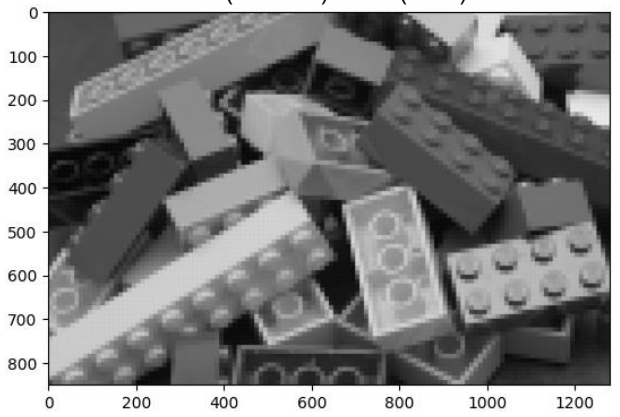
PRINCIPAL COMPONENT ANALYSIS

- If we summary percentage of variance explained by each of the selected components, get about 0.95
- np.sum(pca.explained_variance_ratio_[:2]) = 0.953188309858224 4
- That means we can get most of context (95%) of this image just keep 2 components from PCA model.

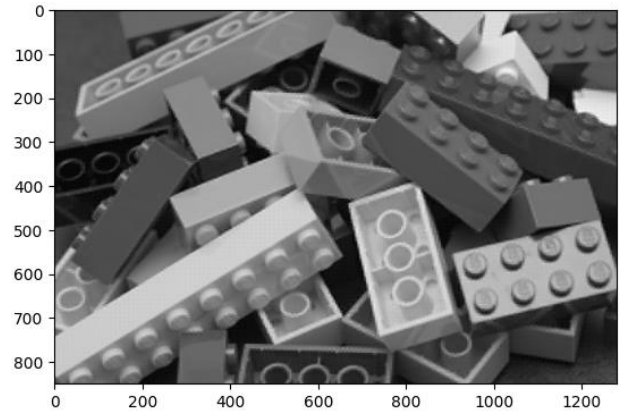
100 (10x10) -> 25 (5x5)



100 (10x10) -> 1 (1x1)



100 (10x10) -> 4 (2x2)



LOGO BRICKS CHARACTERISTICS

- We can find characteristics of Lego bricks from eigen values.
- Pick up some examples to filter characteristics.