

CSC3022H: Machine Learning

Lab 3: Principal Component Analysis (PCA)

Department of Computer Science
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August 13, 2018

Due: Friday, 24 August, 2018, 10.00 AM

Problem Description

Figure 1 illustrates a scatter plot of 64 pairs of data-points for 2 variables — that is, average rainfall (mm) in July and January for 64 selected places. See attached text file of raw data: *2018-AvgRainfall(mm)*.

Implement (in C++) a PCA algorithm [Lever et al., 2017], [Smith, 2002], to find the two (2) principal components of this data-set. Results should answer the following questions:

1. What are the Eigenvalues for the principal components 1 and 2?
2. What are the Eigenvectors for the principal components 1 and 2 (showing July and January component values for each)?
3. What is the total variance?
4. What proportion (as a percentage) of total variance do principal components 1 and 2 "explain"?

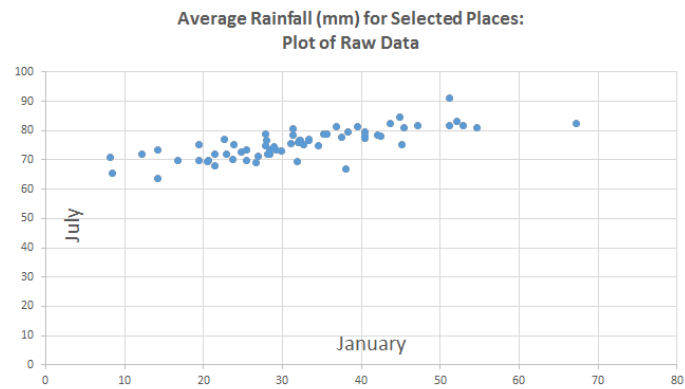


Figure 1: Average rainfall (mm) for selected places in January and July, 2018.

In a ZIP file, place the source code, makefile, and output text file (answers to questions 1 – 4). Upload the ZIP file to Vula before 10.00 AM, Friday, 24 August.

References

- [Lever et al., 2017] Lever, J., Krzywinski, M., and Altman, N. (2017). Points of significance: Principal component analysis. *Nature Methods*, 14(1):641–642.
- [Smith, 2002] Smith, L. (2002). *A tutorial on Principal Components Analysis*. On Vula.