***Note:* There would be components of this mini project which would force you to self-study certain topics by extensive searching in the web.**

**Objective​​ ​-​** ​​ ​Dimensionality​ ​Reduction​ ​through​ ​Principal​ ​Component​ ​Analysis​ ​on​ ​the​ ​Wine​ ​data​ ​set.

**Data​ ​Set​ ​-​** ​​ ​​[https://archive.ics.uci.edu/ml/machine-learning-databases/wine/wine.data Links to an external site.](https://archive.ics.uci.edu/ml/machine-learning-databases/wine/wine.data)

**Data​ ​details​ ​:**​ ​​[https://archive.ics.uci.edu/ml/machine-learning-databases/wine/ Links to an external site.](https://archive.ics.uci.edu/ml/machine-learning-databases/wine/)

**Steps​ ​–**

PCA​ ​involves​ ​following​ ​broad​ ​level​ ​steps​ ​–

1. Standardize​ ​the d-dimensional​ ​dataset.
2. Construct​ ​the covariance​ ​matrix.
3. Decompose​ ​the​ ​covariance​ ​matrix​ ​into​ ​its​ ​eigenvectors​ ​and​ ​eigenvalues.
4. Select k eigenvectors​ ​that​ ​correspond​ ​to​ ​the k largest​ ​eigenvalues, ​ ​where k is​ ​the​ ​dimensionality of​ ​the​ ​new​ ​feature​ ​subspace​ ​( k≤d ).
5. Construct​ ​a​ ​projection​ ​matrix W from​ ​the​ ​"top" k eigenvectors.
6. Transform​ ​the d-dimensional​ ​input​ ​dataset x using​ ​the​ ​projection​ ​matrix W to​ ​obtain​ ​the new k-dimensional​ ​feature​ ​subspace

**Please​ ​do​ ​the​ ​PCA​ ​using​ ​the​ ​steps​ ​given​ ​above-**

**Note:**

* Please submit working code and output (of each step) along with it in pdf,html and ipynb format.
* Please add necessary comments in all the files and make a managerial report based on that.