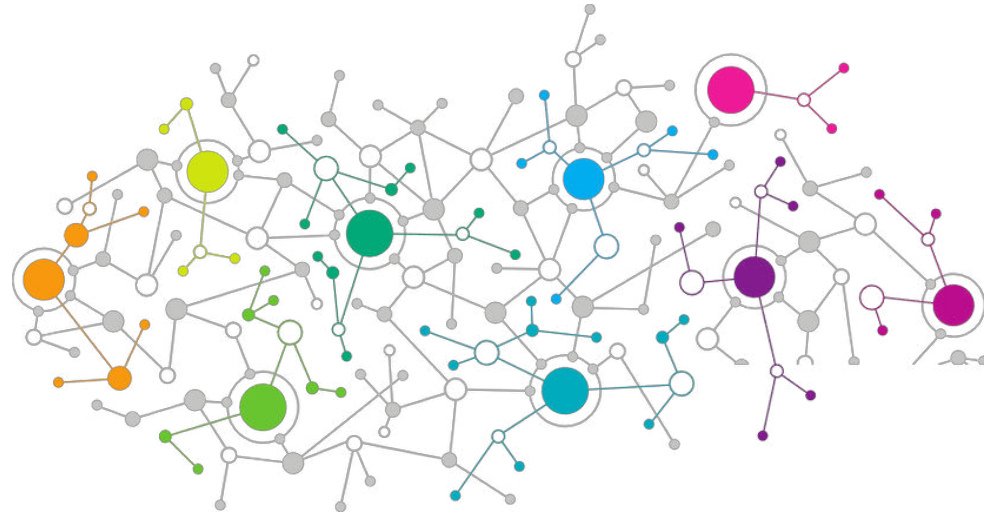




# Data Science

## Module-9.1

### Principal Component Analysis



# Agenda

01

DIMENSIONALITY  
REDUCTION

02

TYPES OF  
DIMENSIONALITY  
REDUCTION

03

PRINCIPAL  
COMPONENT  
ANALYSIS

04

WORKING MECHANISM  
OF PCA

# Dimensionality Reduction

# Dimensionality Reduction

A cartoon illustration of a man with a beard and glasses, wearing a blue shirt and tan pants, standing with his arms crossed and looking thoughtful. A thought bubble above him contains the text "What is Dimensionality Reduction?".

What is  
Dimensionality  
Reduction?

Converting data set of vast dimensions into data with lesser dimensions

Reduce the complexity of data by keeping the relevant structure

# Types of Dimensionality Reduction

# Dimensionality Reduction

What are the  
types of  
Dimensionality  
Reduction?

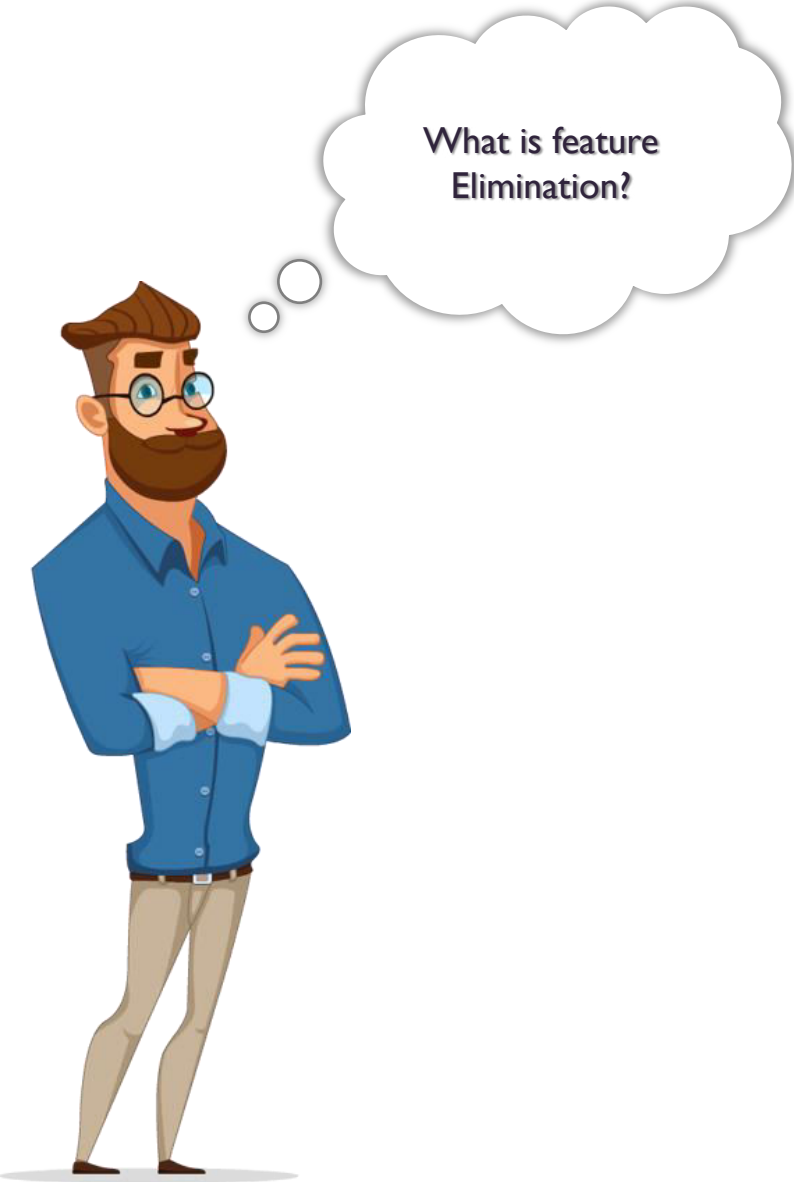


Dimensionality Reduction

Feature Elimination

Feature Extraction

# Dimensionality Reduction

A cartoon illustration of a man with a beard and glasses, wearing a blue shirt and tan pants, standing with his arms crossed. A thought bubble above him contains the text "What is feature Elimination?".

What is feature  
Elimination?

Removing some variables completely if,

- Redundant with other variable
- Not providing any new information



Sets smaller dataset

Might lose some data



# Dimensionality Reduction



Extracting new variables from old variables

PCA works based on feature extraction



# Why dimension Reduction

# Dimensionality Reduction

Why we need  
dimension  
reduction?



Decrease unwanted dimensions in machine learning

GPS sensors

Gyro meters

Video feeds

Smart devices



Each data will be saved with little incremental information

Data has to be treated to reduce the number of dimensions

# Applications of dimensionality Reduction

# Dimensionality Reduction

What are the applications of dimensionality reduction?



Image Processing



Dimension Reduction

# Principal Component Analysis

# Principal Component Analysis

A cartoon illustration of a man with a beard and glasses, wearing a blue shirt and tan pants, standing with his arms crossed and looking thoughtful. A thought bubble above him contains the text "What is PCA?".

What is PCA?

Reducing the number of random variables of a given data set

Identify the low-dimension set of axes

# Principal Component Analysis

Name	Number of Wheels	Color	Height	Number of seats
Mercedes	4	Red	4 feet	5
BMW	4	Blue	3 feet	5
Marco polo	6	Blue	8 feet	10
Volkswagen	4	White	5 feet	5



Has less variance

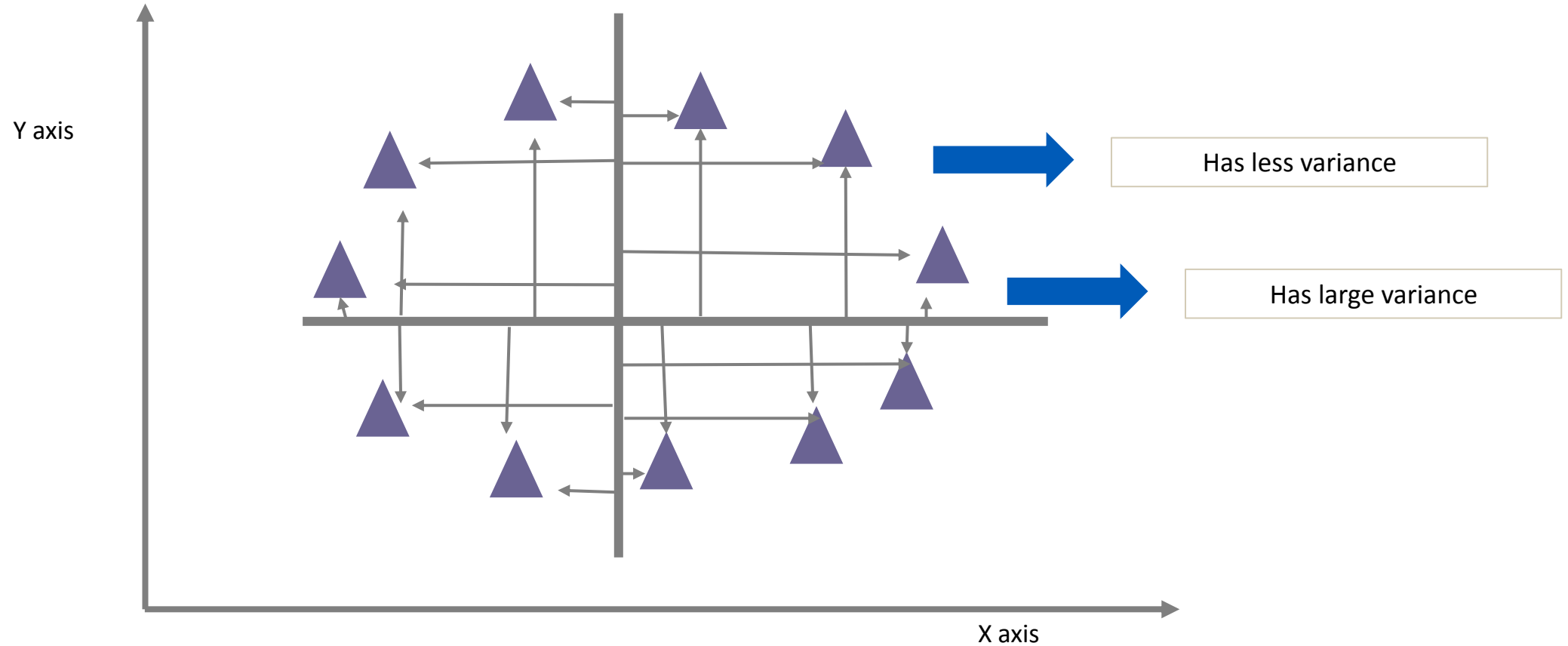


Has High variance

# Working mechanism of PCA



# Principal Component Analysis

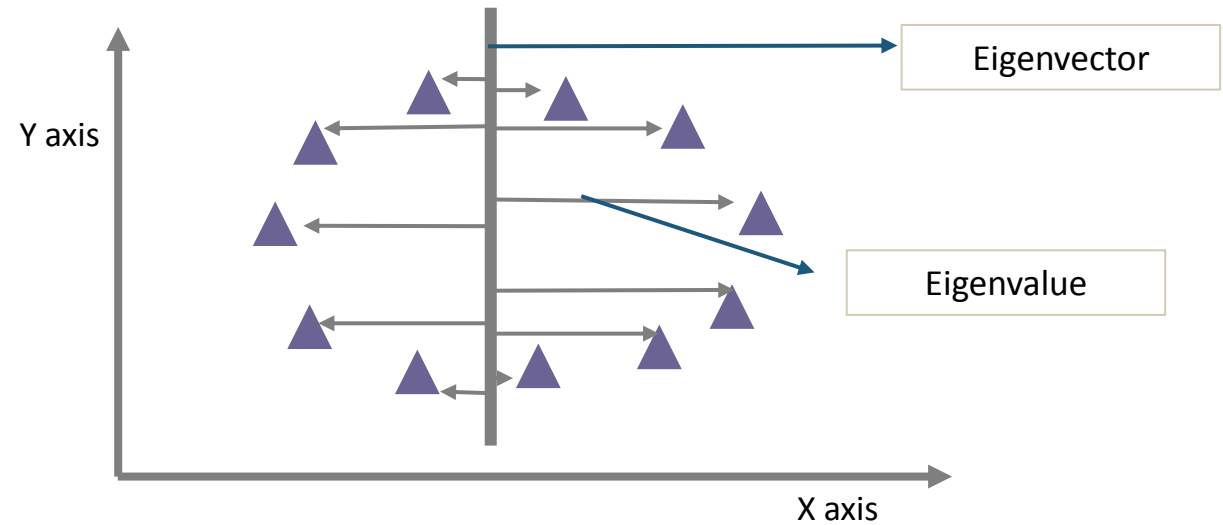


# Principal Component Analysis

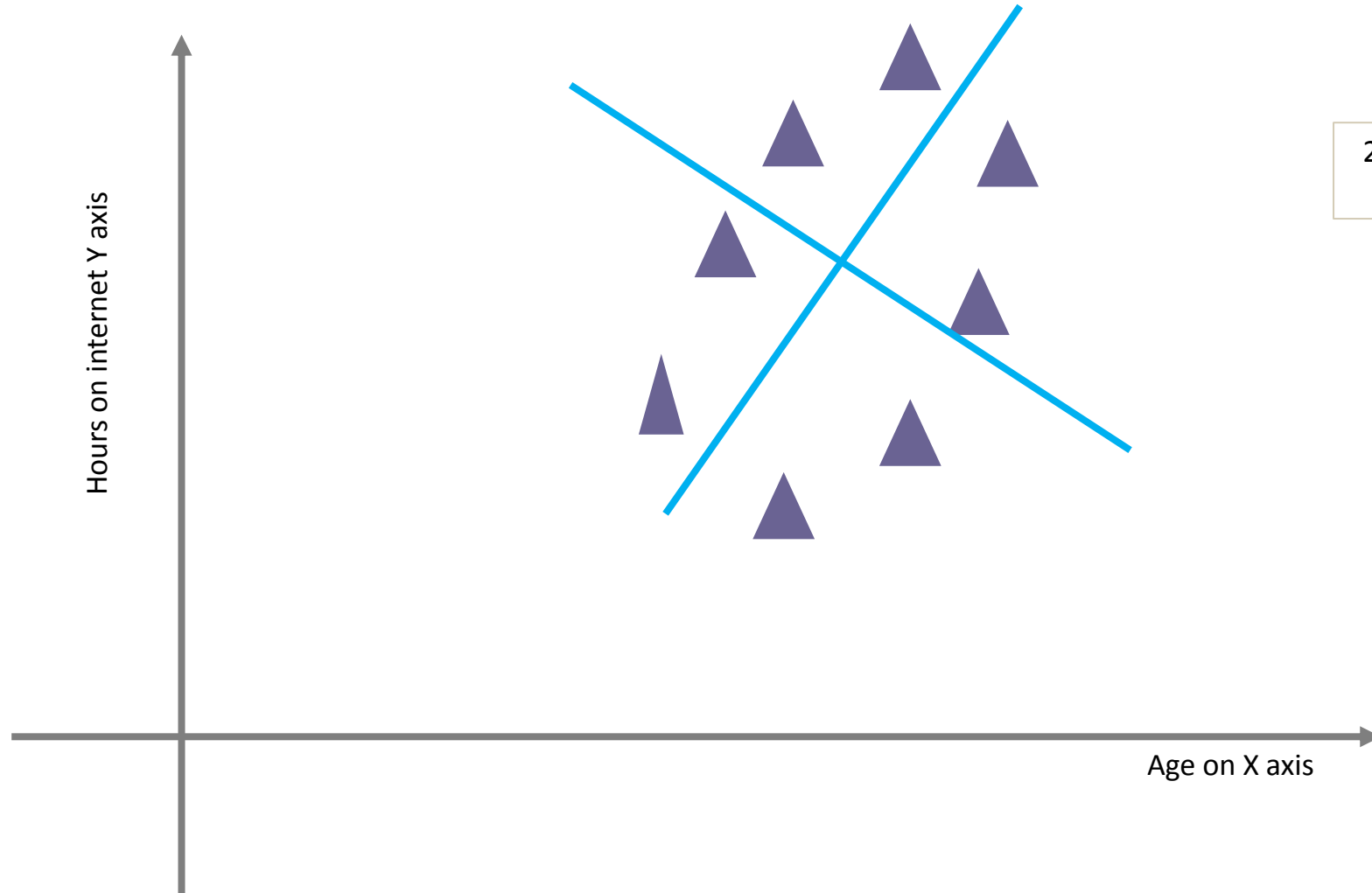
How to find out  
Principal  
Component?



Eigenvectors and Eigenvalues

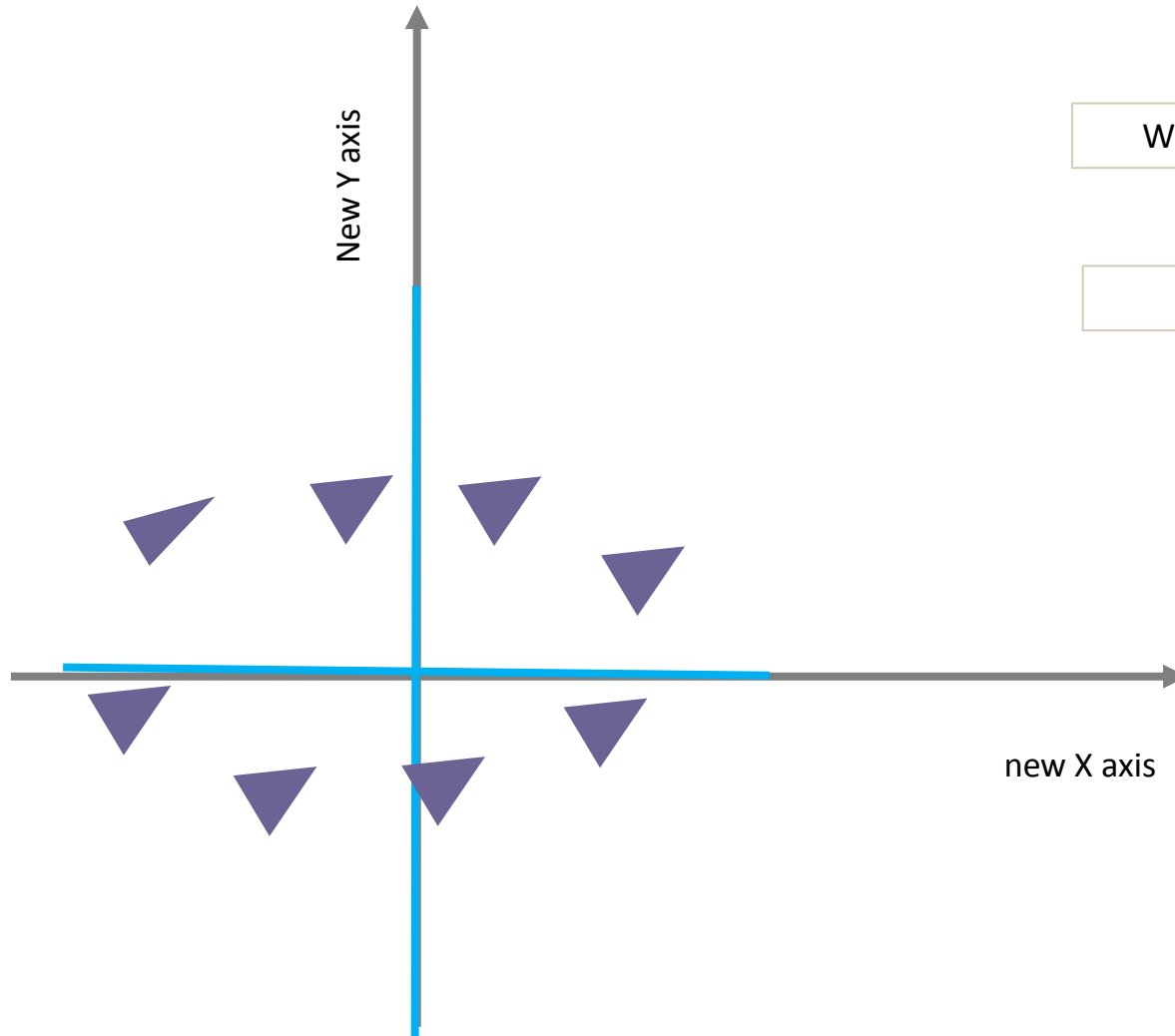


# Principal Component Analysis



2 dimension= 2 Eigenvectors  
and 2 eigenvalues

# Principal Component Analysis



We have just moved the data to origin

More variation

# Principal Component Analysis

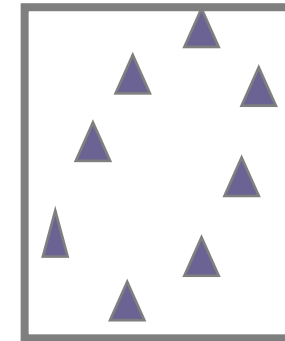
How to PCA  
reduce the  
dimensions?

Reduces the data by removing unnecessary  
dimensions



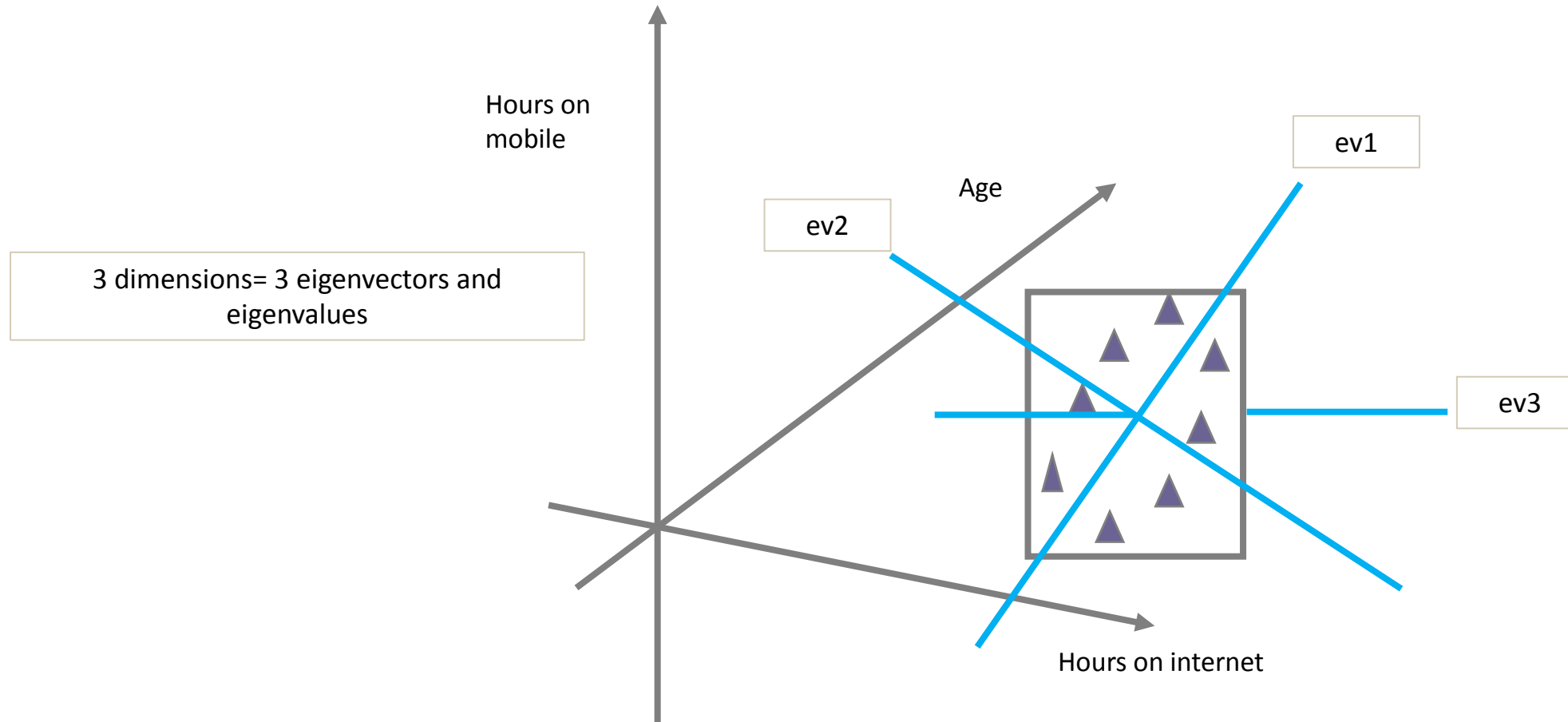
Hours on  
mobile

Age

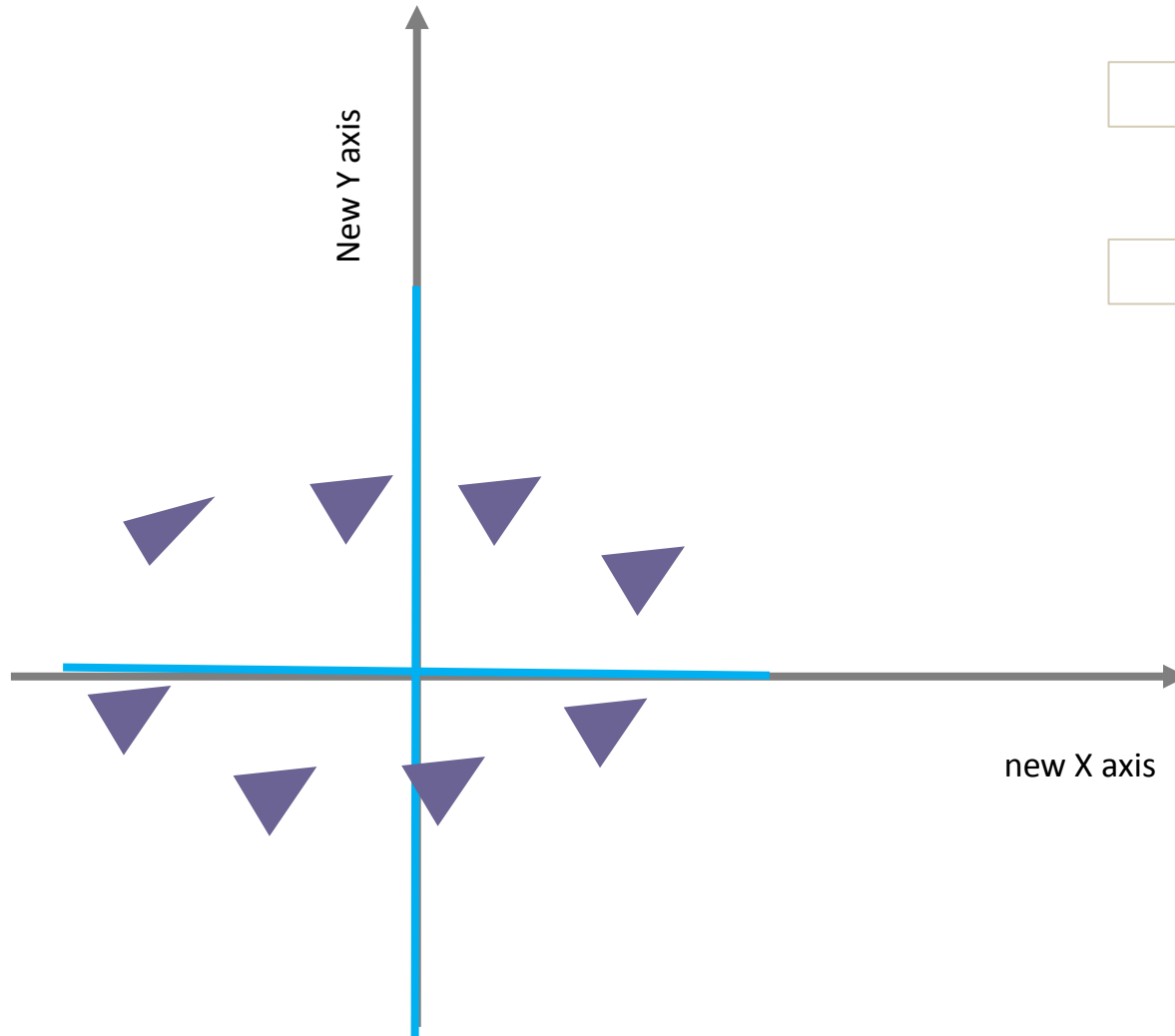


Hours on internet

# Principal Component Analysis



# Principal Component Analysis



3D is reduced to 2D problem

Simplify the data

**Thank You**