Evaluation_4 (Assignment_2)

Projection matrix, Eigenvalues and eigenvectors and SVD

Instructions:

- The submission should consist of 3 files:
    - Program files.
    - Presentation slides clearly showing route taken for simplification and solution.
    - Video recording from Microsoft teams in which you are explaining the simplification and solution, the presenter's camera should be on.
- **Upload the video separately.** Combine the other 2 files into a zip file and submit all files by **16 December. 2021** in assignment section of the MIS-I teams channel.
- It is mandatory for each member to present one of the solutions in the recordings.
- The combined presentation time is maximum 16 mins.
- You should be thorough with every step involved for all the problems given, sooner or later you will be asked to present solution to a problem chosen at random from the assignment.

1. Consider the evolution of the population of a species of birds. Because the number of males and females are nearly equal, we count only females. We assume that each female remains a juvenile for one year and then becomes an adult, and that only adults have offspring. We make four assumptions about reproduction and survival rates:

a. The number of juvenile females hatched in any year is six times the number of adult females alive the year before.

b. The probability of survival of an adult to next year is 100 %.

c. One half of the juvenile females in any year survive into adulthood.

If there were 100 adult females and 40 juvenile females alive initially, compute the population of females for k = 1 to 20 and plot the variation of adult and juvenile populations against years. What is the trend you are observing?

2. "In the great temple at Benares, beneath the dome which marks the centre of the world, rests a brass-plate in which are fixed three diamond needles, each a cubit high and as thick as the body of a bee. On one of these needles, at the creation, God placed sixty-four discs of pure gold, the largest disc resting on the brass plate, and the others getting smaller and smaller up to the top one. This is the Tower of Bramah. Day and night unceasingly the priests transfer the discs from one diamond needle to another according to the fixed and immutable laws of Bramah, which require that the priest must not move more than one disc at a time and that he must place this disc on a needle so that there is no smaller disc below it. When the sixty-four discs shall have been thus transferred from the needle onwhich at the creation God placed them to one of the other needles, tower, temple, and Brahmins alike will crumble into dust, and with a thunderclap the world will vanish." Find out the time required for the collapse of the world according to this myth.

(Hint: Same as the game Tower of Hanoi; but 64 discs instead; Solve the Tower of Hanoi problem just like we solved Fibonacci and you are good to go.)

3. Use PCA to do the dimensionality reduction from 4 parameters to 2 parameters on the Iris_excerpt dataset

(An excerpt of Iris dataset from kaggle). Use
SVD to do the PCA and data reduction.

4. Use the Projection matrices (least square fit) to fit a straight line to the reduced dataset obtained
from the PCA data reduction problem. Report the intercept and slope of the line for the straight line
obtained in the form of equation of a straight line.