**Experiment 18**: Statistical Analysis, Eigenvalues and Eigenvectors

(Edit this document as needed)

Partner 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Partner 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Part A*

1 ) How does the mean relate to the maximum value of the distribution?

What can you say about the values in the diagonal of the matrix and the circular/ellipsoidal levelsets of the distribution?

2) Plot the points of the data set next to the computed values of mean and covariance

|  |  |
| --- | --- |
| Mean |  |
| Covariance |  |

|  |  |
| --- | --- |
| Mean |  |
| Covariance |  |

|  |  |
| --- | --- |
| Mean |  |
| Covariance |  |

Explain how the data distribution is related to the mean and covariance matrix.

*Part B: Eigenvalues and Eigenvectors*

1. $A =\left(\begin{matrix}2&0\\0&1\end{matrix}\right)$ (Show your work)

 Matlab result

|  |  |
| --- | --- |
| Eigenvalues |  |
| Eigenvectors |  |

 Explain differences between Matlab and your results

1. $A =\left(\begin{matrix}-6&3\\4&5\end{matrix}\right)$ (Show your work)

Matlab result

|  |  |
| --- | --- |
| Eigenvalues |  |
| Eigenvectors |  |

Explain differences between Matlab and your results

1. $A =\left(\begin{matrix}0&1\\0&1\end{matrix}\right)$ (Show your work)

Matlab result

|  |  |
| --- | --- |
| Eigenvalues |  |
| Eigenvectors |  |

Explain differences between Matlab and your results

*Part C*

Computed eigenvalues for each covariance matrix in Part A.

|  |  |
| --- | --- |
| Eigenvalues |  |
| Eigenvectors |  |

|  |  |
| --- | --- |
| Eigenvalues |  |
| Eigenvectors |  |

|  |  |
| --- | --- |
| Eigenvalues |  |
| Eigenvectors |  |

What are the principal axes of the ellipses from the level sets of Part A?

|  |  |
| --- | --- |
| Principal axis |  |

|  |  |
| --- | --- |
| Principal axis |  |

|  |  |
| --- | --- |
| Principal axis |  |

Explain the relationship between the orientation of the ellipses and the eigenvectors. Explain the relationship between eigenvalues and how eccentric the ellipses are.

Due: March 28th, 2022 at 11:59 pm eastern on Gradescope

One student submits on Gradescope and adds their partner using “add group members” option on Gradescope.