**Model (A1)**

**Question 1:** Consider the following dataset with 2 features and 4 training examples. Perform PCA to reduce dim. (2 to 1).

|  | **1** | **2** | **3** | **4** |
| --- | --- | --- | --- | --- |
| **F1** | **1** | **5** | **1** | **5** |
| **F2** | **2** | **6** | **9** | **4** |

**Tasks:**

1. Standardize the features.
2. Compute the covariance matrix of the standardized data.
3. Calculate the eigenvalues and eigenvectors.
4. Select the principal component corresponding to the largest eigenvalue. (Hint: put v11 = 1 and get v12).
5. Project the original data points onto the selected principal component to obtain the 1-dimensional.
6. Interpret the results

**Question 2: Answer the following questions (Drawings are allowed)**

1. State the difference between covariance and correlation for both normalized/un-normalized data.
2. What does cross-validation do in the ML pipeline?
3. Explain each type of regularization techniques known in ML so far in our ML course.
4. What is in the context of regularization?
5. What is the effect of highly increased penalty in regularization?
6. What is the purpose of in the context of regularization?
7. What are the trade-offs in PCA?
8. What is the trade-off in Regularization?
9. In coding practice, what is the purpose of the virtual environment.