Artificial Intelligence in Fintech Quiz (2) [1]

[1] No discussion or any collaboration for this assignment. Distinguish yourselves!

Use nSVA to rank Fintech data (30 points)

- Implement nonnegative singular value approximation (nSVA) and use it to rank HFT dataAAPL, WMT and OTM optoin data to find the important observations. What can you find?
- Extra credits: proof for $X > 0$, the entries of first column of U and V in SVD are always positive (20 points).

Baby PCA (50 points)

Write a python function to implement PCA from scrath. Your program should handle the following data

$$X = \begin{pmatrix} 1 & 2 & 0 \\ 7.2 & 5 & 9 \\ -3 & 100 & 5.8 \\ 1 & -90 & 9.7 \\ 2 & 88 & 1.2 \end{pmatrix}$$

1. Compute its PCs, variances
2. Verify the PC matrix U is an orthogonal matrix: $U^t U = I$
3. Compute its newdata
4. Verify 1,2,3 results by using sklearn PCA routines
5. Use SVD to implement PCA and applies to this example.

Visualize the following datasets by PCA (20 points)

- HFT AAPL , WMT, BAC, and AEO data
- Option OTM data
- At least one dataset related in finance/finance you provide

What should you turn in?

- 1. A folder that contains
  - A ppt to show details of your analytics (at MOST 30 pages)
  - your data
  - source files
  - corresponding related output.
- 2. Send the zipped file (.zip instead of ,rar) of your folder to Canvas before the DUE