Daily Math Coding
#5 Subspace, Span, Basis

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AI VIET NAM - MATH TEAM
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In this assignment, you will be asked to create random points and visualize the span.
You can use any Python libraries, such as NumPy, Matplotlib, etc., to solve the questions.

Question 1

Define a vector set containing basis vector $\begin{bmatrix}1\\3\end{bmatrix}$. Then create 100 numbers drawn randomly from a uniform distribution between -4 and $+4$. Those are your random scalars.Multiply the random scalars by the basis vector to create 100 random points in the subspace. Plot those points.

Hint:

Use:

`import matplotlib.pyplot as plt` `plt.plot` to plot scatter.

Question 2

Repeat the procedure but using two vectors in $\mathbb{R}^3$: $\begin{bmatrix}3\\5\\1\end{bmatrix}$ and $\begin{bmatrix}0\\2\\2\end{bmatrix}$. Note that you need 100×2 random scalars for 100 points and two vectors.

Hint:

Use:

```
import plotly.graph_objects as go
fig = go.Figure( data=[go.Scatter3d(x=points[:,0], y=points[:,1], z=points[:,2],
    mode='markers' )])
fig.show()

```

to show the 3D graph

Question 3

Repeat the question 2, but with 2 vectors $\begin{bmatrix}3\\5\\1\end{bmatrix}$ and $\begin{bmatrix}6\\10\\2\end{bmatrix}$.

References

[1] M. Cohen, *Practical linear algebra for data science: From core concepts to applications using Python*. O'Reilly Media, 2022.