Lesson Plan
SI Session #13
September 5, 2017

SI Leader: Eason Chang

Course: Math 18
Academic Quarter: Summer Session 2 2017
Instructor: Professor Drimbe

Topics Covered: Basis & Span, Eigenvalues, Eigenvectors

TEACHING+LEARNING
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Opener Activity:

5:05pm - 5:10pm
Basis and Span

$$S = \left\{ \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \begin{pmatrix} 2 \\ -1 \end{pmatrix} \right\}.$$

Then $\text{span}(S) = \mathbb{R}^2$. (Exercise). In fact, any two of the elements of S span $\mathbb{R}^2$. (Exercise). So we can throw out any one of them, for example, the second one, obtaining the set

$$\widehat{S} = \left\{ \begin{pmatrix} 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 2 \\ -1 \end{pmatrix} \right\}.$$

And this smaller set $\widehat{S}$ also spans $\mathbb{R}^2$. (There are two other possibilities for subsets of S that also span $\mathbb{R}^2$.) But we can't discard an element of $\widehat{S}$ and still span $\mathbb{R}^2$ with the remaining one vector.

(Why not? Suppose we discard the second vector of $\widehat{S}$, leaving us with the set

$$\tilde{S} = \left\{ \begin{pmatrix} 1 \\ 2 \end{pmatrix} \right\}.$$

Now $\text{span}(\tilde{S})$ consists of all scalar multiples of this single vector (a line through $\mathbf{0}$). But anything not on this line, for instance the vector

$$\mathbf{v} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

is not in the span. So $\tilde{S}$ does not span $\mathbb{R}^2$.)

Activity 1

5:10pm - 5:30pm

Practice problem 1a:

3. (a) If a 4 x 5 matrix A has rank 2, find dimRow(A).

(b) If a 5 x 6 matrix A has rank 3, find Rank A^T.

(c) If A is a 7 x 9 matrix, what is the largest possible rank of A?

Solutions for Practice Problem 1a:

a) 2
b) 3
c) 7

Practice Problem 1b:

2. Find a basis for Row A, Nul A and for Col A, where

$$A = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & -1 \\ 1 & 1 & 2 \end{bmatrix}.$$

Practice Problem 1b Solutions:

Null A = {0}
Col A = { (1,2,1), (0,1,1), (-1,-1,2) }
Row A = { (1,0,0), (0,1,0), (0,0,1)}

Rank A = 3

Activity 2
5:30pm - 5:45pm

Practice Problem 2a:

1. Consider the matrices $A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 1 & -3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 0 \\ 1 & -1 & -1 \end{bmatrix}.$

   (a) Find det A and det B.

   (b) Find det A^{-1} and det $A^2 B$.   (c) Is $A^3 B^3$ invertible?

Solution to Practice Problem 2a:

a)
Det A = 3
Det B = 1

b)
Det A^{-1} = 1/3

c)
Det A^2 B = 9

c)

det A^3B^3 = 27

Closure- Survey/ Feedback
5:45pm- 5:50pm

- Wrap-up:
 - Please share with the group one thing you gained understanding of through the session today.
 - Make a note to yourself/ write down anything you need to review/ do more practice problems on.

- Survey/ Feedback:
 1. How fun was the session? (1-10)
 2. How useful was the session? (1-10)
 3. Would you come back? (yes or no)
 4. Optional: Comments (pace of the activity), questions, concerns, suggestions, feedback on the back or wherever

Please recommend SI to your friends/ peers if you found the session useful! Thanks for coming and have a great day :)

PLANNING THE SI SESSION

SI Leader:
Session Date & Day of Week:
Course:
Course Instructor:

Warm-up/ Opening: **(2-4 min.)**	Content to cover:	Collaborative Learning Technique	Strategy to be used:

Please provide a **DETAILED BREAKDOWN** of warm-up activity **OR** attach corresponding document(s)

Cool-down/ Closing: **(2-4 min.)**	Content to cover:	Collaborative Learning Technique	Strategy to be used:

Please provide a **DETAILED BREAKDOWN** of cool-down activity **OR** attach corresponding document(s)

Workout: **(44-46 min.)**	Content to cover:	Collaborative Learning Technique(s)	Strategy(ies) to be used:

Please provide a **DETAILED BREAKDOWN** of workout activity **OR** attach corresponding document(s)