

An aerial photograph of a city, likely Madison, Wisconsin, taken from a high vantage point looking down at the city and the surrounding water. The sun is setting behind a hill in the background, creating a warm, golden glow over the entire scene. The city is densely packed with buildings, and the water is filled with numerous sailboats. A large, semi-transparent rectangular box is overlaid on the center of the image, containing the course title in large, bold, black text.

# CS/ECE/ME 532 Matrix Methods in Machine Learning

*Welcome!*



# Activity 5

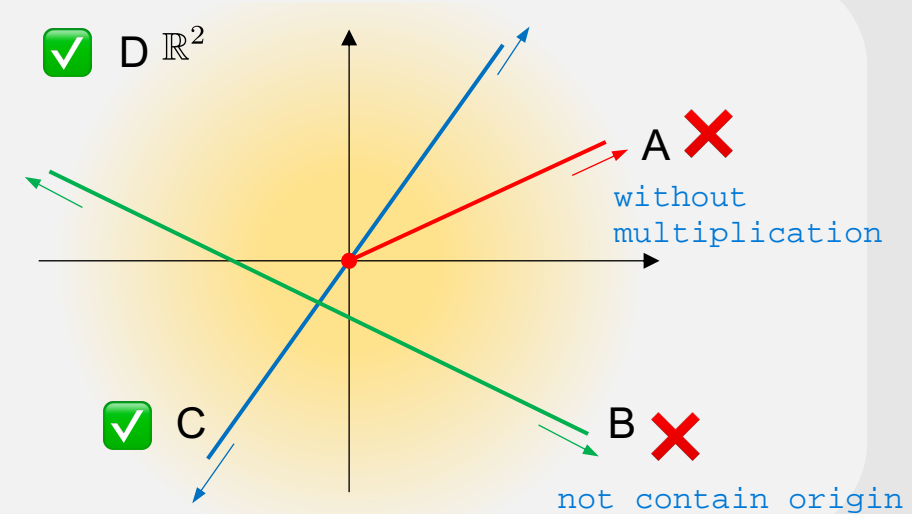


## Subspaces

$S \subseteq \mathbb{R}^n$  is a subspace if:

1.  $\mathbf{0} \in S$  *Contains the origin*
2. if  $\mathbf{x}, \mathbf{y} \in S$  then  $\mathbf{x} + \mathbf{y} \in S$  *Closed under addition*
3. if  $\mathbf{x} \in S$  then  $\alpha \mathbf{x} \in S$  *Closed under scalar multiplication*

equal to  $\mathbb{R}^2$



(lin indep vectors)

## Bases/Tastes profiles

Movie  $\downarrow$

Users  $\rightarrow$

4	7	2	8	7
9	3	5	6	10
4	8	3	7	6

$\approx$

$t_{1,1}$	$t_{1,2}$
$t_{2,1}$	$t_{2,2}$
$t_{3,1}$	$t_{3,3}$

$\left[ \begin{array}{ccc} w_{1,1} & \dots & w_{1,5} \\ w_{2,1} & \dots & w_{2,5} \end{array} \right]$

weights of user 5's preference for taste 2

basis or taste vector 1

**Question 3:**  
*Do your work in Python*

- `A.sum()`
- `A.reshape()`
- `A.T`
- `np.sqrt()`
- `np.ones()`
- `np.matmul()` #or `@`