



what's your favorite programming language?



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Do you have Poll Everywhere?

A) Yes

B) No



Norms

Norms

For all $a \in R$ and all $u, v \in V$,

- $L_p(av) = |a| L_p(v)$
- $L_p(u + v) \leq L_p(u) + L_p(v)$
 - *triangle inequality or subadditivity*
- If $L_p(v) = 0$ then v is the zero vector
 - implies $|v| = 0$ iff v is the zero vector

L_p norm: $(\sum_j |x_j|^p)^{1/p}$

What is

$|(1,2,3)|_1$?

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above

A,B,C,D, or E

B
C
D

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What is

$|(1,2,3)|_2$?

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above

A,B,C,D, or E

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What is

$|(1,2,3)|_{1/2}$?

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above

A, B, C, D, or E

B
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What is

$|(1,2,3)|_0$?

A) 1

B) 3

C) $\sqrt{14}$

D) $\sqrt{14/3}$

E) none of the above

A, B, C, D, or E

B
C
D

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L_0 pseudo-norm

$|\mathbf{x}|_0 = \text{number of } x_j \neq 0$

How is this not a real norm?

Norms

Is $|x|_{1/2}$ convex?

Yes or no?

Yes

No

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Distance

- ◆ How do norms relate to distance?

Distance

- ◆ How do norms relate to distance?

$$d_p(\mathbf{x}, \mathbf{y}) = \|\mathbf{x} - \mathbf{y}\|_p$$

Kernel

A symmetric function $K: \mathbf{X} \times \mathbf{X} \rightarrow \mathbb{R}$

is a positive semi-definite (psd) kernel on \mathbf{X} if

$$\sum_{i,j} c_i c_j K(\mathbf{x}_i, \mathbf{x}_j) \geq 0$$

If x is a vector containing only non-negative numbers, does the following satisfy the 3 properties of a norm?

$\sum_j x_j$ - the sum of the elements of x

Technically, that doesn't make it a norm, since the criteria should hold over a full vector space

Yes or no?

Yes

No

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If x is a vector containing only non-negative numbers, does the following satisfy the 3 properties of a norm?

$\sum_j j x_j$ - the sum of the elements of x , each weighted by its index, j

Yes or no?

Yes

No

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If x is a vector containing only non-negative numbers, does the following satisfy the 3 properties of a norm?

$$\sum_j x_j^2$$

Yes or no?

Yes

No

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If x is a vector containing only non-negative numbers, does the following satisfy the 3 properties of a norm?

$\text{length}(x)$ - number of the elements of x

Yes or no?

Yes

No

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If x is a vector containing only non-negative numbers, does the following satisfy the 3 properties of a norm?

$d(x,y)$ - the Euclidean distance between x and some other (arbitrary, but fixed, vector y , also non-negative)

Yes or no?

Yes

No

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True or False: The only important thing you need to pick when doing k-nearest neighbors is k

Yes or no?

Yes

No

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