4. Points and Vectors

Homework0 due Feb 8, 2023 08:59 -03 Completed

A list of n numbers can be thought of as a point or a vector in n-dimensional space. In

of n-dimensional vectors $\begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ a_n \end{bmatrix}$ flexibly as points and as vectors.

Dot Products and Norm

3/3 points (graded)

Notation: In this course, we will use regular letters as symbols for numbers, vectors, ma
hyperplanes, etc. You will need to distinguish what a letter represents from the context

Recall the dot product of a pair of vectors a and b:

$$a \cdot b = a_1 b_1 + a_2 b_2 + \cdots + a_n b_n \qquad \text{where } a = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ a_n \end{bmatrix} \text{ and } b = \begin{bmatrix}$$

When thinking about a and b as vectors in n-dimensional space, we can also express t

$$a \cdot b = \|a\| \|b\| \cos \alpha,$$

where α is the angle formed between the vectors a and b in n-dimensional Euclidean s
to the length, also known as **norm**, of a:

$$\|a\| = \sqrt{a_1^2 + a_2^2 + \cdots + a_n^2}.$$

What is the length of the vector $\begin{bmatrix} 0.4 \\ 0.3 \end{bmatrix}$?

0.5 ✔

What is the length of the vector $\begin{bmatrix} -0.15 \\ 0.2 \end{bmatrix}$?

Dot Products and Orthogonality

1/1 point (graded)

Given -dimensional vectors and , when is orthog

angle between them is ?

- when
- when
- when

? STANDARD NOTATION

Submit You have used 2 of 2 attempts

Unit Vectors

1.0/1 point (graded)

A unit vector is a vector with length . The length of a vector is also called its norm.

Given any vector what is the unit vector pointing in the same direction as ? Answe
norm of the vector .

(Type **x** for the vector , and **norm(x)** for the norm of the vector .)

x / norm(x)

? STANDARD NOTATION

Submit You have used 3 of 3 attempts

Projections

What is the signed magnitude of the projection of onto ? More pre
vector in the direction of the correct choice above, find a number such that

(Type **a_1** for , **a_2** for , and **a_3** for . If applicable, you may use function such as
notation button.)

(a_1^2 -a_2^2+a_3^2) / sqrt(a_1^2 + a_2^2 + a_3^2)

? STANDARD NOTATION

Submission button: The “submit button" will activate only after you have answered all
multiple choices, in this problem.

Submit You have used 3 of 3 attempts

Discussion

Topic: Unit 0. Brie e
Points and Vectors

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