5. Planes

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

A hyperplane in n dimensions is a $n-1$ dimensional subspace. For instance, a hyperp
space can be any line in that space and a hyperplane in 3-dimensional space can be ar
hyperplane separates a space into two sides.

In general, a hyperplane in n-dimensional space can be written as $\theta_0 + \theta_1 x_1 + \theta_2 x_2$
example, a hyperplane in two dimensions, which is a line, can be expressed as $Ax_1 +$

Using this representation of a plane, we can define a plane given an n-dimensional vec

offset θ_0. This vector and offset combination would define the plane $\theta_0 + \theta_1 x_1 + \theta_2 x$
One feature of this representation is that the vector θ is normal to the plane.

Number of Representations

1/1 point (graded)

Given a d-dimensional vector θ and a scalar offset θ_0 which describe a hyperplane $\mathcal{P}$:
many alternative descriptions θ' and θ'_0 are there for this plane $\mathcal{P}$?

- 0
- 1
- ∞ ✔

? STANDARD NOTATION

Submit You have used 1 of 1 attempt

Orthogonality Check

0/1 point (graded)

To check if a vector x is orthogonal to a plane $\mathcal{P}$ characterized by θ and θ_0, we check

Perpendicular Distance to Plane

1.0/1 point (graded)

Given a point in -dimensional space and a hyperplane described by and find t
between the hyperplane and . This is equal to the perpendicular distance between th
and is positive when is on the same side of the plane as points and negative when
side.

(Enter **theta_0** for the offset .
Enter **norm(theta)** for the norm of a vector .
Use * to denote the dot product of two vectors, e.g. enter **v*w** for the dot product
.)

(x*theta + theta_0) / norm(theta) ✔

? STANDARD NOTATION

Submit You have used 1 of 5 attempts

Orthogonal Projection onto Plane

1.0/1 point (graded)

Find an expression for the **orthogonal projection** of a point onto a plane that is cha
Write your answer in terms of , and .

(Enter **theta_0** for the offset .
Enter **norm(theta)** for the norm of a vector .
Use * to denote the dot product of two vectors, e.g. enter **v*w** for the dot product
.)

v - (theta * v + theta_0)/norm(theta)^2*theta ✔

? STANDARD NOTATION

Submit You have used 2 of 5 attempts

Perpendicular Distance to Plane

-2.5 ✖

Second coordinate:

-1.5 ✖

? STANDARD NOTATION

Submit You have used 3 of 3 attempts

2. (f)

0/1 point (graded)

Consider a hyperplane in a -dimensional space. If we project a point onto the plane, c
original point from this projection?

(More precisely: is there a function from the points on the plane to points in the -dime
always exactly undoes the projection operation?)

yes ✖

? STANDARD NOTATION

Submit You have used 1 of 1 attempt

Discussion

Topic: Unit 0. Brie e
Planes

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When trying to enter a response to "Orthogonal Projection on a plane" I am getting the following error: Invalid

some hint may help you

For Orthogonal Projection onto Plane, make sure you are using the Perpendicular Distance to Plane times the

? Format of answer to Perpendicular Distance to Plane

Hi, what's the correct format to answer the 2 first questions: "What is the signed perpendicular distance...?" I

? Last question

Good morning, I find the last question a bit misleading. Do I have to assume that I have no more than a descr

? For Question Perpendicular Distance to Plane, What is the answer format for the last two que

For First coordinate and Second coordinate, I put my answers in a format of (X, Y) and [X, Y]. Both of these d