4. Feature Vectors

Ungrading Note: The problems on this page should be placed after lecture 5. Hence, **all problems on this page are ungraded, and will reappear in Homework 3.** Feel free to work on these for fun now, especially parts (a) to (d).

Consider a sequence of n-dimensional data points, $x^{(1)}, x^{(2)}, \ldots$, and a sequence of m-dimensional feature vectors, $z^{(1)}, z^{(2)}, \ldots$, extracted from the x's by a linear transformation, $z^{(i)} = Ax^{(i)}$. If m is much smaller than n, you might expect that it would be easier to learn in the lower dimensional feature space than in the original data space.

4. (a)

0 points possible (ungraded)

Suppose $n = 6$, $m = 2$, z_1 is the average of the elements of x, and z_2 is the average of the first three elements of x minus the average of fourth through sixth elements of x. Determine A.

Note: Enter A in a list format: $[[A_{11}, \ldots, A_{16}], [A_{21}, \ldots, A_{26}]]$

[[1/6,1/6,1/6,1/6,1/6,1/6] ✔

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4. (b)

0 points possible (ungraded)

Using the same relationship between z and x as defined above, suppose $h(z) = sign(\theta_z \cdot z)$ is a classifier for the feature vectors, and $h(x) = sign(\theta_x \cdot x)$ is a classifier for the original data vectors. Given a θ_z that produces good classifications of the feature vectors, determine a θ_x that will identically classify the associated x's.

Note: Use `trans(...)` for transpose operations, and assume A is a fixed matrix (enter this as `A`).

Note: Expects θ_x (an $[n \times 1]$ vector), not $\theta_x^\top$.

$\theta_x =$ A^{T}*(\theta_{z})^T

Submit You have used 0 of 5 attempts

4. (c)

0 points possible (ungraded)

Given the same classifiers as in (b), if there is a θ_x that produces good classifications of the data vectors, will there **always** be a θ_z that will identically classify the associated z's?

Note: A is a fixed matrix.

- Yes
- No ✔

Submit You have used 2 of 5 attempts

4. (d)

0 points possible (ungraded)

Given the same classifiers as in (b), if there is a θ_x that produces good classifications of the data vectors, will there **always** be a θ_z that will identically classify the associated z's?

Note: Now assume that you can change the $m \times n$ matrix A.

- Yes ✔
- No

You have used 1 of 5 attempts

Submit

4. (e-1)

0 points possible (ungraded)

If $m < n$, can we find a more accurate classifier by training in z-space, as measured on the training data?

- Yes
- No
- Depends

Submit You have used 0 of 5 attempts

4. (e-2)

0 points possible (ungraded)

How about on unseen data?

- Yes

- No
- Depends

Submit You have used 0 of 5 attempts

Discussion

Topic: Unit 1 Linear Classifiers and Generalizations (2 weeks):Homework 1 / 4. Feature Vectors

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💬	I can't see the solutions of this 4. Feature Vectorsproblem Staff, I can't see the solutions of this 4. Feature Vectorsproblem	3
?	[STAFF] I know this is fairly trivial but... Is there any way any way that I could get the green check marks on this unanswered Homework 1 section on the progress bar at the top? The on...	3
?	Invalid Input: thetaz not permitted in answer as a variable What's notation for theta z?	2
💬	4.a)	5
💬	This course is tough .	15

I have done 10+ AI courses including the best from udemy , coursera and other sites . Those were far more into coding and this is much more int...

	Notation hint for 4b	1
?	PLease a little bit guidance on 4.b . I done the rest . I can't figure out what to find . please help . I did 4.a	2
?	This is not in today's deadline right ? the date is changed for this ?	2
	4d: Given the same classifiers as in (b), if there is a θx that produces good classifications of the data vectors, will there always be a θz that will identically classify the associated z's? The correct answer is supposedly positive ('yes'). I don't see why this must be true. Think of two cocentric circles on a 2D plane. Obviously they ar...	6
?	[Staff] Progression tab I noticed that my score of homework 1 in the progression tab is less than my cumulative score. Can you please check it?	3
	[STAFF] Requesting extension for HW1.... Can we get extension for HW1 please? Atleast for a couple of extra days....	6
	Suggestion: Emphasize that the linear classifiers under consideration are a subset of all linear classifiers.	1
	"If m is much smaller than n, you might expect that it would be easier to learn in the lower dimensional feature space than in the original data space." Is this really true? As we move from lower to higher dimensions, the data density becomes thinner and the data distance themselves from each other making in ge...	4