ECE5984 Homework1

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1. **cost function of the linear regression**

(a).

Let’s partial derivative about .

J() can be written in a quadratic form, which is convex.

(b).

Let proof of … Let **(A)**

About , , ,

-> will be 0.

(Because in any linear function)

Left side of **(A)**:

(Because )

J(θ) is a convex function.

1. **Newton’s method**

By Newton’s method in this problem,

About any

One iteration of Newton’s method gives us the solution.

1. **Positive definite matrices**

(a).

Let be any non-zero vectors

And the identity matrix I is symmetric

I is positive definite matrix.

(b).

Let

And is 11 matrix, so it is symmetric

A is positive semidefinite.

(c).

is PSD.

Let

(Because *A* is PSD, always about )

And

(Because *A* is PSD, *A* is symmetric)

is symmetric

is positive semidefinite.

(d).

In case )

(Because )

In case )

(The scalar terms are combined in a diagonal matrix A)

(Because A is a diagonal matrix)

H is symmetric by (C), and H by (D)