Exercise 1 - Introduction

August 8, 2019

1 Linear Algebra Refresher

a) Matrix Operations (1 point)

A fellow student suggests that matrix addition and multiplication are very similar to scalar addition and multiplication, i. e. commutative, associative and distributive. Is this a correct statement? Prove it mathematically or disprove it by providing at least one counter example per property (commutativity, associativity, distributivity).

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b) Matrix Inverse (1 point)

What is a matrix inverse? How can you build the inverse of a non-square matrix? You would like to invert a matrix $M \in \mathbb{R}^{2 \times 3}$ - write down the equation for computing it and specify the dimensionality of the matrices after each single operation (e.g. multiplication, inverse).

c) Eigenvectors and Eigenvalues (1 point)

Explain what eigenvectors and eigenvalues of a matrix M are. Why are they relevant in machine learning?

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2 Statistics Refresher

a) Expectation and Variance (1 point)

State the general definition of expectation and variance for the probability density $f : \Omega \rightarrow \mathbb{R}$ of a continuous random variable. What do expectation and variance express?

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