QUY NHON UNIVERSITY

DEPARTMENT OF MATHEMATICS AND STATISTICS

Introduction to the course

Nguyen Quoc Duong

Master's Student, Department of Mathematics and Statistics, Quy Nhon University

April 1, 2023

Organization

- Part I: Math
  1. Linear Algebra
  2. Analytic Geometry
  3. Matrix Decomposition
  4. Vector Calculus
  5. Probability and Distributions
  6. Optimization
- Part II: 4 Basic Machine Learning Problems
  1. When Models Meet Data
  2. Dimensionality Reduction with Principal Component Analysis
  3. Density Estimation with Gaussian Mixture Models
  4. Classification with Support Vector Machines

Basic Notations

- Scalars: $a, b, c, \alpha, \beta, \gamma$
- Vectors: $\boldsymbol{x}, \boldsymbol{y}, \boldsymbol{z}$
- Matrices: $\boldsymbol{X}, \boldsymbol{Y}, \boldsymbol{Z}$
- Sets: $\mathcal{A}, \mathcal{B}, \mathcal{C}$
- (Ordered) tuple: $B = (\boldsymbol{b}_1, \boldsymbol{b}_2, \boldsymbol{b}_3)$
- Matrix of column vectors: $\boldsymbol{B} = [\boldsymbol{b}_1, \boldsymbol{b}_2, \boldsymbol{b}_3]$ or $\boldsymbol{B} = \begin{pmatrix} \boldsymbol{b}_1 & \boldsymbol{b}_2 & \boldsymbol{b}_3 \end{pmatrix}$
- Set of vectors: $\mathcal{B} = \{\boldsymbol{b}_1, \boldsymbol{b}_2, \boldsymbol{b}_3\}$
- $\mathbb{R}$, $\mathbb{C}$, $\mathbb{Z}$, $\mathbb{N}$, $\mathbb{R}^n$, etc
- Probability: We use both $p(\cdot)$, $\mathbb{P}[\cdot]$.