

Lab 1: KNN and cancer classification

(Statistical Learning, BST 263)

Practice problems (Individual activity – 10 minutes)

(Problems 1 and 2 are to be handed in on paper during class.)

Suppose $f(x)$ is a real-valued function on \mathbb{R}^n , i.e., $f(x) \in \mathbb{R}$ for $x \in \mathbb{R}^n$. The gradient of f , denoted $\nabla f(x)$, is the column vector in \mathbb{R}^n with k th entry

$$(\nabla f(x))_k = \frac{\partial}{\partial x_k} f(x).$$

1. If $A \in \mathbb{R}^{m \times n}$ and $f(x) = x^T A^T A x$, then what is $\nabla f(x)$?

Hint: $f(x) = \sum_i \left(\sum_j A_{ij} x_j \right)^2$.

The Hessian of f , denoted $\nabla^2 f(x)$, is the $n \times n$ matrix with (k, ℓ) th entry

$$(\nabla^2 f(x))_{k\ell} = \frac{\partial^2}{\partial x_k \partial x_\ell} f(x).$$

2. If $A \in \mathbb{R}^{m \times n}$ and $f(x) = x^T A^T A x$, then what is $\nabla^2 f(x)$?

KNN and cancer classification (Team activity)

Form teams of 2 to 4 people. Download `lab-1.r` from Files/Labs on Canvas, and follow the instructions in the file. Submit your completed R code file to the Lab 1 assignment on Canvas. Only one person per team should submit the file.