Chapter ML:I

I. Introduction

- Examples of Learning Tasks
- Specification of Learning Tasks
- Elements of Machine Learning
- Notation Overview
- Classification Approaches Overview

Notation Overview

Data, Sets, and Distributions

Symbol	Semantics
$x,\ x_i,\ x_1, \ldots, x_p$	Feature
$\mathbf{x} = (x_1, \ldots, x_p)^T \in \mathbf{R}^p$	Feature vector
$\mathbf{x} = (1, x_1, \ldots, x_p)^T \in \mathbf{R}^{p+1}$, i.e., $x_0 = 1$	Extended feature vector
$\mathbf{X}$	Feature space, Cartesian product of the domains of the p dimensions of a feature vector $\mathbf{x}$.
$X = \{\mathbf{x}_1, \ldots, \mathbf{x}_n\}$	Multiset of feature vectors
X	Random variable (randomness regarding feature x of an object o)
$\mathbf{X}$	Multivariate random variable, random vector (randomness regarding feature vector $\mathbf{x}$ of an object o)

Notation Overview

Indexing

Running		Sequence	Semantics of maximum
$\square_s$	$\in$	$\{\square_1, \ldots, \square_d\}$	Number of layers in a multilayer perceptron
$\square_i$	$\in$	$\{\square_1, \ldots, \square_k\}$	Number of classes Number of folds during cross validation
$\square_l$	$\in$	$\{\square_1, \ldots, \square_m\}$	Number of elements in a domain of a feature Number of hyperparameter values during model selection
$\square_i$	$\in$	$\{\square_1, \ldots, \square_n\}$	Number of elements in a data set D
$\square_j$	$\in$	$\{\square_1, \ldots, \square_p\}$	Dimension of a feature space or a feature vector

Notation Overview

Functions

Function definition	Function name	Occurrence
$I_{\neq}(a,b) = \begin{cases} 0 & a = b \\ 1 & a \neq b \end{cases}$	Indicator function	Part II: Machine Learning Basics Part III: Linear Models
$f(x) = \dots$	function	Part :

Notation Overview

Algorithms

Signature	Algorithm name	Occurrence
LMS(D, η)	Least Mean Squares	Part I: Introduction Examples of Learning Tasks
ALG$(\ldots)$	algorithm	Part : ...

Classification Approaches Overview