AutoML Lecture: Notation Cheat Sheet

Symbol	Meaning
	Machine Learning
$\mathcal{D}$	Dataset
$\mathcal{D}_{\text{train}}$	Training dataset
$\mathcal{D}_{\text{val}}$	Validation dataset
$\mathcal{D}_{\text{test}}$	Test dataset
$\mathbf{D}$	Space of datasets
$\mathbf{x}$	Feature vector
y	Label
$(\mathbf{x}^{(i)}, y^{(i)})$	i-th observation
$L(y, \hat{f}(\mathbf{x}))$	(empirical) loss
$\mathcal{R}$	risk
$\mathcal{R}_{\text{emp}}$	empirical risk
$f(\mathbf{x})$	continuous prediction function
$\mathcal{H}$	hypothesis space where f is from
$\hat{f}$	estimated prediction function
	Hyperparameter Optimization
$\boldsymbol{\lambda}$	Hyperparameter configuration
$\boldsymbol{\lambda}_i$	Value of i-th hyperparameter
$\boldsymbol{\lambda}_{\text{def}}$	Default hyperparameter configuration
$\hat{\boldsymbol{\lambda}}$	finally returned hyperparameter configuration
$\boldsymbol{\lambda}^*$	Optimal hyperparameter configuration
$\boldsymbol{\Lambda}$	Space of possible hyperparameter configurations
$\mathcal{A}$	Algorithm (e.g. SVM, RF, DNN)
$\mathbf{A}$	Distribution or set of algorithms
$c(\boldsymbol{\lambda})$	Target cost function (e.g., empirical risk, validation loss, runtime)
$\hat{c}(\boldsymbol{\lambda})$	Surrogate (probabilistic) model of target function
$\mathcal{D}_{\text{Hist}} = \langle \boldsymbol{\lambda}^{(t)}, c(\boldsymbol{\lambda}^{(t)}) \rangle_{t=1}^{T}$	All observations collected for BO / HPO
	Gaussian Processes and Bayesian Optimization
$\mathcal{G}$	Gaussian process
t	BO loop counter
T	BO loop counter max, the counter runs from 1 to this value
u	Acquisition Function, no args
ϕ	Standard Normal PDF
Φ	Standard Normal CDF
μ	Mean
σ	Standard Deviation
σ^2	Variance
ν	Noise
$\mathbb{R}$	Real numbers set
$\mathbb{E}$	Expected value
κ	kernel
c	Constraint function
$\mathcal{N}$	Normal distribution

Symbol	Meaning
	Algorithm Selection
$\mathbf{x}_{\text{meta}}$	Vector of (meta-) features
$\mathcal{X}_{\text{meta}}$	Space of (meta-)features
$\mathbf{P}$	Portfolio (i.e., discrete set) of algorithms or hyperparameter configurations
$\mathcal{S}$	Schedule of algorithms or hyperparameter configurations
	Meta-Learning
θ	Weights (a.k.a. parameters) of ML model (e.g., DNN)
ϕ	Weights of meta-model
$\mathcal{D}_{\text{meta}}$	Meta-dataset
	Reinforcement Learning
π	Reinforcement learning policy
$\mathbf{\Pi}$	Space of policies
a	action in RL-setting
s	state in RL-setting
$\mathcal{S}$	Space of states
r	Reward in RL-setting
$\mathcal{R}$	Random variable or function of reward
	Algorithm Configuration
κ	Cutoff (often runtime) of an algorithm run
i	a single instances (a.k.a. problem, dataset, task)
$\mathcal{I}$	Distribution over instances (a.k.a. problems, datasets, tasks)