Machine Learning I

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Machine Learning for Computer Vision
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- **Semi-supervised and unsupervised learning**
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- Clustering
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- **Supervised structured learning**

Prerequisites

- ► Mathematics
    - ► Linear algebra (basics)
    - ► Multivariate calculus (basics)
    - ► Probability theory (basics)
- ► Computer Science
    - ► Algorithms and data structures (basics)
    - ► Theoretical computer science (basics of complexity theory)

Notation

- We write "iff" as shorthand for "if and only if".
- For any finite set A, we denote by $|A|$ the number of elements of A.
- For any set A, we denote by 2^A the power set of A.
- For any set A and any $m \in \mathbb{N}$, we denote by $\binom{A}{m}$ the set of all m-elementary subsets of A, i.e. $\binom{A}{m} = \{B \in 2^A \colon |B| = m\}$.
- For any sets A, B, we denote by B^A the set of all maps from A to B
- For any map $f \in B^A$, any $a \in A$ and any $b \in B$, we may write $b = f(a)$ or $b = f_a$ instead of $(a, b) \in f$
- Given any set J and, for any $j \in J$, a set S_j, we denote by $\prod_{j \in J} S_j$ the Cartesian product of the family $\{S_j\}_{j \in J}$, i.e.

$$\prod_{j \in J} S_j = \left\{ f \colon J \to \bigcup_{j \in J} S_j \,\middle|\, \forall j \in J \colon f(j) \in S_j \right\} \tag{1}$$

- We denote by $\langle \cdot, \cdot \rangle$ the standard inner product, and by $\| \cdot \|$ the l_2-norm.
- For any $m \in \mathbb{N}$, we define $[m] = \{0, \ldots, m-1\}$.