# Intelligent Systems Introduction to Machine Learning

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### Machine Learning everywhere

#### Completing requests

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	machine learning - Google-Suche	1
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	Weitere Informationen	
	Maschinelles Lernen – Wikipedia	
	https://de.wikipedia.org/wiki/Maschinelles_Lernen 🔻	
	aus Christopher M. Bishop: Pattern Recognition and Machine Learning .	
	Symbolische und subsymbolische Algorithmische Ansätze - Lernkategorien	
	Machine learning - Wikipedia, the free encyclopedia	
	https://en.wikipedia.org/wiki/Machine_learning * Diese Seite übersetzen	
	Machine learning is a subfield of computer science that evolved from the study of nations recognition and computational learning theory in artificial intelligence.	
	List of machine learning - Supervised learning - Computational learning theory	
	Machine Learning - Stanford University   Coursera	
	https://www.coursera.org/learn/machine-learning > Diese Seite übersetzen	
	Machine Learning from Stanford University. Machine learning is the science of getting	
	computers to act without being explicitly programmed. In the past decade,	
	Machine Learning – Predictive Analytics   Microsoft Azure	
	https://azure.microsoft.com/de-de/services/machine-learning/ *	
	Dienst für Predictive Analytics in den Bereichen Big Data Mining, künstliche	
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#### Recommender systems



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#### Image segmentation





### What is Machine Learning?



#### Symbolic data and measurements $\Rightarrow$ Semantics and structure



### What is Machine Learning?

Machines that learn to perform a task from experience We can formalize this as:

$$y = f(x; \theta)$$

- y is called output variable,
- x the input variable and
- heta the model parameters

learn... adjust the parameter  $\theta$ 

- ... to perform ...
- $\dots$  a task  $\dots$  the function f
- ... from experience using a training dataset

$$L = ((x_1, y_1), (x_2, y_2) \dots (x_l, y_l))$$
 or  $L = (x_1, x_2 \dots x_l)$ 



### What does it mean "to perform" ?

Performance: "99% correct classification"

- of what ?
- i.e. on speech recognition (correct words, characters, speakers identification etc.)
- over which dataset ?
- Is 99% good enough ?
- 1% false alarm for 300.000 passengers at airport Frankfurt ?

"The car drives without human intervention 99% of the time on country roads"





### Different learning scenarios

Statistical vs. discriminative: probabilities vs. strategies

Supervised: there is a completely labelled (annotated) dataset

Semi-Supervised: dataset is partially labelled

Unsupervised: no annotations at all

*Reinforcement*: there is a reward for correct action/recognition

Transductive: no model, just find the "true" answer

On-line: the training samples are not available at a time

Large-scale: lots of data

Active: how to ask a "teacher" for an annotation ?

### Lecture overview

- 14.12: Introduction to Machine Learning, Probability Theory
- 21.12: Decision Making, Statistical Learning (Schlesinger)
- 04.01: Directed Graphical Models (Rother)
- 11.01: Undirected Graphical Models (Rother)
- 18.01: Neural Networks (Schlesinger)
- 25.01: Reinforcement Learning (Krull)
- 01.02: Wrap-up (Rother)

First exercise: 14.12 about Probability Theory (Heidrich)

Course homepage:

http://cvlab-dresden.de/courses/intelligente-systeme/

