Problems addressed
Background and prerequisites
Teaching methodology, material, exams, contacts

Introduction to Machine Learning - Lecture 1

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Find slides: http://montefiore.ulg.ac.be/~lwh/AIA/

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Problems addressed in this course

How can we design and/or make use of algorithms in order to extract from (possibly very large) datasets good decision strategies, predictive models, explanations and interpretations ?

⇒ Batch-mode supervised learning   (The main building block)

⇒ Classical algorithms   (Decision trees, nearest-neighbor, neural nets etc.)

⇒ Theory   (Sampling, likelihood, bias/variance, statistical learning theory)

⇒ Advanced algorithms   (Ensemble methods, kernel-based methods)

⇒ Diverse learning protocols   (SSL, RL, ActL, USL, on-line learning etc.)

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NB.   ▶ Many practical problems are concerned
       ▶ Most are related to complex and uncertain environments
       ▶ Scalability considerations are important

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- ▶ Way of thinking:
  - ▶ probability theory, information theory, logic
- ▶ Mathematical analysis tools:
  - ▶ linear algebra, calculus, optimization theory, statistics
- ▶ Problem solving attitude:
  - ▶ algorithmics, complexity theory, intuition

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- ▶ Lectures: mandatory every Wednesday AM (9:00-12:00)
- ▶ Personal work: readings, 3 projects by group of two students with written report and oral defense
- ▶ Material: slides of lectures and selected chapters of reference textbooks
- ▶ Evaluation: projects (40%); oral exam (60%) (January)
- ▶ Contacts persons:
  - ▶ P.Geurts@ulg.ac.be, L.Wehenkel@ulg.ac.be: any question related to the course
  - ▶ A.Sutera@ulg.ac.be, JM.Begon@ulg.ac.be: any question related to the projects

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Lecture topics

▶ Introduction to machine learning Today

▶ Supervised learning

  ▶ Decision trees
  ▶ Linear models
  ▶ Nearest-neighbor methods
  ▶ Neural networks
  ▶ Sampling, bias and variance, model assessment and selection
  ▶ Ensemble methods and feature selection
  ▶ Support vector machines and kernel-based methods

▶ Unsupervised learning

  ▶ Clustering
  ▶ Dimensionality reduction

▶ Plus a few special lectures related to the projects: introduction to scikit-learn, project explanations and corrections.