Machine Learning

Introduction

Aleksandr Petiushko

ML Research

January 8th, 2024

Content

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Intro

About the lecturer[1]

- Aleksandr Petiushko, PhD in theoretical CS (2016)
- Lecturer in Lomonosov MSU / MIPT for Machine Learning, Computer Vision, Deep Learning Theory, Python for an ML Researcher since 2019
- Former Huawei Chief Scientist (Scientific Expert), AIRI Director of Key Research Programs (Leading Scientific Researcher)
- Currently at Nuro, leading the ML Research

[1] Homepage: `https://petiushko.info/`

Intro

Time to introduce yourselves: what are your hobbies, motivation in ML, etc.: please go into "**Module 1 Students Introduction**" thread

Sofia Plagiarism Policy

- It covers parts "*sourced from AI*"
  - Please read the "**Sofia Plagiarism Policy**" thread
  - **First offense**: students need to rewrite assignment
  - **Second offense**: students fail the course
  - **Third offense**: students re to be withdrawn from their program

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- The caveats are the following:
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  - It can produce very different information in comparison to the source used to ask question (e.g., book chapter)

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- Only the answers with some non-trivial arguments that contradict the initial post will be considered as graded ones

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- Preliminary grading scale:

Grade	Percent accumulated
A	90-100 %
B	75-89 %
C	60-74 %

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  - **Math**: for research and design of ML algorithms
  - **Programming**: usage and tuning of ML algorithms
- Hopefully we could touch on both a little

Github

- Course page: `https://github.com/fatheral/sofia-ml-2024-winter`
- The professor's lectures will be uploaded there

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- Able to perceive the information, analyze it, make decisions based on this analysis

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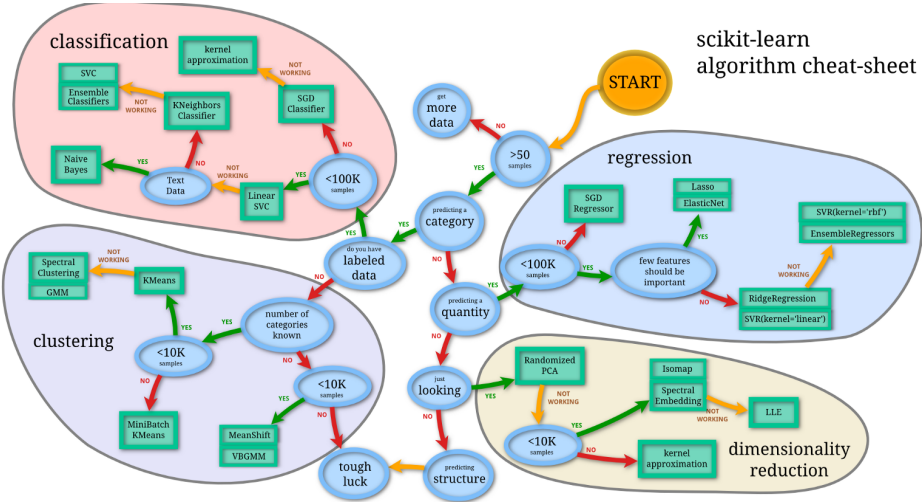
- (**Weak**) Algorithm which is able to train using the input data in order to do tasks afterward — instead of human

Scikit-Learn[2] Roadmap



[2] https://scikit-learn.org/stable/tutorial/machine_learning_map/

(Tentative) future content

Theoretic part

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  - Precision / Recall, TPR / FPR, ROC, AUC, Cross-Validation, ...

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Practice part

- Data processing and analysis by Python
  - Scikit-Learn, Numpy, ...

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In 1997 Tom M. Mitchell introduced more formal definition of a machine learning algorithm.

Formal definition

A **computer program** is said **to learn** from examples E for some set of problems T and a quality metric P if its performance on problems from T, as measured by P, is improved by using examples E.

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- **1901**: Karl Pearson invented the Principal Component Analysis (PCA) — a master method for data dimensionality reduction.
- **1906**: Andrey Andreyevich Markov develops the apparatus of Markov chains, which in **1913** he uses to study the text "Eugene Onegin". Markov chains are used to generate and recognize signals.

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- **1963**: Lawrence Roberts formulated the thesis of computer vision in his dissertation at MIT.

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- **1997**: The Deep Blue computer beat world chess champion Garry Kasparov.

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- **2022**: OpenAI, a (not so) non-profit research company, provided the breakthrough in LLMs: ChatGPT.

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Definitions

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- Reinforced
  - Action generation based on interaction with the environment

Takeaway notes

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3. We are going to cover the most important things needed for ML, and will have small optional programming tasks
4. ML History is intriguing!

Thank you!