Applied statistics and Machine learning in Python with subsurface applications

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University of Stavanger

What are we going to talk about?

Artificial Intelligence (AI)

A field of computer science dedicated to creating systems capable of performing tasks that require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

Machine Learning (ML)

A subset of AI that involves the development of algorithms and statistical models that enable computers to perform tasks. A model is tuned in a learning phase and it can then make inferences from unseen data.

AI contains ML (and much more)

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ML can be taught as a very large toolset. Each tool is aimed to solve a particular type of problem. It is up to a user to frame a task (using the domain expertise) as a problem that can be then solved with a ML approach.

The aim of this course is exactly this. We will thus get an overview on what questions can be answered with ML, how data might be used and what output can be obtained.

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- An introduction to the major ML python libraries available.
- A set of hands-on exercises and tutorials, with applications in subsurface.

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Through various examples, we will explore how data can be gathered, refined, and ideally utilised to train machine learning algorithms.

We will also discuss the realistic expectations and limitations of such methods. Moreover, the course will guide you in developing your own Python code to tackle various, manageable ML challenges.

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Online Machine Learning python libraries

We will use a set of machine learning libraries:

skilearn Originally developed in affiliation with Google, it is the most used open source Python module for machine learning built on top of SciPy.

pytorch Originally developed by Meta AI and now part of the Linux Foundation umbrella. It is free and open-source software.

TensorFlow Developed and owned by Google, is a free and open-source software library.

Deeptime A Python library for analysis of time series data. In particular, methods for dimension reduction, clustering, and Markov model estimation (scikit-learn based).

Keras Keras is a deep learning API based on pytorch and sklearn.

There is plenty of material online that is worth checking for further learning. I personally recommend:

Applied machine learning

Machine learning with python