Training Sessions
Python & Artificial Intelligence for Geoscientists

The following training sessions have been designed to train geoscientists to the use of Python and machine learning techniques, emphasizing on statistical analysis and graphical displays using practical examples from the geoscience industry.

Who should attend: Geologists, engineers, and more generally geoscientists from the energy industry.

Pre-requisites: No background in coding is required.

Objectives: Get an understanding of what can be done using Python for geological data validation, modeling and reporting, and develop knowledge on the benefits and use of artificial intelligence techniques, machine learning in particular.

At the end of the training sessions, participants will be able to :

- Setup a Python environment from scratch
- Understand basic coding in Python
- Read, manipulate and visualize geological data
- Perform Exploratory Data Analysis (EDA)
- Write procedures to automate tasks
- Understand ML/AI principles, benefits and pitfalls
- Setup and run ML/AI algorithms
- Collaborate efficiently in Python programming

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Agenda

■ Session #1: Getting Hands on Python

Duration: 2 Days

Who should attend: Beginners

Content Overview:

- Python environment installation
- Introduction to Jupyter notebook and alternatives
- Overview of useful Python libraries and illustrations
- Python coding basics:
    - Importing functions
    - Variables types
    - Loops "for/while"
    - List management, dictionary and tuples
    - Reading Python library documentation

■ Session #2: Focus on Data Preparation & EDA

Duration: 2 Days

Who should attend: Intermediate to confirmed Python users

Content Overview:

- Data loading, manipulation and visualization
    - Reading geological datasets (*.csv, *.las, *.xlsx, *.seg-y, *.shp, etc.)
    - Cleaning, filtering and grouping with Pandas
        - Data edition
        - Indexes and masks
        - Categories
        - Grouping and filtering
    - Basic graphs and statistics with Matplotlib, Plotly and Seaborn
- Exploratory Data Analysis (EDA)
    - Scientific calculations and multivariate analysis using Numpy, Scipy, Scikit-Learn and other libraries
    - Advanced visualization graphs

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Session #3: A Dive in AI & Machine Learning

Duration: 3 Days

Who should attend: Intermediate to confirmed Python users

Content Overview:

- Introduction to AI/ML principles and workflow
- Focus on how to address "geos" issues
- AI/ML playground:
  - Data standardization
  - Data balancing
  - Dataset size
  - Overfitting
- Regular ML &. Deep Learning: practical exercises on well data
- Use Cases (pick 2 from the list) :
  - Rock/facies image recognition with pre-trained Convolutional Neural Net
  - Well production profile prediction
  - Machine learning on well data (facies prediction, etc.)
  - Geological information extraction from text with Natural Language Processing (NLP) techniques
- Team Contest on one of previously selected item
  - Data collection
  - Data preparation
  - Training + Evaluation
  - Team presentation

Session #4: Best Practices in Coding

Duration: 1 Day

Who should attend: Confirmed Python users

Content Overview:

- Best practices in collaborative programming
  - Use of versioning solutions (Git)
  - How to organize and share code
  - Code standards
- Python code deployment

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