

2 Weeks Practical Training Applied Machine Learning & Data Science for Production Engineering



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ABOUT THIS TRAINING

- Our intensive Machine Learning training for reservoir engineering domain will covers all the basics about ML implementation in production engineering and production monitoring with hands on project to implement the typical ML tasks: Clustering, Time Production Analysis, Regression, Classifications
- This training is designed by an oil and gas professional for professionals likewise, where real oil and gas data are used in the training with diversity in data sets.









SKILLS GAINED

-  Get started with Python and Machine Learning.
-  Learn Basics of Python as an ML tool.
-  Data Manipulation, Filtering, visualization and processing.
-  Machine Learning Implementation.
-  Work with actual Oil and Gas Data.
-  Learn from an instructor with 11 year's experience in programming, technology and Upstream Industry.



AUDIENCE

-  Reservoir Engineers.
-  Production engineers.
-  Chemical engineers.
-  Drilling engineers.
-  Geologists and petrophysics
-  AL and workover engineers.
- Undergraduate students.







PREREQUISITE

- No knowledge is required.
- A working laptop with Windows 10 OS, MacOS or GNU Linux Distro



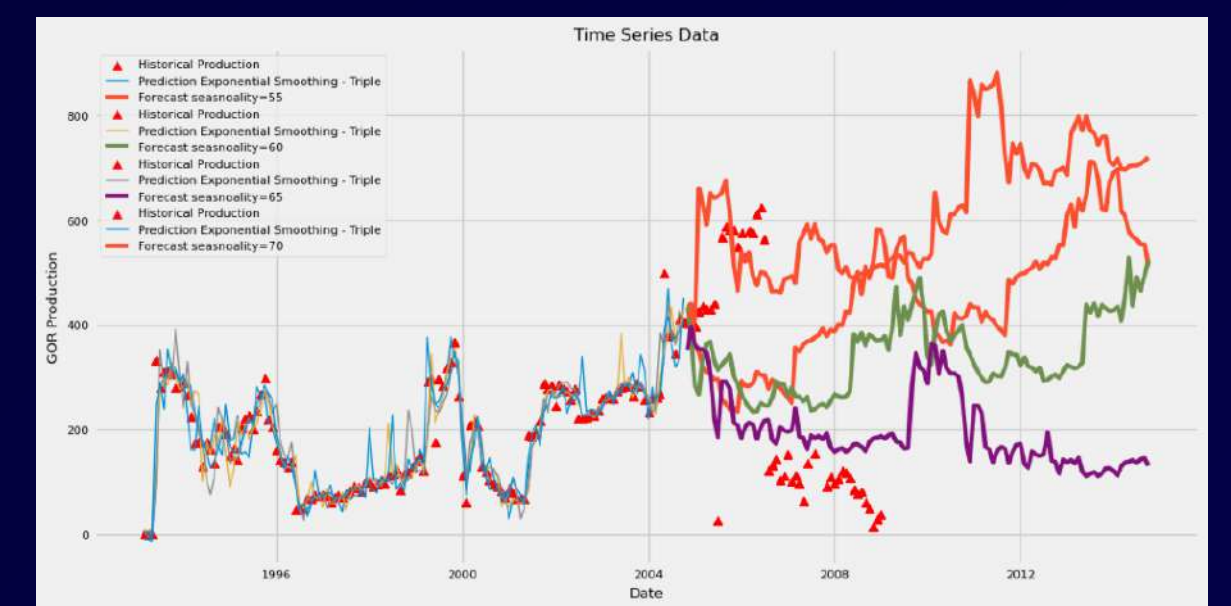
WHAT YOU WILL GET FROM JOINING

-  Access to Video Recordings on daily basis.
-  Study materials ppt, pdf
-  Many Oil and Gas Datasets.
-  Learn Python through anaconda package

MODULE 1

TOPICS

- Introduction to Data Science and related Methodologies
- A gentle introduction to Python Programming Language
- Introduction to Python Environment and Ecosystem
- Data types and Structures in Python
- Introduction to Data Visualization
- Working with Tabulated Data using Pandas
- Basics of Data Cleaning and Transformation using Pandas.
- Creating Calculations and Data Exports.
- Linking Excel, CSV, TXT to Python



EXERCISES

- Oil and Gas Data Reading and excel connection to python
- Simple Reservoir Data Visualization.
- Filtering Reservoir Data based on Wells (single or Multiple)
- Cleaning and organizing historical data, with proper datetime conversion.

WHAT YOU WILL LEARN

- **Understand the Basics of Python Programming:** Gain a foundational understanding of the Python programming language, including its syntax, structure, and common uses.
- **Navigate the Python Environment and Ecosystem:** Familiarize yourself with the Python environment, including IDEs, libraries, and tools that form the Python ecosystem.
- **Identify and Utilize Python Data Types and Structures:** Learn to work with various data types and structures in Python, such as lists, dictionaries, tuples, and sets, for efficient data management.
- **Create Basic Data Visualizations:** Explore fundamental data visualization techniques using Python to represent data graphically.
- **Manipulate and Analyze Tabular Data Using Pandas,** in any form for production, reservoir and petrophysical parameters
- **Perform Basic Data Cleaning and Transformation:** Learn essential data cleaning techniques, including handling missing data, filtering, and transforming datasets with Pandas.
- **Create Calculations and Export Data:** Develop skills to perform calculations and export the processed data into various formats

MODULE 2

TOPICS

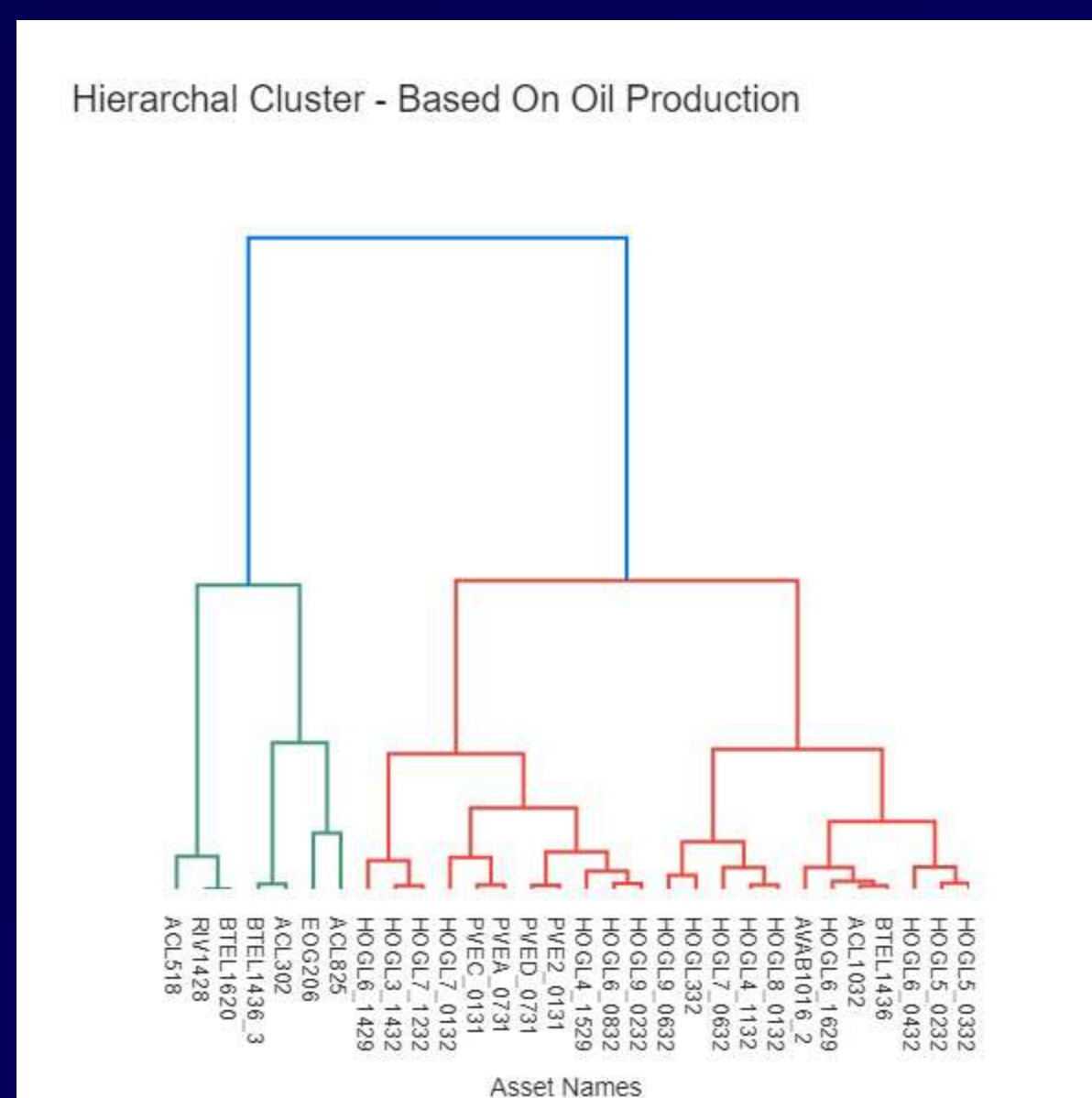
- Introduction to the Concept of Clustering
- Understanding Distance Metrics
- Introduction to the Scikit-Learn Library for Machine Learning
- Fundamental Python Expressions and Functions
- Introduction to Python Plotting
- Anomaly Detection Techniques

EXERCISES

- Clustering Water Production Data.
- Detecting Anomaly in Production Data

WHAT YOU WILL LEARN

- Gain an understanding of clustering as a powerful unsupervised machine learning technique, and how to group similar data points together.
- Explore various distance metrics such as Euclidean, Manhattan, and Cosine distances, and their importance in clustering and other machine learning algorithms.
- Learn to utilize the Scikit-Learn library to implement machine learning algorithms efficiently in Python.
- Master fundamental Python expressions, functions, and key programming constructs essential for building machine learning models.
- Discover Python plotting libraries like Matplotlib and Seaborn to visually represent data and insights.
- Understand the concept of anomaly detection and how to identify outliers in datasets using Python-based methods.



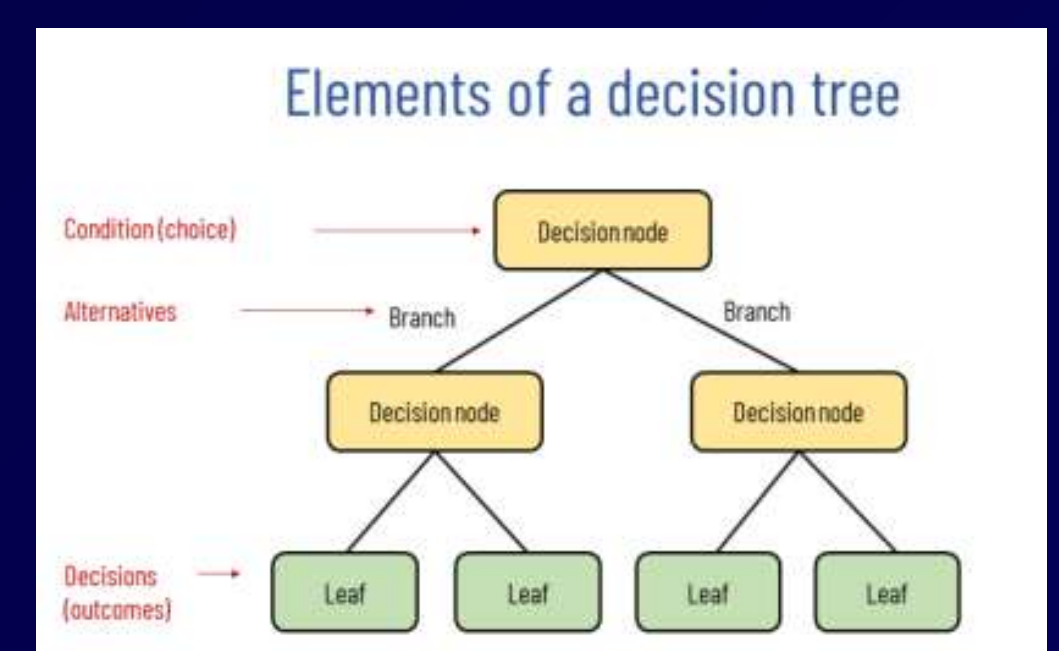
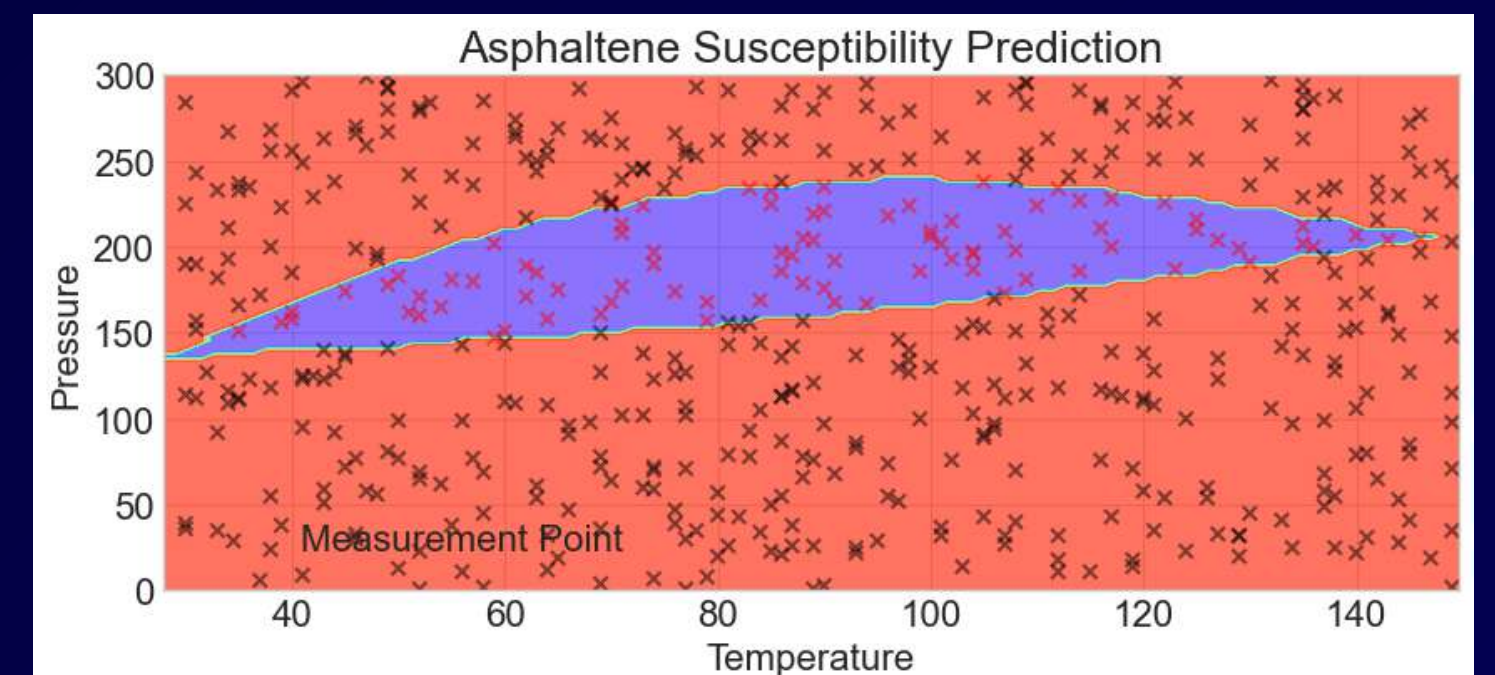
MODULE 3

TOPICS

- Introduction to the Concept of Clustering
- Understanding Distance Metrics
- Introduction to the Scikit-Learn Library for Machine Learning
- Fundamental Python Expressions and Functions
- Introduction to Python Plotting
- Anomaly Detection Techniques

EXERCISES

- Classifying ESP Operational Problems.
- Predicting Asphaltene Deposition Possibility
- Predicting Flow Regime Type
- Predicting Liquid Loading of Gas Wells



WHAT YOU WILL LEARN

- Understand the role of labels and events in the oil and gas industry, and how they influence data-driven decision-making.
- Learn the fundamentals of labeled data and how classification models use these labels to predict outcomes.
- Explore decision trees and their related algorithms, and how they are used in machine learning to make decisions based on data.
- Gain proficiency in using Pandas Data Frames to manage, manipulate, and analyze tabular data efficiently.
- Discover the One-V-Rest technique for binary classification and how to apply it when dealing with two-class problems.
- Dive into multiclass classification techniques, learning how to handle datasets with more than two categories.
- Master the evaluation of classification models using performance metrics such as accuracy, precision, recall, and F1-score.
- Visualize decision boundaries using decision maps to understand how classifiers separate different classes in a dataset.

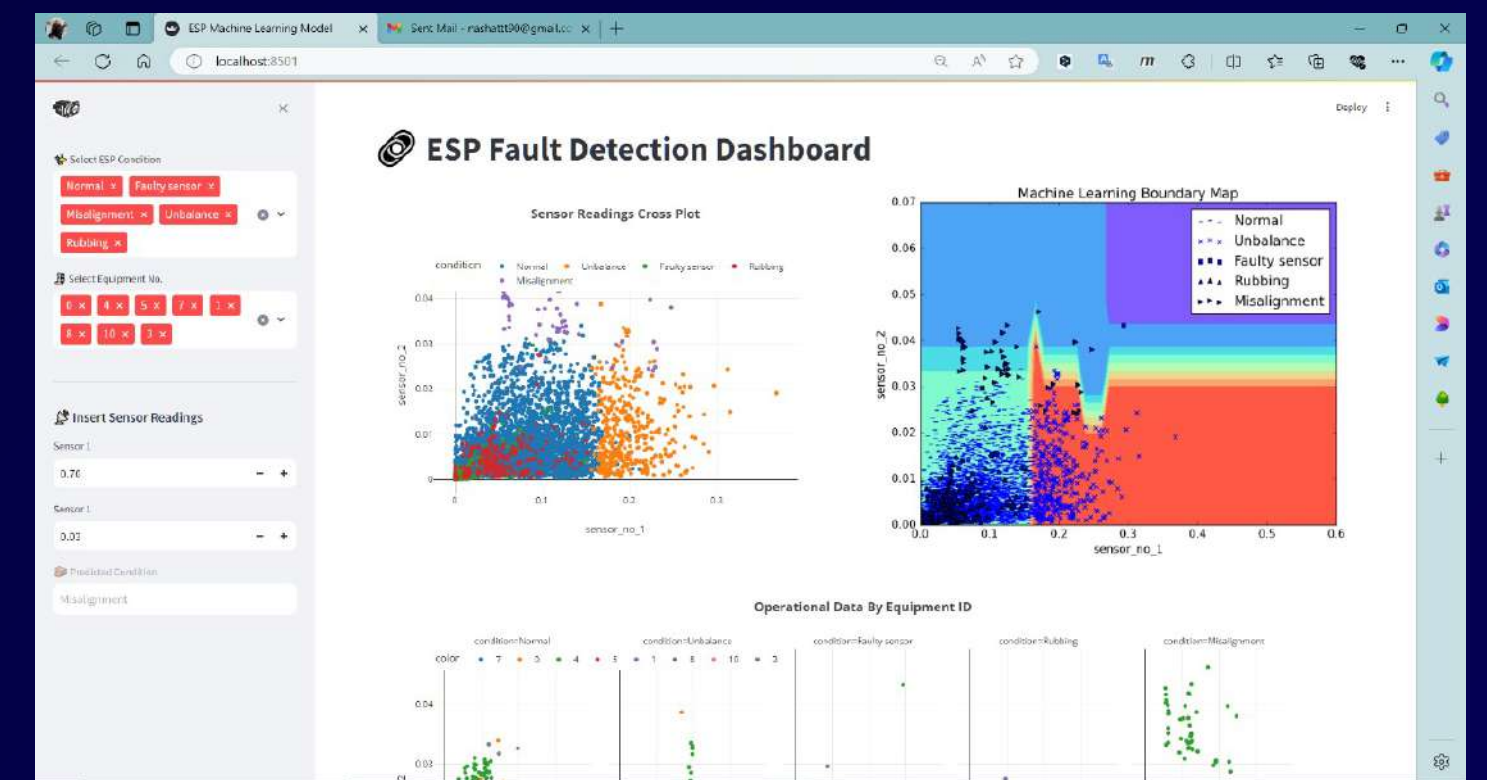
MODULE 4

TOPICS

- Introduction to Continuous Data and Corresponding Relationships
- Relationship Visualization and Correlation Matrix
- Introduction to Regression Analysis
- Linear Regression Fundamentals
- Support Vector Regression (SVR)
- Xtreme Gradient Regression (XGBoost Library)

EXERCISES

- Training ML to Behave like PROSPER software
- Predicting Hydrocarbon Properties using ML



WHAT YOU WILL LEARN

- Understand continuous data and how it differs from categorical data, as well as the relationships that can be formed between continuous variables.
- Learn how to visualize relationships between variables using various plots and generate correlation matrices to understand variable interdependencies.
- Explore regression analysis as a key technique for modeling relationships between variables and predicting continuous outcomes.
- Gain a deep understanding of linear regression, its assumptions, and how it is used to fit straight-line relationships between variables.
- Learn how to implement Support Vector Regression (SVR), a powerful algorithm for dealing with both linear and non-linear relationships in data.
- Discover the XGBoost library for performing extreme gradient boosting, a highly efficient and accurate machine learning algorithm for regression and classification tasks.

MODULE 5

TOPICS

- Introduction to Time-Bounded Data in the Oil and Gas Industry
- Understanding Typical Decline Curve Analysis (DCA) and Its Limitations
- Introduction to Time Series Analysis (TSA)
- Time Series Data Patterns and Components
- Comparing Decline Curve Analysis (DCA) to Time Series Analysis
- Short-Term Production Prediction Using Time Series Analysis
- Simple Moving Average (SMA) and Exponential Moving Average (EMA)
- Introduction to Autoregressive (AR) Models

EXERCISES

- Predicting Shale Production Decline using Auto Regression Models.
- Predicting Water Cut Based on WHP, Q_o , Q_g
- Multiwell Forecasting
- WOR, GOR Forecasting
- Hybrid Solution of Diffusivity Equation using Time Series and Steady State Equation.



WHAT YOU WILL LEARN

- Understand the concept of time-bounded data in the oil and gas industry and its importance for production and reservoir analysis.
- Learn the fundamentals of Decline Curve Analysis (DCA), a traditional tool in oil and gas, and explore its limitations when predicting long-term production.
- Dive into Time Series Analysis (TSA), a modern approach to handling temporal data, and learn how it differs from DCA.
- Recognize patterns and components in time series data, such as trends, seasonality, and cycles, and how these components influence predictions.
- Compare and contrast the application of DCA and TSA for predicting production rates and how time series can provide more dynamic insights.
- Learn to apply time series methods for short-term production forecasting and how it can improve decision-making.
- Master the concepts of Simple Moving Average (SMA) and Exponential Moving Average (EMA) for smoothing time series data.
- Explore Autoregressive (AR) models, a key technique for modeling and predicting future values in a time series based on its past behavior.