

Internship in Machine Learning applied to Reservoir Engineering

Summary

- **Length:** 6 months
- **Location:** 232 Avenue Napoléon Bonaparte, Rueil-Malmaison, 92500, France
- **Starting Date:** First semester 2024
- **Internship paid and compliant with school conventions**

Title

Application of artificial neural networks to reservoir engineering workflows.

Intern profile

Final year student enrolled in a master's degree program with a reservoir engineering option. A strong taste for Python programming and Machine Learning is required along with a good intuition to represent physical phenomena.

Objectives

To assist specific tasks related to its reservoir engineering studies for petroleum systems, Beicip-Franlab has developed data-driven workflows leveraging the benefits of Python programming and associated Machine Learning libraries.

This internship will be focused on 2 specific applications :

1. Machine learning based proxy models to replicate physics-based numerical models
2. Prediction of production and pressure data of oil and gas systems.

For the first objective the work will consist in:

- Familiarization with existing Python codes to replicate physics-based numerical simulators already applied on distinct areas of Beicip-Franlab expertise (reservoir simulation, basin modeling, stratigraphic modeling)
- Improvement of the existing workflow using advanced structures / architectures of artificial neural networks such as convolutional neural networks
- Application of the workflow on a new dataset corresponding to a field-wise reservoir model of geo-resources field (oil and gas, or geothermal)

For the second objective, the work will consist in:

- Familiarization with existing workflows (Python) and case studies already developed within Beicip-Franlab to predict oil and gas production and pressure data with neural networks
- Understanding the concept of graph neural networks and their practical implementation
- Application of graph neural network approach on a real case study to improve the predictions of well-wise production and pressure data of an oilfield.

Main tasks undertaken during the internship

- Critical review of several existing codes (Python)
- Literature review (on proxy modelling, on graph neural networks, ...)
- Continuation and consolidation of Machine Learning applications to several reservoir engineering problems
- Redaction of relevant supportive material to document the consolidated codes
- Participation to other (shorter) Data Science tasks, if any and if deemed relevant

The internship will be supervised by a senior reservoir engineer experienced with Machine Learning applications.

Software used

- Python (compulsory), in particular with the following libraries: pandas, sklearn, tensorflow, keras
- OpenFlow suite (IFPEN softwares: PumaFlow, CougarFlow, TemisFlow, DionisosFlow)

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Reference: **RP-2024-01**