

2024 SPE Europe Energy GeoHackathon





Italian Section



Croatian Section



Netherlands Section



London Section



Romanian Section



SPE France Section



SPE Vienna Basin Section



Central Ukraine Section



Geothermal Technical Section



Data Science and
Engineering Analytics
Technical Section

Bootcamp 2

Introduction to the Challenge

Josh Sellars
Mike Gunningham
Boris Vidoš

#2 Data review, handling, and interpretation



Josh Sellars
Project Geophysicist – Energy

is a Geophysicist based in Vancouver, Canada, and specializes in geophysical processing, interpretation, and geological modelling for Energy exploration and feasibility studies. He holds a Bachelor's in Geophysics from Memorial University. Josh has extensive experience using Leapfrog for Geothermal and Hydrocarbon exploration projects, using Leapfrog's dynamic model building tools for early-stage exploration and structural interpretation to create a conceptual model of the subsurface. Integration and management of data from multiple fields of geoscience is key to developing a holistic understanding of the subsurface, which is Josh's main focus using Seequent's suite of products. Josh joined Seequent in 2017 and is based in Vancouver, Canada. In his current role as Project Geophysicist he contributes to Training, Support, and Technical advice to Oasis montaj and Leapfrog users in North America.

 SEEQUENT

#2 Data review, handling, and interpretation



Mike Gunningham

Principal Petroleum Engineering Consultant - Mike Gunningham Consultancy

Mike is currently the Chief Production Technologist for the Mike Gunningham Consultancy, with over 30 years' experience around the world in oil and gas fields, in Production Technology, Production Optimisation, Well and Facility Integrity, Well, Reservoir and Facility Management (WRFM), Waterflooding and Enhanced Oil Recovery. He was a Principal Consultant in the SGS Subsurface Consultancy for 5 years, responsible for all Brownfield applications and Technical Due Diligence. Before that, Mike was the Head of Subsurface Support Team in Maersk Oil in Qatar (MOQ), as well as the Well, Reservoir & Facility Management Team Lead in MOQ, rolling out and embedding WRFM in the Al Shaheen oilfield. Mike has worked for Shell for 26 years, based mainly in Holland, while working all over the world on numerous projects (Bonga, Nigeria NLG, Brunei, Malaysia, Oman, GOM, Canada, Brazil, New Zealand, and half of the North Sea). Mike graduated from Bradford University with a Chemical Engineering degree before completing his MSc in Petroleum Engineering at Imperial College. He has been a member of the SPE since 1984 and is currently representing the SPE on the IPTC Board of Directors. He has received the 2022 SPE Europe Regional Service Award and 2010 SPE North Sea Region Award for Production & Operations.

#2 Data review, handling, and interpretation



Boris Vidoš

Project Manager | ENNA Geo

Boris has petroleum engineering background with obtaining his Master's degree in PE back in 2021 from the Faculty of Mining, Geology and Petroleum Engineering – University of Zagreb. As a young engineer he started his career in geothermal industry, working as a drilling engineer and drilling supervisor in Turkiye and Croatia. Currently Boris is the Project Manager responsible for developing a 20 MWe Geothermal Power Plant project in Slatina, Croatia (Slatina 2 Geothermal Exploitation Area). Slatina 2 is at the moment the most advanced geothermal project in Croatia, where drilling of the first planned, 5000 m deep geothermal well is underway. He has been a member of the SPE since 2015 and is currently representing the SPE Croatian section as a Young Professionals Chairperson. Boris has received the 2024 SPE Europe Regional Young Professional Member Outstanding Service Award.

The Challenge - Introduction

This year, the challenge for the SPE Europe GeoHackathon will be to use a dataset from Croatia.

The aim is to use machine learning to predict reservoir properties for two new wells, using well and seismic data from 6 other, already existing wells.

This information will then be the basis, to generate a geothermal field development plan, to generate electricity for a town of 50,000 people.

The Challenge

Part 1 (60% - data analytics task):

1. Review the well and seismic data and initialise the neural net
2. Take the data from the 6 wells (wells 1-6) and train the model using them
3. Confirm that the neural net has been correctly trained
4. Using the neural net, to predict the reservoir properties for two new wells (wells 7 and 8)

Part 2 (40% - Geothermal Development Plan):

Using the data given above plus cost and heat data, come up with a plan to develop a geothermal reservoir for power generation. Determine:

- How many wells need to be drilled and determine what the production is?
- How much electricity can be generated based on predicted production rates?
- How much does it cost and is it economic?

Deliverables

- Deliver a readable and workable code, with sufficient comments, so that the judges can reproduce your results
- Prepare a short (4 page) high level management report covering both parts of the challenge
 - For the data analytics, describe what you did, how you did it, how good are results
 - For the FDP, what are your main assumptions and risks, how much electricity do you generate with the costs.
- Make a 5 min video presentation of the project

Data Review

- Map
- Seismic lines
- Petrophysical data
 - Gamma Ray
 - Porosity
 - Permeability
- Well Coordinates
- Lithologies
- Geothermal Gradients

Software available:

- Leapfrog
- Python
- Excel (forecast and economics)
- Other software that you have available

(I need to cover well names with new numbers and the two blocks with Block 1 and Block 2) – Mike I maybe only cover the pink/field names



Data Handling

- Use Leapfrog for visualizing the well and seismic data
- Use Python to generate the algorithms and code to carry out the data analytics and carry out prediction of reservoir properties



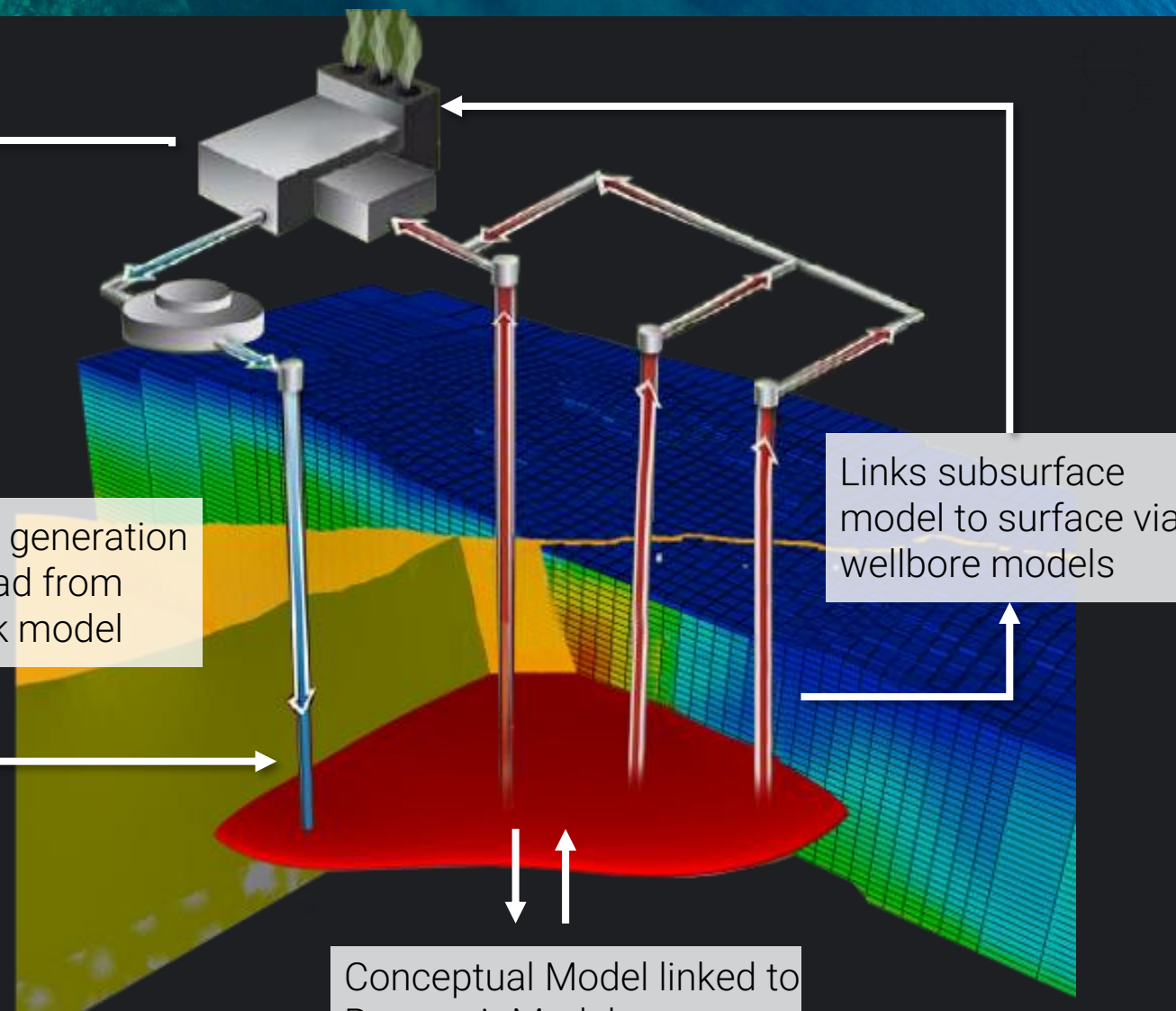
World-leading coupled modeling software to address the challenges of Geothermal Assets



Forecast power generation and injection load from surface network model

Links subsurface model to surface via wellbore models

Conceptual Model linked to Reservoir Model





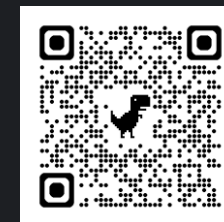
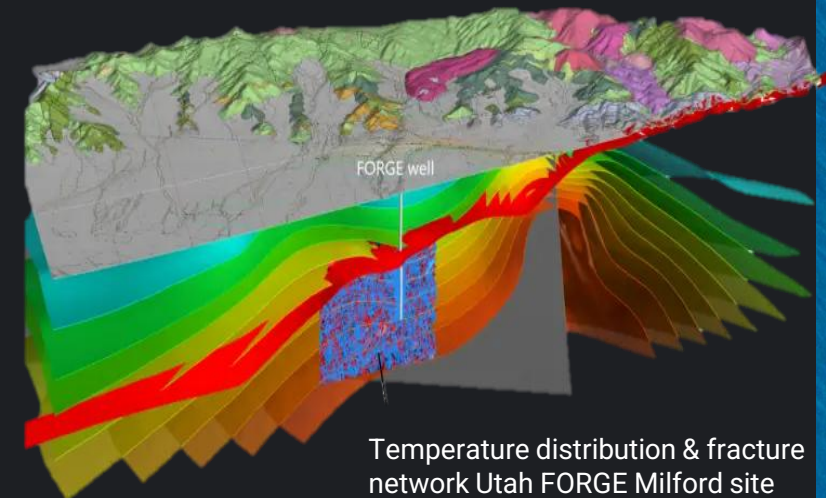
Seequent is providing Leapfrog Energy 3D geomodeling software licenses for the GeoHackathon



Leading software used by geothermal operators worldwide to model the subsurface, understand risk, and plan and operate their resource

Your teams will have access to Leapfrog to:

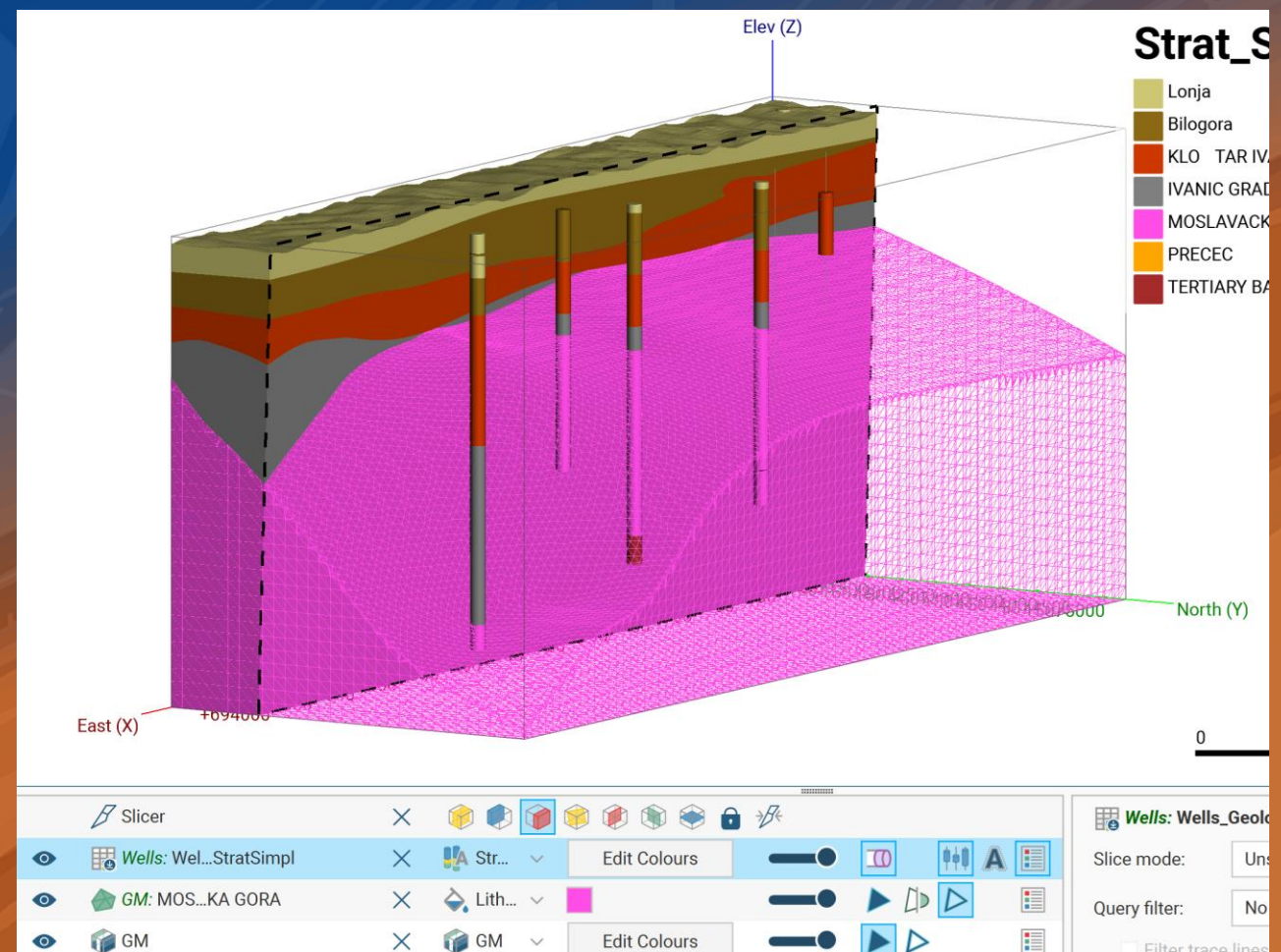
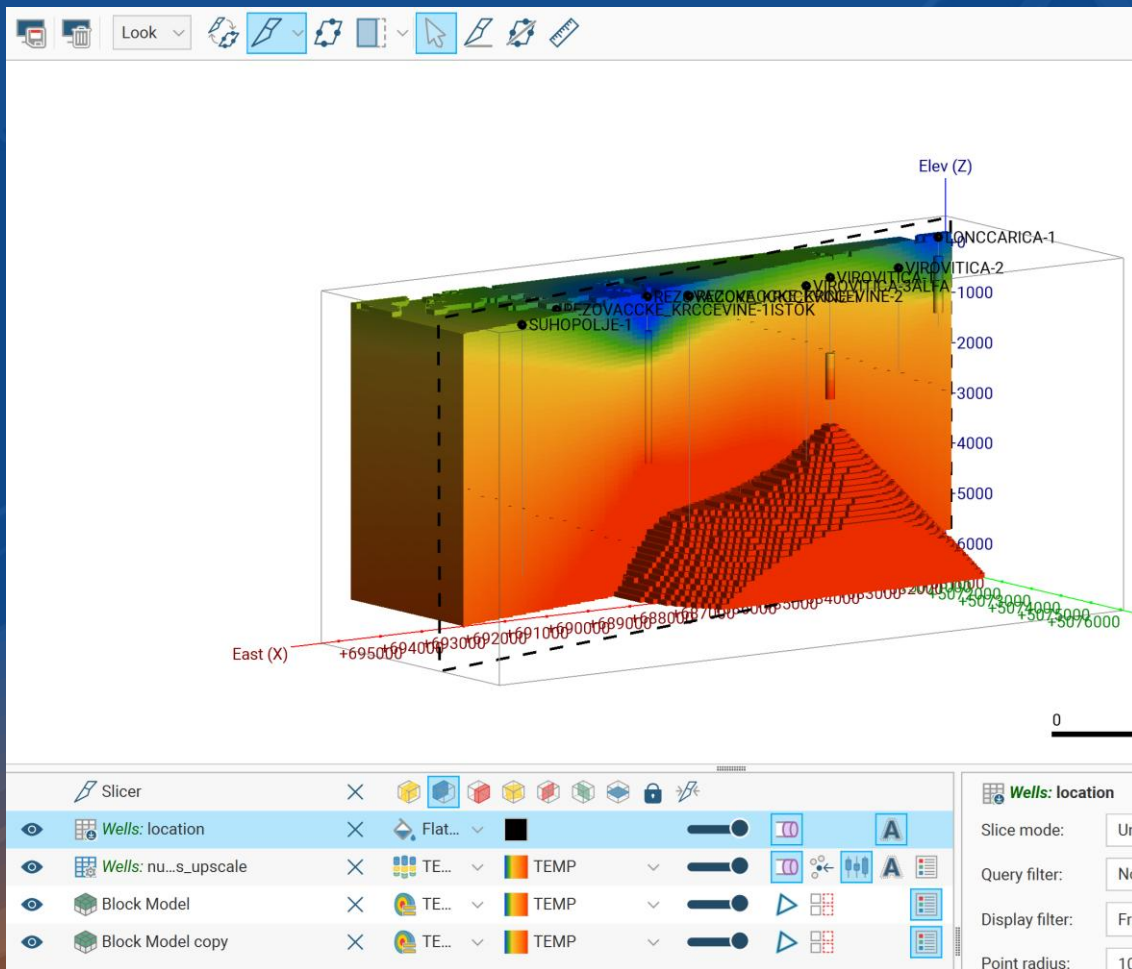
- Build a 3D conceptual model of the geothermal system by combining and interpreting geological and geophysical data
- QA/QC of ML-derived properties & update geo model
- Visualize and present results



Case Studies

Note: Leapfrog licenses are personal, non-transferable, and non-exclusive and use is restricted to the hackathon only. You must not use the software for any commercial purposes. By accessing and using the software, you agree to the User Terms (<https://www.seequent.com/legal-privacy/online-services-user-terms>). Any information you provide will be managed and used in accordance with our Privacy Policy.

Interpretation (Leapfrog)



Summary

- Follow the bootcamps to:
 - Understand the processes and how to do data analytics
 - Learn how to use the tools (Python and Leapfrog)
- Review and visualize the data
- Correlate the 6 known wells with the seismic lines
- Use Machine Learning and Artificial Intelligence to predict the properties of the two unknown wells
- Prepare a Geothermal Field Development Plan to generate electricity

2024 SPE Europe Energy GeoHackathon Geothermal education.

BootCamps Schedule – Starting October 21, 2024

- | | | |
|--------|--|--|
| Oct 21 | Croatia – the geothermal energy front - the past, present and future | - Dragutin Domitrović, CEO Calida Acqua |
| Oct 23 | Introduction to the challenge - Data review, handling interpretation | – Josh Sellars / Mike Gunningham |
| Oct 24 | Geothermal Reservoirs - Geology basics | – Ana Maria Alexandru, Expert Geoscience, OMV |
| Oct 28 | Geothermal Reservoirs - Deciphering the rocks through petrophysics | – Tom Bradley, Sr.Petrophysical Advisor BH |
| Oct 30 | Introduction to Machine Learning and Deep Learning | - Chiara Galimberti, Data & AI Scientist Expert, Eni |
| Nov 4 | Leapfrog – Building a conceptual model | – Josh Sellars, Project Geophysicist, Seequent |
| Nov 6 | Geothermal energy - heat flow quantification | – Yamal Askoul, Global SME Reservoir Engineering, GaffneyCline |
| Nov 14 | Geothermal Field Development Plan - the Approach | – Tim Lines, CEO Geothermal Wells LLC |
| Nov 15 | Geothermal energy - Project economics | – Davis Varghese, Senior Economist GaffneyCline |

ALL SESSIONS WILL BE RECORDED AND MADE AVAILABLE TO PARTICIPANTS – Sessions 1,2,3 starting at 15:00 UTC

2024 SPE Europe Energy GeoHackathon Questions?

