Energy A.I. 2022
2nd Annual Hackathon
Introduction

Dr. Michael Pyrcz and Dr. John Foster
Energy A.I. 2022 Hackathon Hosts
Hildebrand Department of Petroleum and Geosystems Engineering

Dr. Jon Olson
Sponsor and Advisor
Chair of the Hildebrand Department of Petroleum and Geosystems Engineering

Wen Pan and Elnara Rustamzade
Hackathon Architects and Mentors, Graduate students in PGE

Gabby Banales Sara Hernando and Tracey Wilson
Coordinators

Appreciation

Appreciation to the student participants, the hackers!

Thank you for your enthusiasm!

Appreciation

Professor Jon Olson
PGE Chair
Strong support and engagement

Gabby Banales
Organizing, Student Engagement

Sara Hernando
Business Development, Student Support

Tracey Wilson
Organizing, Student Support

None of this would be possible without our sponsors. Thank you for supporting Energy Data Science Education!

Thank You to Our Sponsors

Underwriter

Elizabeth Huth Coates Charitable Foundation of 1992

Gold

ComboCurve™

Silver

PIONEER NATURAL RESOURCES

Bronze

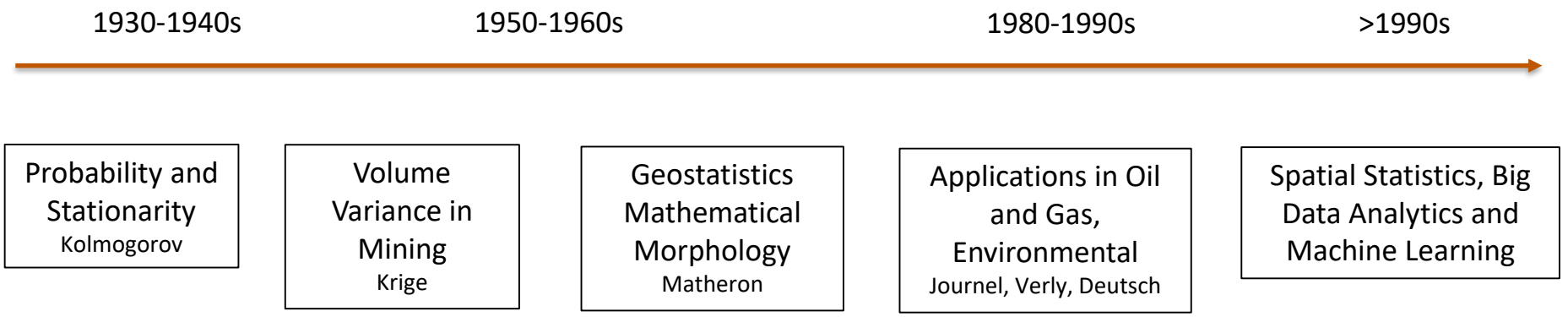
Baker Hughes

Welcome Message

Professor Jon Olson
Chair of the Hildebrand Department of Petroleum and Geosystems Engineering

Petroleum / Mining / Spatial Engineering and Science Leadership in the Fourth Paradigm

'We are the original data-driven science, we have been big data long before tech learned about big data!'



'Complicated, heterogeneous, sparsely sampled, vast systems with complicated physics and high value decisions.'

What is a Hackathon?

'an event in which a large number of people meet to engage in collaborative computer programming.'

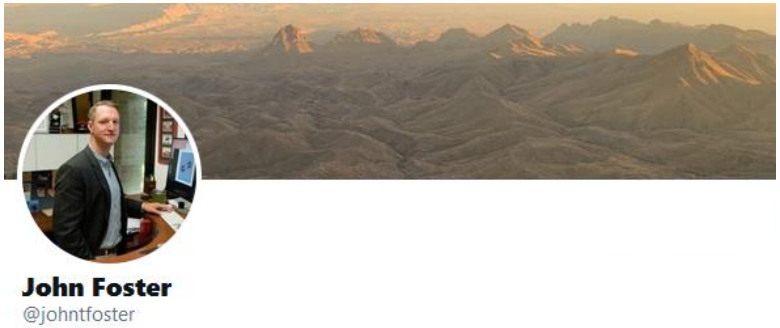
Dictionary.com

'The goal of a hackathon is to create functioning software or hardware by the end of the event'

Wikipedia

Who's Running this Show?

Professor Michael Pyrcz (aka GeostatsGuy)
Hackathon Host



Professor John T. Foster
Hackathon Host

Wen Pan, PhD Candidate PGE
Hackathon Architect

Elnara Rustamzade, PhD Candidate PGE
Hackathon Architect, Volunteer

Energy A.I. Hackathon

Hosted by PGE's Resident A.I. Experts
Dr. John Foster and **Dr. Michael Pyrcz**
@johntfoster @GeostatsGuy

Mentors

Sercan Gul — Pioneer Natural Resources; The University of Texas at Austin, Hildebrand Department of Petroleum and Geosystems Engineering, Cockrell School of Engineering

Ilyas Iyoob — IBM; TEXAS

Fabien Laugier — Chevron

Thatcher Thornberry — bp; The University of Texas at Austin, Hildebrand Department of Petroleum and Geosystems Engineering, Cockrell School of Engineering

Shane Prochnow — Chevron

Matthias Imhof — ExxonMobil

Alena Grechishnikova — Chevron

Nickolas Raterman — Chevron

Nkem Egboga — sparkcognition; The University of Texas at Austin, Hildebrand Department of Petroleum and Geosystems Engineering, Cockrell School of Engineering

Elizaveta Onegova — Baker Hughes

Allison Gilmore — IHS Markit

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Judges

Ben Amaba
CTO Cloud & Cognition

Kumar Lakshmipathi
Principal Architect

Sarita Salunke
Team Leader

David Holmes
CTO Energy

Vikram Jayaram
Head of Data Science

Doug McMaster
VP Product

Who is Here to Build?

20 Teams, from UT Austin Cockrell, Jackson and Natural Sciences Including:

ANP-X
Boolean Hooligans
Carpe Datum
Darcy Analytics
Energy Challengers
Fourier Mirage
gufunc
HackBros
JOJO
Longhorn Energy Club
MMVS Team
Nguyen Win
No Free Lunch – NFL
Quarter Life Crisis
RunTimeTerror
S-MAN
Saut
Sleepless Knights
Sphere

Petroleum and Geosystems Engineering, Operations Research, Mechanical Engineering, Geological Sciences, Materials Science Engineering, Electrical and Computer Engineering, Data Science, Computer Science, Aerospace Engineering, Mathematics,

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The Plan at 30,000 ft

Apply Data-driven Solutions with Data Analytics and Machine Learning

Schedule:

Solution Submission
12:00 noon

Friday March 25th	Saturday March 26th	Saturday March 26th	Sunday March 27th	Sunday March 27th
Evening	Morning	Afternoon	Morning	Afternoon
Meals	8:30 am	12:30 pm	8:30 am	12:30 pm
Workshop and Problem Introduction 5:00 pm – 9:00 pm	Mentoring Session 9:00 am – 12:00 noon	Mentoring Session 1:00 pm – 4:00 pm	Mentoring Session 9:00 am – 12:00 noon	Presentations, Judging and Awards 1:00 pm – 5:00 pm
Rooms CPE 2.208		CPE 2.204/6/8/10/12/16/20		CPE 2.208

Enhance Learning

Promote collaboration & data-driven science

Inspire Innovation

Teams:

Register teams of 3-4, which can include students from other departments and schools (UT EID required), but one student must be a UT PGE student. At least 1 undergraduate student per team.

Awards:

Winners of the A.I. Hackathon will be awarded bragging rights and $5,000 for first place, $2,500 for second place, $1,000 for third place and $500 for fourth place teams.

The Hackathon Rules

Submit to GitHub by Noon March 27th:

1. Well-documented Python workflow in a Jupyter Notebook
2. Results as a .cvs DataFrame with 3 well locations (x, y, unit (upper or lower) and estimated 2 year cumulative production.
3. Short presentation with executive summary, goals workflow choices and defense, results and discussion. Every team member participates in the presentation.

Participation: All team members contribute to the above products. There are various roles! Participate in sessions.

Coding: Use only open source and methods / workflows developed by during the hackathon. Provide code for testing and scoring. All code in Python, Jupyter Notebook. **Readable code!**

The Hackathon Rules

Participate in the Scheduled Workshops and Working Sessions

Treat All other Hackers, Hosts, Mentors, Judges, Coordinators with the utmost respect.

The data has been sanitized. Do not attempt to hack the source!

Cite all code used from other sources in your workflows.
Pyrcz, M.J. (2020) GeostatsPy 0.0.19 [Source code]. https://github.com/GeostatsGuy/GeostatsPy

Work Hard, Learn and Have Fun!

Hackathon Team Scoring

Results: 60% - Results, Results, Results!

- Average of rank transform of accuracy error measure and of sum of 2-year cumulative production for 3 proposed wells.

Presentation: 25% - and We Must Be Able to Communicate Our Work!

- Executive summary, project goals, workflow description, results and discussion, finish on time

Workflow: 15% - Others Must Understand our Work for Adoption!

- Scoring metrics: readable code, efficient code, documentation of steps

Use the provided templates for results, workflow and presentation. Follow the submission guidelines and submit on time.

The Plan for Today's Workshop

DAY 1 / March 25th - Energy A.I. Hackathon 2022 Workshop Schedule

5 pm – 5:15 pm: Hackathon Welcome, Introduction and Review Plan and Rules, Prof. Olson / Prof. Pyrcz

5:15-6:30 pm: Essential Energy Data Science, Numpy, Pandas, Git - Prof. Foster

6:30 – 7:00 pm: Feature Importance, Engineering and Selection, Multivariate Analysis and Shapley Values Prof. Pyrcz

7:00 – 7:30 pm: Spatial Mapping and Spatial Data Analytics – Prof. Pyrcz

7:30 – 8:00 pm: Machine Learning Basics, Train and Tune Overview of Methods - Prof. Pyrcz

8:00 – 8:30 pm: Machine Learning in Python, scikit-learn and TensorFlow Packages – Prof. Foster

8:30 – 9:00 pm: Introduce the Energy A.I. Hackathon Problem and Mystery Data Set – Prof. Pyrcz / Prof. Foster

9:00 pm - : Teams Break-out for Initial Data Review and Planning

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We are looking forward to a great event.