Energy A.I. 2024
4th Annual Hackathon
Introduction

Dr. Michael Pyrcz and Dr. John Foster
Energy A.I. 2021-2024 Hackathon Hosts
Hildebrand Department of Petroleum and Geosystems Engineering

Dr. Matt Balhoff
Sponsor and Advisor
Chair of the Hildebrand Department of Petroleum and Geosystems Engineering

Elnara Rustamzade and Fehmi Özbayrak
Hackathon Architects and Mentors, Graduate students in PGE

Rowan Halliday, Heba Abdel-Rahim, Gabby Banales, Coordinators of Chaos

Appreciation

Appreciation to the student participants, the hackers!

Thank you for your enthusiasm!

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

Thank You to Our Sponsors

Platinum

PIONEER NATURAL RESOURCES

PHILLIPS 66

Silver

Chevron

Elizabeth Huth Coates Charitable Foundation of 1992

Shell

ExxonMobil

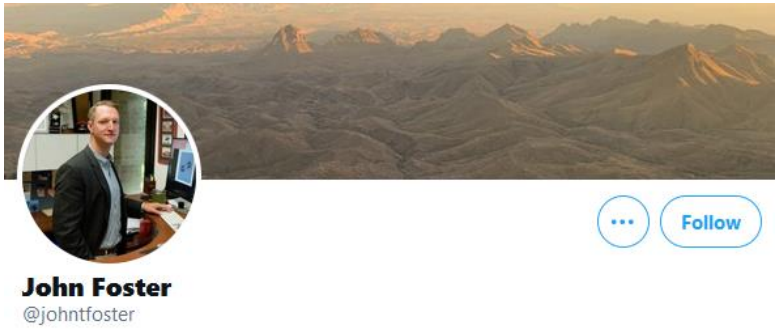
Bronze

ComboCurve™

General Electric

Who's Running this Show?

Professor Michael Pyrcz (aka GeostatsGuy)
Hackathon Host



Professor John T. Foster
Hackathon Host

Elnara Rustamzade, PhD Candidate PGE
Hackathon Architect, Volunteer

Fehmi Özbayrak, PhD Candidate PGE
Hackathon Architect

Appreciation

Professor Matt Balhoff
PGE Chair
Strong support and engagement

Rowan Halliday
Coordination

Heba Abdel-Rahim
Business Development, Student Support

Elnara Rustamzade
PhD Candidate PGE
Hackathon Architect, Volunteer

Fehmi Ozbayrak
MSc Candidate PGE
Hackathon Architect, Volunteer

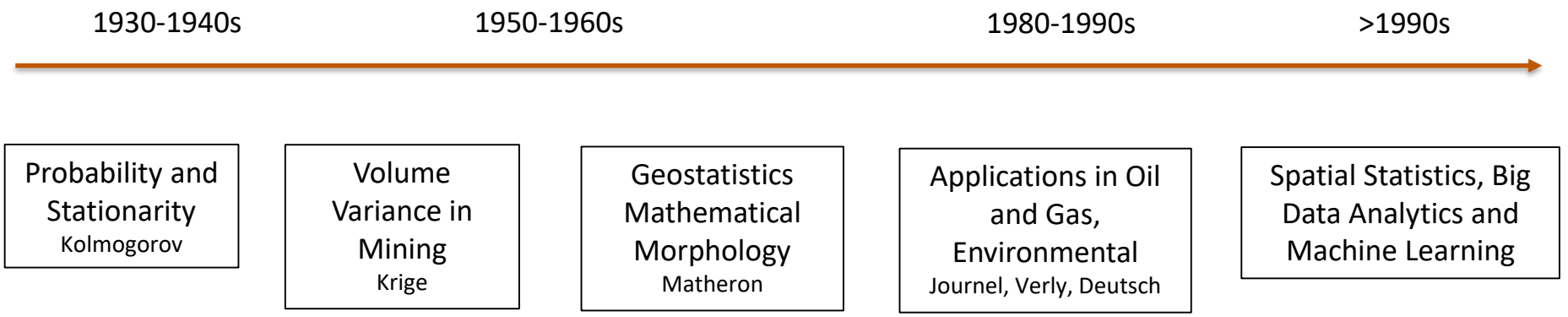
Gabby Banales
Organizing, Student Engagement

Welcome Message

Professor Matt Balhoff
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

Energy A.I. Hackathon

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

Mentors

Eric Qian
Amy Rueve

PIONEER NATURAL RESOURCES

Julio De La Colina
Shane Prochnow
Guillaume Dulac
Eduardo Maldonado-Cruz
Julian Salazar
Alena Grechishnikova
Yogashri Pradhan

Chevron

Preetika Srivastava

IBM

Matthias Imhof
Marcelo Jimenez
Hector Martinez

ExxonMobil

Tyrel Krohn

ConocoPhillips

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Judges

Matt Duke
General Manager
Geology Department
Chevron Technology

Susan Howe
President

Kumar Lakshmipathi
Principal Solutions Architect

Andy Flowers
Director of Advanced Analytics

Kathryn Briggs
Completions Engineering Coordinator

Doug McMaster
VP Product

Manuel E Rosales
Data Analytics Supervisor

Who is Here to Build?

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

ChatPGE	Rubber Duckies
Cool Cat Fracking Party	Bitumen Bandits
HB Analytics	Banana Ducks
Desi Drillers	Wild Cats
Flat Earth Society	6

Petroleum and Geosystems Engineering, Operations Research, Mechanical Engineering, Geological Sciences, Materials Science Engineering, Electrical and Computer Engineering, Data Science, Computer Science, Aerospace Engineering, Mathematics, McCombs, Math, Physics, Economics, Neuroscience,

The Hackathon Rules

Submit to GitHub by 12:00 noon, January 21st:

1. Well-documented Python workflow in a Jupyter Notebook. **See template in resources folder.**
2. Results as a .cvs DataFrame ESPs (fail in 30 days = 1, otherwise = 0). Named: solution.csv, **use the file in data folder.**
3. Short presentation with executive summary, goals workflow choices and defense, results and discussion. Every team member participates in the presentation. **Use template in resources.**

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 during the hackathon. Provide code for testing and scoring. All code submitted in Jupyter Notebook. **Readable code!**

The Hackathon Rules

Our academic staff have volunteered to assist over the weekend.

- **Please let them know that we appreciate.**
- **Let's all do house keeping, clean up and disposal of recycling and waste in your work area and general areas, as we go. Take out the trash.**
- **Share contacts in case you get locked out.**

The Hackathon Rules

Participate in the Scheduled Workshops and Working Sessions

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

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
Foster, J.T., (2015) 1DPDpy 1.0 [source code]. http://dx.doi.org/10.5281/zenodo.15795

Work Hard, Learn and Have Fun!

The Hackathon Rules

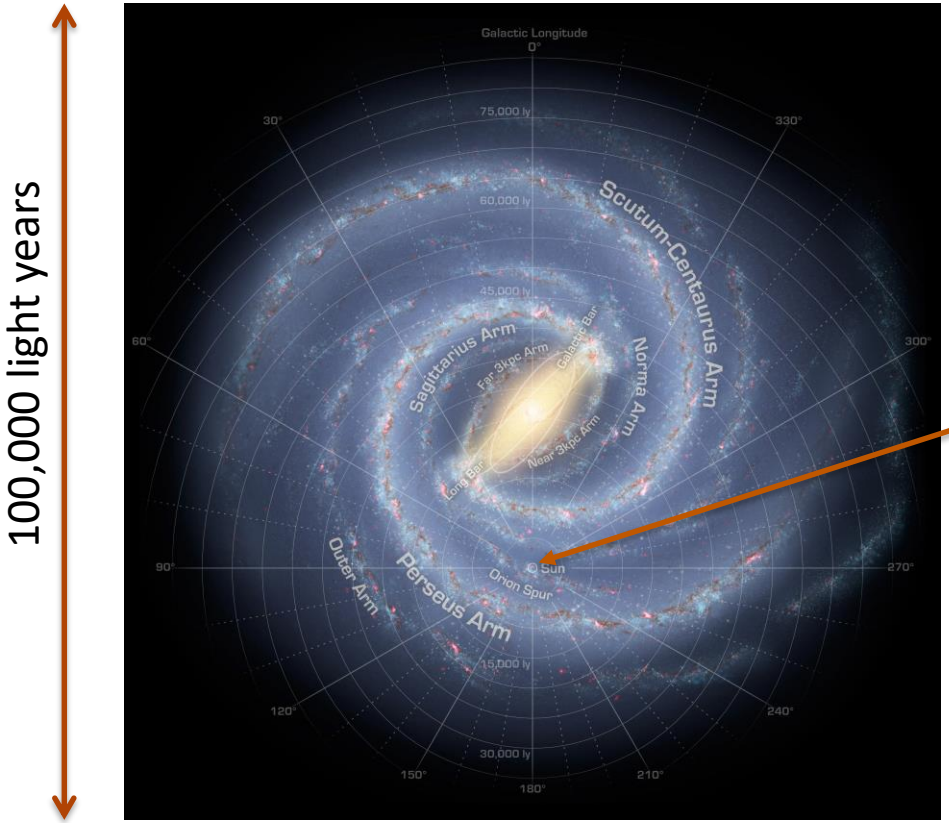
The data has been sanitized. Do not attempt to hack the source!

But, here's a hint…

The Hackathon Rules

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

We can provide the following general location of the data set.



Our Galaxy

Hackathon Team Scoring

Results: 75% - Results, Results, Results!

- Average of rank transform of accuracy error measure and uncertainty model goodness over all groups.

Presentation: 20% - and We Must Be Able to Communicate Our Work!

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

Workflow: 5% - 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.

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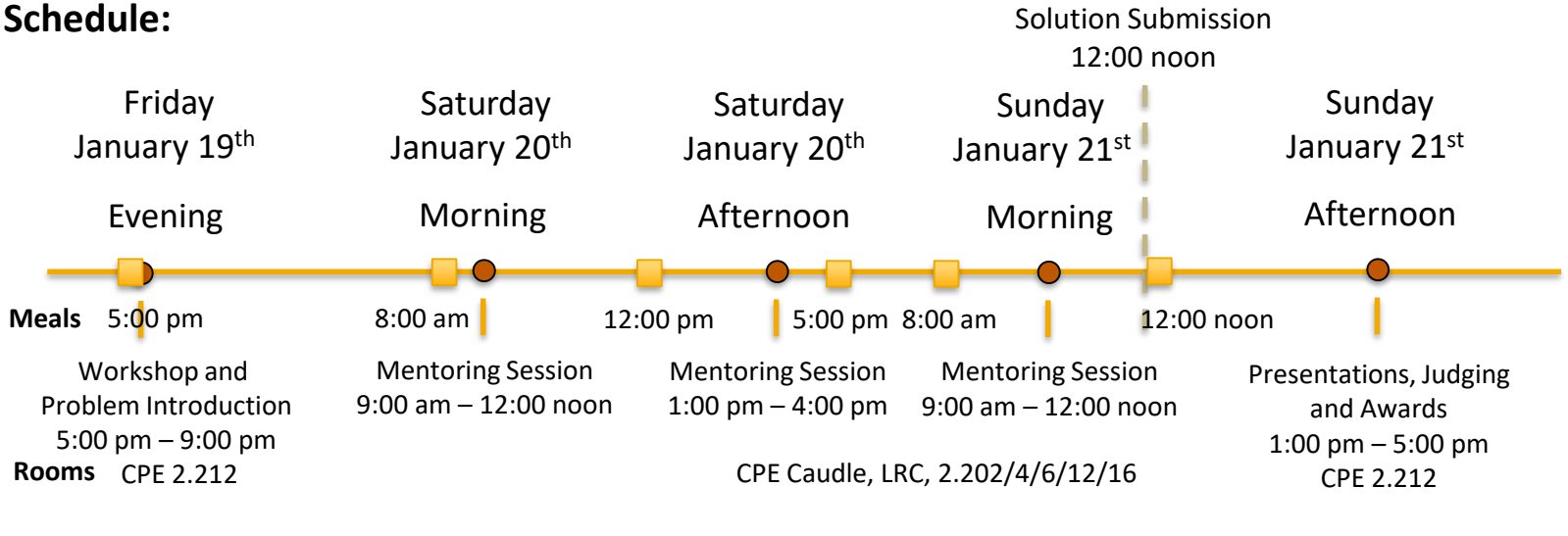
@johntfoster @GeostatsGuy

The Plan at 30,000 ft

Apply Data-driven Solutions with Data Analytics and Machine Learning

Schedule:



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 and one 1 undergraduate student per team (could be the same student).

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 Plan for Today's Workshop

DAY 1 / March 25th - Energy A.I. Hackathon 2024 Workshop Schedule

5 pm – 5:15 pm: Hackathon Welcome, Introduction and Review Plan and Rules, Prof. Balhoff / 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: Uncertainty Models – 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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Top Teams from Last Year

DrillPy, First Place

Hackelope, 2nd Place

Don't Jump to Complexity

Deep learning generated image of Professor Pyrcz.

Deep learning generated image of Professor Foster.