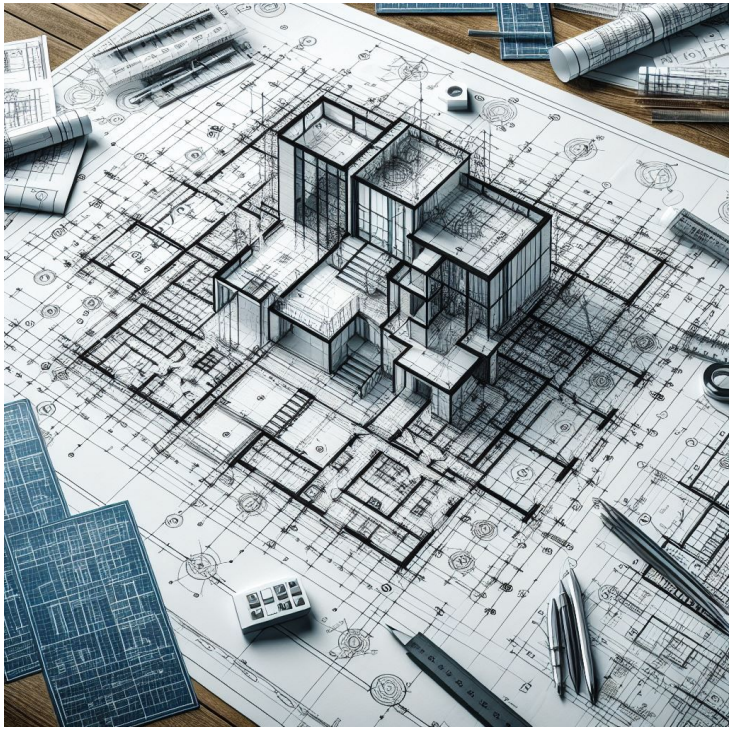

HACKHPC.ORG
ADMI 2024
Code-a-thon
TACC
TEXAS ADVANCED COMPUTING CENTER
omnibond
ORANGEFS • CLOUDYCLUSTER
SGX3
Extend. Expand. Exemplify.

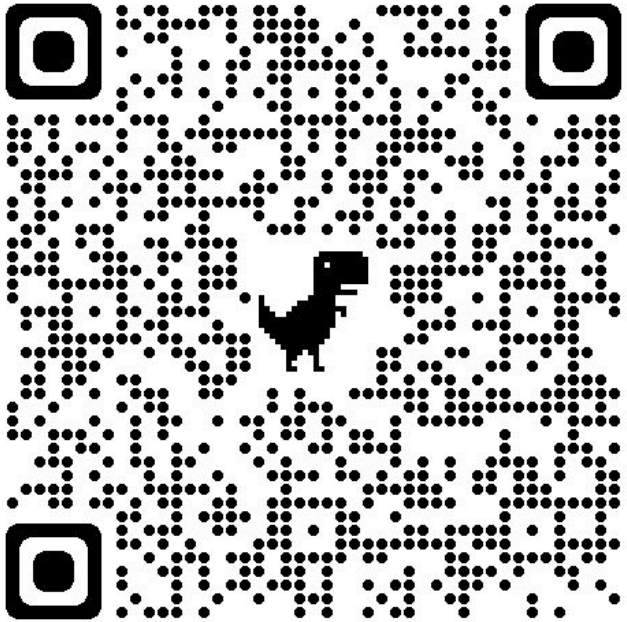
THE PLAN

- Introductions
- What are we doing here?
- What is Software Engineering
- Software Engineering vs Science Gateways vs High Performance Computing (HPC)
- Technology we're going to be using
- Welcome to EUREKA!



BUT FIRST!

It's time to Jam.



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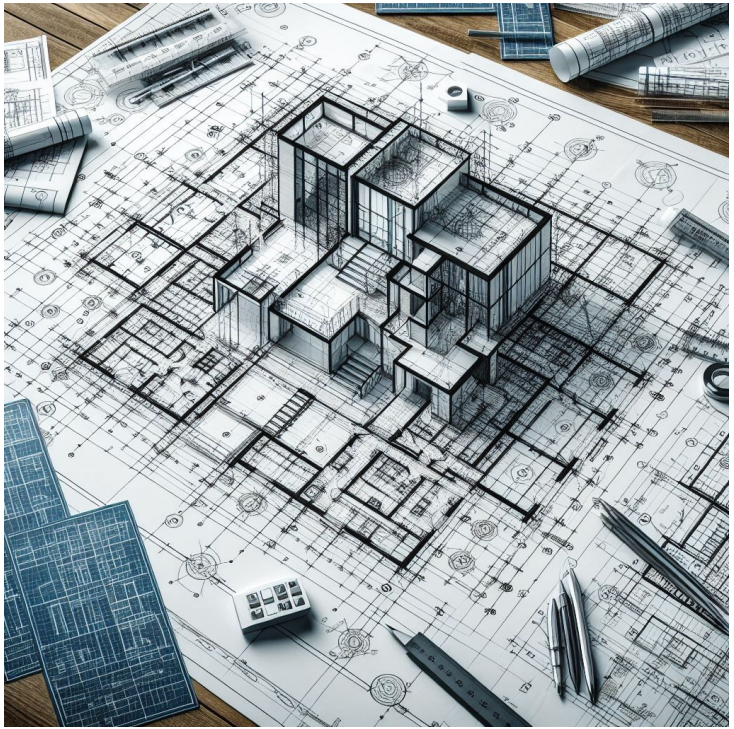

INTROS

WHAT ARE WE DOING HERE?

Hackathons: A Brief Overview

Hackathons are **intensive**, **time-bound** events where teams of participants **come together to collaboratively work on solving real-world problems** or **creating innovative software projects.**

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THE CODE-A-THON!

Code-a-thons have a more narrow **focus** primarily on **iterative coding**, **algorithmic development, over-the-shoulder peer coding**

THE CODE-A-THON!

Participants are going to **engage** in **coding challenges or competitions**, where each **challenge builds on the previous challenge**. These challenges are algorithmic or data structure-related and **each challenge combines together to become a major project**.

SOFTWARE ENGINEERING?

- What is Software Engineering
  - Requirements Gathering
  - Software Architecture
  - Coding and Programming
  - Software Testing and Debugging
  - Software Maintenance
  - Software Project Management
  - Software Quality
  - Software Metrics
  - Software Development Models & Architecture

SOFTWARE ENGINEERING vs SCIENCE GATEWAYS vs HIGH PERFORMANCE COMPUTING

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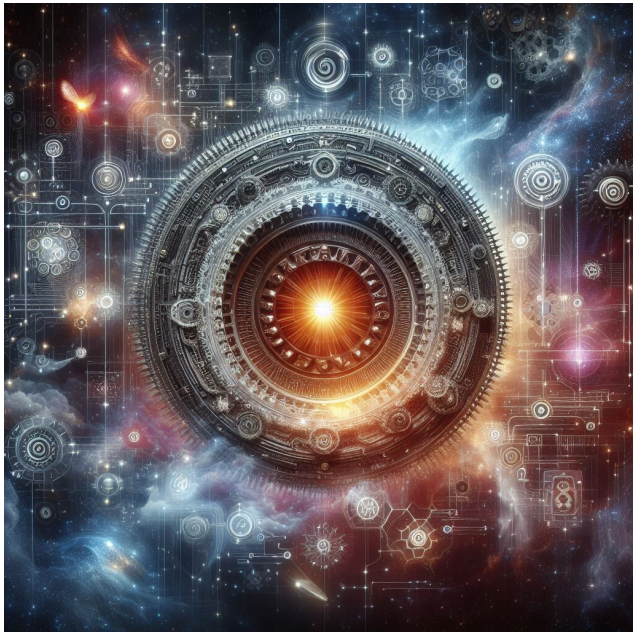
SOFTWARE ENGINEERING AND SCIENCE GATEWAYS

- **What is a Science Gateway?**

  Science gateways are **user-friendly interfaces** that allow **researchers and educators** to **access advanced resources**, **tools**, **applications**, and **data collections** specific to a science or engineering



SCIENCE GATEWAYS AND HIGH PERFORMANCE COMPUTING

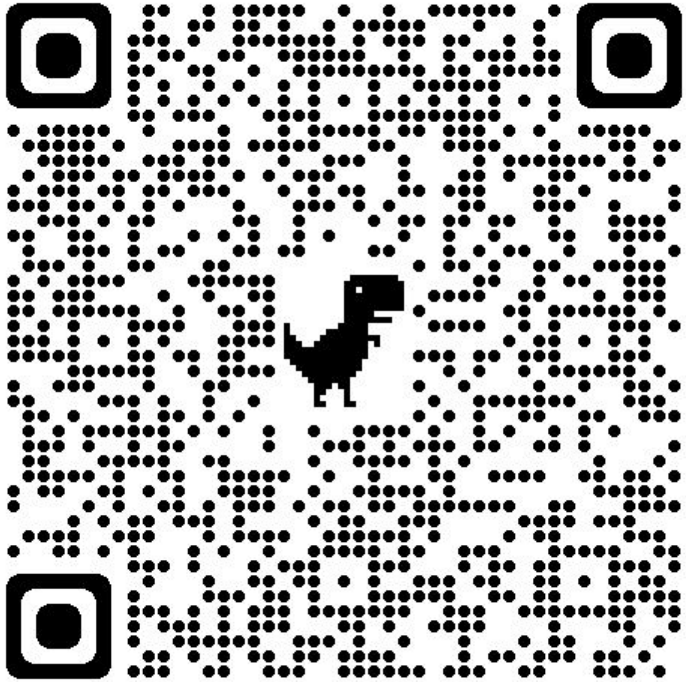
- **So what does this have to do with High Performance Computing?**

  Science Gateways are connected to High Performance Computing (HPC), they provide a **user-friendly interface to HPC resources**

TECHNOLOGY

- Cloud Computing
- Python
- JSON
- Docker
- Redis
- AND…

POLLS

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LET'S DO THIS

Your First Task.

- **Get into teams of 3 - 4 people**
- **Choose a Team Name**
- **Pick Your Team Colors (Your slides will use these colors in your theme)**
- **Choose a Team Theme Song (nothing from Disney, nothing from the Beatles)**
- **Make a Team Introduction Slide**
  - Include your Team Name, Team Members, Your Colors, And your Song

Upload your slide here!

https://tinyurl.com/ADMI-Code24

EUREKA!

https://diamondbrillrook.cloudycluster.net/

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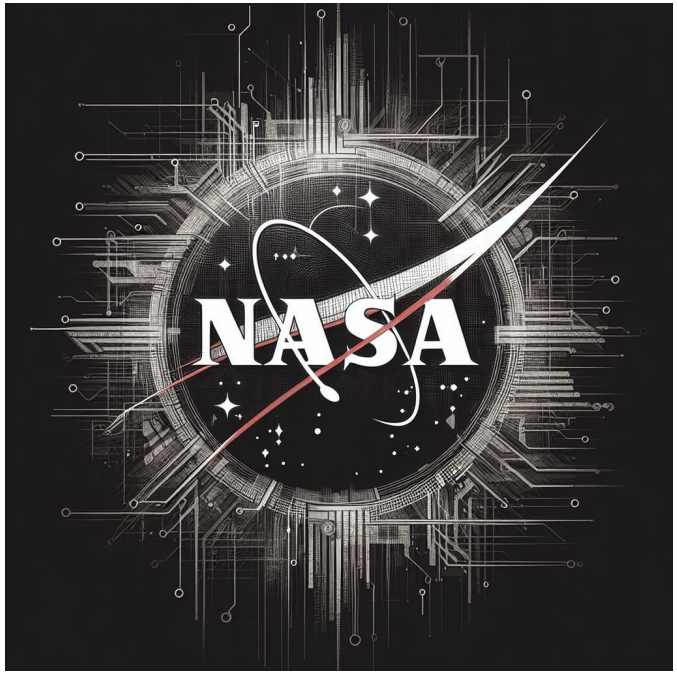
WHERE IS THE ISS?

Let's find the ISS

FIND THE ISS

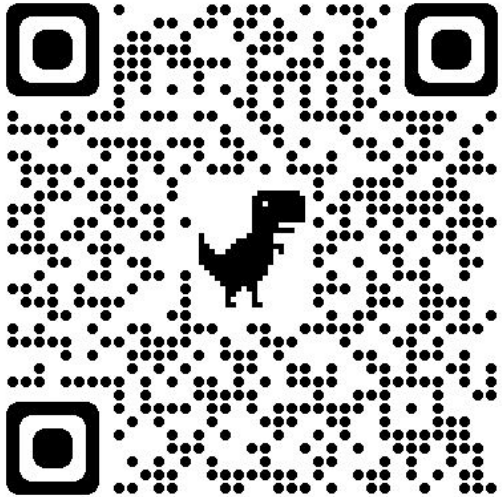
NASA has a dataset of telemetry data of the ISS.

We want to use this data to **track** where **the ISS has been**, and maybe where **it's going to be**.



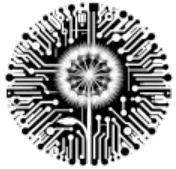
WHERE's THE DATA?

https://spotthestation.nasa.gov/trajectory_data.cfm



FIND THE ISS

- Where is the ISS now?
  Is it over land or the ocean?
- Plot the telemetry data
- Plot the Longitude/Latitude data
- When was the last time it was visible from Atlanta?
- How many times in the past year has it been over Atlanta?



BRAINSTORM

What's our steps?

PYTHON

- **Readability**: Python's syntax is designed to be easily readable and understandable, resembling plain English. This makes it easier for both beginners and experienced programmers to write and maintain code.
- **Versatility**: Python is a versatile language, suitable for a wide range of applications, including web development, data analysis, machine learning, artificial intelligence, automation, and more. Its extensive standard library and third-party packages contribute to its versatility.
- **Ease of learning**: Python's simplicity and readability make it an ideal choice for beginners. Its straightforward syntax and extensive documentation enable newcomers to start coding quickly and efficiently.
- **Community and support**: Python has a large and active community of developers who contribute to its growth and provide support through forums, tutorials, and documentation. This vibrant community makes it easier to find solutions to problems and stay updated with the latest developments.
- **Portability**: Python is a cross-platform language, meaning code written in Python can run on various operating systems without modification. This portability makes it convenient for developers working on different platforms.

OTHER PYTHON RESOURCES

astropy==6.0.0

geopy==2.4.1

numpy==1.26.4

pytest==8.0.0

requests==2.25.1

xmltodict==0.13.0

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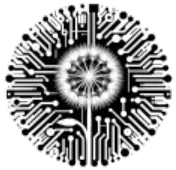

DATABASE (REDIS)

We're going to need to "pull" in a REDIS container

start the Redis server on the command line:

```
[user-vm]$ docker run -p 6379:6379 redis:7
```

```
1:C 27 Feb 2024 03:53:38.154 * oO0OoO0OoO0Oo Redis is starting oO0OoO0OoO0Oo
1:C 27 Feb 2024 03:53:38.154 * Redis version=7.2.4, bits=64, commit=00000000, modified=0, pid=1, just started
1:C 27 Feb 2024 03:53:38.154 # Warning: no config file specified, using the default config. In order to specify a config file use redis-server /path/to/redis.conf
1:M 27 Feb 2024 03:53:38.154 * monotonic clock: POSIX clock_gettime
1:M 27 Feb 2024 03:53:38.155 * Running mode=standalone, port=6379.
1:M 27 Feb 2024 03:53:38.156 * Server initialized
  1:M 27 Feb 2024 03:53:38.156 * Ready to accept connections tcp
```

DATABASE (REDIS)

We have to get the data *into* Redis

```
>>> import redis
>>> rd=redis.Redis(host='127.0.0.1', port=6379, db=<some integer>)
>>> type(rd)
  <class 'redis.client.Redis'>
rd.get('my_key')
b'my_value'
>>> type(rd.get('my_key'))
<class 'bytes'>
>>> rd.get('my_key').decode('utf-8')
'my_value'
>>> type( rd.get('my_key').decode('utf-8') )
  <class 'str'>
```

DATABASE (REDIS)

We have to get the data *into* Redis

```
>>> import json
>>> d = {'a': 1, 'b': 2, 'c': 3}
>>> rd.set('k1', json.dumps(d))
True
```

DATABASE (REDIS)

We have to get the data *into* Redis

```
>>> rd.get('k1')
b'{"a": 1, "b": 2, "c": 3}'
>>> type(rd.get('k1'))
<class 'bytes'>
>>>
>>> json.loads(rd.get('k1'))
{'a': 1, 'b': 2, 'c': 3}
>>> type(json.loads(rd.get('k1')))
<class 'dict'>
```

TASKS

Get the data in Redis - optional, but worth it

Convert Telemetry Data into Longitude/Latitude/Altitude

Convert the Velocity Vector into Current Speed

Plot Your Data

Find Atlanta's Longitude and Latitude

Search the Data to see how *close* it's been to those coordinates

Find how many times it been that close over the past year

The Plan

- Get w/ your teams!
- Presentation: Status Update at 9:30am
  - What have you accomplished?
    - Data has been read in, starting plots, etc…
  - What are your hangups?
    - How can we help?
- Final Presentations, 11:00
- Upload slides here: https://tinyurl.com/ADMI-Code24

You all got this!

The Plan

- Final Presentations, 11:00
  - What have you accomplished?
    - Data has been read in, starting plots, etc…
  - What are your hangups?
    - How did you get through it
  - What were some of the things you learned?
- Upload slides here: https://tinyurl.com/ADMI-Code24

Form for Swag