An aerial photograph of a desert landscape, likely in the southwestern United States, showing a prominent fault line running diagonally across the terrain. The terrain is arid, with sparse vegetation and distinct geological features. The title text is overlaid on the upper portion of the image.

Real-Time Data Pipeline & Dashboard for US Earthquake Analytics

By Nicholas Bronson

Agenda

1. Introduction & Questions
 2. Data & Pipeline Setup
 3. App Demonstration
 4. Conclusions & Next Steps
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1. Introduction & Problem



Introduction: Earthquake Basics

- Tectonic plates build tension and eventually slip past each other over an area known as a fault line
- Earthquakes occur in waves, and vary drastically in strength, known as magnitude
- Earthquake magnitude is on a logarithmic scale, and an increase of 1 point can represent a dramatic difference in strength



Problem

Idea Catalyst: A CNN article asserted that the Blanco Fracture zone off the coast of Oregon has seen an uptick in earthquakes, some of which had a magnitude of 5.0+

Questions: Is the frequency of earthquakes occurring in Oregon and off its coast increasing?
Can I provide a convenient way for those who are curious to investigate earthquake trends?



2. Data & Pipeline Setup



Data

- Over 870,943 rows of data representing all Recorded earthquakes since 2010
- Acquired the US Geological Survey Quakes API
 - 22 Features pulled, key features include:
Magnitude, Depth, Magnitude Error, Latitude, Longitude, Depth, Depth Error, and ID
- Data is pulled weekly using an API call, processed, and then stored



Pipeline Setup



Data Pulled from
USGS using an API
call



Data ingested
into the SQL
database DB
Browser



Data
preprocessing
and analysis
using pySpark



Further
preprocessing
using Pandas



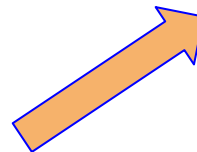
Data exported
uploaded to
GitHub and
SQL



Streamlit Share
page deployed,
using data from
GitHub

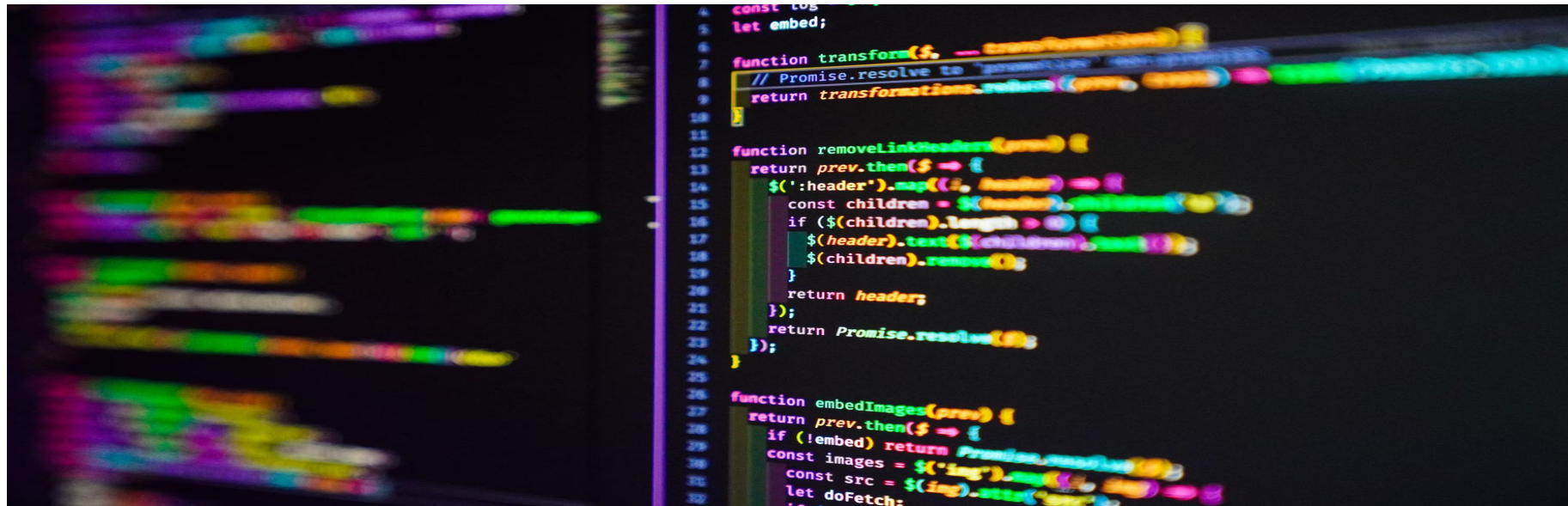


Real- time data
acquired using
API, processed
with minimal
manual steps



3. App Demonstration

https://share.streamlit.io/bronsonnh/streamlit_repo/main/nick-app.py



4. Conclusions & Next Steps



Conclusions

- There has been a **massive increase** in number earthquakes off the coast of Oregon. While this **does not appear to have caused any significant damage**, perhaps this trend is worth analyzing if it continues in subsequent years
- The vast majority of earthquakes in the database are **under the detectable level** – perhaps it would be worth focusing analysis on the relationship between lower level earthquakes and more impactful seismic events

Next Steps

- Investigate earthquake frequency and magnitude globally
- Post about seismic events as they occur, case studies on previous earthquakes
- Build a model that can predict number of earthquakes and strength of earthquakes in a given month

A scenic view of a rocky coastline. In the foreground, a dark, rocky cliff edge is visible. To the left, a steep, forested cliff rises. In the center, a large, dark rock formation juts out into the water, topped with several tall, thin evergreen trees. The water is a vibrant turquoise color, with white foam from waves crashing against the rocks. The sky is a pale, hazy blue.

Thank you!