DSCI-560: Data Science Practicum Laboratory Assignment 6

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Oil Wells Analysis and Visualization

This lab focuses on text extraction, web scraping, data preprocessing, and visualization from scanned PDF files. You assigned tasks include writing and running scripts that efficiently and effectively collect and organize data from PDFs and create a web interface to visualize the collected information. You will work with your team on pdf text extraction in this lab. Additionally, you'll preprocess the data to remove missing values, fetch additional data from the web, and store them in a database.

1) Initial Setup

You may use any available tools and scripts including OCRMYPDF, PyPDF, PyTesseract, requests/selenium, beautifulsoup4, mySQL database for this assignment.

For the assignment, you must use Python scripts and other useful tools in the Linux environment. (Document any setup steps/requirements for running your scripts in your submitted document).

Do not spend too much time on the installation and setup, and invest your time in exploring the concepts and improvising your submission.

2) Data Collection / Storage

For this task, you will focus on creating the database tables, parsing PDF files, and collecting information from given websites.

For this set of assignments, we would focus on information related to oil wells, such as their physical location and specifications, and create a webpage in Part 2 to plot this information on maps and visualize the collected data.

3) PDF Extraction

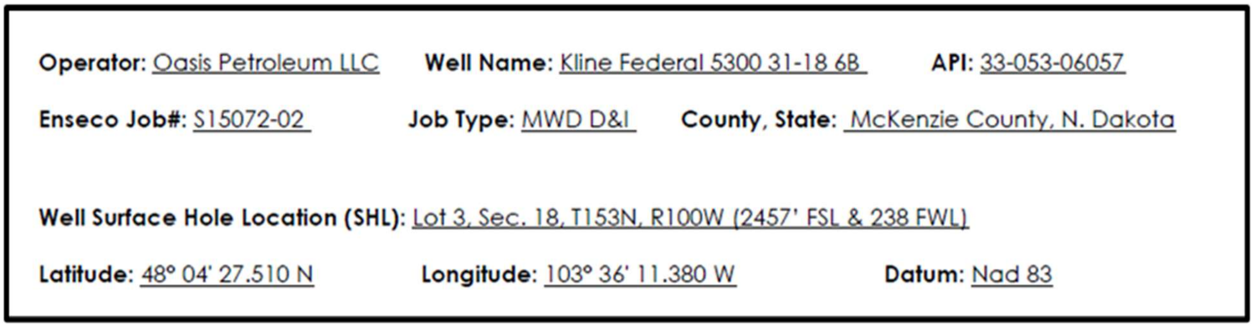
We will be using this Drive Folder for the Assignment

https://drive.google.com/drive/u/4/folders/12g-bhOylyaMoLF5djocnAeZHBx-gsxgY

The above folder has different PDFs of scanned images of different oil wells and information/specifications related to them.

Download a copy of the folder to your local machine. Your task is to write a Python script to iterate over all the PDFs in the folder, extract the information from the PDFs, and store it in your database tables.

All PDFs will have well-specific information and stimulation data (how much proppant chemical was injected after drilling).



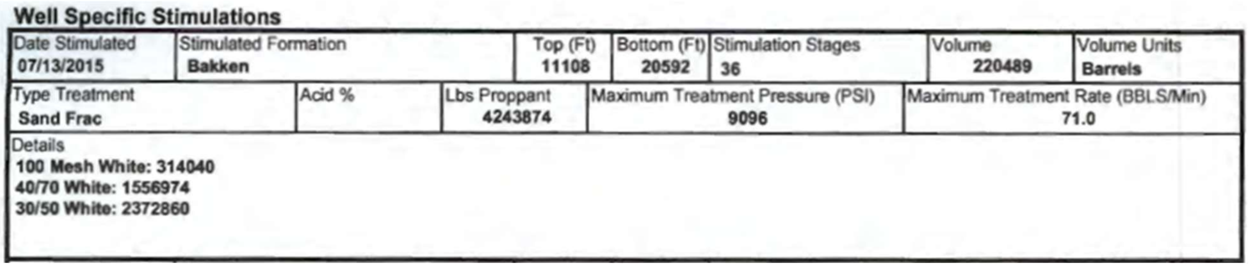
Operator: Oasis Petroleum LLC **Well Name:** Kline Federal 5300 31-18 6B **API:** 33-053-06057

Enseco Job#: S15072-02 **Job Type:** MWD D&I **County, State:** McKenzie County, N. Dakota

Well Surface Hole Location (SHL): Lot 3, Sec. 18, T153N, R100W (2457' FSL & 238 FWL)

Latitude: 48° 04' 27.510 N **Longitude:** 103° 36' 11.380 W **Datum:** Nad 83

Figure 1: Relevant data include API#, longitude, latitude, well name & number, address, and any relevant fields.



Well Specific Stimulations

Date Stimulated	Stimulated Formation	Top (Ft)	Bottom (Ft)	Stimulation Stages	Volume	Volume Units
07/13/2015	Bakken	11108	20592	36	220489	Barrels

Type Treatment	Acid %	Lbs Proppant	Maximum Treatment Pressure (PSI)	Maximum Treatment Rate (BBLS/Min)
Sand Frac		4243874	9096	71.0

Details
100 Mesh White: 314040
40/70 White: 1556974
30/50 White: 2372860

Figure 2: For Stimulation Data, extract all the fields mentioned in the snapshot above.

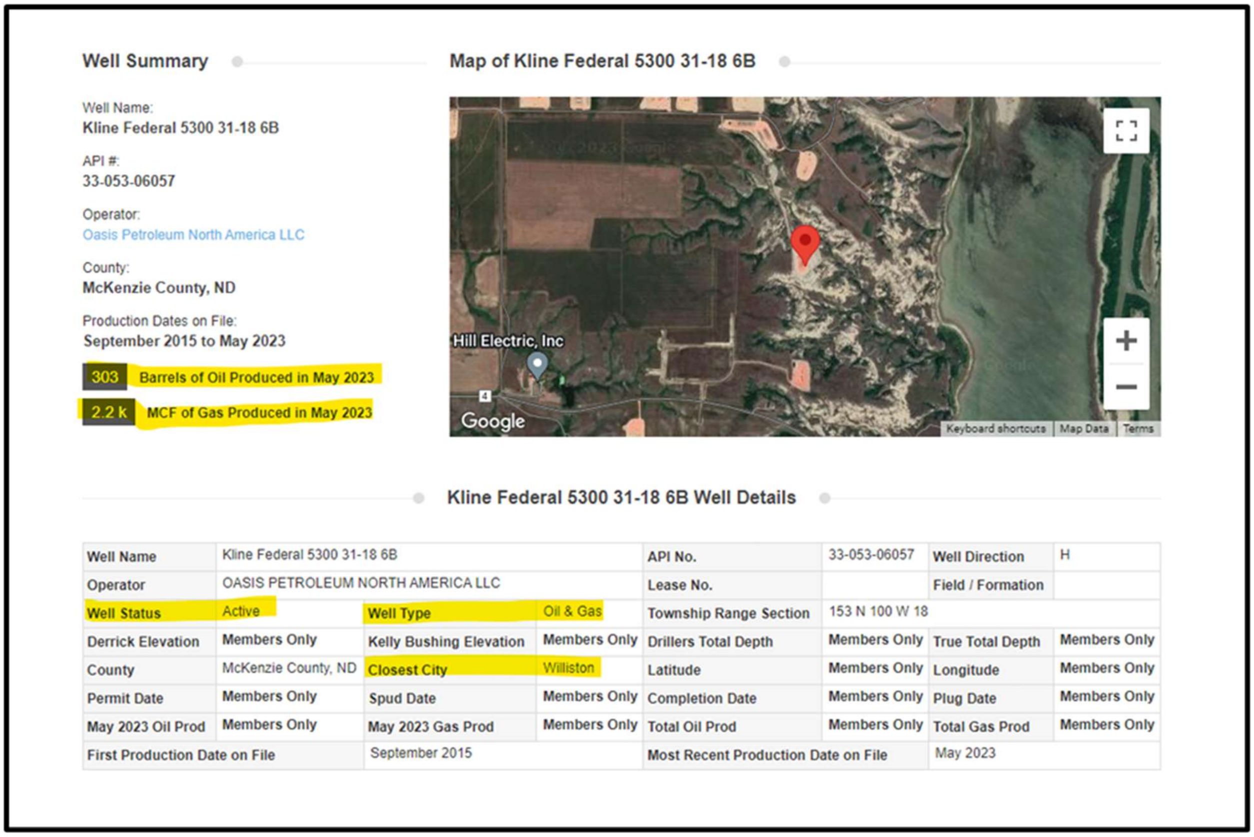
4) Additional Web Scraped Information

In This part, we will use the API# and well name extracted above to gather additional information related to the wells from Internet sources.

Your task here is to iterate over each row of the database, and for each database entry, use the API# and well name to make a search query on this page: https://www.drillingedge.com/search

Once you get the search results, you must open the well page and gather information about the well status, type, closest city, and barrels of oil and gas produced.

The required fields you need to scrape are highlighted in yellow in the example snapshot below.



Well Summary

Well Name:
Kline Federal 5300 31-18 6B

API #:
33-053-06057

Operator:
Oasis Petroleum North America LLC

County:
McKenzie County, ND

Production Dates on File:
September 2015 to May 2023

303 Barrels of Oil Produced in May 2023

2.2 k MCF of Gas Produced in May 2023

Map of Kline Federal 5300 31-18 6B

Kline Federal 5300 31-18 6B Well Details

Well Name	Kline Federal 5300 31-18 6B			API No.	33-053-06057	Well Direction	H
Operator	OASIS PETROLEUM NORTH AMERICA LLC			Lease No.		Field / Formation	
Well Status	Active	Well Type	Oil & Gas	Township Range Section	153 N 100 W 18		
Derrick Elevation	Members Only	Kelly Bushing Elevation	Members Only	Drillers Total Depth	Members Only	True Total Depth	Members Only
County	McKenzie County, ND	Closest City	Williston	Latitude	Members Only	Longitude	Members Only
Permit Date	Members Only	Spud Date	Members Only	Completion Date	Members Only	Plug Date	Members Only
May 2023 Oil Prod	Members Only	May 2023 Gas Prod	Members Only	Total Oil Prod	Members Only	Total Gas Prod	Members Only
First Production Date on File		September 2015		Most Recent Production Date on File		May 2023	

Figure 3: Search results on drillingedge.com

The extracted information should be appended as additional fields to the existing entries in the database.

5) Data Preprocessing

Preprocess the data by removing HTML tags, special characters, and irrelevant information before storing it in the database. Transform the data into a suitable format for analysis, such as converting timestamps. Replace any missing data with 0 /or N/A for web-scraped information and text extracted from PDF files.

6) References

Extracting text from PDFs using PyPDF2: https://automatetheboringstuff.com/chapter13/

OCRMYPDF: https://github.com/ocrmypdf/OCRmyPDF

Understanding PyTesseract: https://nanonets.com/blog/ocr-with-tesseract/

7) Team Discussions

Your team is expected to meet in-person / virtually each day of the week and discuss the assignment progress & next steps. Document and compile minutes of all meetings in a separate file called 'meeting_notes_A5_P1_<team_name>.pdf'

8) Submission

Make one submission per team. Each team must submit all the code files for the working solution, a readme document containing information for running the code in PDF format, and a document that outlines the minutes of all team meetings in PDF format.

Please include a detailed GitHub history with descriptions of what each team member submitted.

For the demo video submission, prepare one video per team that demonstrates the entire working solution, explains how the data tables were loaded, demonstrates query results, and talks about the design decisions made along with reasoning for the same. Also, include details about how your team preprocessed the data. Please include the team's name and the names of all members in the video.

There will be a 50% penalty for all late submissions.