CAPSTONE PROJECT

ANALYZING DEMOGRAPHIC AND REGIONAL DISPARITIES IN TELE-LAW CASE

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OUTLINE

- **Problem Statement**
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

PROBLEM STATEMENT

Despite the expansion of the Tele-Law initiative, there is limited understanding of demographic utilization patterns and regional disparities in legal aid access. The challenge is to analyze Tele-Law case registration data to uncover gender-wise, caste-wise, and geographic disparities in service utilization across CSCs. Uneven representation among marginalized groups (SC, ST, OBC) and low outreach in certain districts raise concerns about equity and effectiveness. Moreover, the varying number of CSCs per region complicates direct comparisons. This problem demands a data-driven approach to evaluate inclusivity and optimize service delivery.

PROPOSED SOLUTION

- The proposed solution involves a systematic analysis of the provided dataset using the IBM Cloud platform, adhering to the project's technical requirements.

- **Methodology**:

  - Environment Setup: Utilize IBM Watson Studio for project management and development.

  - Data Storage: Host the dataset securely on IBM Cloud Object Storage.

  - Data Analysis: Employ a Jupyter Notebook with Python to perform data cleaning, aggregation, and analysis using the Pandas library.

  - Data Visualization: Use Matplotlib and Seaborn libraries to create clear and insightful charts (bar charts, pie charts, heatmaps) to represent the findings.

SYSTEM APPROACH

Overall strategy and methodology for implementing the data analysis of Demographic and Regional Disparities in Tele-Law Case Registrations.

Here's a suggested structure for this section:

- **System requirements**:
  - Data: IBM Cloud Object Storage hosts the raw “DistrictswiseCR_AEdataf_24-25.csv” dataset.
  - Processing & Analysis: IBM Watson Studio provides the core environment for the project. A Jupyter Notebook running a Python kernel serves as the tool for all data manipulation and analysis.
  - Presentation: The results, including data tables and visualizations (charts, graphs), are generated within the Jupyter Notebook.
  - Library used: Matplotlib and Seaborn libraries to create charts (bar charts, pie charts, heatmap)

IMPLEMENTATION

1. **Project Creation in IBM Watson Studio:**

   - Logged into IBM Cloud and launched the Watson Studio service.
   - Created a new project and associated it with a Cloud Object Storage instance.

2. **Data Asset Ingestion:**

   - Uploaded the csv dataset to the project as a data asset, making it accessible to tools within Watson Studio.

3. **Notebook Setup:**

   - Created a new Jupyter Notebook within the project.
   - Used the "Insert to code" feature to generate the initial code snippet to connect to and load the data from Cloud Object Storage.

IMPLEMENTATION

5. **Data Cleaning and Preparation:**

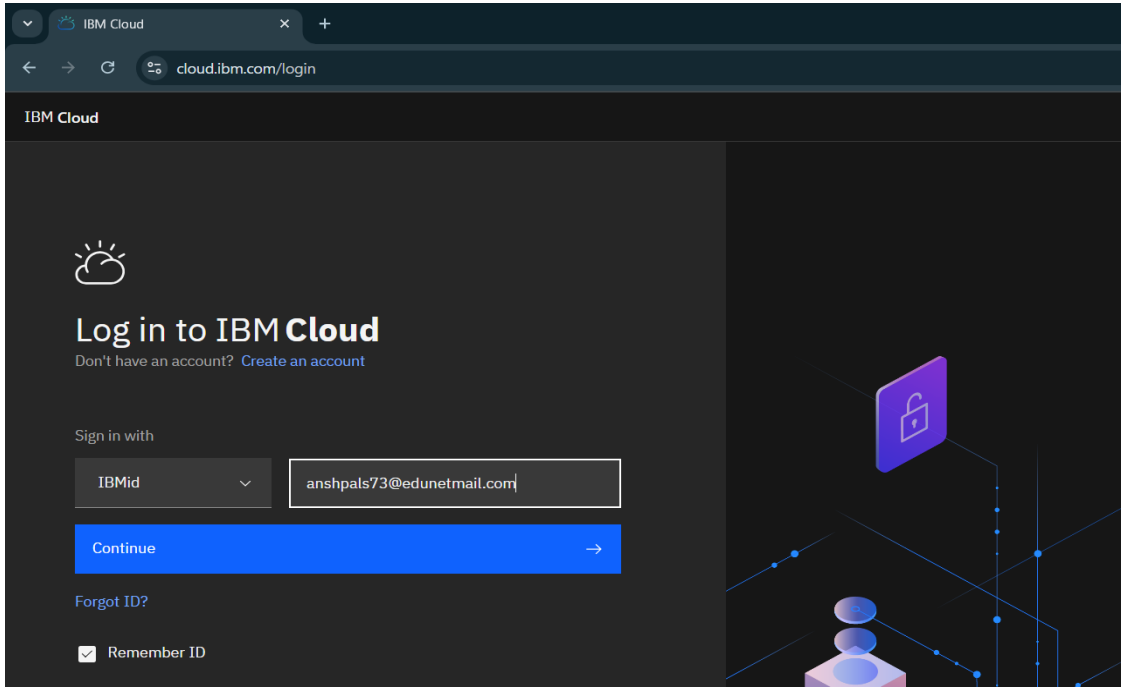
   - The loaded data was cleaned.
   - For geographic analysis, the data was deduplicated to ensure each district was represented only once.

6. **Analysis Execution:**

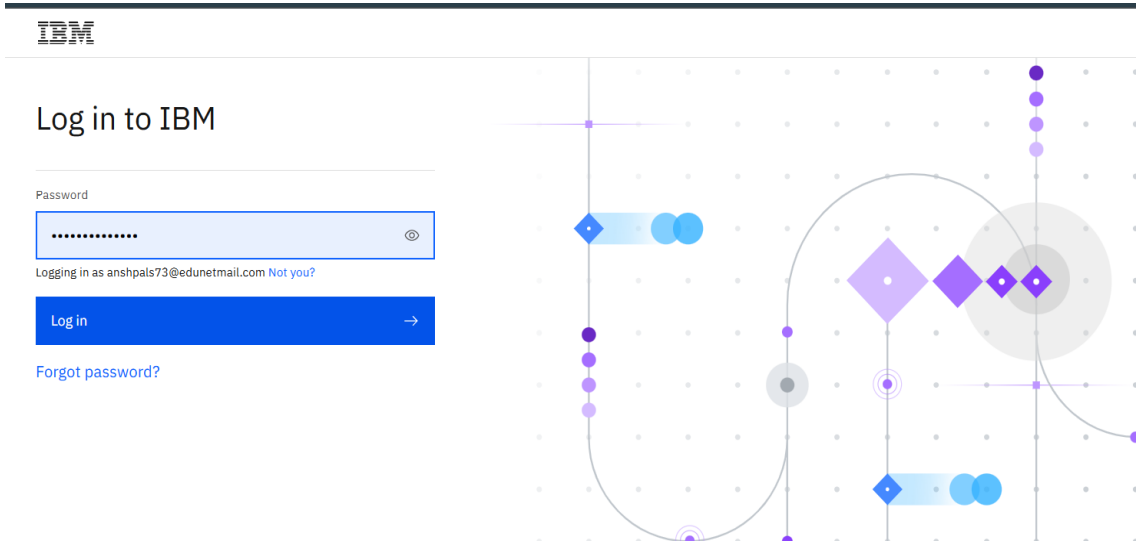
   - Wrote and executed Python code to perform aggregations for gender, caste, and geographic analyses.
   - Generated all visualizations as seen in the results section.

Next- *Implementation Visual references*

> Go to cloud.ibm.com
> Login with IBMid or other methods



> Enter Your Login Password



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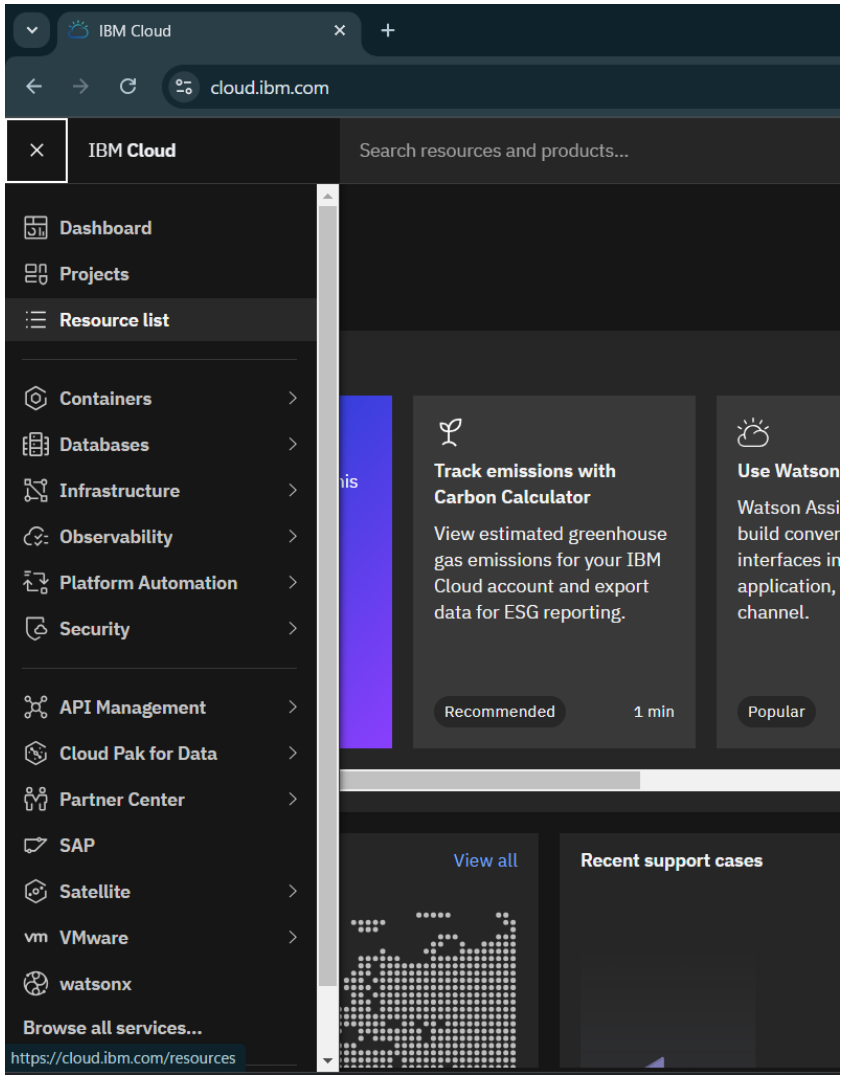
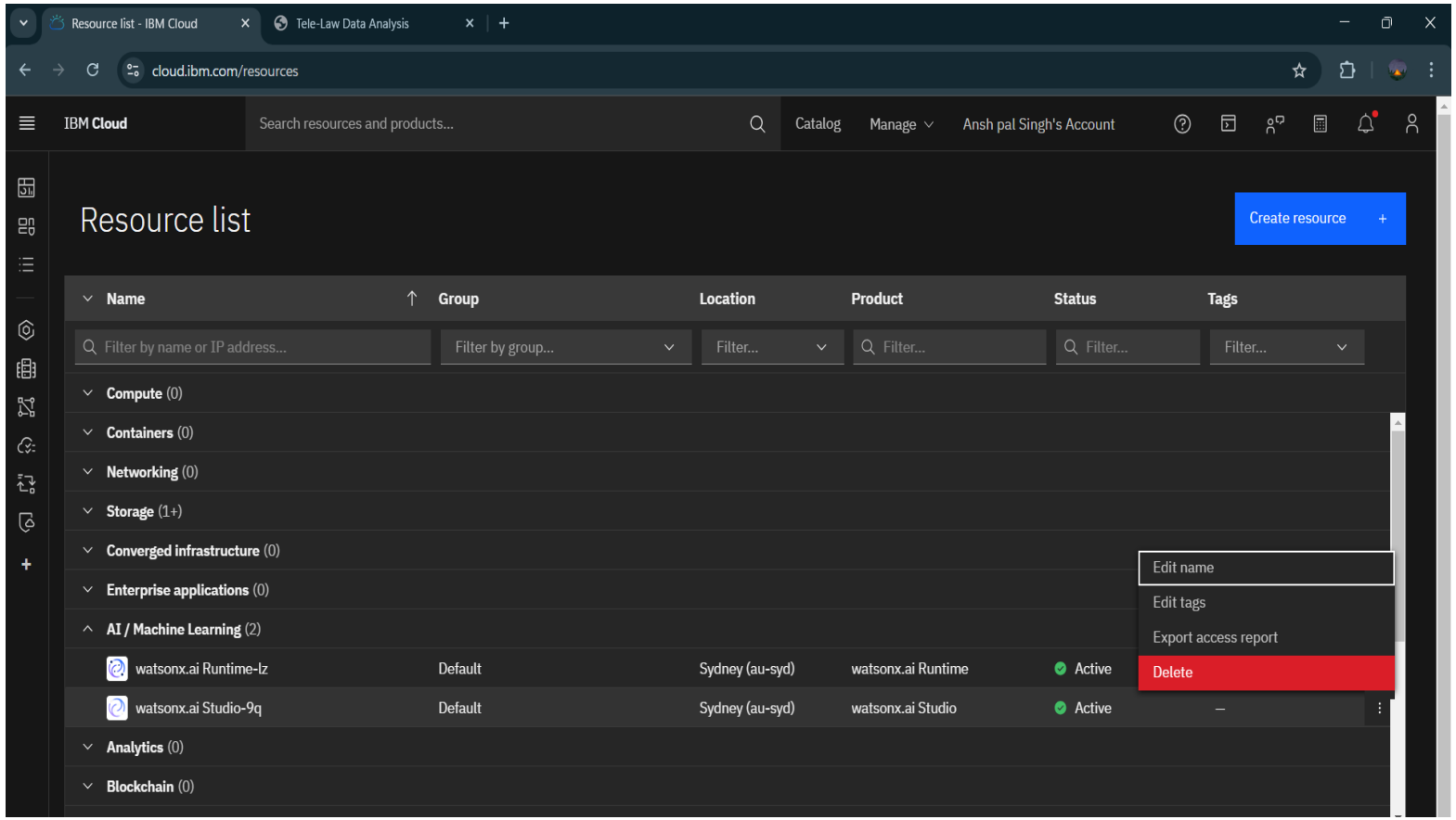


> Click on Navigation Menu then Resource List



> Deleted all resources under Storage and AI/ Machine Learning (Necessary for creating new instances)

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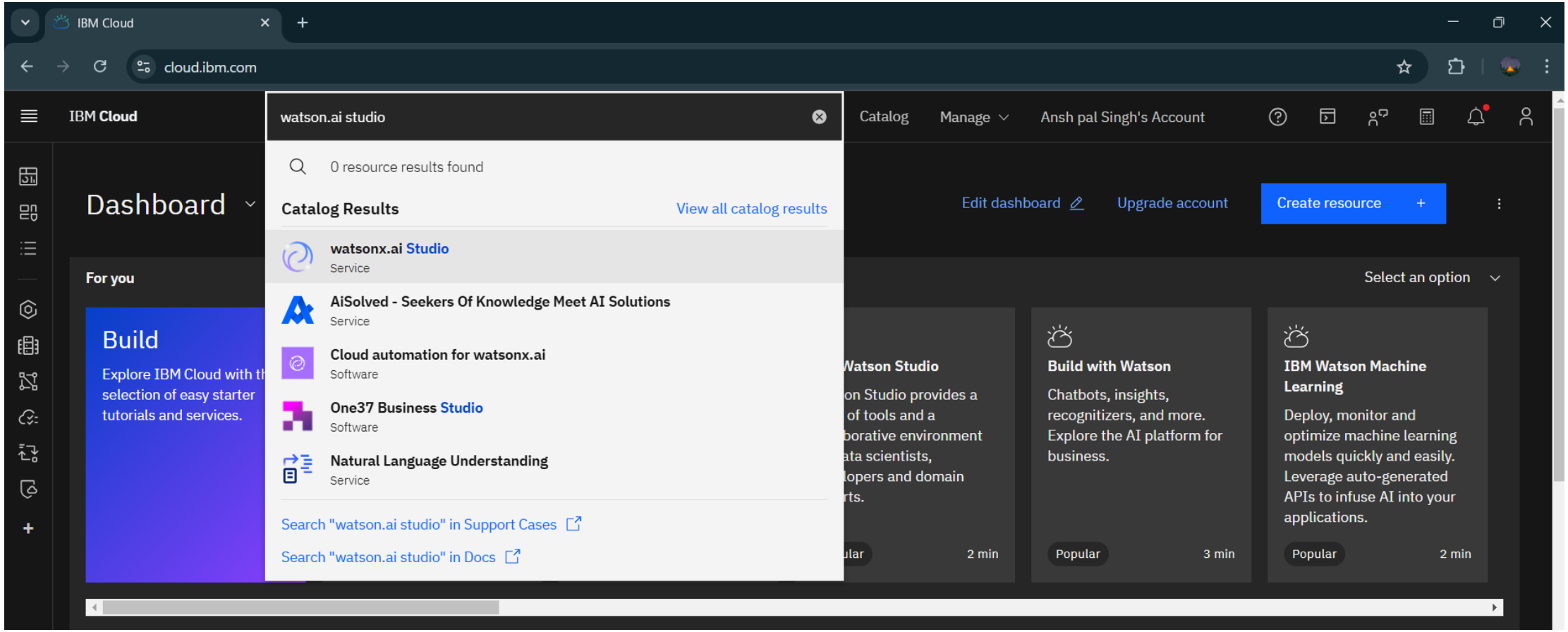
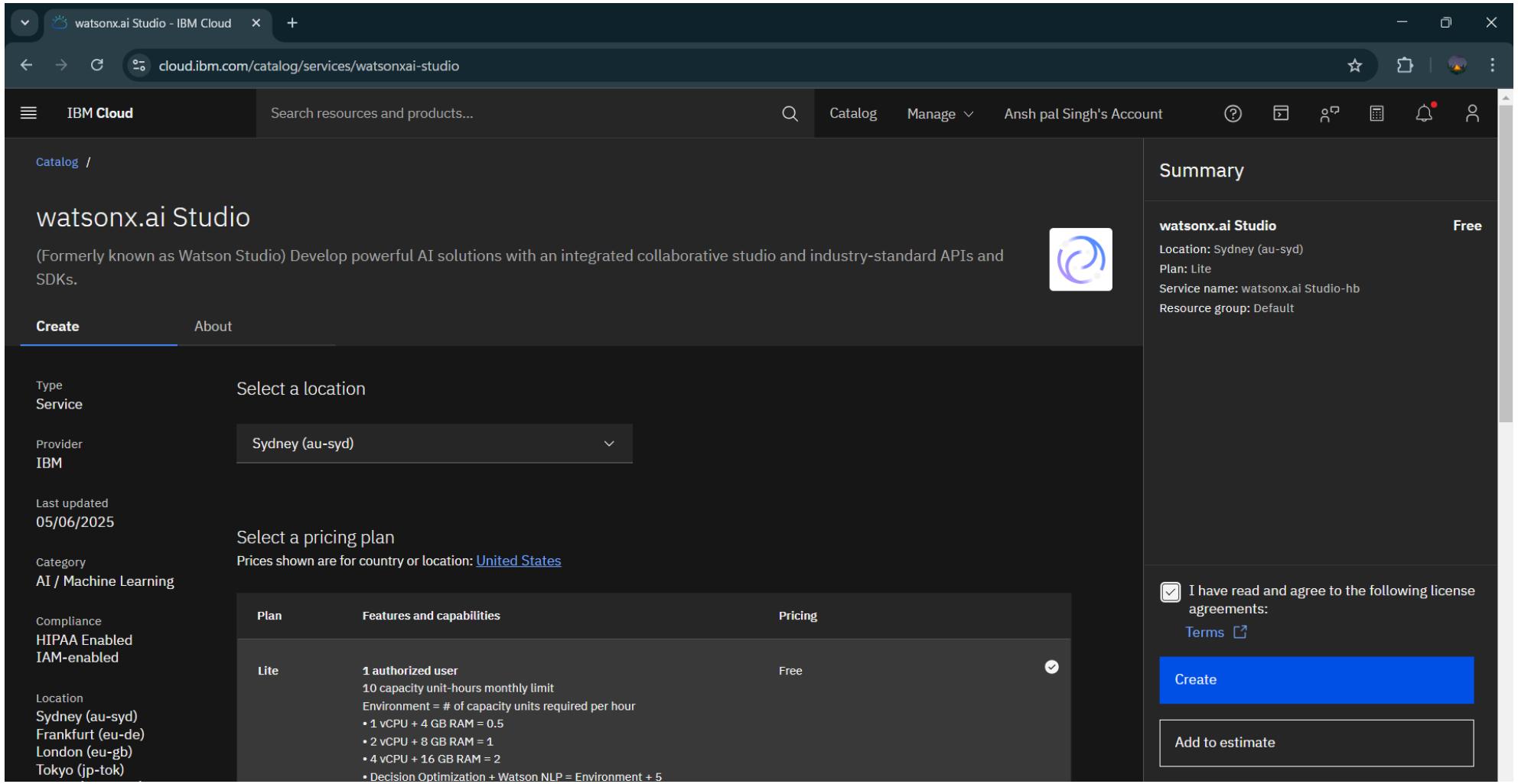
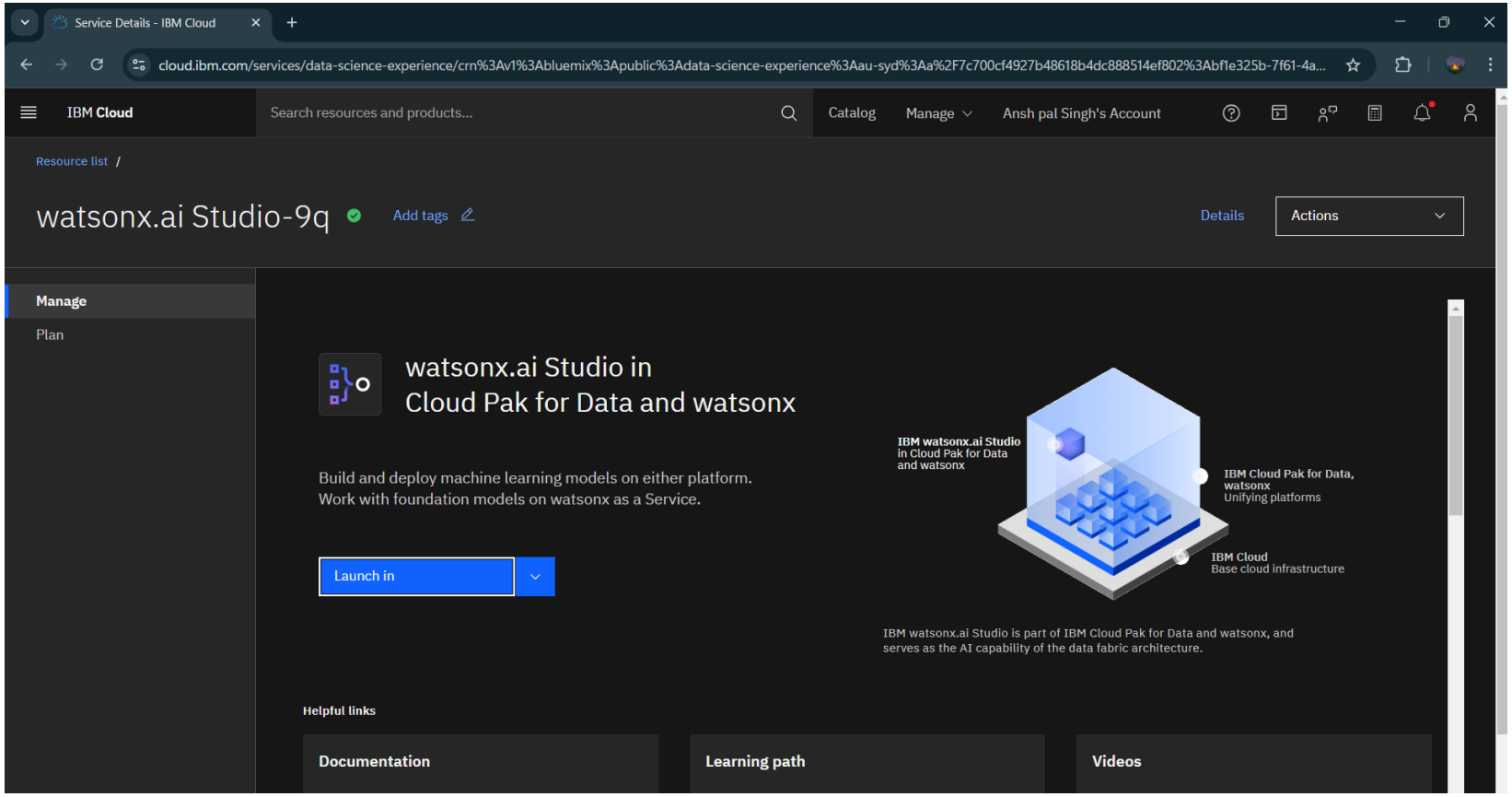
> Search for Watsonx.ai Studio service



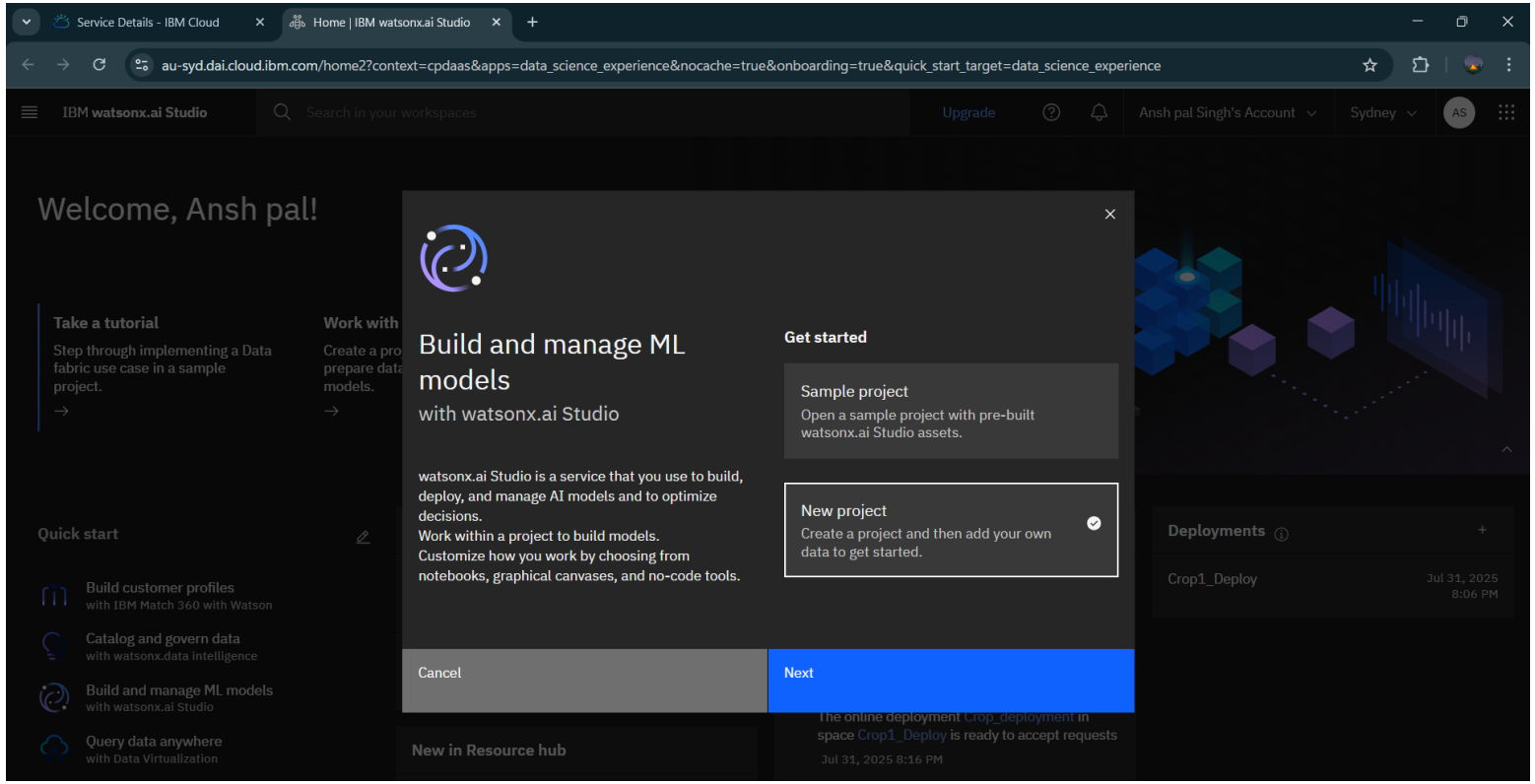
> Create Watsonx.ai Studio service with Free pricing,
> Click on check box then click on create.



> Click on **Launch In**



> Click on New Project and Next



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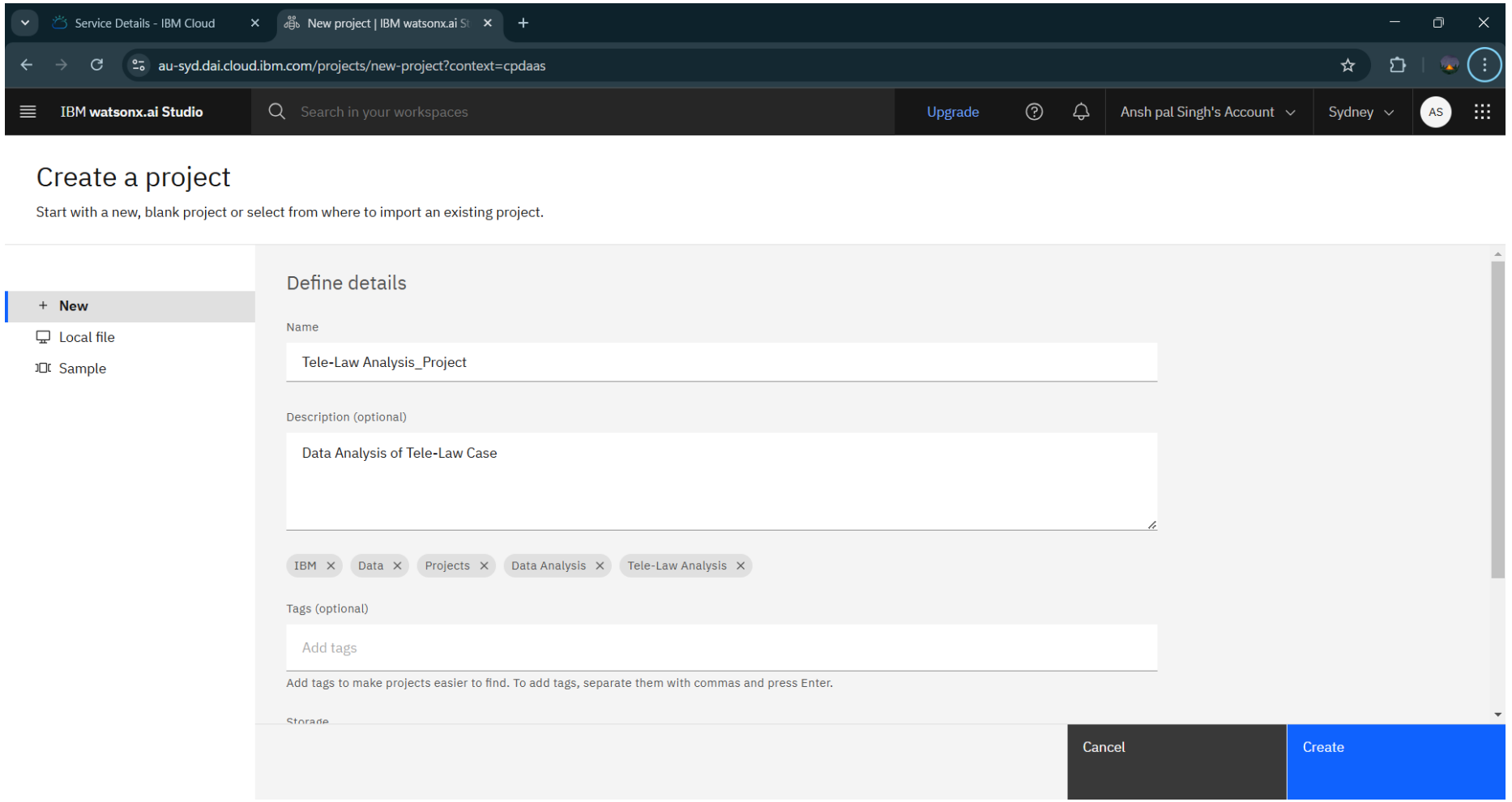
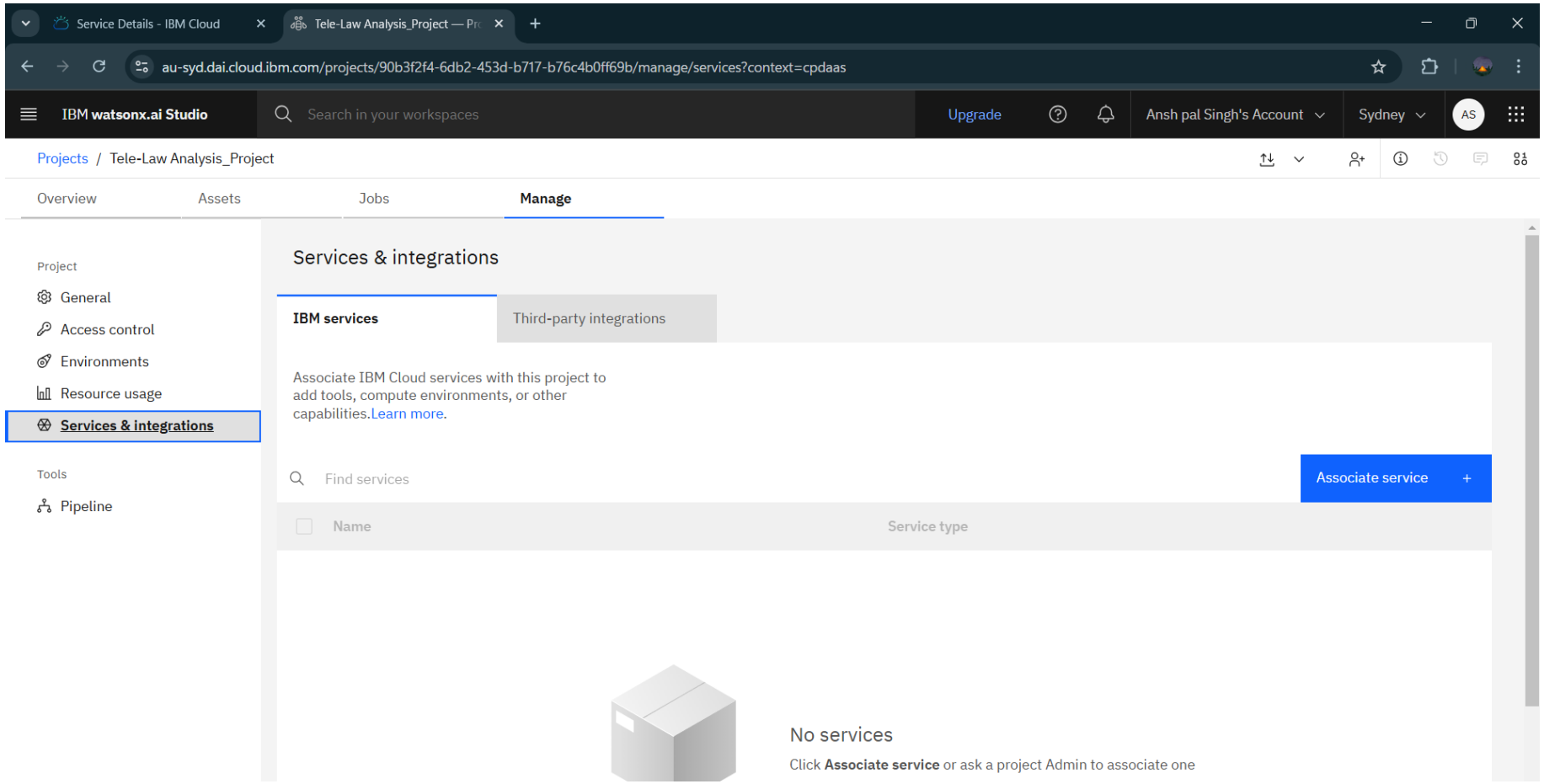
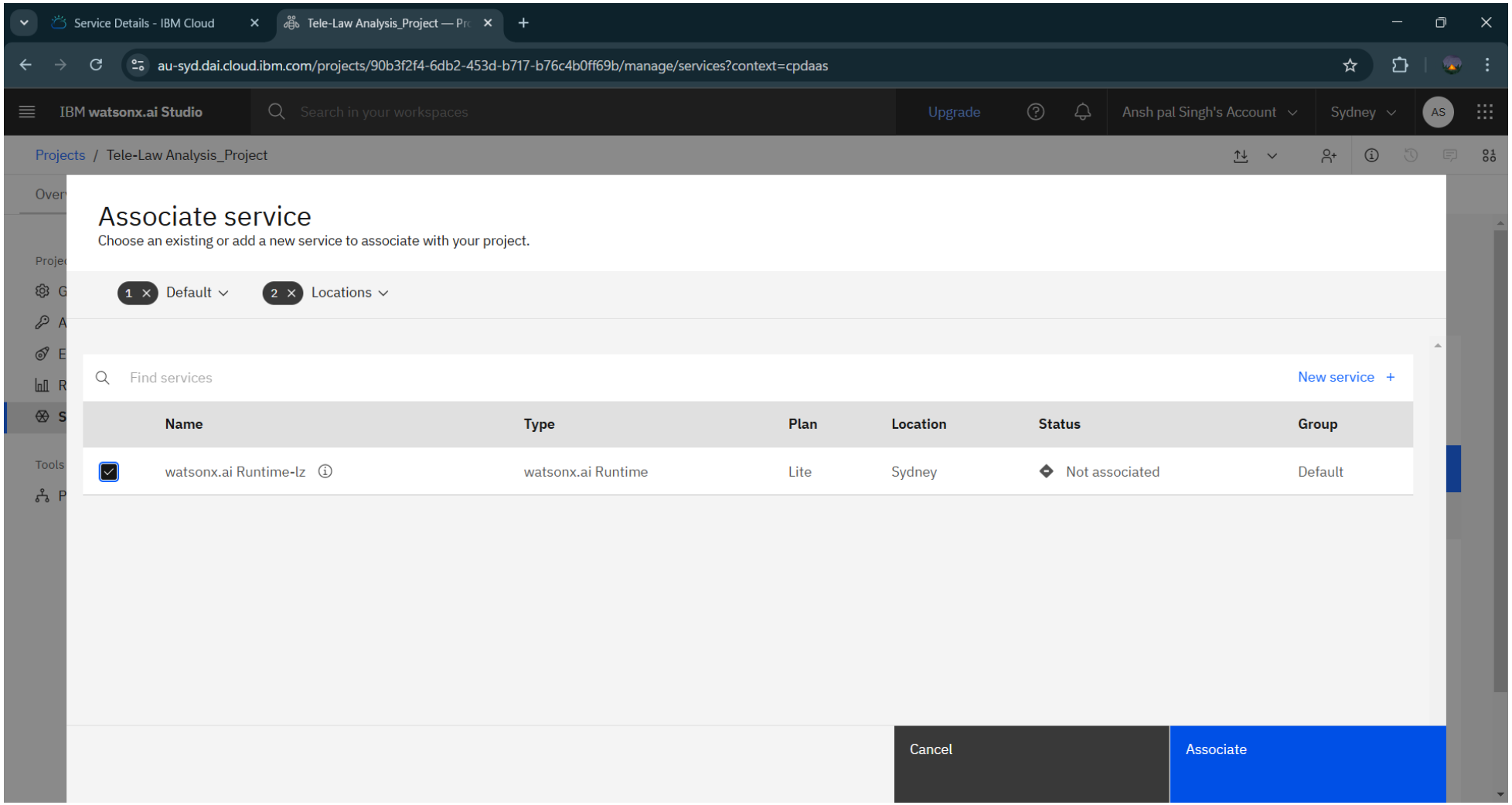
> In Create Project window – Provide details about Name, Description and click on Add for storage



> Navigate to the Manage Section
> Click on the Service & Integrations



> Associate the service watsonx.ai Runtime



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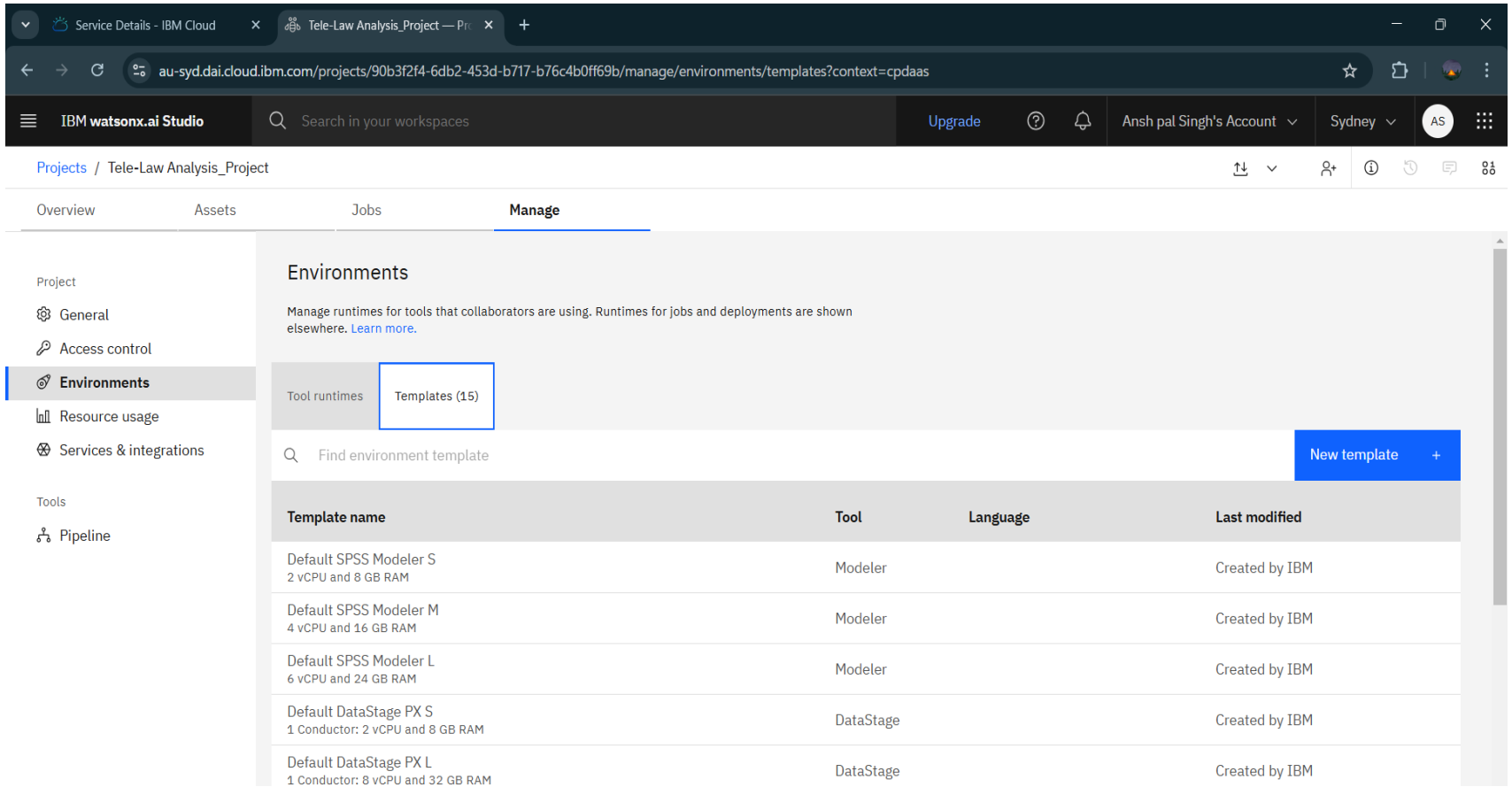
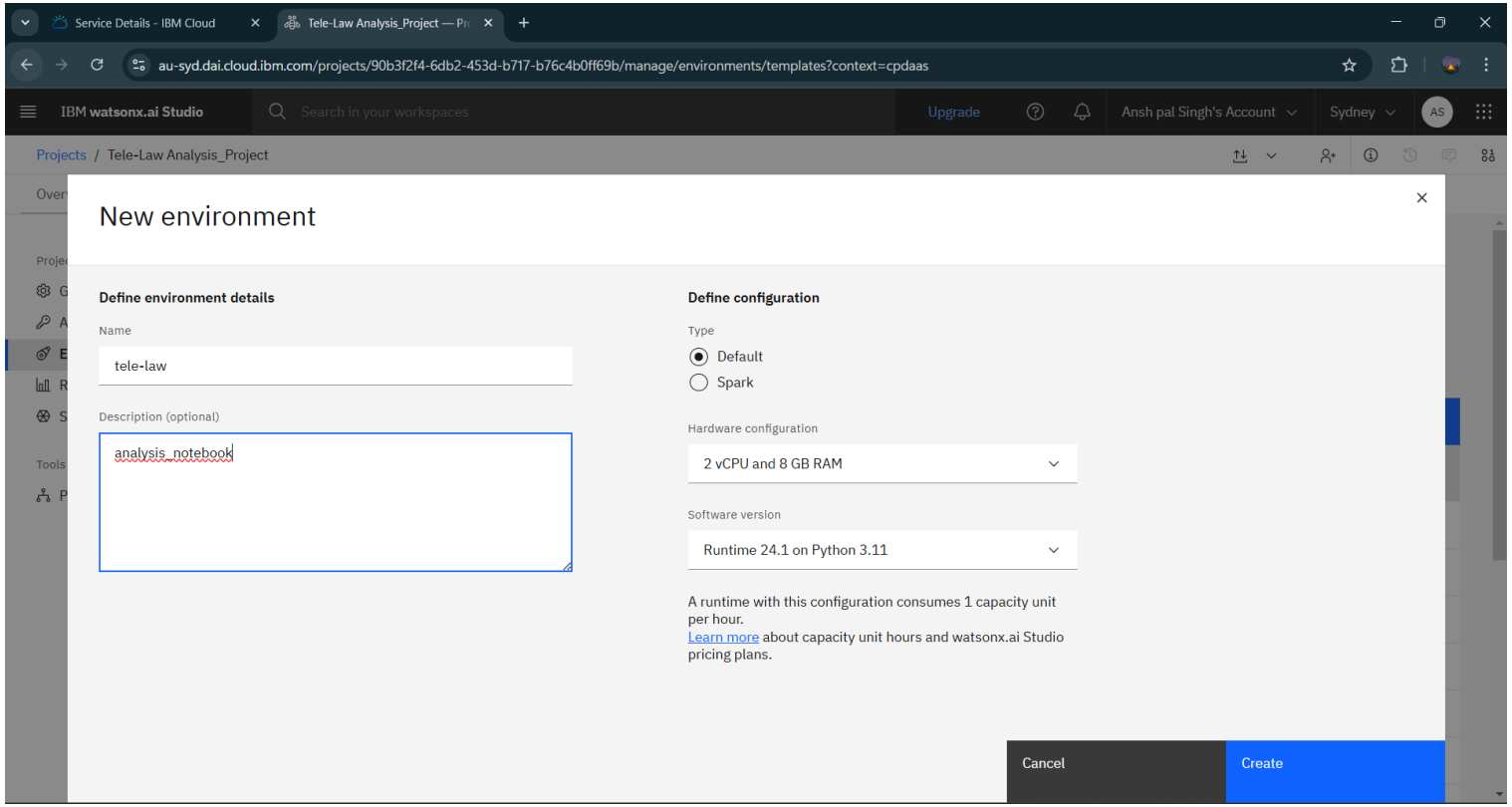
> Select the Environments section

> Select Templates section

> Click on New Template +



> Define New environment Name & Hardware Configuration
> Click Create



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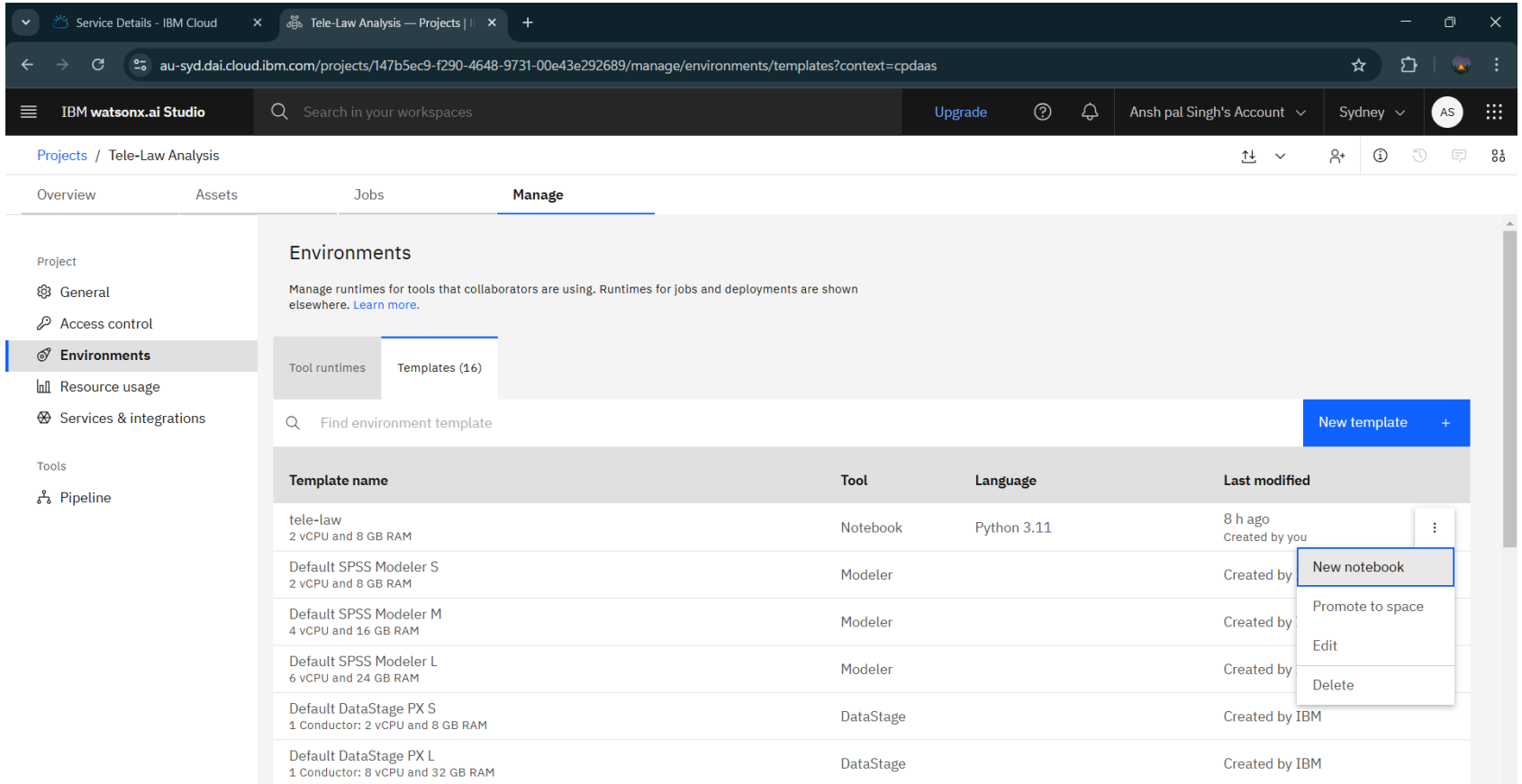
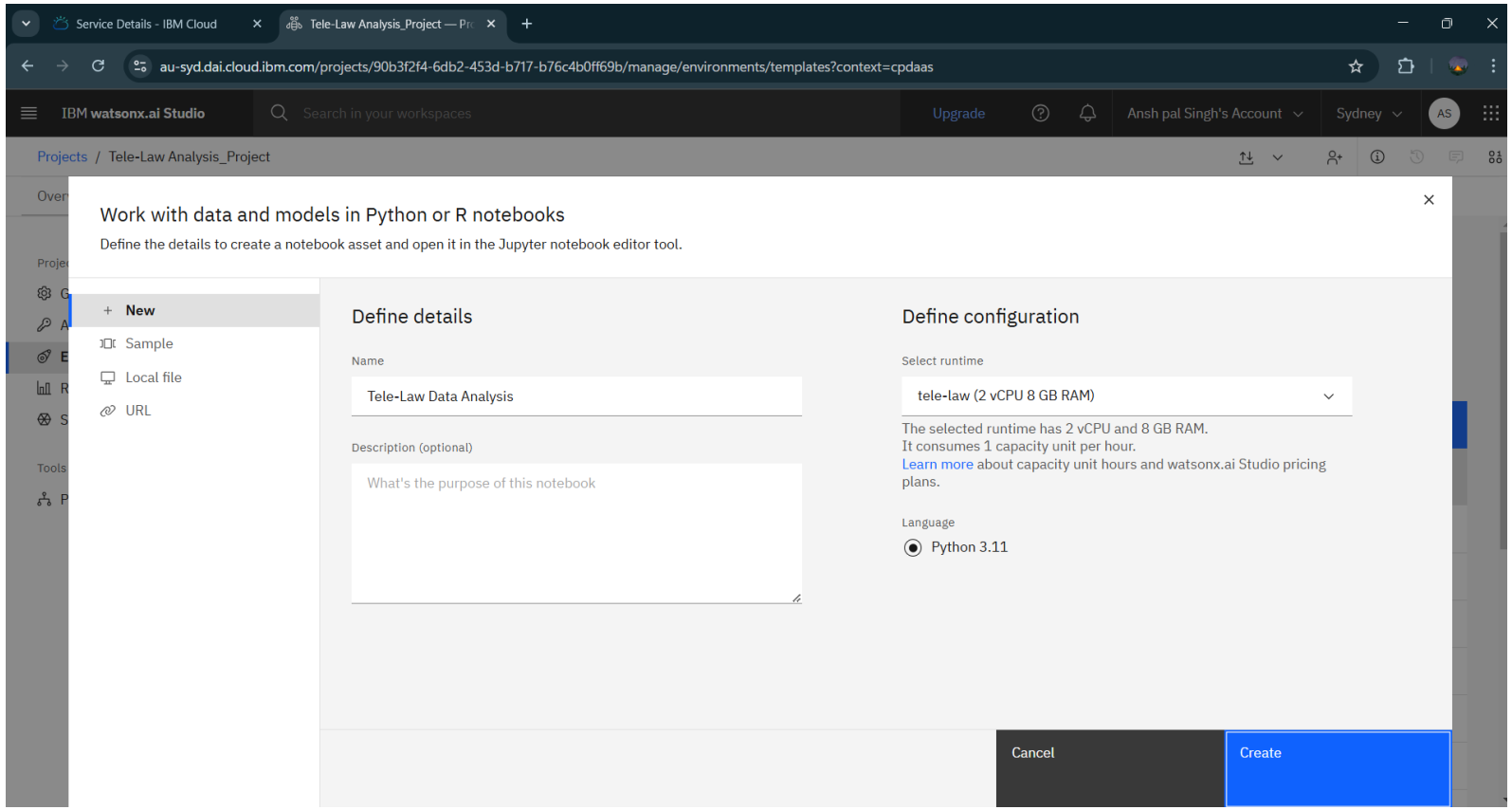
> Create New notebook



> Configure



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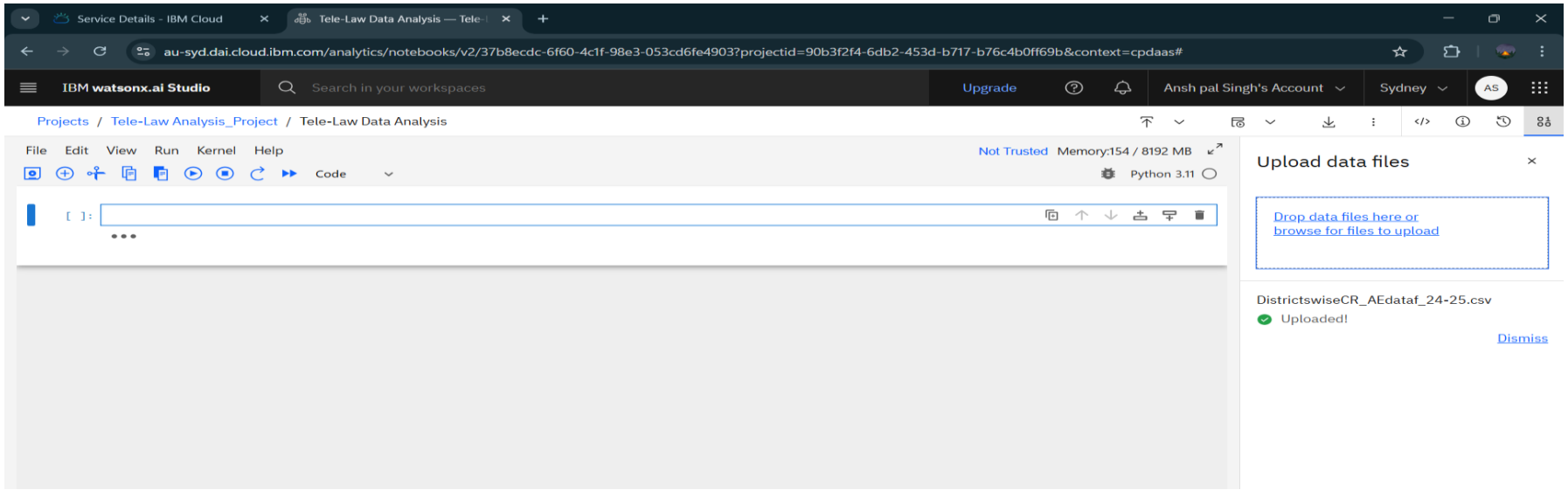
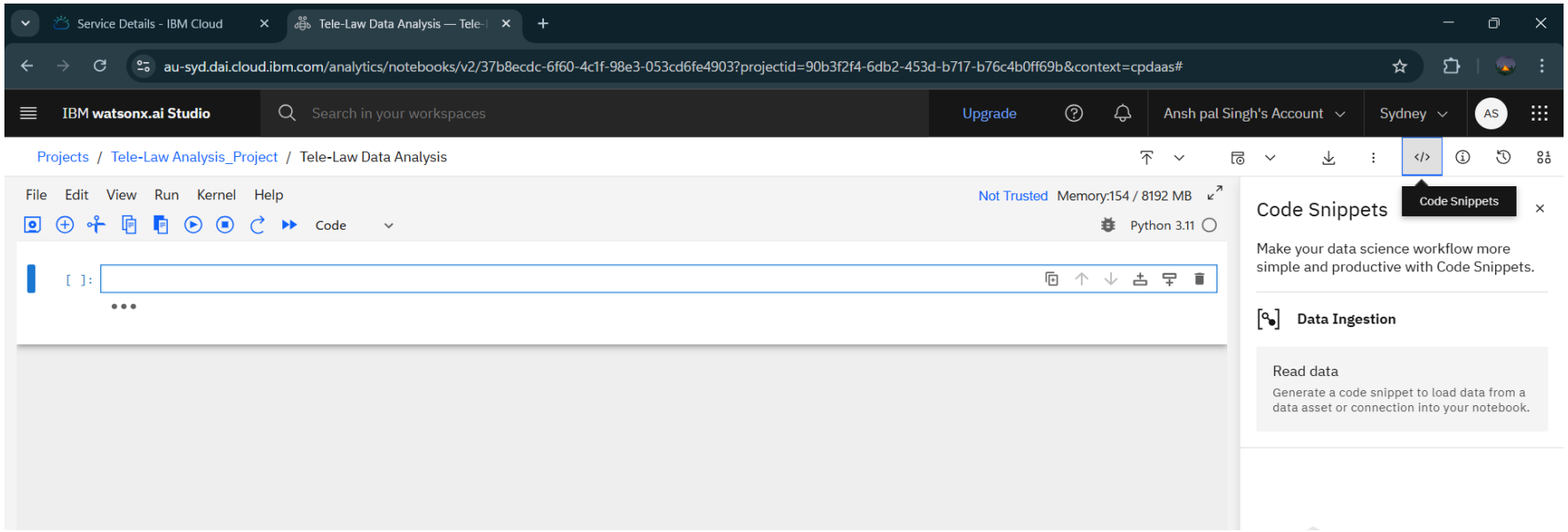
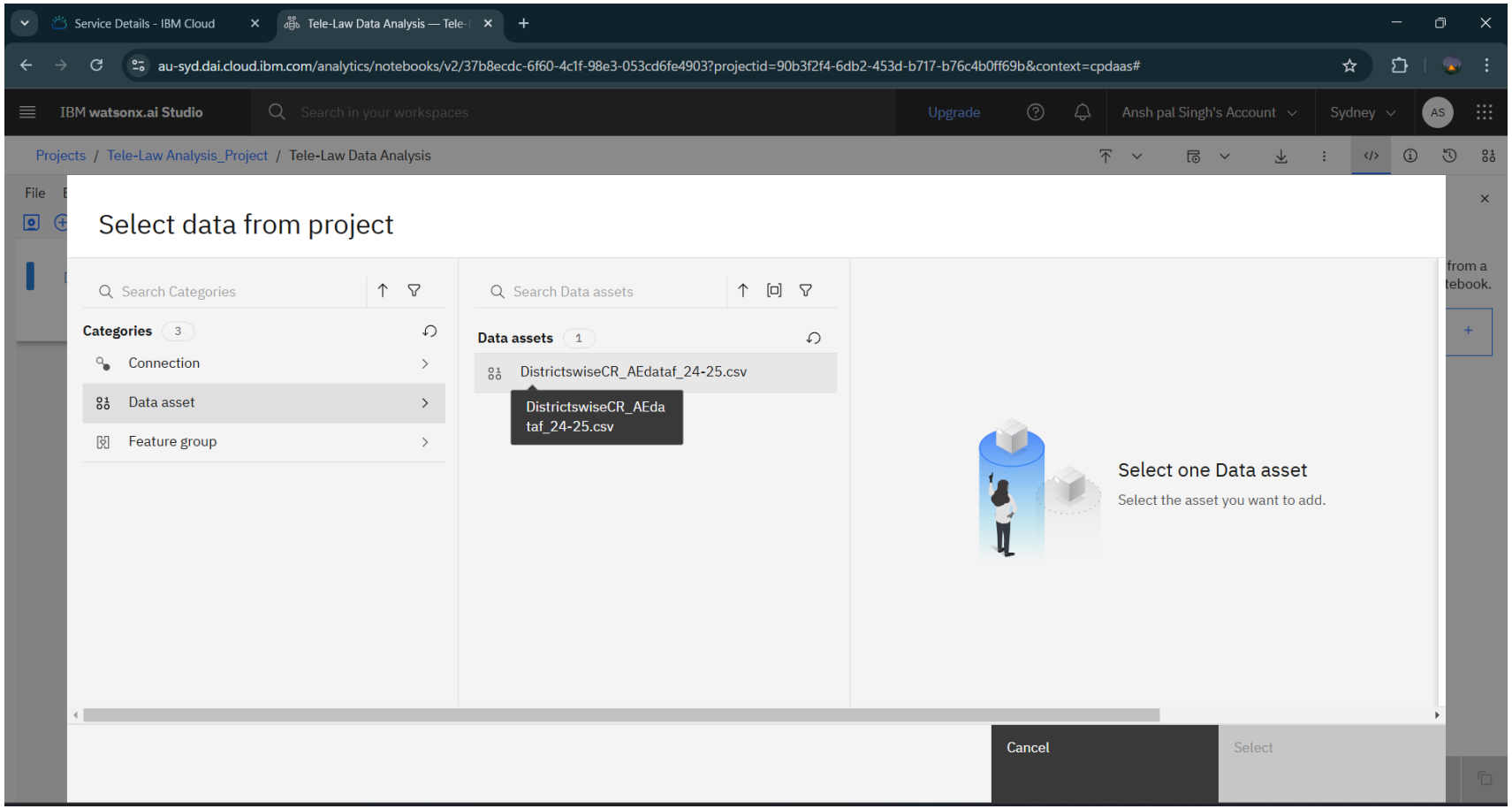
> After Notebook is loaded, Click on top right corner button to upload data (.csv file)



Click on Code Snippets button to Read the added data



> Find data file in data asset section and select the file



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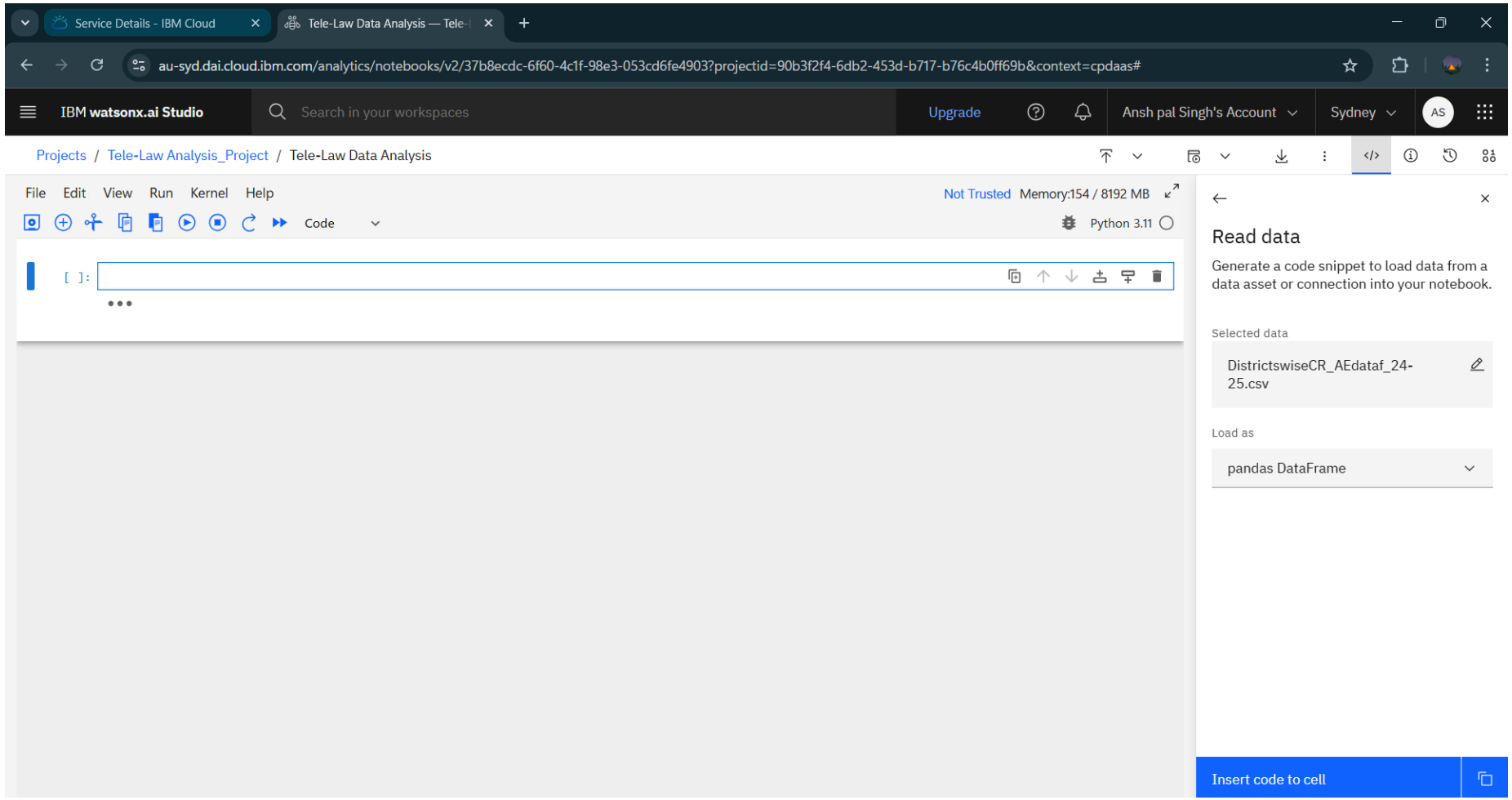
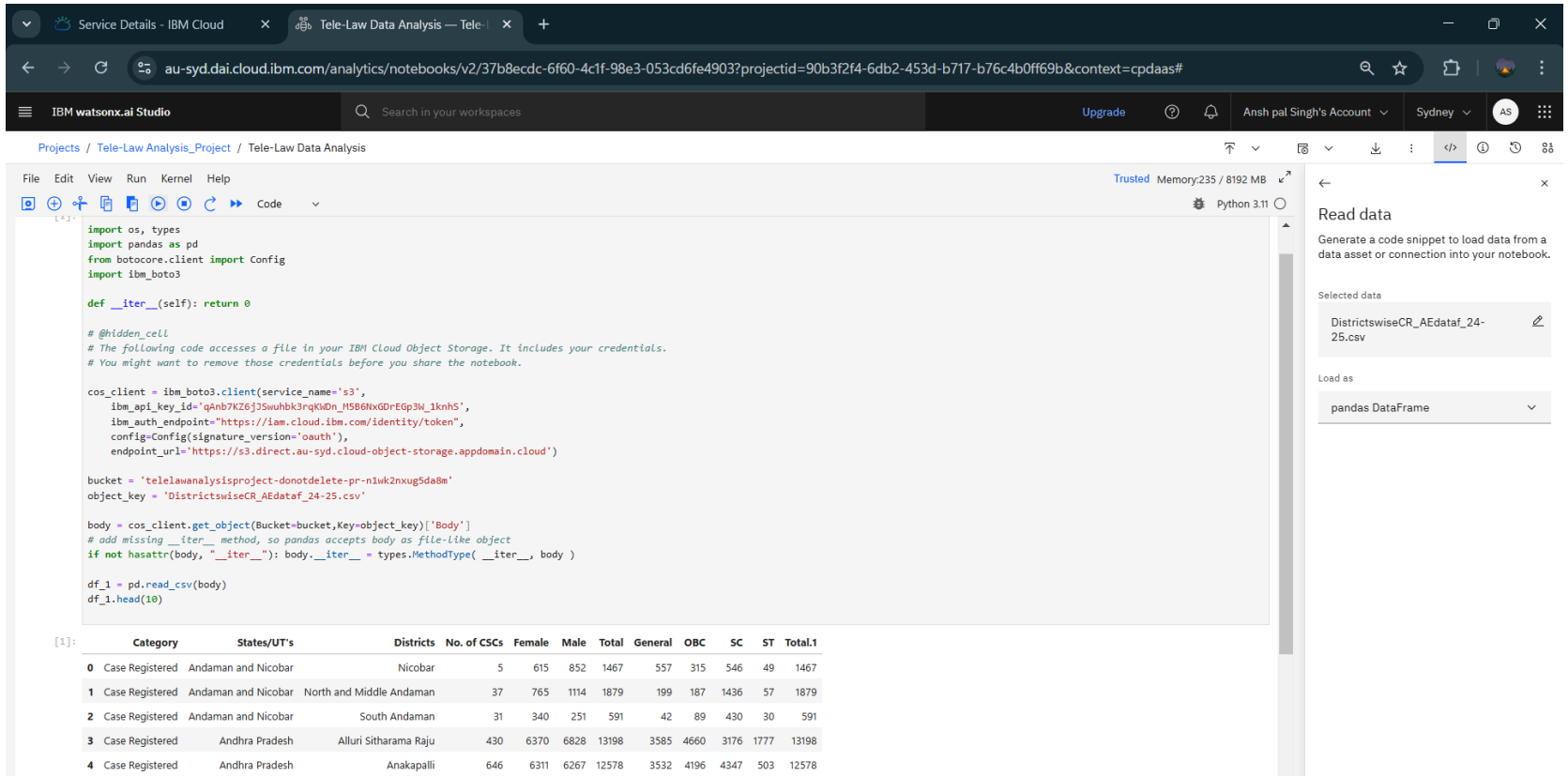
> Click on Insert code to cell, this will add data file into notebook



> Data records from file is loaded successfully. To validate, first few records are retrieved and printed

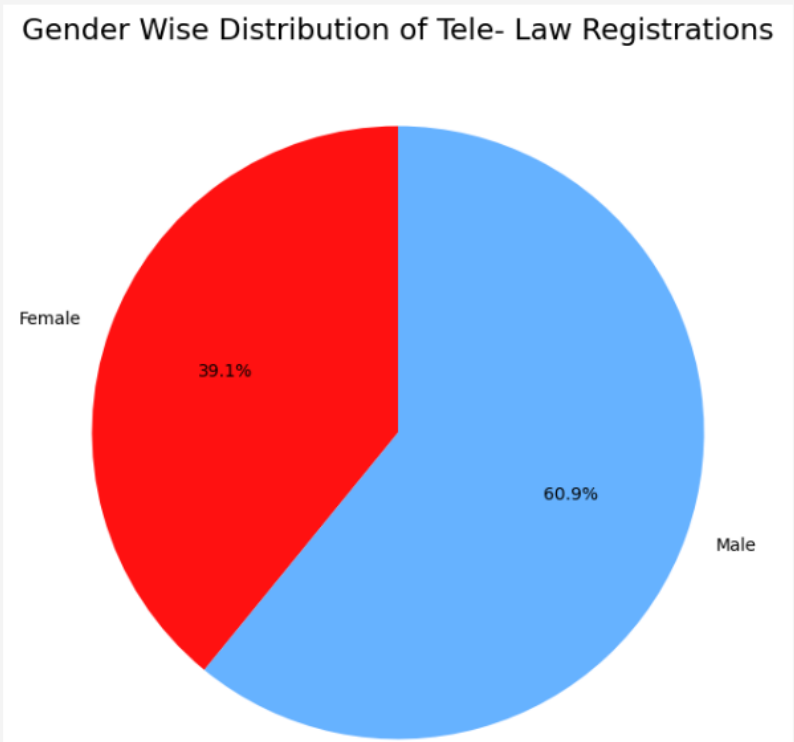


	Category	States/UT's	Districts	No. of CSCs	Female	Male	Total	General	OBC	SC	ST	Total.1
0	Case Registered	Andaman and Nicobar	Nicobar	5	615	852	1467	557	315	546	49	1467
1	Case Registered	Andaman and Nicobar	North and Middle Andaman	37	765	1114	1879	199	187	1436	57	1879
2	Case Registered	Andaman and Nicobar	South Andaman	31	340	251	591	42	89	430	30	591
3	Case Registered	Andhra Pradesh	Alluri Sitharama Raju	430	6370	6828	13198	3585	4660	3176	1777	13198
4	Case Registered	Andhra Pradesh	Anakapalli	646	6311	6267	12578	3532	4196	4347	503	12578

In [4]:
```
# Calculate total registrations by gender
gender_total = {'Female': telelaw_df['Female'].sum(), 'Male': telelaw_df['Male'].sum()}
print("Gender-wise Total Registrations:")
print(gender_total)
```

```
Gender-wise Total Registrations:
{'Female': 15956220, 'Male': 24862532}
```

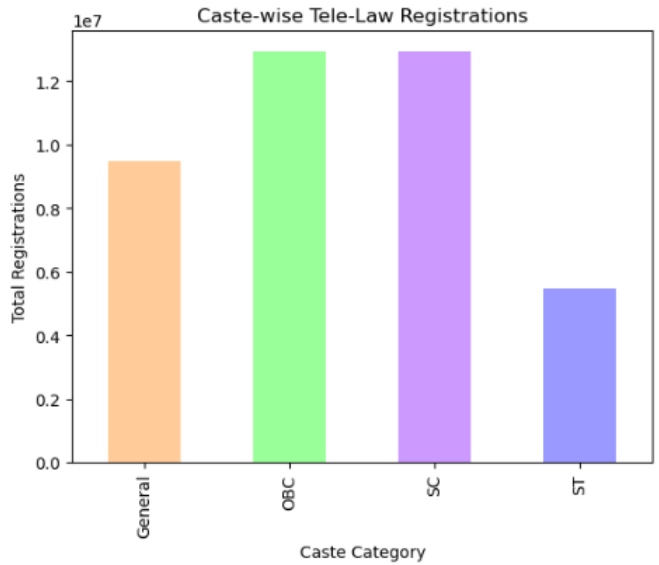
In [5]:
```
import matplotlib.pyplot as plt

gender_total = telelaw_df[['Female', 'Male']].sum()

plt.figure(figsize=(8, 8))
plt.pie(gender_total, labels=gender_total.index, autopct='%1.1f%%', colors=['#FF1111', '#66B2FF'], startangle=90)
plt.title('Gender Wise Distribution of Tele- Law Registrations', fontsize=17)
plt.ylabel('') # Hides the 'Female' label on the side
plt.show()
```



[6]:
```
# total registrations by caste
caste_disparity = telelaw_df[['General', 'OBC', 'SC', 'ST']].sum()
print("Caste-wise Total Registrations:")
print(caste_disparity)
```

```
Caste-wise Total Registrations:
General     9479618
OBC        12931124
SC         12921364
ST          5486646
dtype: int64
```

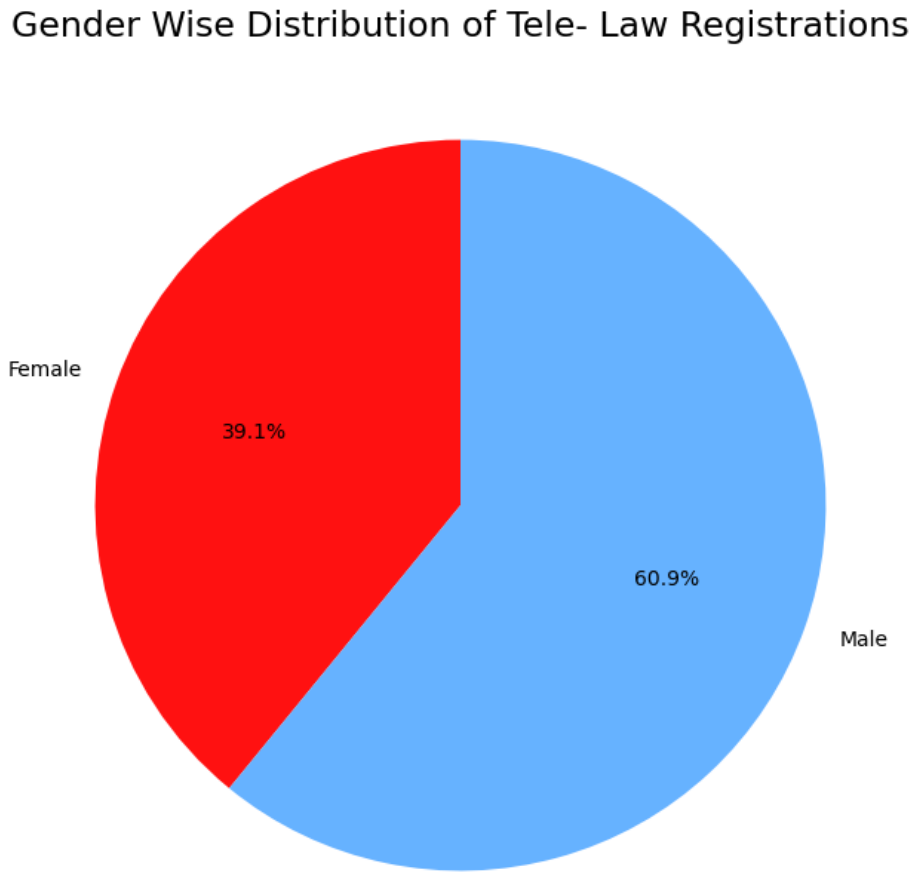
[7]:
```
import matplotlib.pyplot as plt
caste_data = telelaw_df[['General', 'OBC', 'SC', 'ST']].sum()
caste_data.plot(kind='bar', color=['#FFCC99', '#99FF99', '#CC99FF', '#9999FF'])
plt.title('Caste-wise Tele-Law Registrations')
plt.xlabel('Caste Category')
plt.ylabel('Total Registrations')
plt.show()
```



RESULT

I. GENDER DISPARITY:

- A significant imbalance was found, with Males accounting for 60.9% of registrations compared to 39.1% for Females
- This gap suggests potential barriers for women, such as lower digital literacy, lack of awareness, or socio-cultural factors.



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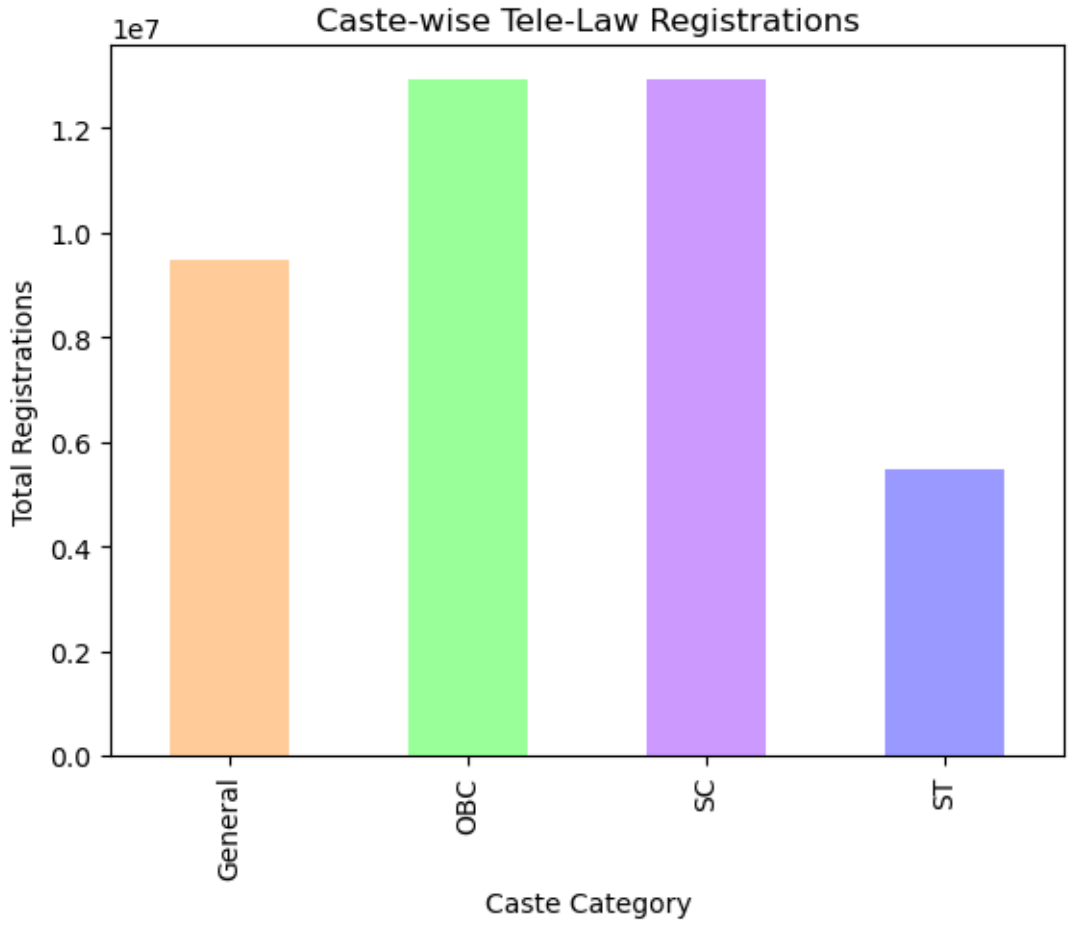
II. CASTE DISPARITY:

- The ST community is significantly underrepresented (13.4% of registrations) compared to OBC (31.7%) and SC (31.6%) communities.
- The low uptake among the ST population may be due to factors like geographic isolation or lack of CSC infrastructure and awareness in tribal regions.



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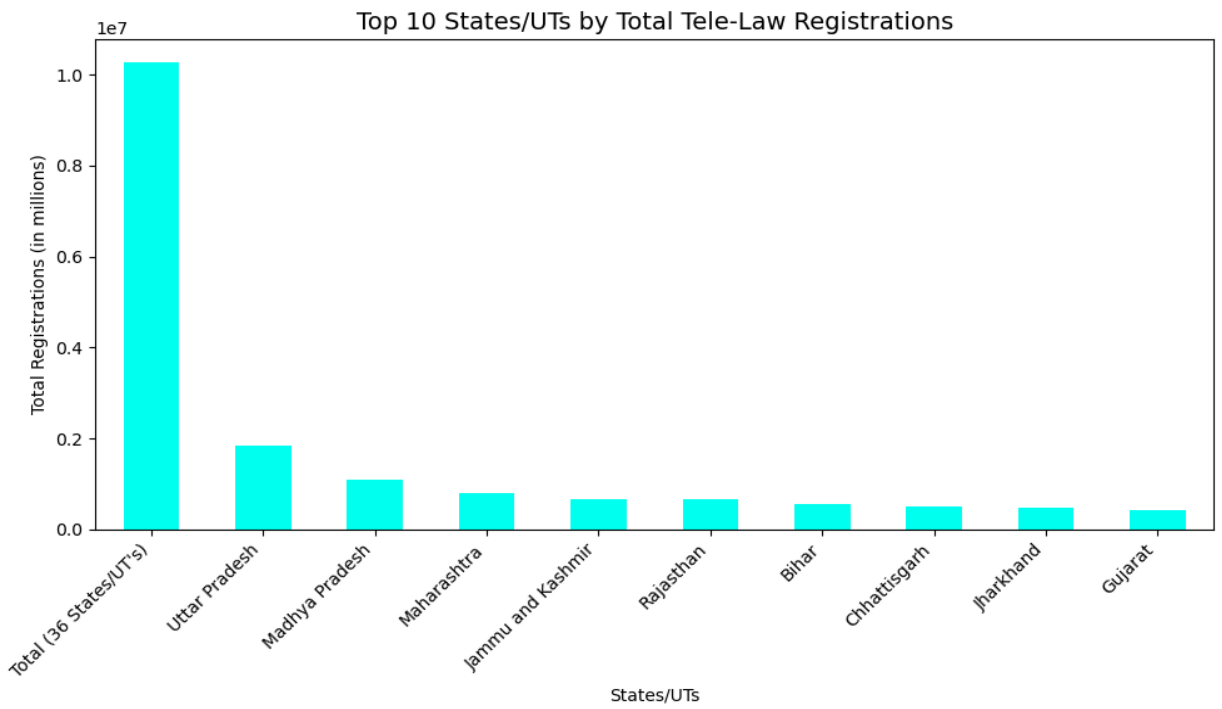
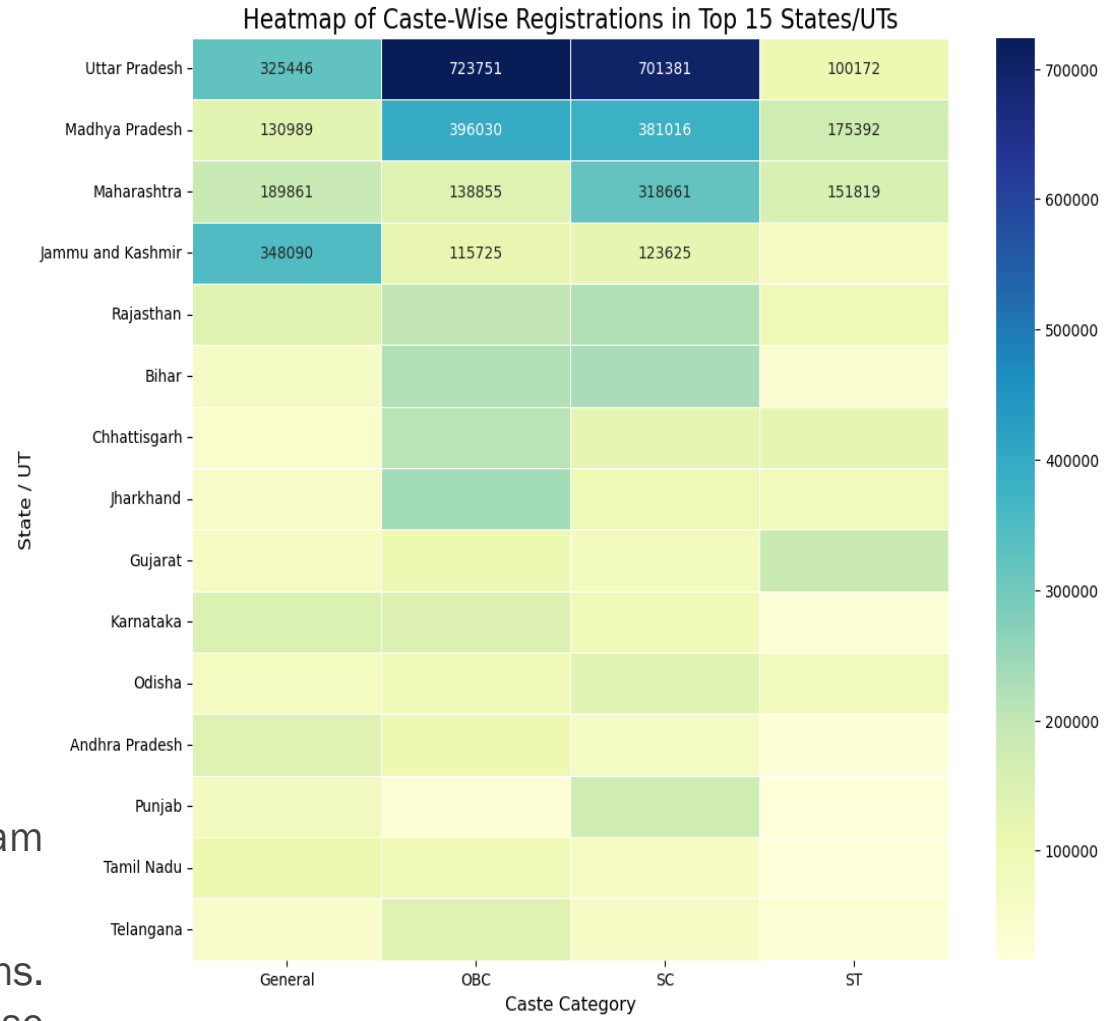
III. STATE-LEVEL DISPARITY:





- Uttar Pradesh leads in total registrations, indicating high program penetration.
- However, 22 districts across the country reported zero registrations. which is a critical concern, pointing to complete service failure in these areas. The heatmap shows that high registration numbers are concentrated in a few states and primarily within OBC and SC communities.

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CONCLUSION

- The data analysis successfully identified significant disparities in Tele-Law service utilization along demographic and geographic lines.
- The program shows strong engagement in certain states and among OBC/SC communities but struggles to reach women and the ST community effectively.
- The existence of zero-registration districts highlights critical gaps in the program's implementation and outreach machinery.
- To achieve its goal of inclusive legal access, the Tele-Law initiative requires targeted interventions aimed at these specific underrepresented groups and inactive regions.

FUTURE SCOPE

- **Qualitative Analysis**: Conduct on-the-ground surveys in low-performing and zero-registration districts to understand the root causes of low uptake.
- **Predictive Modeling**: Develop a model to predict which districts are at risk of low engagement based on demographic and infrastructure data.
- **Interactive Dashboard**: Create a live, interactive dashboard (e.g., using IBM Cognos) for policymakers to monitor Tele-Law performance and disparities in real-time.

REFERENCES

- **Dataset:**

- **Title:** District-wise Tele-Law Case Registration and Advice Enabled Data for FY 2021-22 to 2024-25.
- **Source:** Data.gov.in - The Government of India's Open Government Data (OGD) Platform.
- **Link:** https://www.data.gov.in/resource/district-wise-tele-law-case-registration-and-advice-enabled-data-fy-2021-22-2024-25

- **Technology & Platform:**

- IBM Cloud
- IBM Watson Studio
- IBM Cloud Object Storage

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Completion date: 24 Jul 2025 (GMT) **Learning hours:** 20 mins

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