
CAPSTONE PROJECT

ANALYZING DEMOGRAPHIC AND REGIONAL DISPARITIES IN TELE-LAW CASE

Presented By:
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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 “DistrictwiseCR_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:

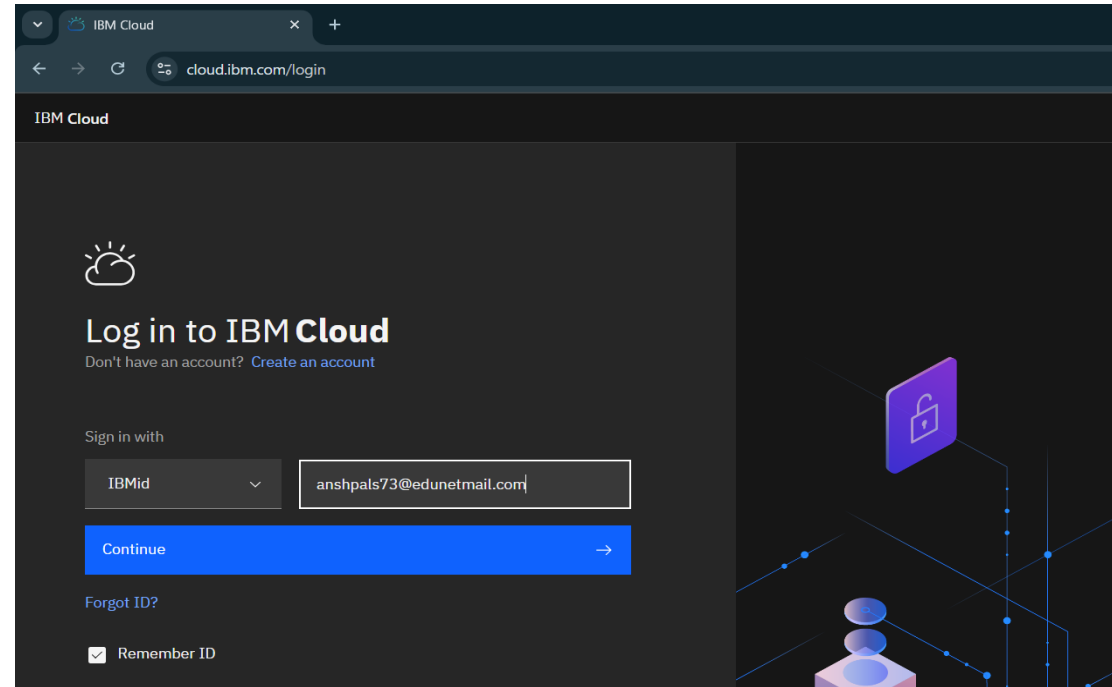
- The loaded data was cleaned.
- For geographic analysis, the data was deduplicated to ensure each district was represented only once.

6. Analysis Execution:

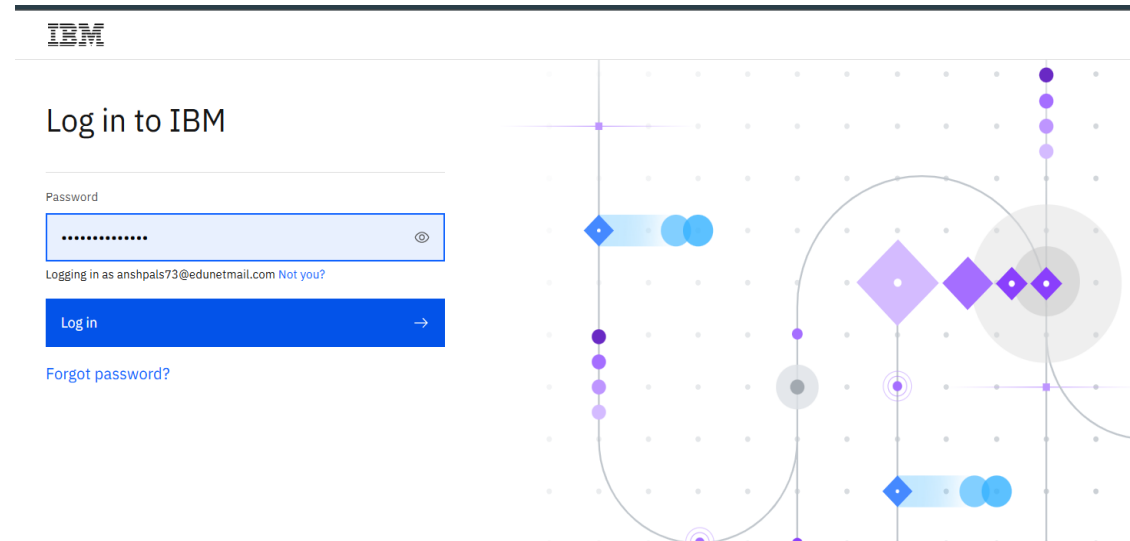
- Wrote and executed Python code to perform aggregations for gender, caste, and geographic analyses.
- Generated all visualizations as seen in the results section.

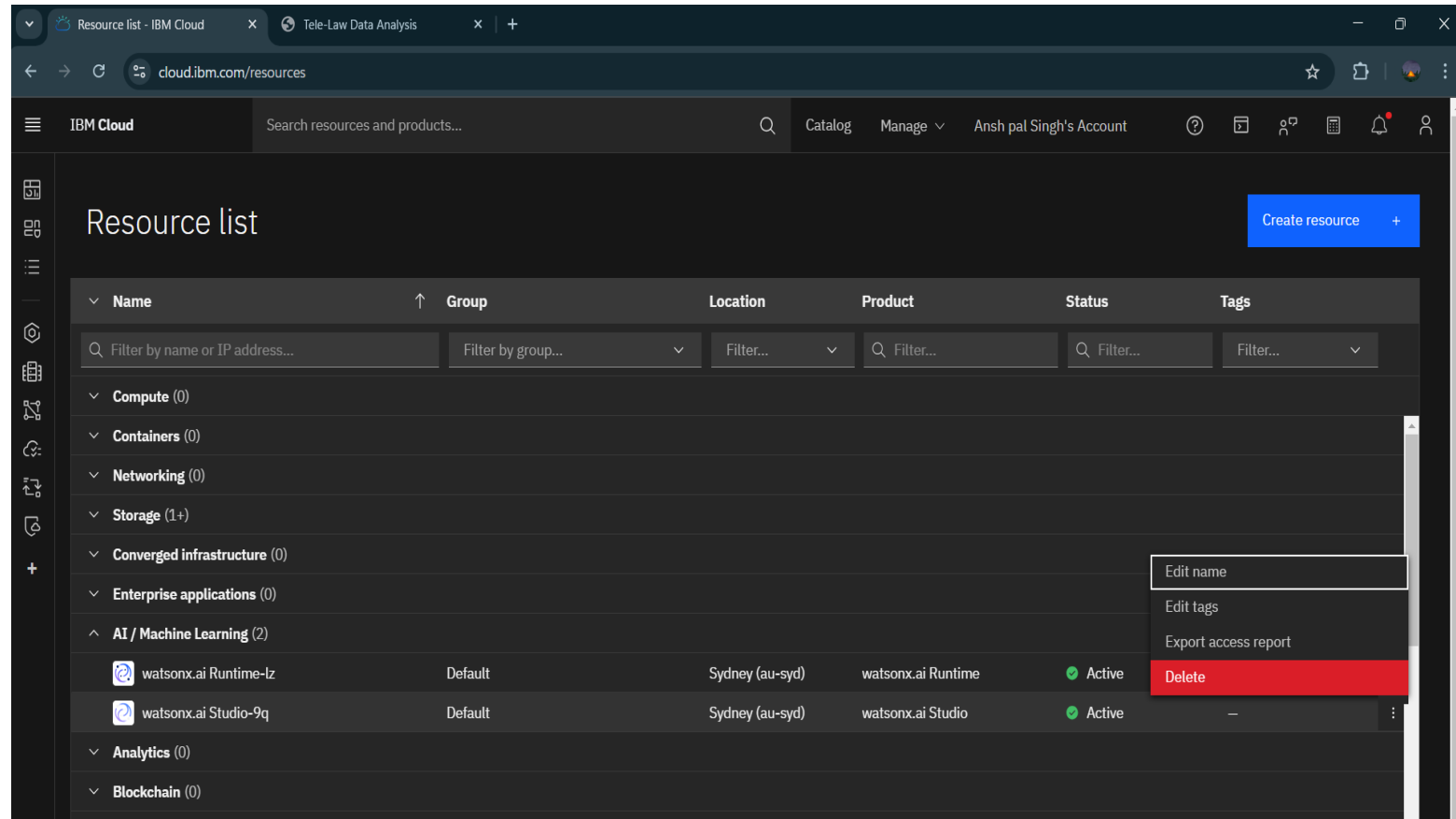
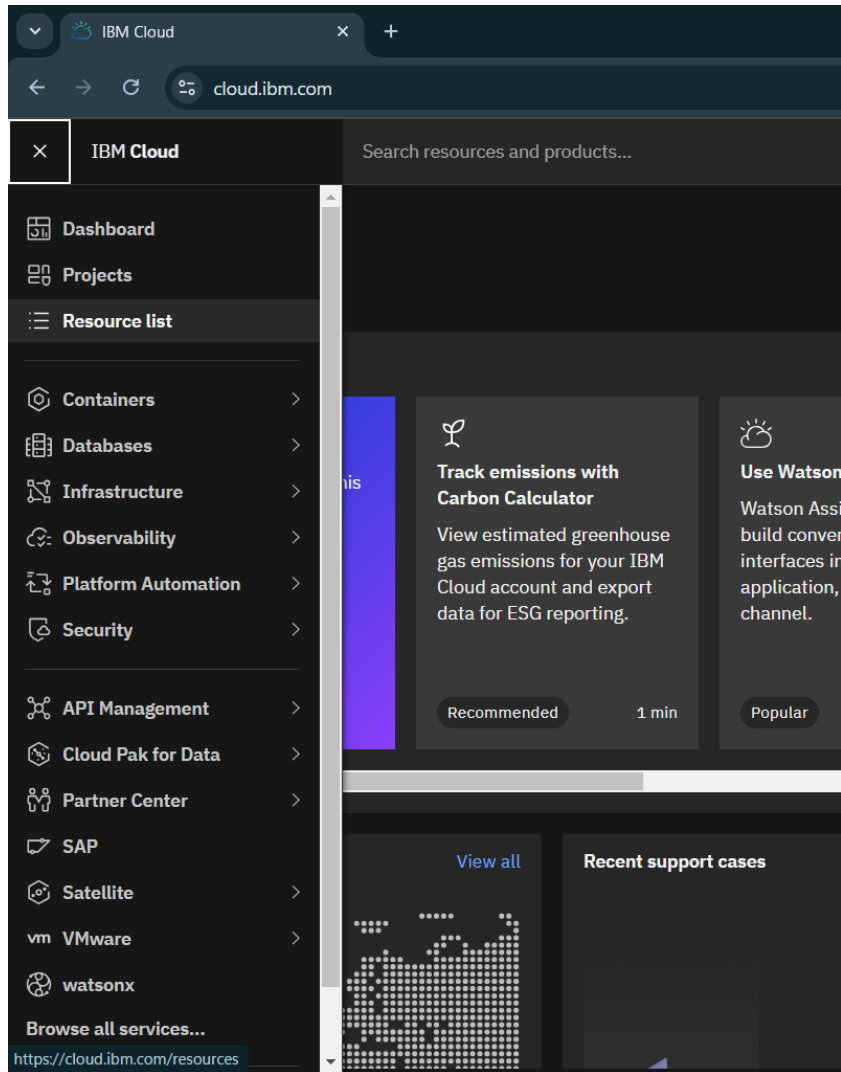
Next- *Implementation Visual references*

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



- > Enter Your Login Password





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

> Click on Navigation Menu then Resource List

> Search for Watsonx.ai Studio service

The screenshot shows the IBM Cloud console interface. A search bar at the top left contains the text "watson.ai studio". Below the search bar, a dropdown menu displays "0 resource results found" and "Catalog Results". The search results list several services:

- watsonx.ai Studio** (Service)
- AI Solved - Seekers Of Knowledge Meet AI Solutions** (Service)
- Cloud automation for watsonx.ai** (Software)
- One37 Business Studio** (Software)
- Natural Language Understanding** (Service)

At the bottom of the search results, there are links to "Search 'watson.ai studio' in Support Cases" and "Search 'watson.ai studio' in Docs". The background of the console shows the "Dashboard" with a "Build" section and a "Watson Studio" card.

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

The screenshot shows the IBM Cloud Watsonx.ai Studio service page. The browser address bar shows `cloud.ibm.com/catalog/services/watsonxai-studio`. The page header includes the IBM Cloud logo, a search bar, and navigation links for Catalog, Manage, and the user's account (Ansh pal Singh's Account).

The main content area is titled "watsonx.ai Studio" and includes a description: "(Formerly known as Watson Studio) Develop powerful AI solutions with an integrated collaborative studio and industry-standard APIs and SDKs." Below this, there are tabs for "Create" and "About".

The "Create" tab is active, showing a form to select a location and pricing plan. The "Type" is "Service". The "Provider" is "IBM". The "Last updated" date is "05/06/2025". The "Category" is "AI / Machine Learning". The "Compliance" section lists "HIPAA Enabled" and "IAM-enabled". The "Location" dropdown shows "Sydney (au-syd)" selected, with other options: "Frankfurt (eu-de)", "London (eu-gb)", and "Tokyo (jp-tok)".

The "Select a pricing plan" section shows a table with the following data:

Plan	Features and capabilities	Pricing
Lite	<ul style="list-style-type: none">1 authorized user10 capacity unit-hours monthly limitEnvironment = # of capacity units required per hour<ul style="list-style-type: none">1 vCPU + 4 GB RAM = 0.52 vCPU + 8 GB RAM = 14 vCPU + 16 GB RAM = 2Decision Optimization + Watson NLP = Environment + 5	Free

The "Summary" panel on the right shows the service is "Free". It lists the "Location: Sydney (au-syd)", "Plan: Lite", "Service name: watsonx.ai Studio-hb", and "Resource group: Default". Below this, there is a checkbox labeled "I have read and agree to the following license agreements:" which is checked. A link for "Terms" is provided. At the bottom of the panel, there is a blue "Create" button and a "Add to estimate" button.

> Click on **Launch In**

The screenshot shows the IBM Cloud console interface. At the top, there's a navigation bar with the IBM Cloud logo, a search bar, and user account information. Below this, the main content area displays the details for 'watsonx.ai Studio-9q'. On the left sidebar, the 'Manage' tab is selected. The main content area features a large blue 'Launch in' button. To the right of the button is a diagram illustrating the architecture: 'IBM watsonx.ai Studio in Cloud Pak for Data and watsonx' is shown as a blue cube on top of a stack of blue cubes representing 'IBM Cloud Pak for Data, watsonx Unifying platforms', which is itself on top of a grey base representing 'IBM Cloud Base cloud infrastructure'. Below the diagram, text states: 'IBM watsonx.ai Studio is part of IBM Cloud Pak for Data and watsonx, and serves as the AI capability of the data fabric architecture.' At the bottom, there are three tabs: 'Documentation', 'Learning path', and 'Videos'.

Service Details - IBM Cloud

cloud.ibm.com/services/data-science-experience/crn%3A1%3Abluemix%3Apublic%3Adata-science-experience%3Aau-syd%3Aa%2F7c700cf4927b48618b4dc888514ef802%3Abf1e325b-7f61-4a...

IBM Cloud

Search resources and products...

Catalog Manage Ansh pal Singh's Account

Resource list /

watsonx.ai Studio-9q Add tags Details Actions

Manage

Plan

Launch in

watsonx.ai Studio in Cloud Pak for Data and watsonx

Build and deploy machine learning models on either platform. Work with foundation models on watsonx as a Service.

IBM watsonx.ai Studio in Cloud Pak for Data and watsonx

IBM Cloud Pak for Data, watsonx Unifying platforms

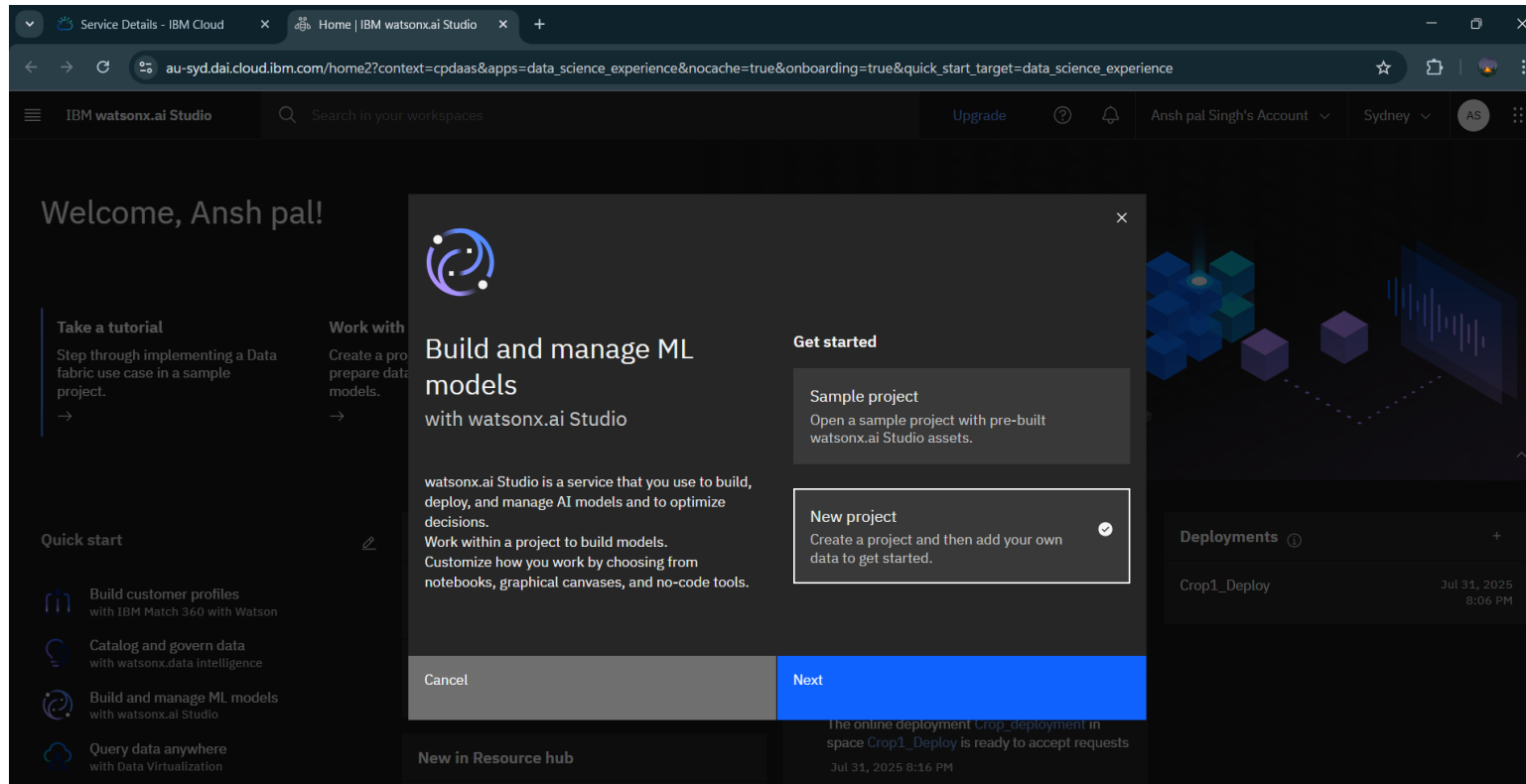
IBM Cloud Base cloud infrastructure

IBM watsonx.ai Studio is part of IBM Cloud Pak for Data and watsonx, and serves as the AI capability of the data fabric architecture.

Helpful links

Documentation Learning path Videos

> Click on New Project and Next



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

Service Details - IBM Cloud x New project | IBM watsonx.ai Studio x +

au-syd.dai.cloud.ibm.com/projects/new-project?context=cpdaas

IBM watsonx.ai Studio Search in your workspaces Upgrade ? Ansh pal Singh's Account Sydney AS

Create a project

Start with a new, blank project or select from where to import an existing project.

- + New
 - Local file
 - Sample

Define details

Name

Tele-Law Analysis_Project

Description (optional)

Data Analysis of Tele-Law Case

IBM x Data x Projects x Data Analysis x Tele-Law Analysis x

Tags (optional)

Add tags

Add tags to make projects easier to find. To add tags, separate them with commas and press Enter.

Storage

Cancel Create

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

Service Details - IBM Cloud | Tele-Law Analysis_Project — Pr | x +

au-syd.dai.cloud.ibm.com/projects/90b3f2f4-6db2-453d-b717-b76c4b0ff69b/manage/services?context=cpdaas

IBM watsonx.ai Studio | Search in your workspaces | Upgrade | ? | Ansh pal Singh's Account | Sydney | AS

Projects / Tele-Law Analysis_Project

Overview | Assets | Jobs | **Manage**

Project

- General
- Access control
- Environments
- Resource usage
- Services & integrations**

Tools

- Pipeline

Services & integrations


IBM services | Third-party integrations

Associate IBM Cloud services with this project to add tools, compute environments, or other capabilities. [Learn more.](#)

Find services

Associate service +

Name	Service type
------	--------------

 No services
Click **Associate service** or ask a project Admin to associate one

> Associate the service watsonx.ai Runtime

Service Details - IBM Cloud | Tele-Law Analysis_Project — Pr | +

au-syd.dai.cloud.ibm.com/projects/90b3f2f4-6db2-453d-b717-b76c4b0ff69b/manage/services?context=cpdaas

IBM watsonx.ai Studio | Search in your workspaces | Upgrade | ? | Bell | Ansh pal Singh's Account | Sydney | AS

Projects / Tele-Law Analysis_Project

Associate service

Choose an existing or add a new service to associate with your project.

1 x Default | 2 x Locations

Find services | New service +

Name	Type	Plan	Location	Status	Group
<input checked="" type="checkbox"/> watsonx.ai Runtime-lz ⓘ	watsonx.ai Runtime	Lite	Sydney	Not associated	Default

Cancel | Associate

> Select the Environments section

> Select Templates section

> Click on New Template +

The screenshot shows the IBM watsonx.ai Studio interface. The browser address bar indicates the URL: `au-syd.dai.cloud.ibm.com/projects/90b3f2f4-6db2-453d-b717-b76c4b0ff69b/manage/environments/templates?context=cpdaas`. The page title is "IBM watsonx.ai Studio". The left sidebar contains a navigation menu with the following items: Project, General, Access control, **Environments** (selected), Resource usage, Services & integrations, Tools, and Pipeline. The main content area is titled "Environments" and includes a sub-header "Manage runtimes for tools that collaborators are using. Runtimes for jobs and deployments are shown elsewhere. [Learn more.](#)". Below this, there are two tabs: "Tool runtimes" and "Templates (15)". The "Templates (15)" tab is selected and highlighted with a blue border. A search bar labeled "Find environment template" is present, along with a "New template +" button. The table below lists the templates:

Template name	Tool	Language	Last modified
Default SPSS Modeler S 2 vCPU and 8 GB RAM	Modeler		Created by IBM
Default SPSS Modeler M 4 vCPU and 16 GB RAM	Modeler		Created by IBM
Default SPSS Modeler L 6 vCPU and 24 GB RAM	Modeler		Created by IBM
Default DataStage PX S 1 Conductor: 2 vCPU and 8 GB RAM	DataStage		Created by IBM
Default DataStage PX L 1 Conductor: 8 vCPU and 32 GB RAM	DataStage		Created by IBM

- > Define New environment Name & Hardware Configuration
- > Click Create

The screenshot shows the 'New environment' dialog box in the IBM Watson AI Studio interface. The dialog is divided into two main sections: 'Define environment details' and 'Define configuration'.

Define environment details:

- Name:** A text input field containing 'tele-law'.
- Description (optional):** A text input field containing 'analysis_notebook'.

Define configuration:

- Type:** Two radio buttons are present: 'Default' (selected) and 'Spark'.
- Hardware configuration:** A dropdown menu showing '2 vCPU and 8 GB RAM'.
- Software version:** A dropdown menu showing 'Runtime 24.1 on Python 3.11'.

At the bottom right of the dialog, there are two buttons: 'Cancel' and 'Create'.

Below the configuration section, there is a note: 'A runtime with this configuration consumes 1 capacity unit per hour. [Learn more](#) about capacity unit hours and watsonx.ai Studio pricing plans.'

> Create New notebook

The screenshot shows the IBM watsonx.ai Studio interface. The browser address bar indicates the URL: `au-syd.dai.cloud.ibm.com/projects/147b5ec9-f290-4648-9731-00e43e292689/manage/environments/templates?context=cpdaas`. The page title is "Projects / Tele-Law Analysis". The "Manage" tab is active, displaying the "Environments" section. The left sidebar shows the "Environments" menu item selected. The main content area shows a table of environment templates. A context menu is open for the "tele-law" template, with the "New notebook" option highlighted.

Environments

Manage runtimes for tools that collaborators are using. Runtimes for jobs and deployments are shown elsewhere. [Learn more.](#)

Tool runtimes Templates (16)

Find environment template [New template +](#)

Template name	Tool	Language	Last modified
tele-law 2 vCPU and 8 GB RAM	Notebook	Python 3.11	8 h ago Created by you
Default SPSS Modeler S 2 vCPU and 8 GB RAM	Modeler		Created by
Default SPSS Modeler M 4 vCPU and 16 GB RAM	Modeler		Created by
Default SPSS Modeler L 6 vCPU and 24 GB RAM	Modeler		Created by
Default DataStage PX S 1 Conductor: 2 vCPU and 8 GB RAM	DataStage		Created by IBM
Default DataStage PX L 1 Conductor: 8 vCPU and 32 GB RAM	DataStage		Created by IBM

Context menu options for "tele-law":

- New notebook
- Promote to space
- Edit
- Delete

> Configure

The screenshot shows the IBM watsonx.ai Studio interface. A modal dialog titled "Work with data and models in Python or R notebooks" is open, guiding the user to "Define the details to create a notebook asset and open it in the Jupyter notebook editor tool." The dialog is divided into two main sections: "Define details" and "Define configuration".

Define details:

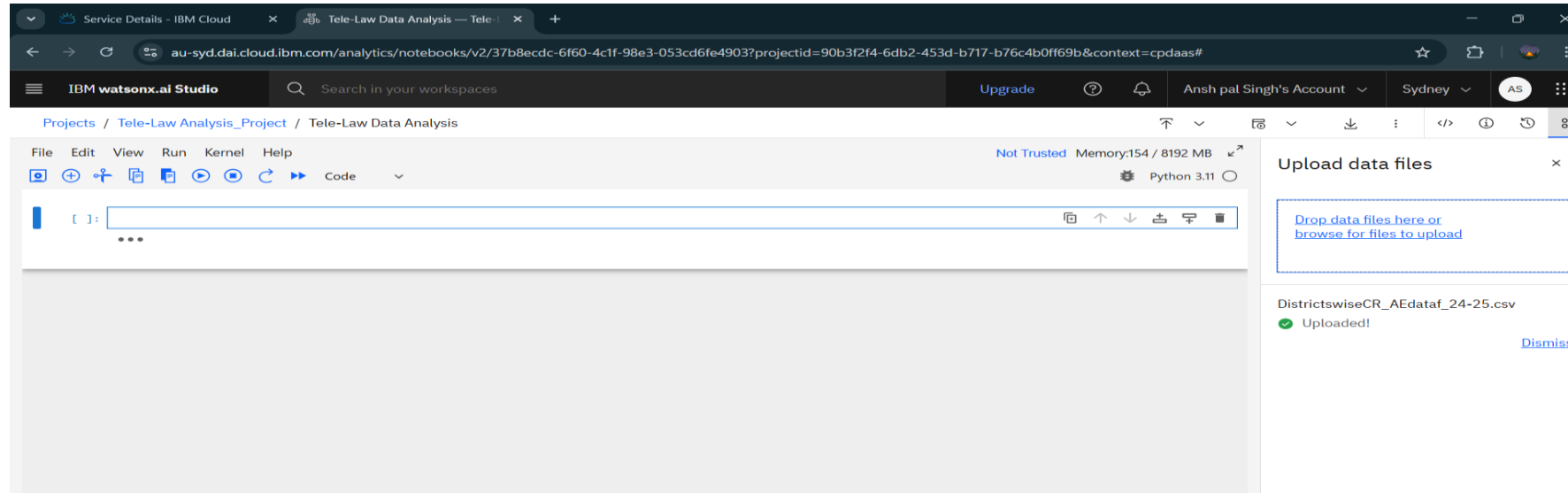
- Name:** A text input field containing "Tele-Law Data Analysis".
- Description (optional):** A text area with the placeholder text "What's the purpose of this notebook".

Define configuration:

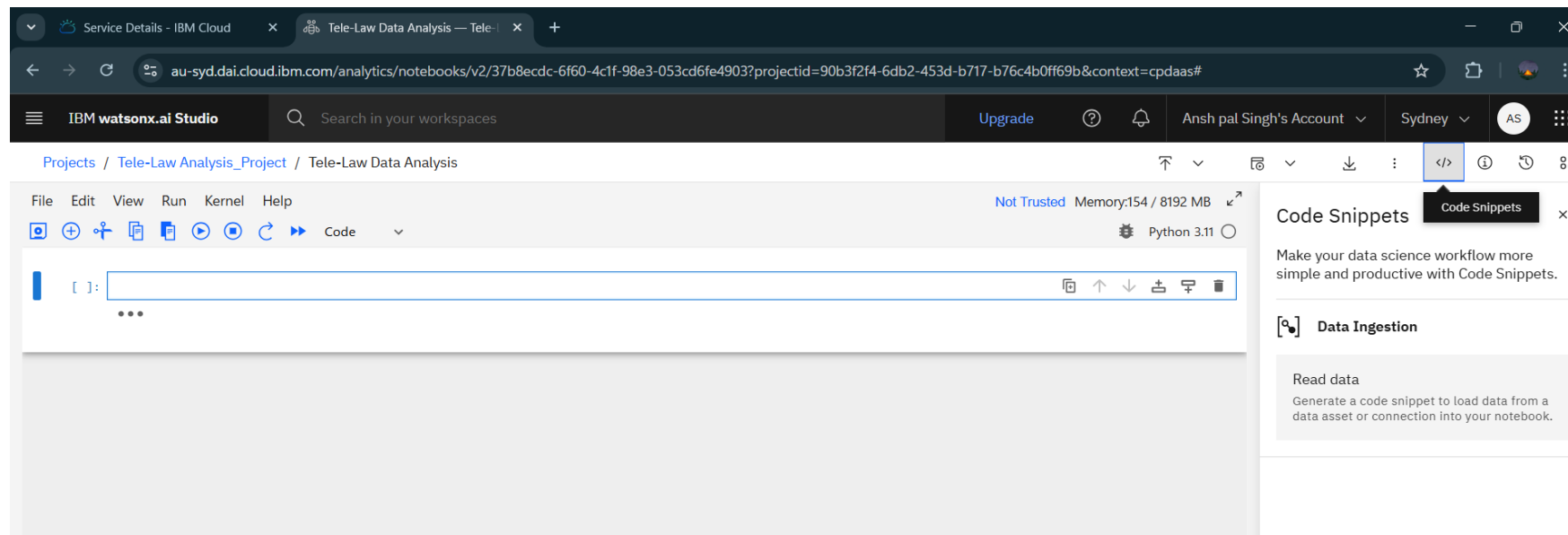
- Select runtime:** A dropdown menu showing "tele-law (2 vCPU 8 GB RAM)". Below the dropdown, a note states: "The selected runtime has 2 vCPU and 8 GB RAM. It consumes 1 capacity unit per hour. [Learn more](#) about capacity unit hours and watsonx.ai Studio pricing plans."
- Language:** A radio button selection with "Python 3.11" selected.

At the bottom right of the dialog are two buttons: "Cancel" and "Create".

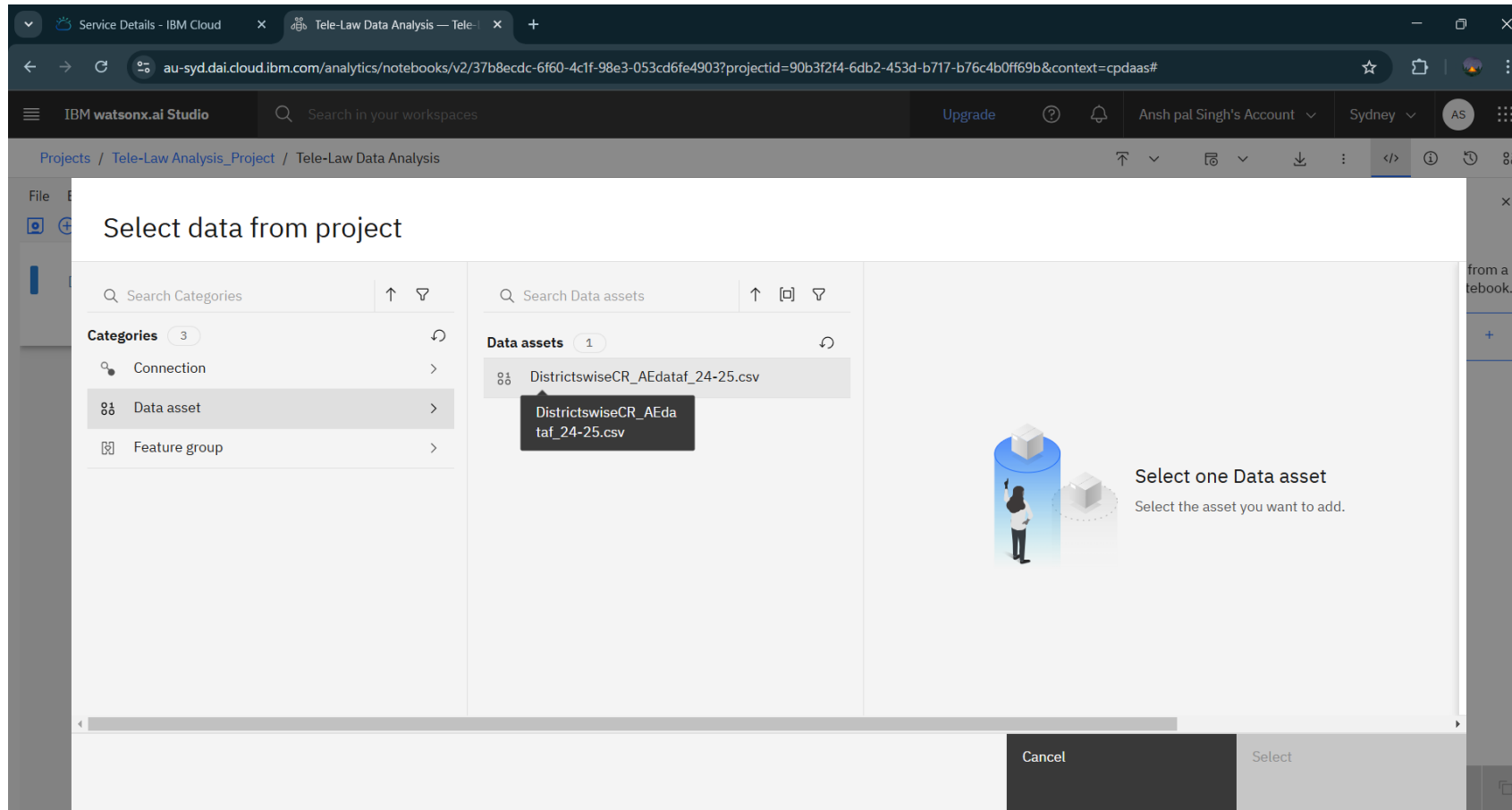
> After Notebook is loaded, Click on top right corner button to upload data (.csv file)



Click on Code Snippets button to Read the added data



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



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

The screenshot displays the IBM Watsonx.ai Studio web interface. The browser address bar shows the URL: `au-syd.dai.cloud.ibm.com/analytics/notebooks/v2/37b8ecdc-6f60-4c1f-98e3-053cd6fe4903?projectid=90b3f2f4-6db2-453d-b717-b76c4b0ff69b&context=cpdaas#`. The interface includes a top navigation bar with the IBM Watsonx.ai Studio logo, a search bar, and user account information. The main workspace is divided into a code editor and a sidebar. The code editor shows a single cell with a prompt `[]:` and a dropdown menu. The sidebar on the right contains a 'Read data' section with instructions to generate a code snippet. It lists 'Selected data' as 'DistrictwiseCR_AEdataf_24-25.csv' and 'Load as' as 'pandas DataFrame'. At the bottom right of the sidebar, there is a blue button labeled 'Insert code to cell' and a copy icon.

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

The screenshot shows the IBM Watson AI Studio interface. The notebook code defines a custom iterator for reading CSV data from IBM Cloud Object Storage. The code uses the boto3 library to interact with S3. The selected data is 'DistrictswiseCR_AEdataf_24-25.csv', loaded as a 'pandas DataFrame'.

```
[1]:  
import os, types  
import pandas as pd  
from botocore.client import Config  
import ibm_boto3  
  
def __iter__(self): return 0  
  
# @hidden_cell  
# The following code accesses a file in your IBM Cloud Object Storage. It includes your credentials.  
# You might want to remove those credentials before you share the notebook.  
  
cos_client = ibm_boto3.client(service_name='s3',  
                              ibm_api_key_id='qAnb7KZ6jJ5wuhbk3rq0Adn_M5B6NxDnEGp3W_1knhS',  
                              ibm_auth_endpoint='https://iam.cloud.ibm.com/identity/token',  
                              config=Config(signature_version='oauth'),  
                              endpoint_url='https://s3.direct.au-syd.cloud-object-storage.appdomain.cloud')  
  
bucket = 'telelawanalysisproject-donotdelete-pr-n1wk2nxug5da8m'  
object_key = 'DistrictswiseCR_AEdataf_24-25.csv'  
  
body = cos_client.get_object(Bucket=bucket,Key=object_key)['Body']  
# add missing __iter__ method, so pandas accepts body as file-like object  
if not hasattr(body, "__iter__"): body.__iter__ = types.MethodType( __iter__, body )  
  
df_1 = pd.read_csv(body)  
df_1.head(10)
```

	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	Anapapalli	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)
```

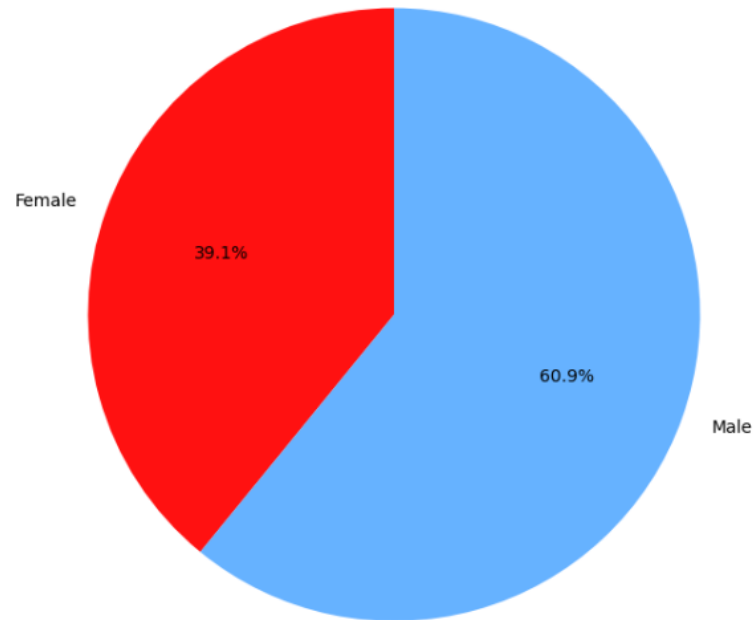
```
Gender-wise Total Registrations:
{'Female': 15956220, 'Male': 24862532}
```

```
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()
```

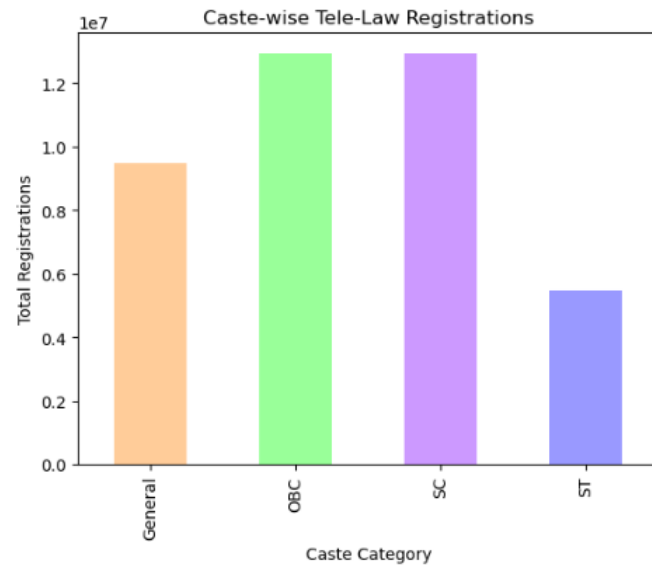
Gender Wise Distribution of Tele- Law Registrations



```
[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()
```

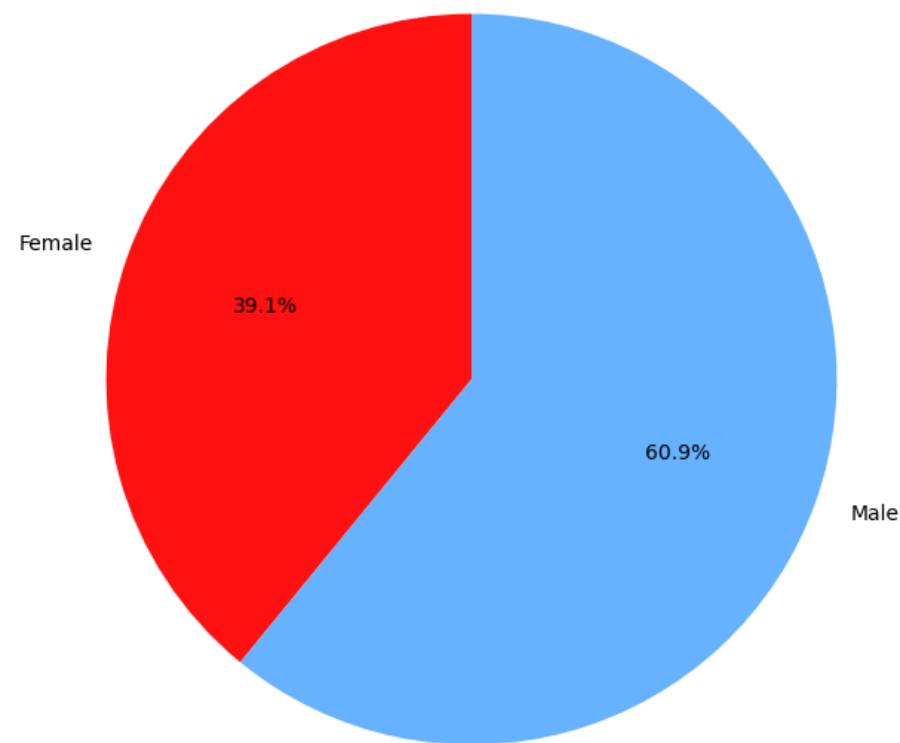


RESULT

I. GENDER DISPARITY:

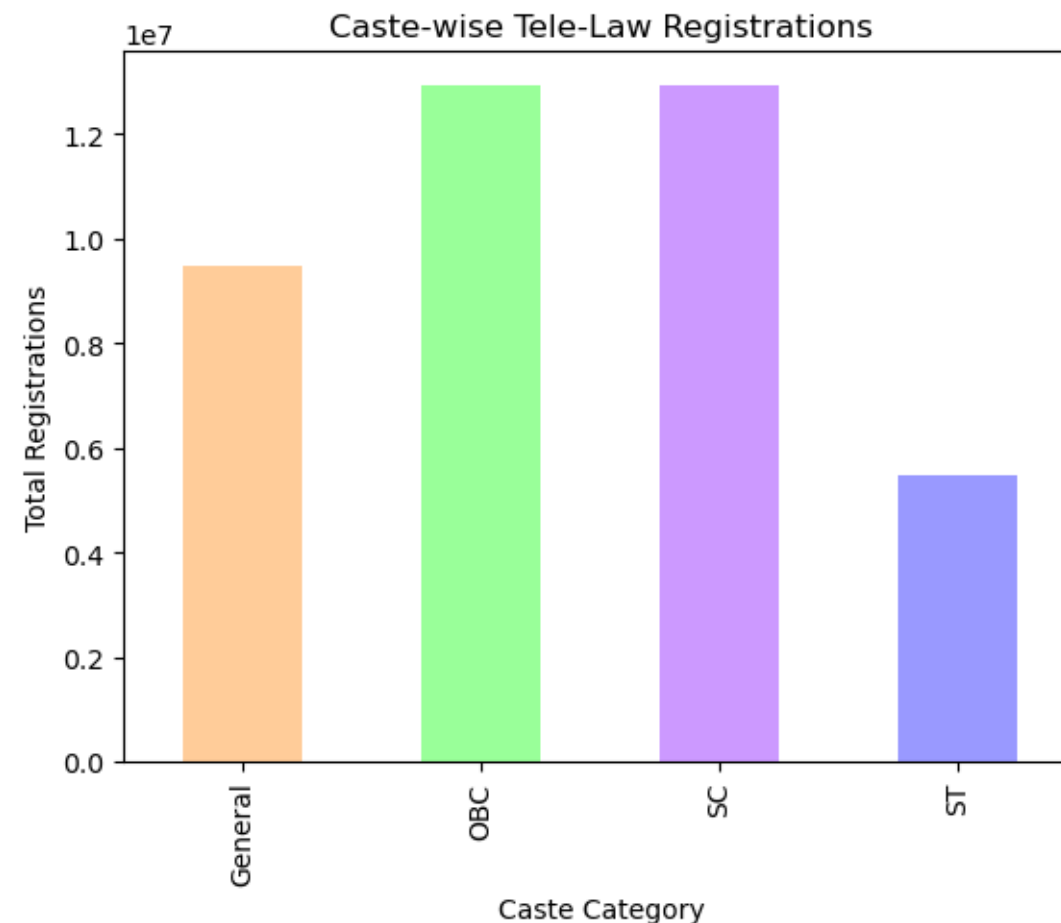
- A significant imbalance was found, with Males accounting for 60.9% of registrations compared to 39.1% for Females
- This gap suggests potential barriers for women, such as lower digital literacy, lack of awareness, or socio-cultural factors.

Gender Wise Distribution of Tele- Law Registrations

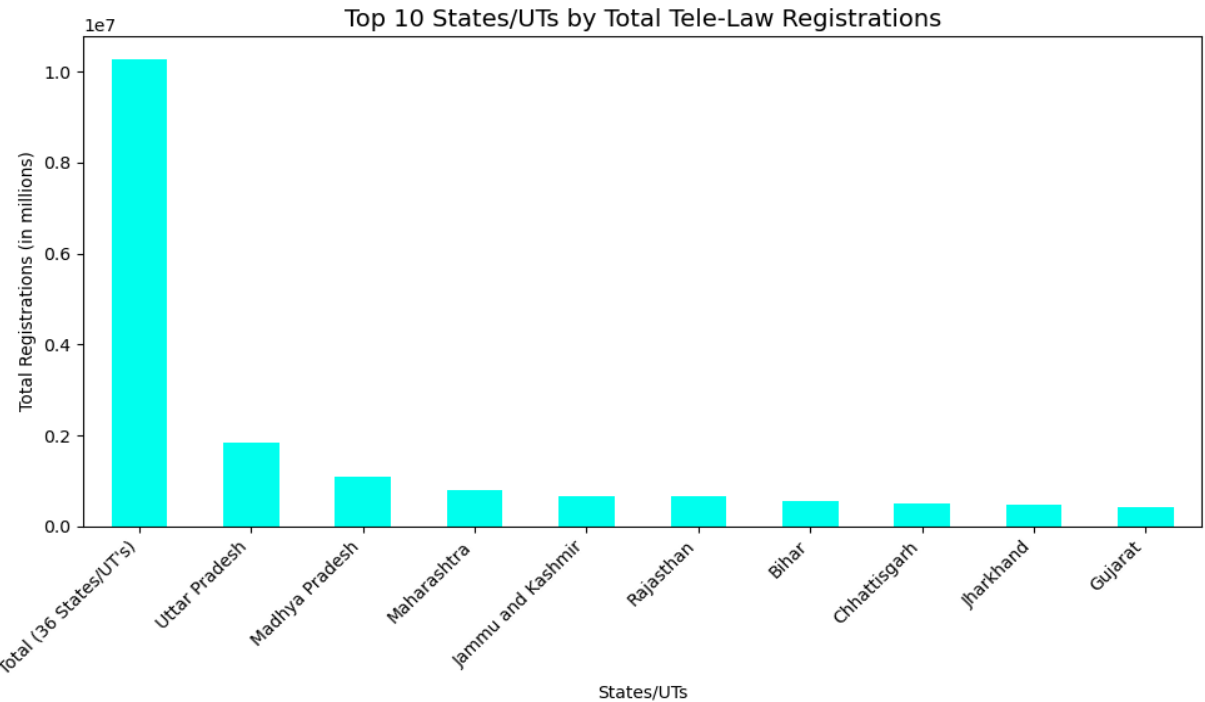


II. CASTE DISPARITY:

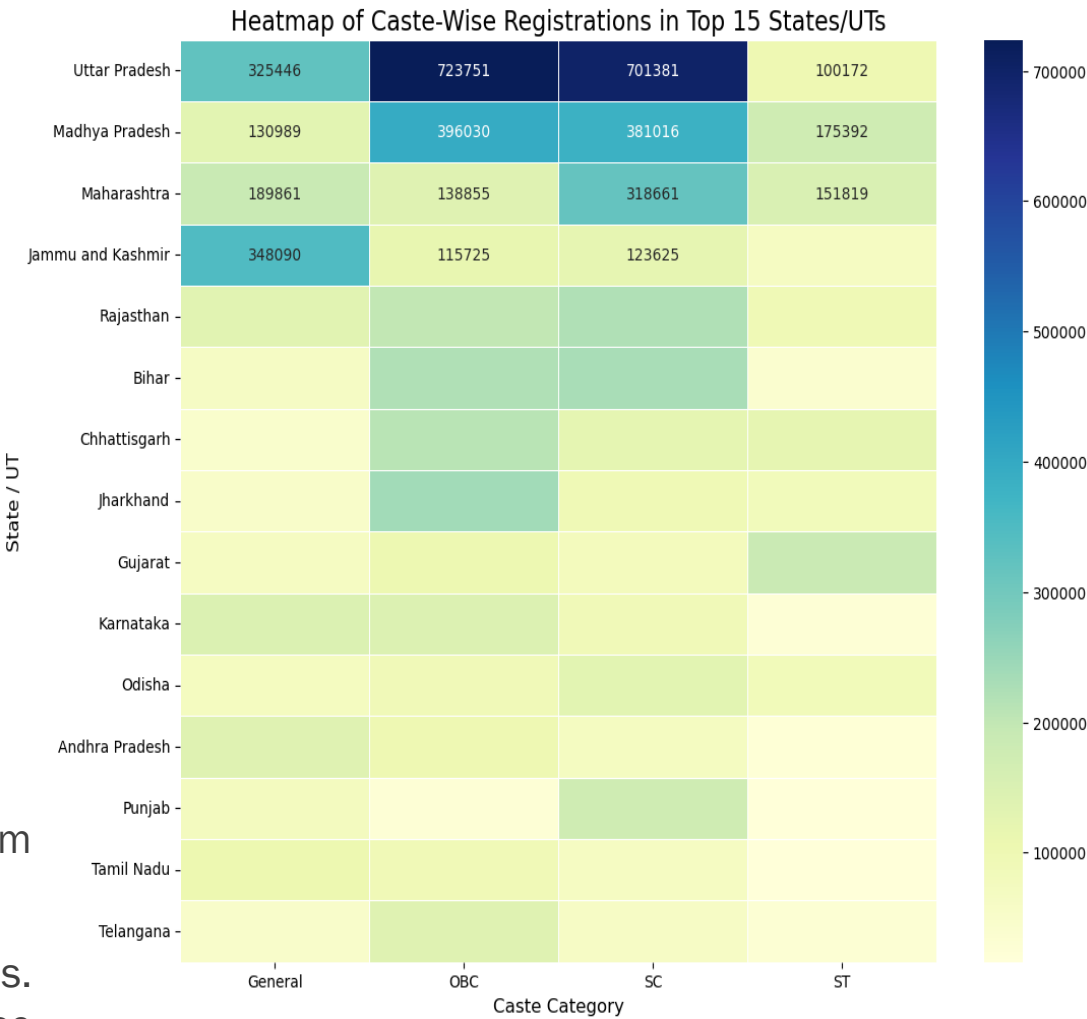
- The ST community is significantly underrepresented (13.4% of registrations) compared to OBC (31.7%) and SC (31.6%) communities.
- The low uptake among the ST population may be due to factors like geographic isolation or lack of CSC infrastructure and awareness in tribal regions.



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.



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:

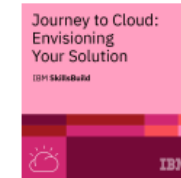
- IBM Cloud
- IBM Watson Studio
- IBM Cloud Object Storage

IBM CERTIFICATION- GETTING STARTED WITH ARTIFICIAL INTELLIGENCE



IBM CERTIFICATION- JOURNEY TO CLOUD: ENVISIONING YOUR SOLUTION

In recognition of the commitment to achieve
professional excellence



Ansh Pal singh

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 21, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/68879fcc-946e-4a64-bf84-b85dd75aeb03>



IBM CERTIFICATION- (RAG LAB)

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Ansh Pal singh

for the completion of

**Lab: Retrieval Augmented Generation with
LangChain**

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 24 Jul 2025 (GMT)

Learning hours: 20 mins



THANK YOU