

# Crop Recommendation -Maximize agricultural yield by recommending appropriate crops

**Data set link :** <https://www.kaggle.com/datasets/siddharthss/crop-recommendation-dataset?resource=download>

## About Dataset

### Context

Precision agriculture is in trend nowadays. It helps the farmers to get informed decision about the farming strategy. Here, we present you a dataset which would allow the users to build a predictive model to recommend the most suitable crops to grow in a particular farm based on various parameters.\*\*

### Source

This dataset was build by augmenting datasets of rainfall, climate and fertilizer data available for India. Gathered over the period by ICFA, India.

### Data fields

N - ratio of Nitrogen content in soil

P - ratio of Phosphorous content in soil

K - ratio of Potassium content in soil

temperature - temperature in degree Celsius

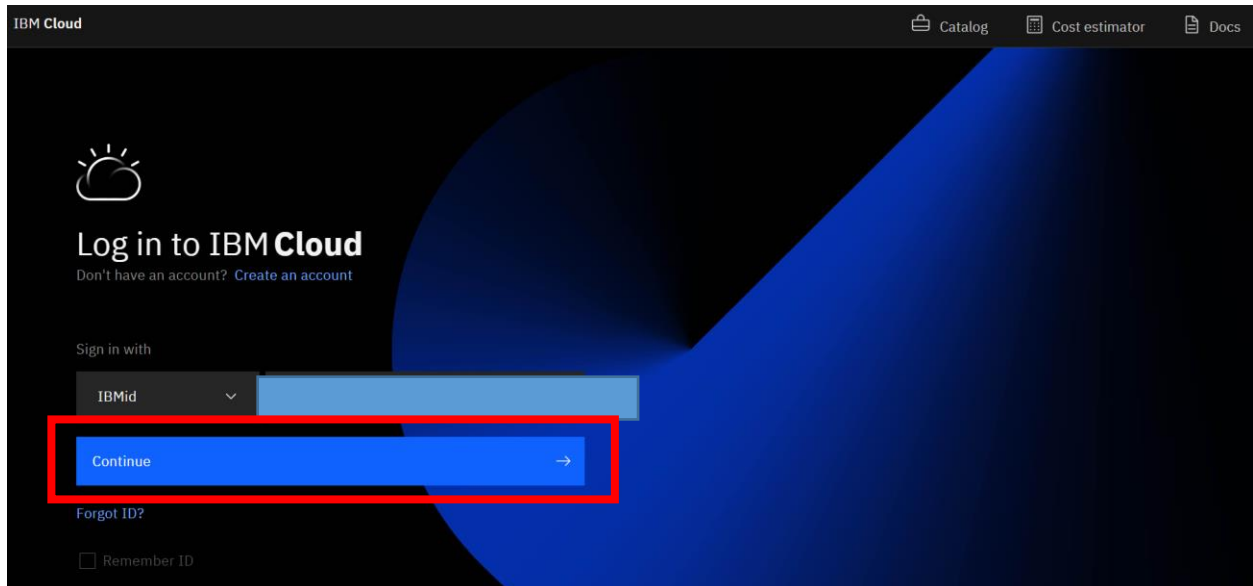
humidity - relative humidity in %

ph - ph value of the soil

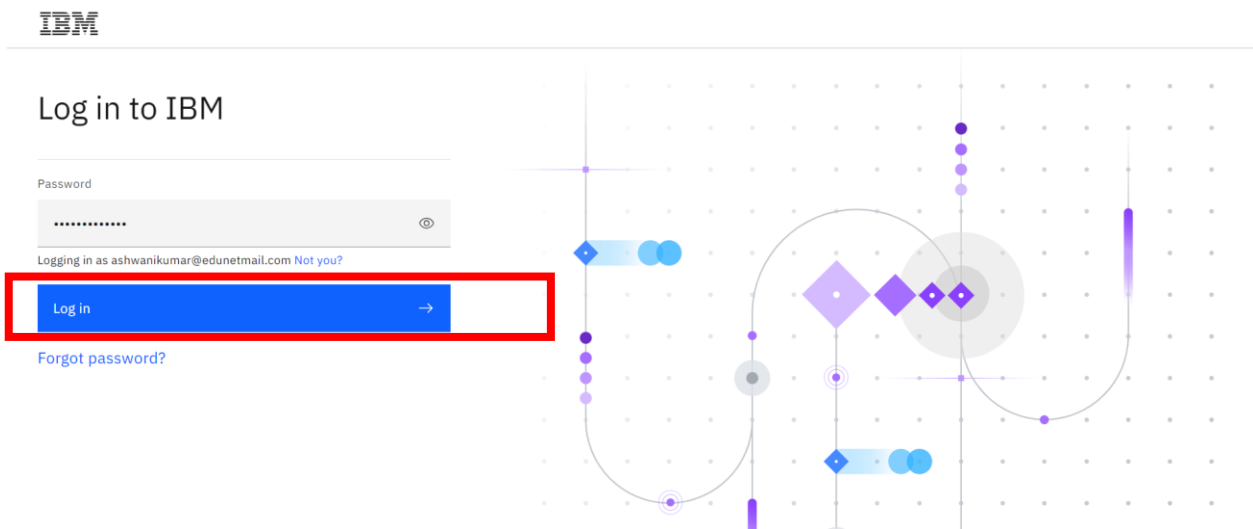
rainfall - rainfall in mm

COPYRIGHT: Indian Chamber of Food and Agriculture <https://www.icfa.org.in/>

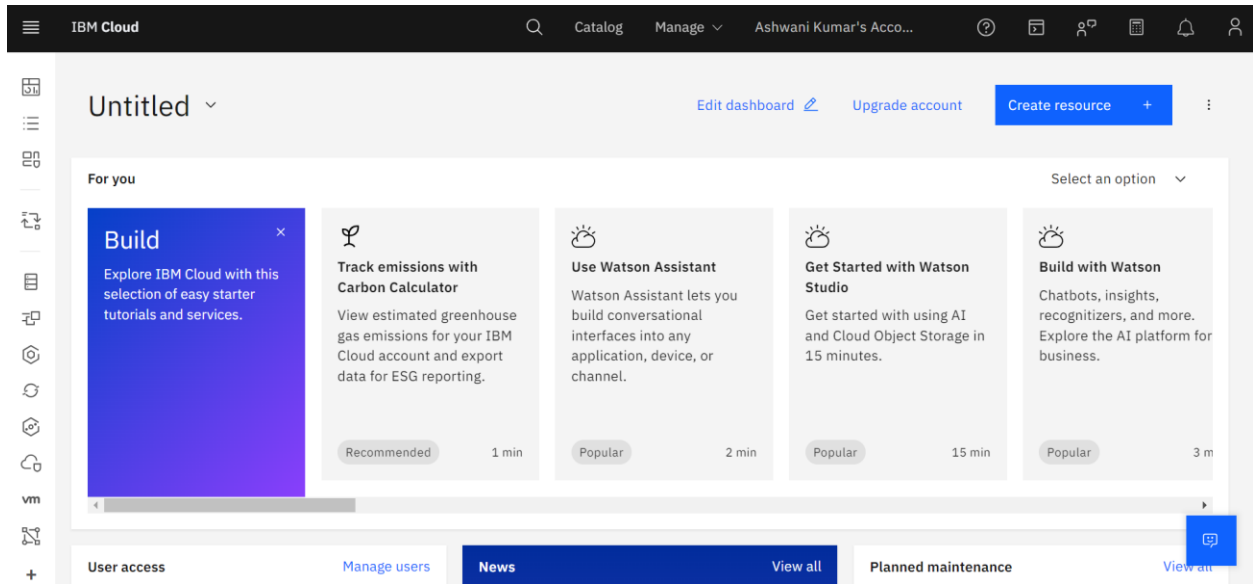
**Step1 : Open IBM Cloud login page with this link [cloud.ibm.com](https://cloud.ibm.com), enter your Gmail and click on Continue**



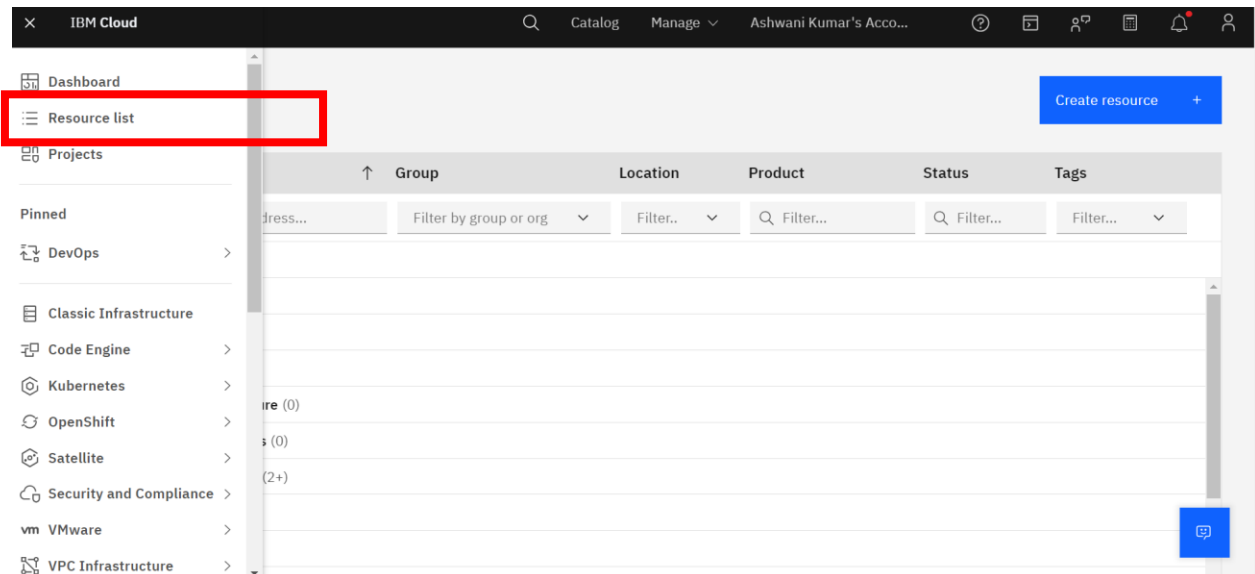
**Step2 : Enter your IBM Academic portal password, Click on Login**

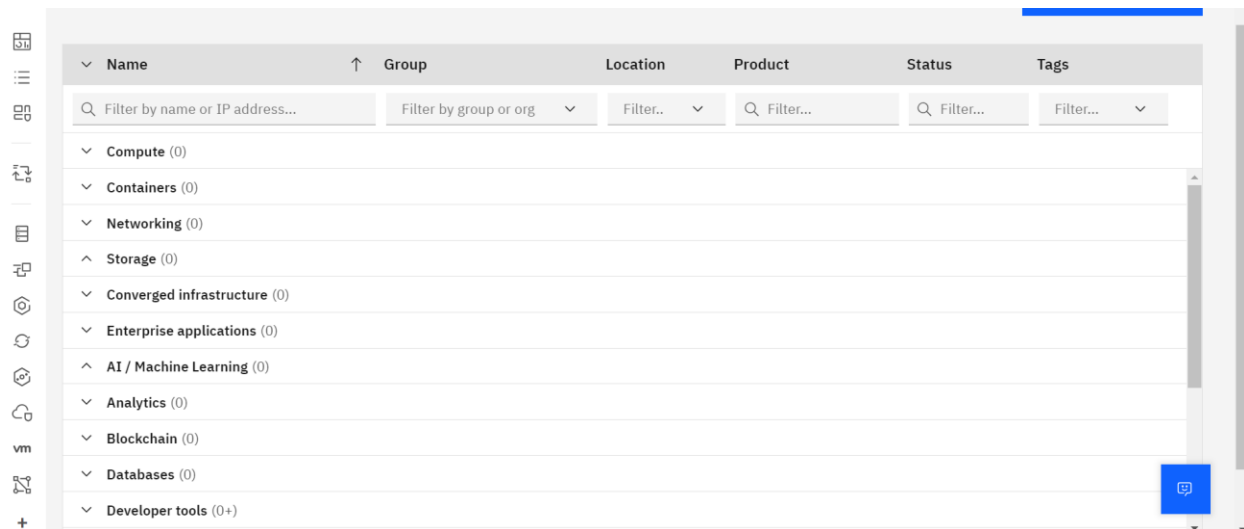


### Step3: This is IBM Cloud Dash board

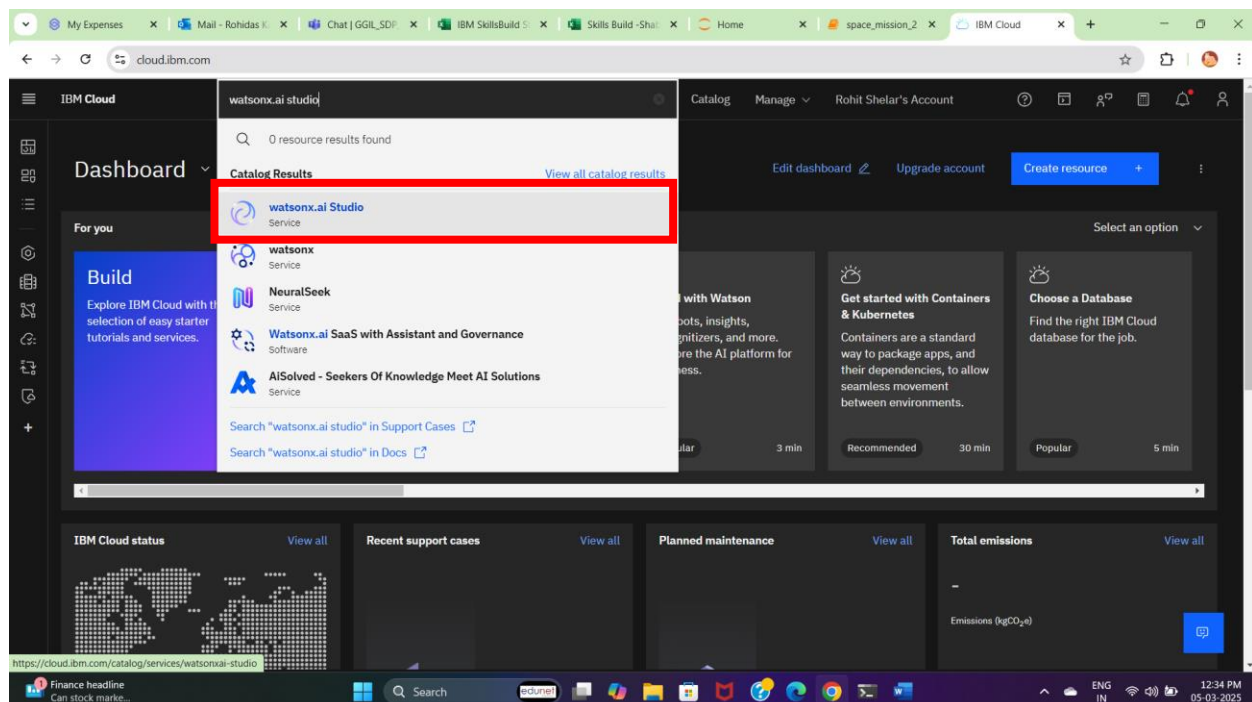


### Step4 : Click on Navigation menu, go to Resources list and clear all the resources

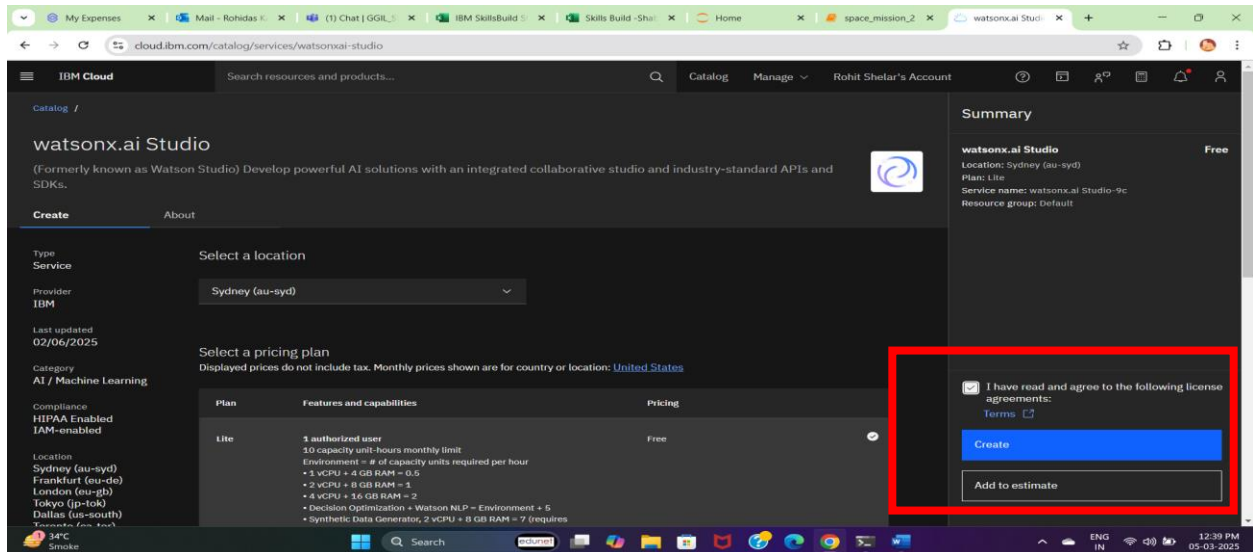




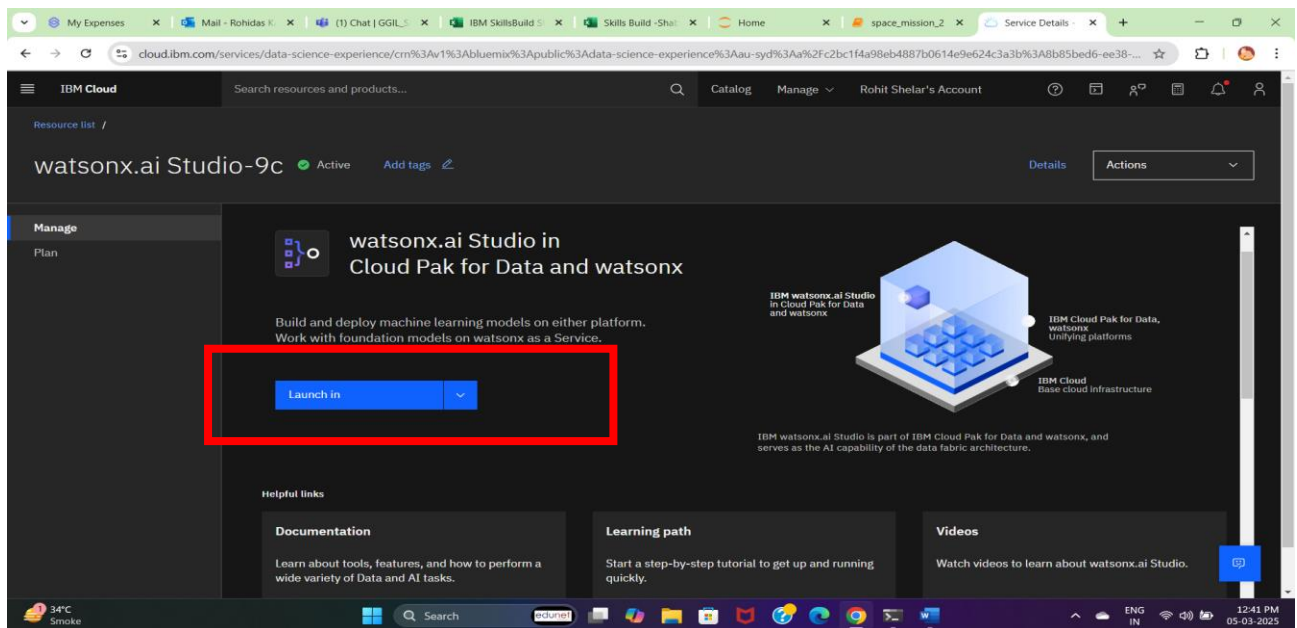
**Step5: Click on search icon and type “Watsonx.ai studio”. Select Watsonx.ai studio(Service).**



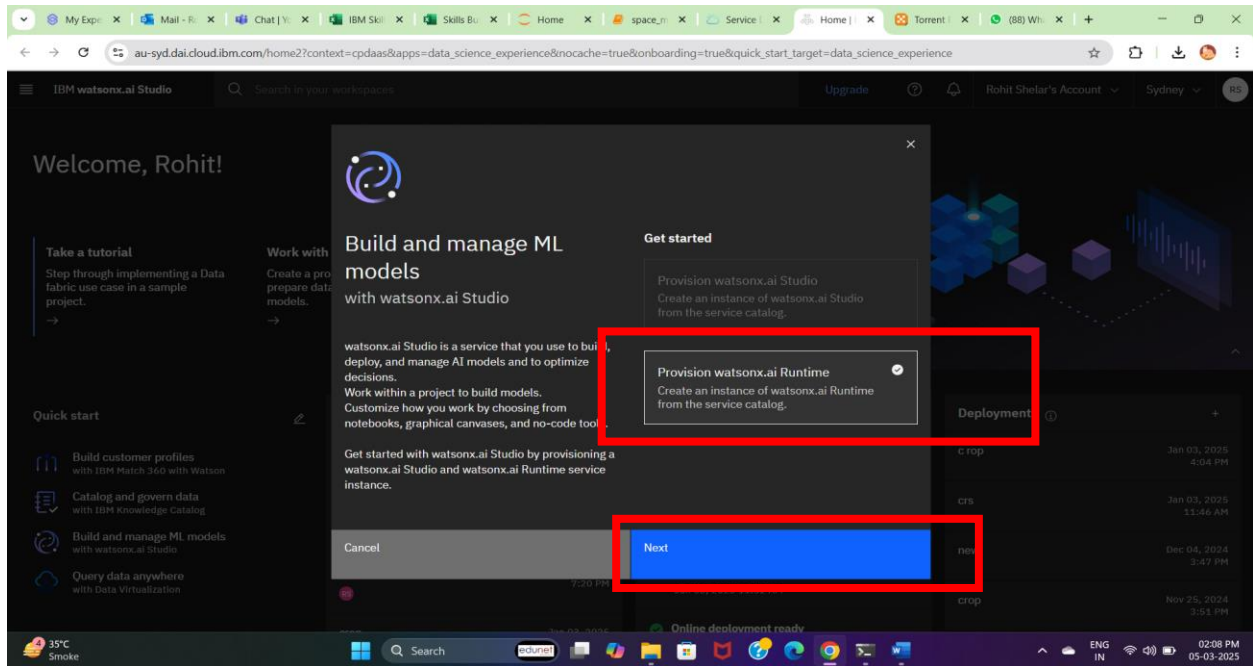
**Step6: Click on the check box and Create.**



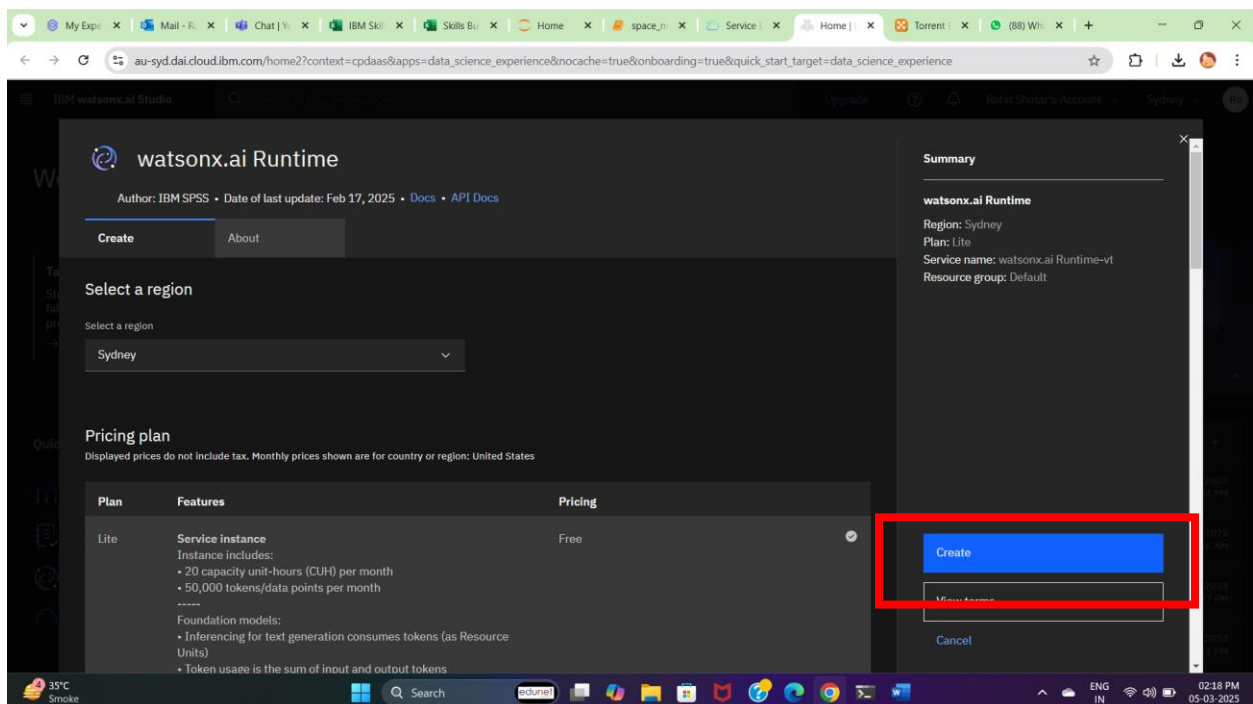
**Step7: Click on the Launch in**



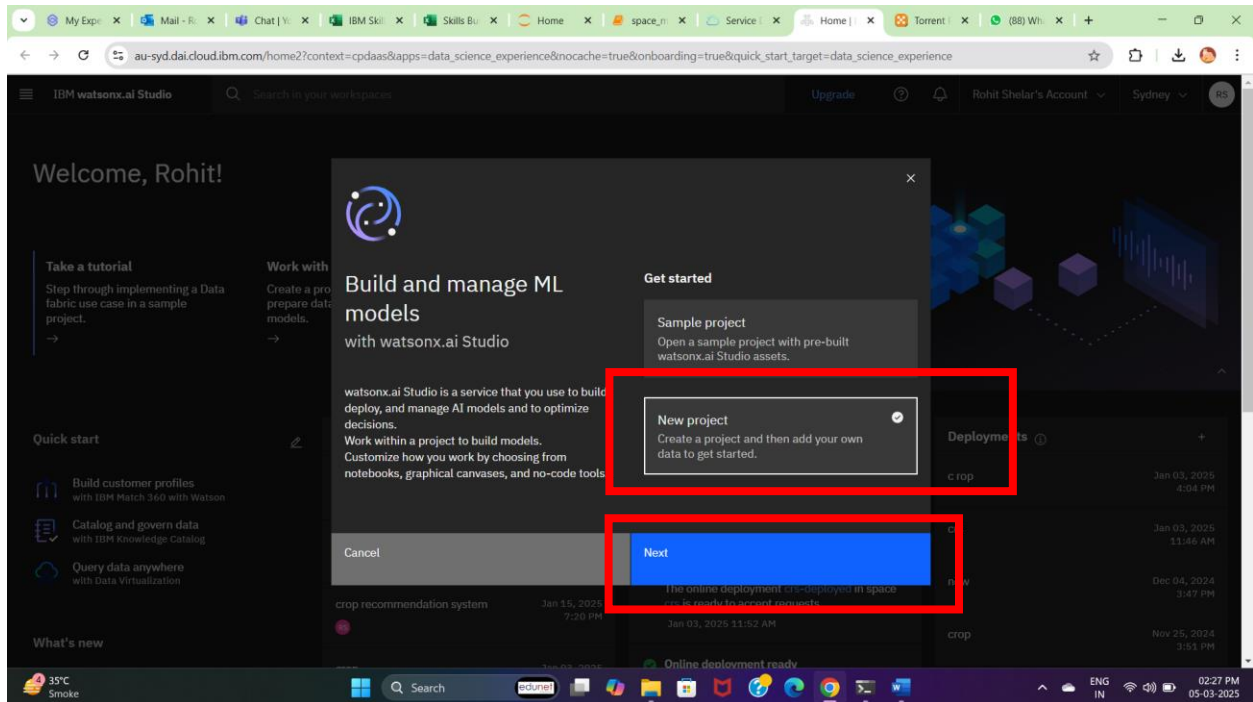
## Step8: Select Provision Watsonx.ai Runtime and click on Next.



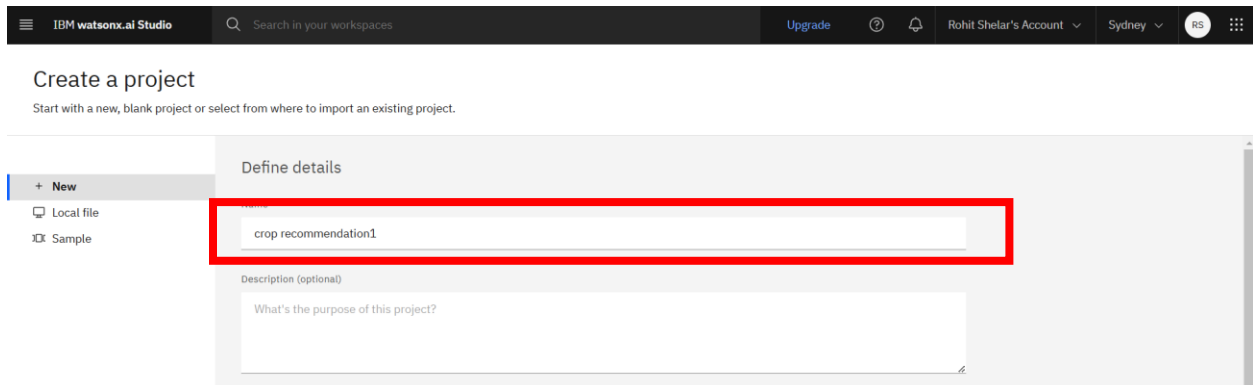
## Step9 : Click on the Create.



## Step10: Select New project and click on Next.



## Step11: Enter project name and scroll a little.



## Step12: Click on Add

### Create a project

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

+ New

Local file

Sample

Define storage

1 Select storage service

Add

2 Refresh

Add an object storage instance, and then return to this page and click Refresh.

Project includes integration with [Cloud Object Storage](#) for storing project assets.

Advanced settings

Cancel

Create

## Step13: Select Free plan, Click on Continue

Services catalog /

Cloud Object Storage

Author: IBM • Date of last update: Jul 1, 2024 • Docs • API Docs

Create

About

Pricing plan

Displayed prices do not include tax. Monthly prices shown are for country or region: United States

Plan	Features	Pricing
One Rate	One Rate plan offers a flat monthly charge that includes capacity, and built-in allowances for outbound bandwidth and data access. It is best suited for active workloads with large amounts of outbound bandwidth as a percent of their storage capacity.	<a href="#">See pricing details</a>
Lite(deprecated)	Lite plan instance is free to use for Storage capacity up to 25 GB per month. Lite plan instance is used for trial, and can be easily upgraded to Standard plan for unlimited scalability and full functionality.  None  Lite plan services are deleted after 30 days of inactivity.	Free

Summary

Cloud Object Storage

Region: Global

Plan: Lite(deprecated)

Service name: Cloud Object Storage-dr

Resource group: Default

Create

View terms



## Step14: Click on the Refresh, click on the Create.

Create a project

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

+ New

Local file

Sample

What's the purpose of this project?

Tags (optional)  
Add tags

Storage  
Cloud Object Storage-dr  
Project includes integration with [Cloud Object Storage](#) for storing project assets.

Advanced settings

Cancel

Create

## Step15: Click on the Manage and Associate the service.

Projects / Auto\_AI

Overview Assets Jobs **Manage**

Project

General

Access control

Environments

Resource usage

**Services & integrations**

Services & integrations

IBM services

Third-party integrations

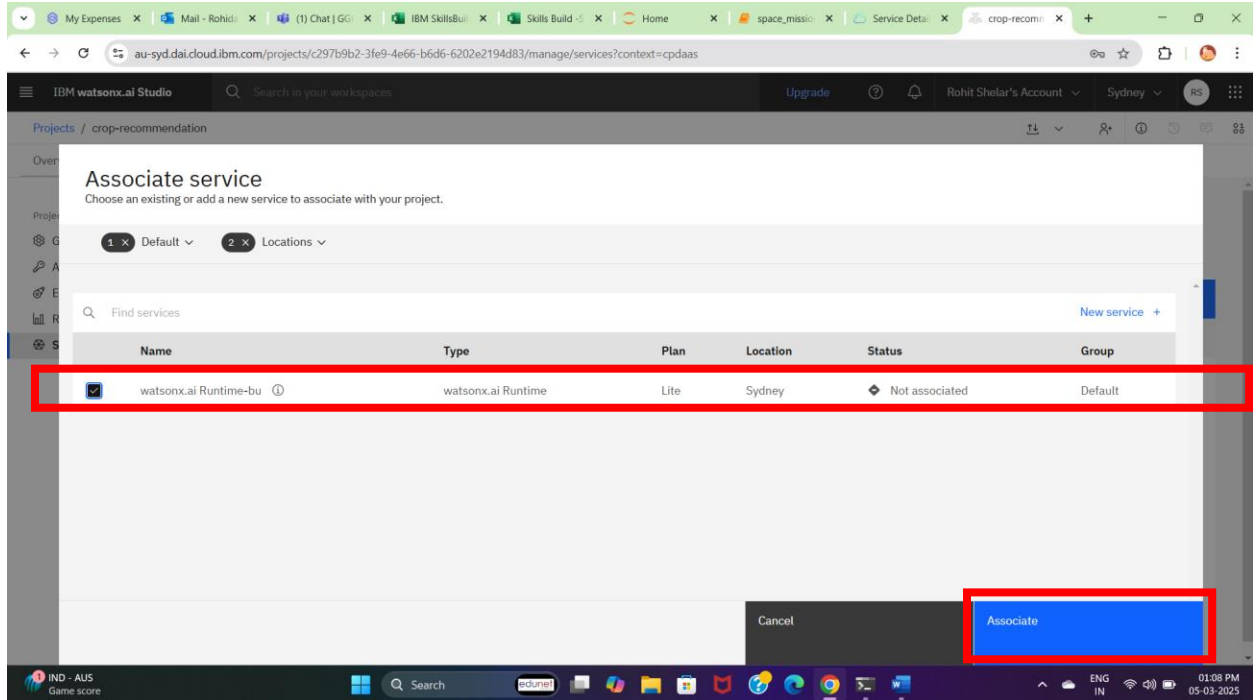
Find services

Associate service +

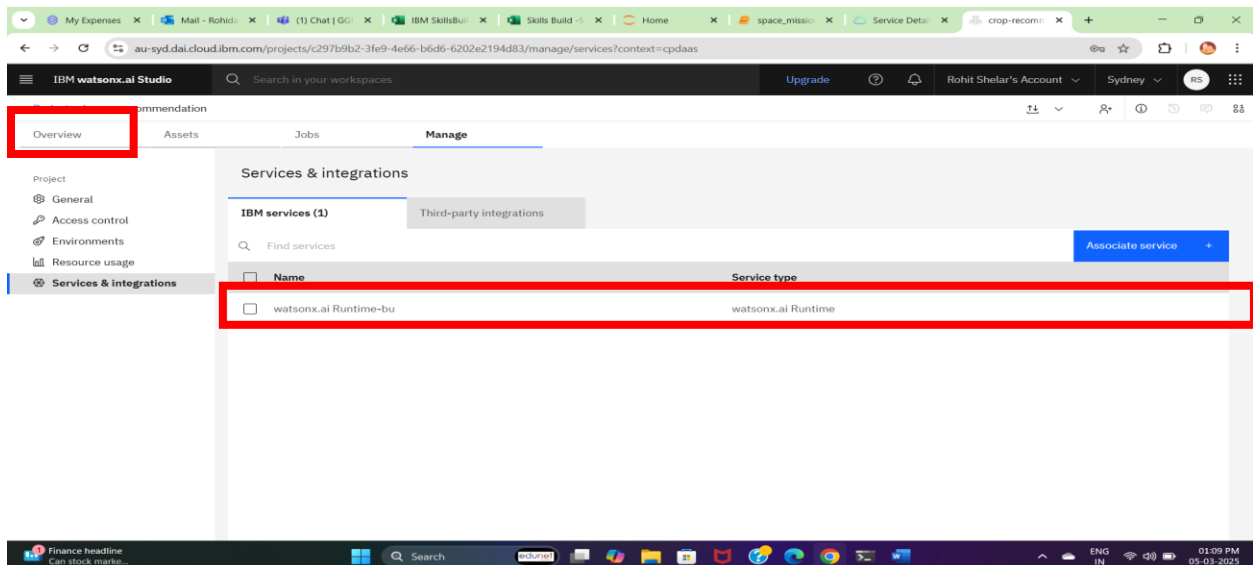
Name	Service type
No services	

Click **Associate service** or ask a project Admin to associate one

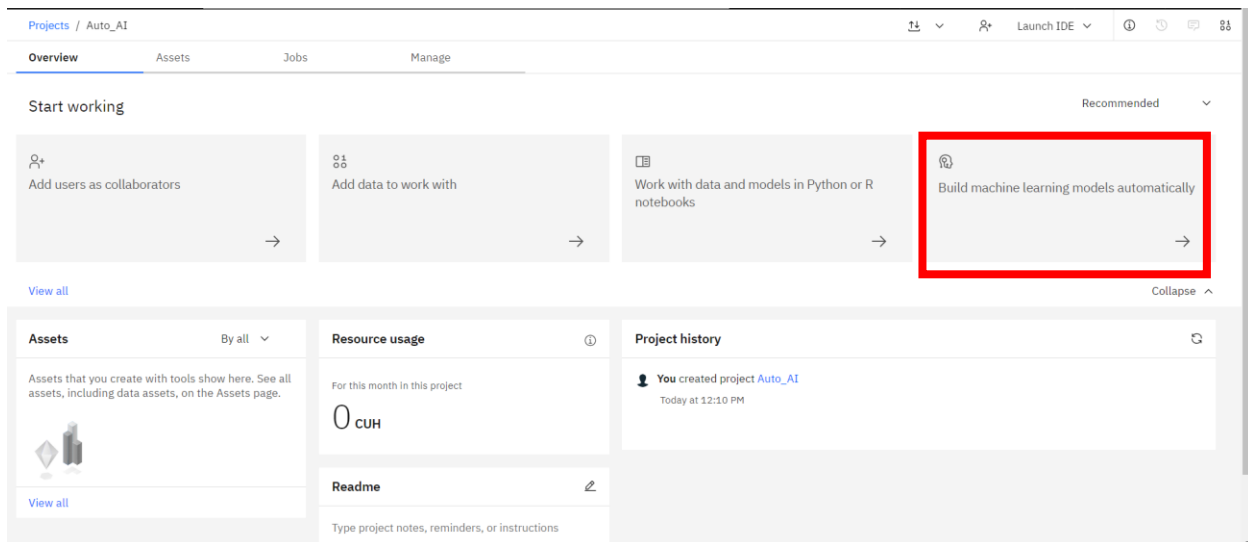
## Step16: Click on the Watsonx.ai Runtime and Associate



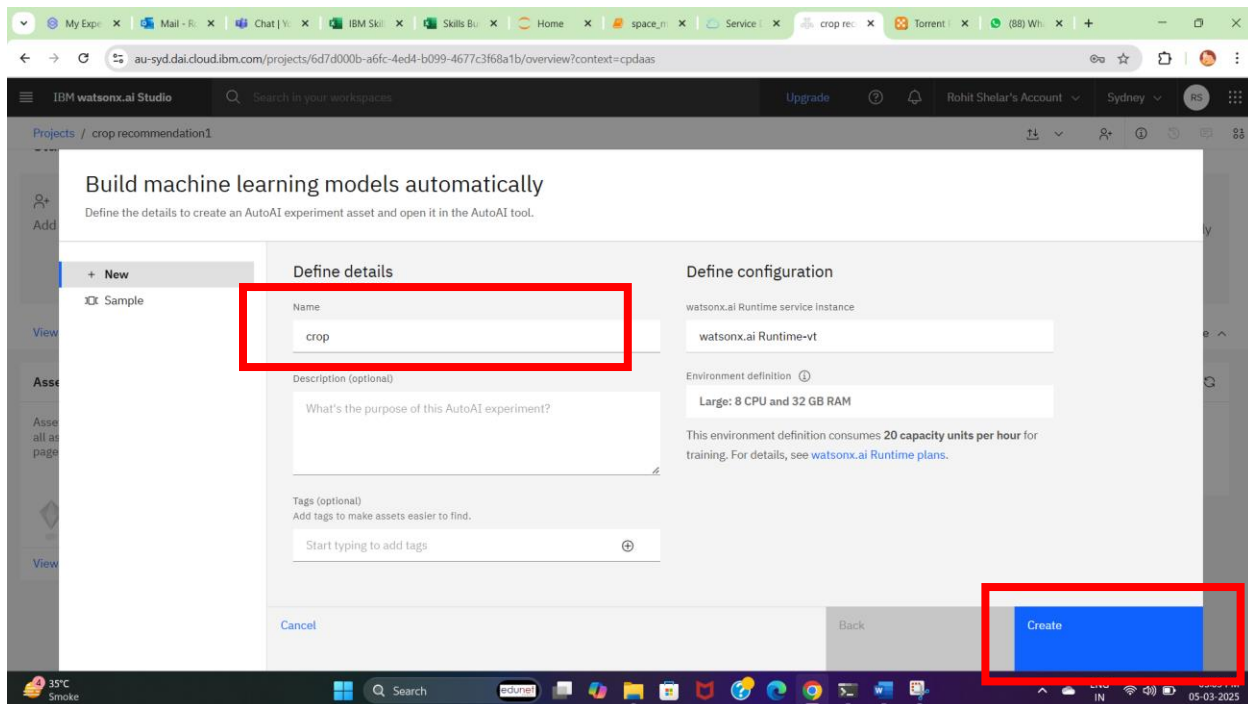
**Step17: Watsonx.ai Runtime service associated now click on the Overview.**



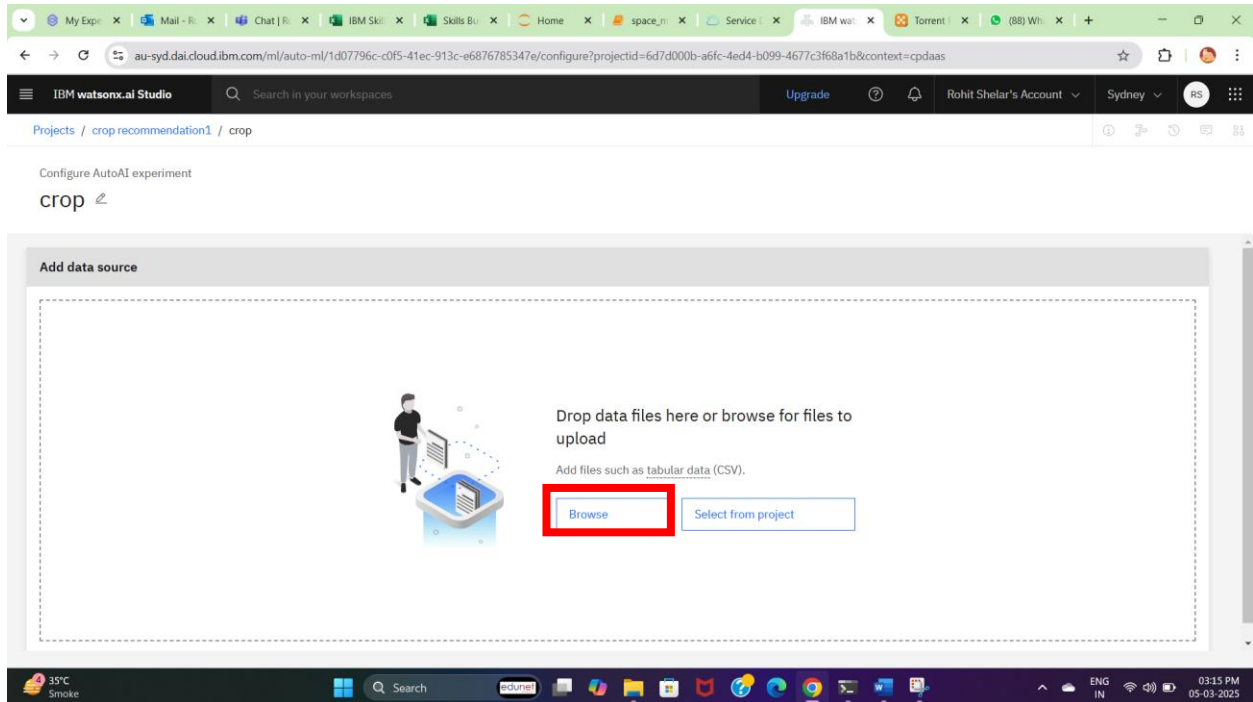
## Step18: Click on “Build machine learning models automatically”



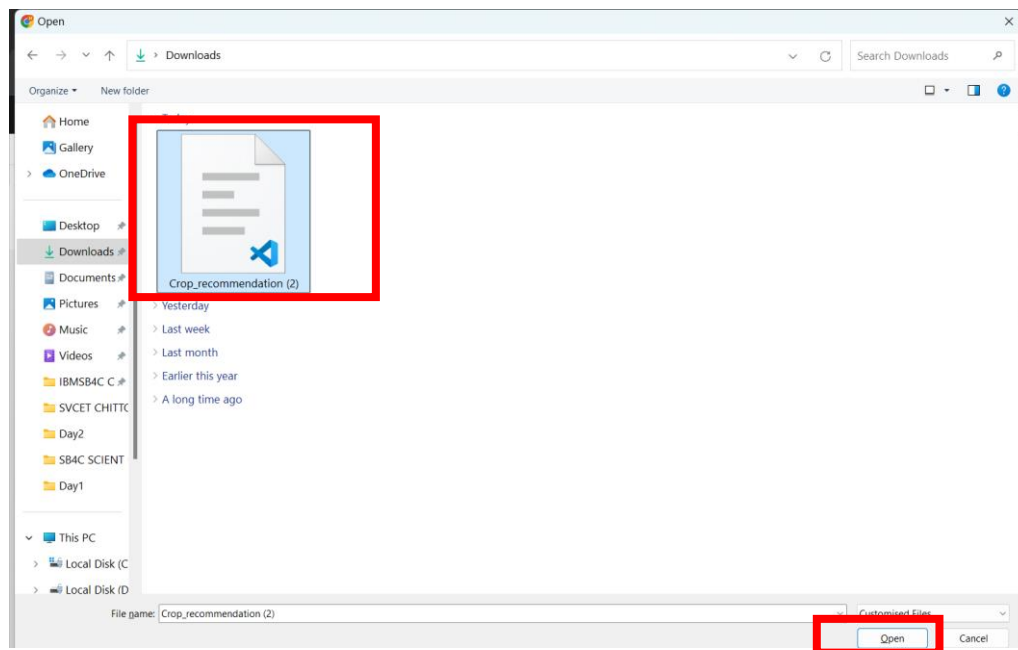
## Step19: Enter the experiment name and click on Create



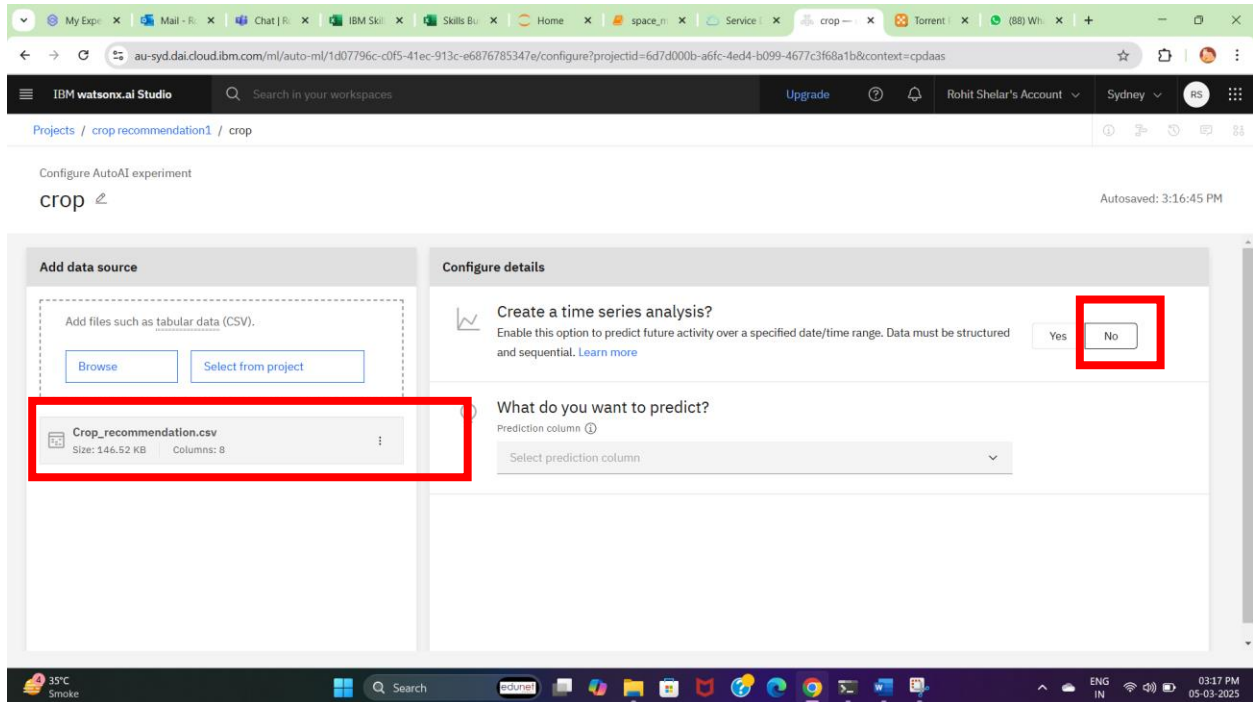
## Step20: Add the downloaded data set (Crop\_recomondation.csv) with the help of Browse option



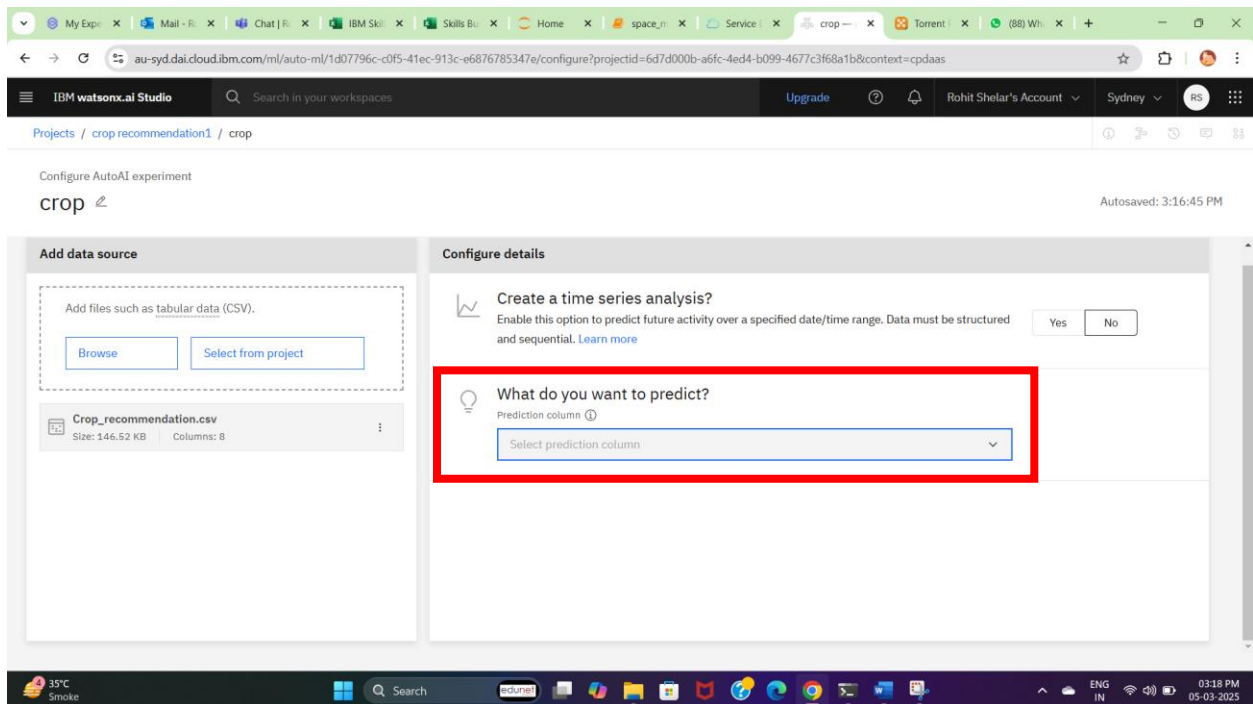
## Step21: Select the data set and click on Open



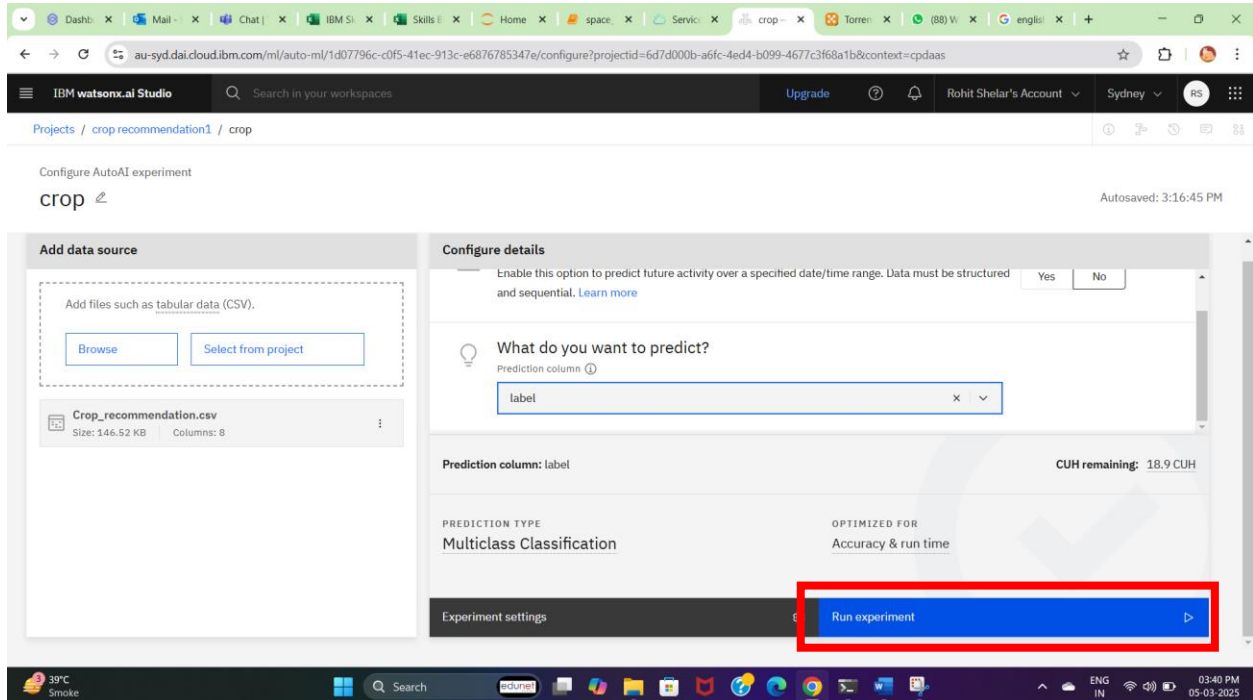
## Step22: Data set is loaded. In create a time series analysis? You can choose No option



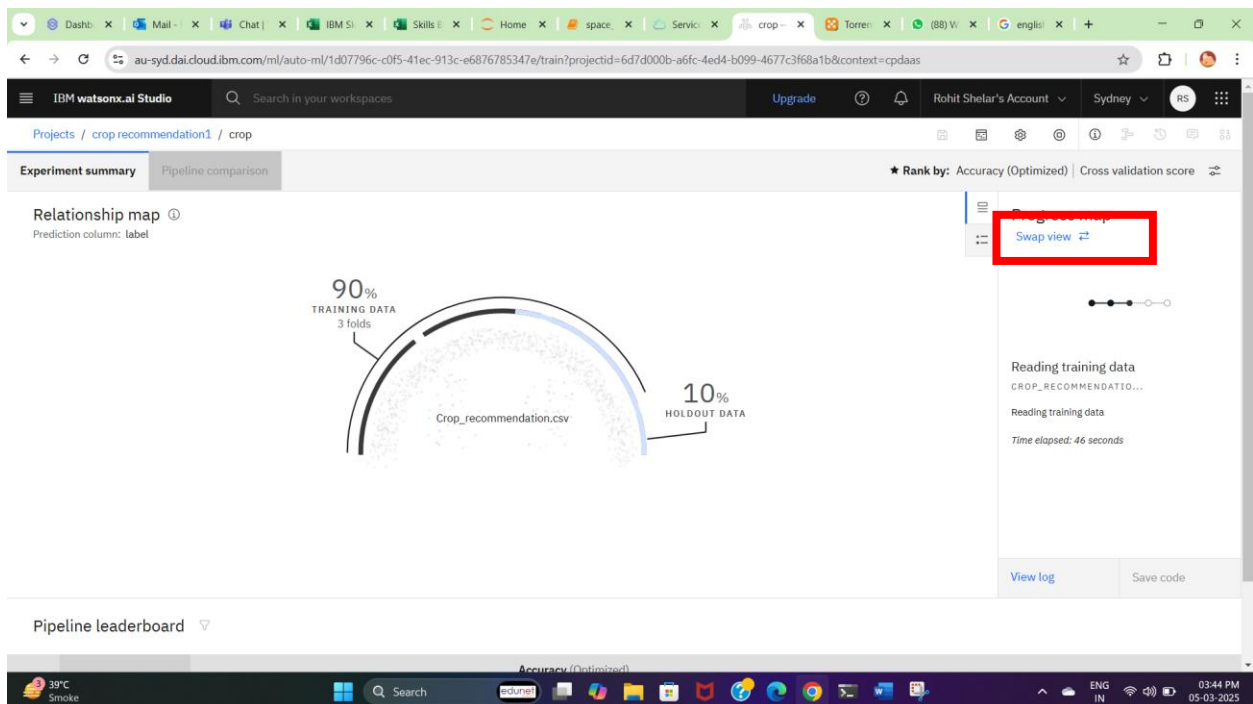
## Step23 : Choose prediction column.



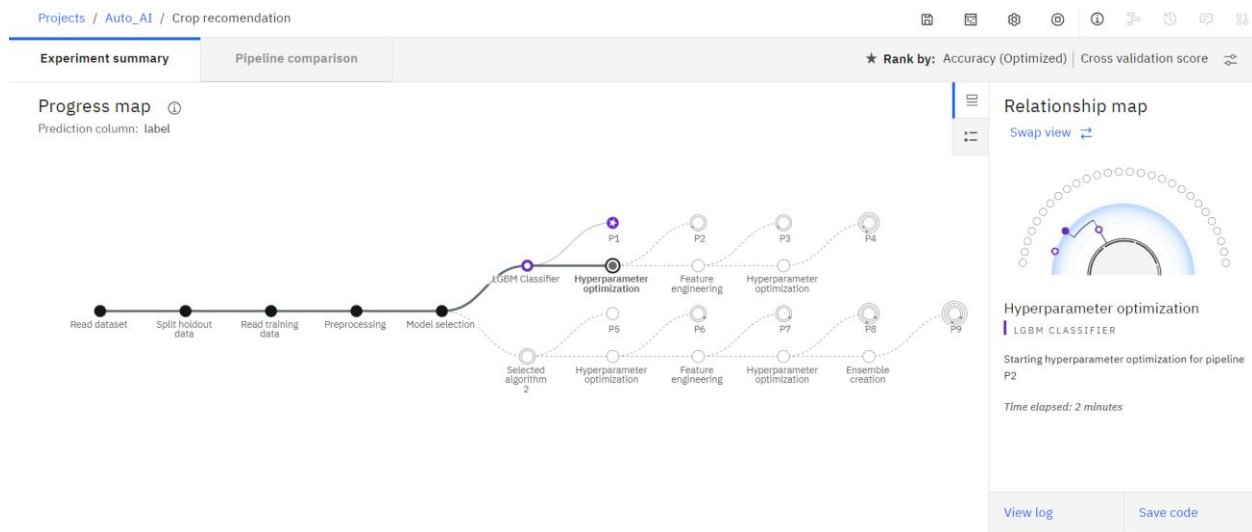
## Step24: Now click on the Run experiment



**Step25: Auto AI experiment is running. Now click on swap view**



## Step26: Pipelines are building.



## Step27: This is the pipeline leader board. In this Pipeline2 is the top performer.

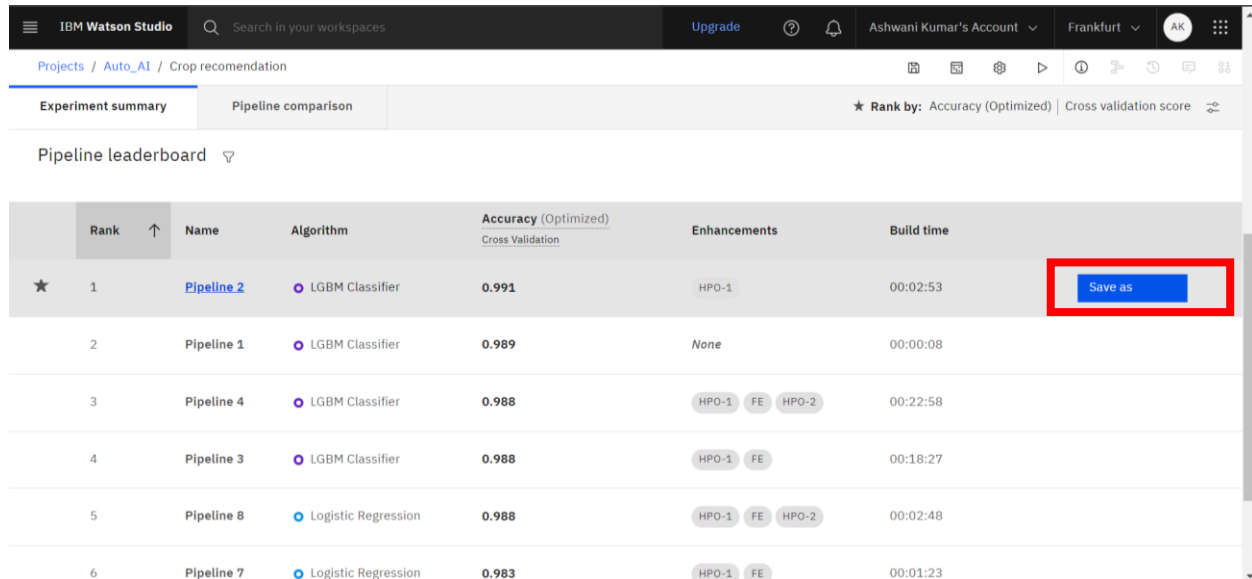
Projects / Auto\_AI / Crop recommendation

Experiment summary Pipeline comparison ★ Rank by: Accuracy (Optimized) | Cross validation score

Pipeline leaderboard ▾

	Rank	↑	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build time
★	1		Pipeline 2	LGBM Classifier	0.991	HPO-1	00:02:53
	2		Pipeline 1	LGBM Classifier	0.989	None	00:00:08
	3		Pipeline 4	LGBM Classifier	0.988	HPO-1 FE HPO-2	00:22:58
	4		Pipeline 3	LGBM Classifier	0.988	HPO-1 FE	00:18:27
	5		Pipeline 8	Logistic Regression	0.988	HPO-1 FE HPO-2	00:02:48
	6		Pipeline 7	Logistic Regression	0.983	HPO-1 FE	00:01:23

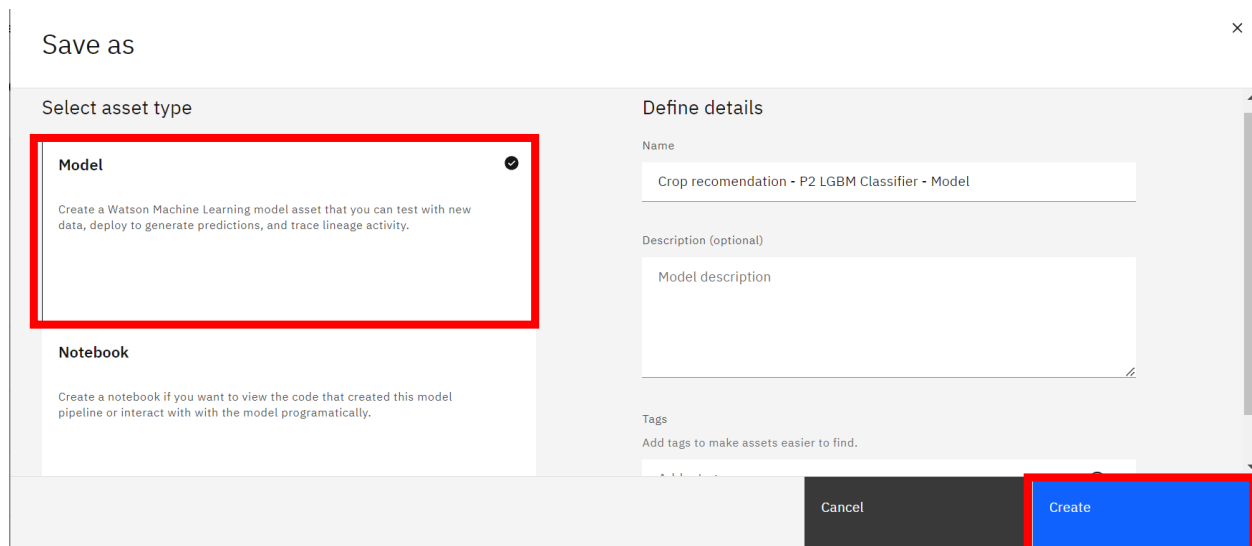
## Step28: Now we can save this model. Click on the Save as



The screenshot shows the IBM Watson Studio interface. At the top, there's a navigation bar with 'IBM Watson Studio', a search bar, and user information. Below it, the 'Projects / Auto\_AI / Crop recommendation' path is visible. The main area is titled 'Pipeline leaderboard' and shows a table of pipelines. The first pipeline, 'Pipeline 2', is highlighted, and a red box around the 'Save as' button in the top right corner of the table indicates the next step.

Rank	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build time
1	Pipeline 2	LGBM Classifier	0.991	HPO-1	00:02:53
2	Pipeline 1	LGBM Classifier	0.989	None	00:00:08
3	Pipeline 4	LGBM Classifier	0.988	HPO-1 FE HPO-2	00:22:58
4	Pipeline 3	LGBM Classifier	0.988	HPO-1 FE	00:18:27
5	Pipeline 8	Logistic Regression	0.988	HPO-1 FE HPO-2	00:02:48
6	Pipeline 7	Logistic Regression	0.983	HPO-1 FE	00:01:23

## Step29: Choose Model asset and click on Create



The screenshot shows the 'Save as' dialog box. On the left, under 'Select asset type', the 'Model' option is selected and highlighted with a red box. On the right, under 'Define details', there are fields for 'Name' (filled with 'Crop recommendation - P2 LGBM Classifier - Model'), 'Description (optional)' (filled with 'Model description'), and 'Tags'. At the bottom right, the 'Create' button is highlighted with a red box.

## Step30: The mode saved successfully and click on view in project



The screenshot shows the IBM Watson AI Studio interface. At the top, there's a navigation bar with 'Projects / crop recommendation1 / crop'. Below it, the 'Experiment summary' tab is active. A notification bubble in the top right corner states: 'Saved Model successfully. crop - P4 Random Forest Classifier - Model was successfully saved to'. Below the notification, a red box highlights the 'View in project' link. The main area displays a 'Pipeline leaderboard' table with columns: Rank, Name, Algorithm, Accuracy (Optimized) Cross Validation, Enhancements, and Build time. The table lists six pipelines, with Pipeline 4 at the top having an accuracy of 0.994.

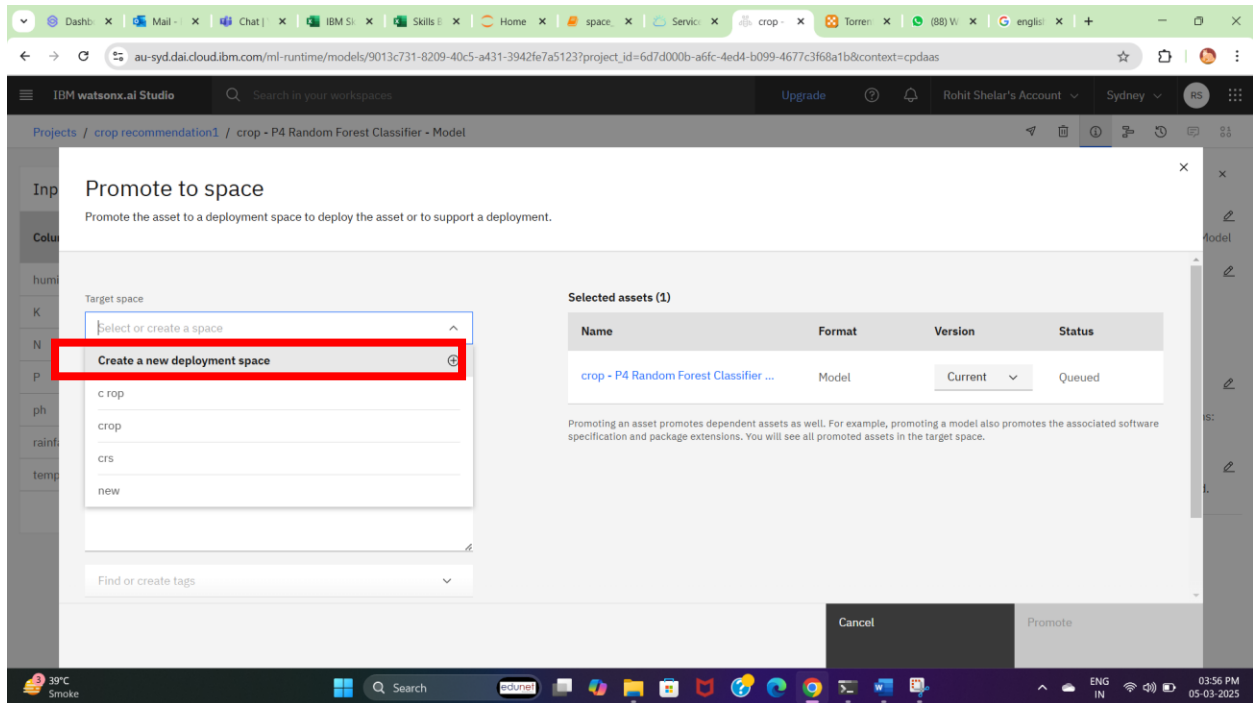
Rank	Name	Algorithm	Accuracy (Optimized) Cross Validation	Enhancements	Build time
1	Pipeline 4	Random Forest Classifier	0.994	HPO-1 FE HPO-2	00:00:58
2	Pipeline 6	Extra Trees Classifier	0.992	HPO-1	00:00:14
3	Pipeline 5	Extra Trees Classifier	0.992	None	00:00:05
4	Pipeline 3	Random Forest Classifier	0.992	HPO-1 FE	00:00:37
5	Pipeline 2	Random Forest Classifier	0.992	HPO-1	00:00:10
6	Pipeline 1	Random Forest Classifier	0.992	None	00:00:02

**Step31: Click on promote to space on arrow**

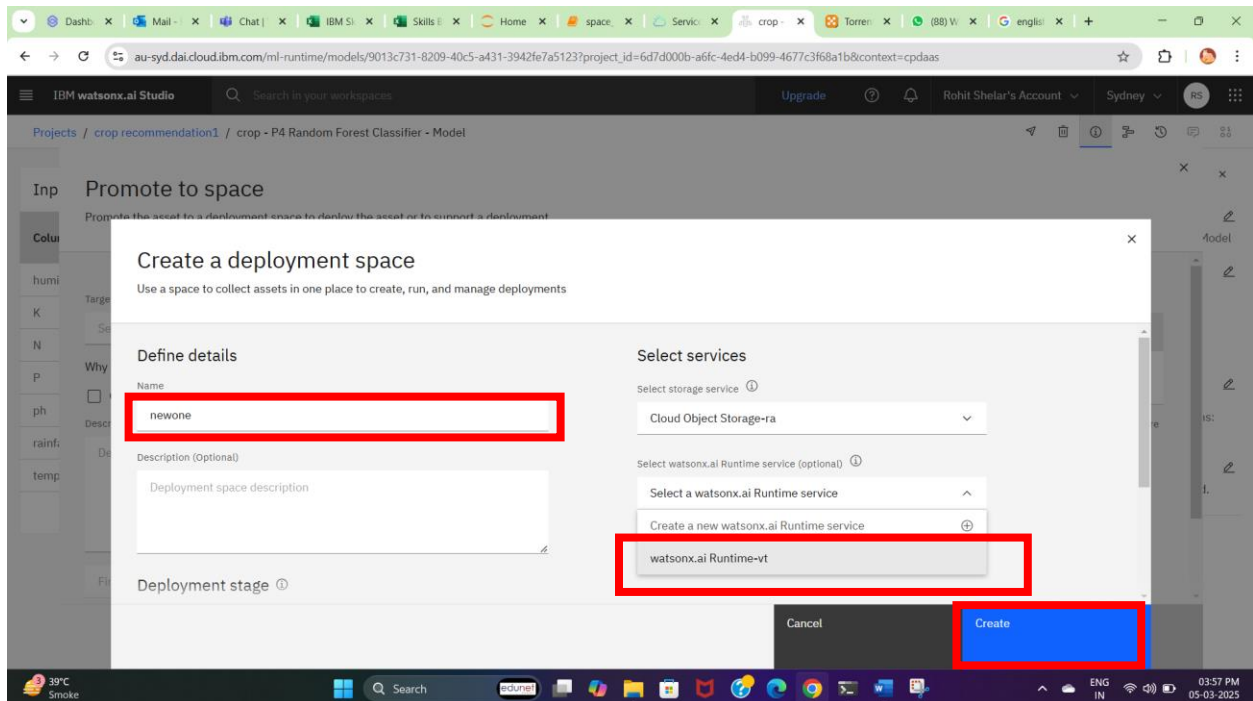
The screenshot shows the 'Model Details' page for 'crop - P4 Random Forest Classifier - Model'. On the left, there's an 'Input (1)' table with columns: Column, Type. The inputs are: humidity (double), K (integer), N (integer), P (integer), ph (double), rainfall (double), and temperature (double). On the right, there's a 'Promote to space' button highlighted with a red box. Below it, the 'Asset Details' section shows: Type: wml-hybrid\_0.1, Model ID: 9013c731-8209-40c5-a431-3942fe7a5123, Software specification: hybrid\_0.1 @ autoai-kb\_r124.1-py3.11. The 'Tags' section says 'Add tags to make assets easier to find.' The 'Last modified' section says '1 minute ago by Service' and 'Created on Mar 5, 2025 by Rohit Shelar'.

Column	Type
humidity	double
K	integer
N	integer
P	integer
ph	double
rainfall	double
temperature	double

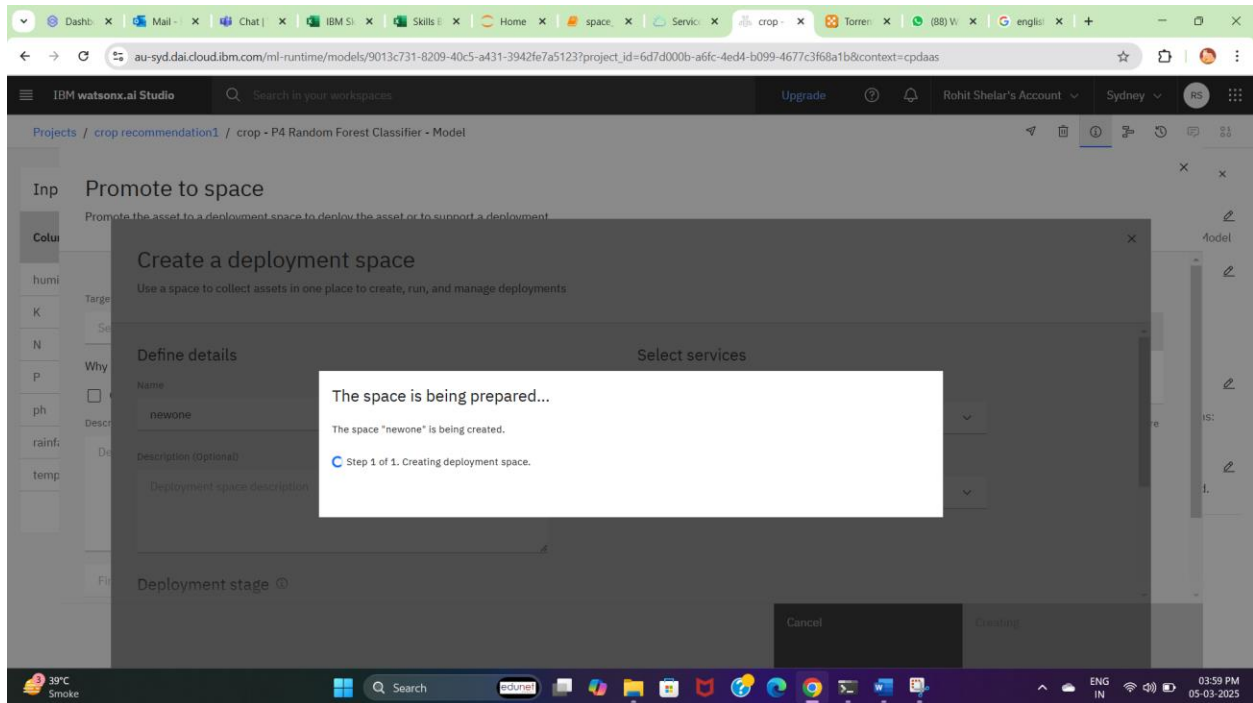
**Step32: Create the new deployment space.**



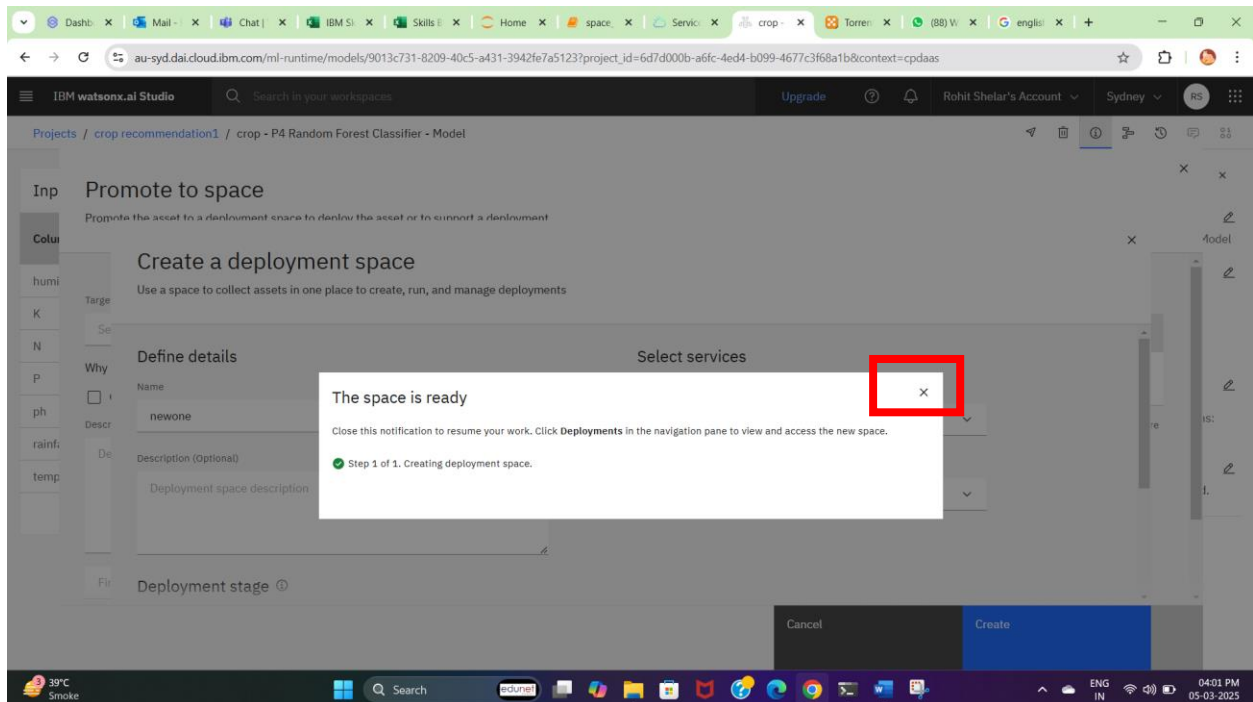
**Step33: Give the deployment space name and select watsonx.ai Runtime service , click on Create**



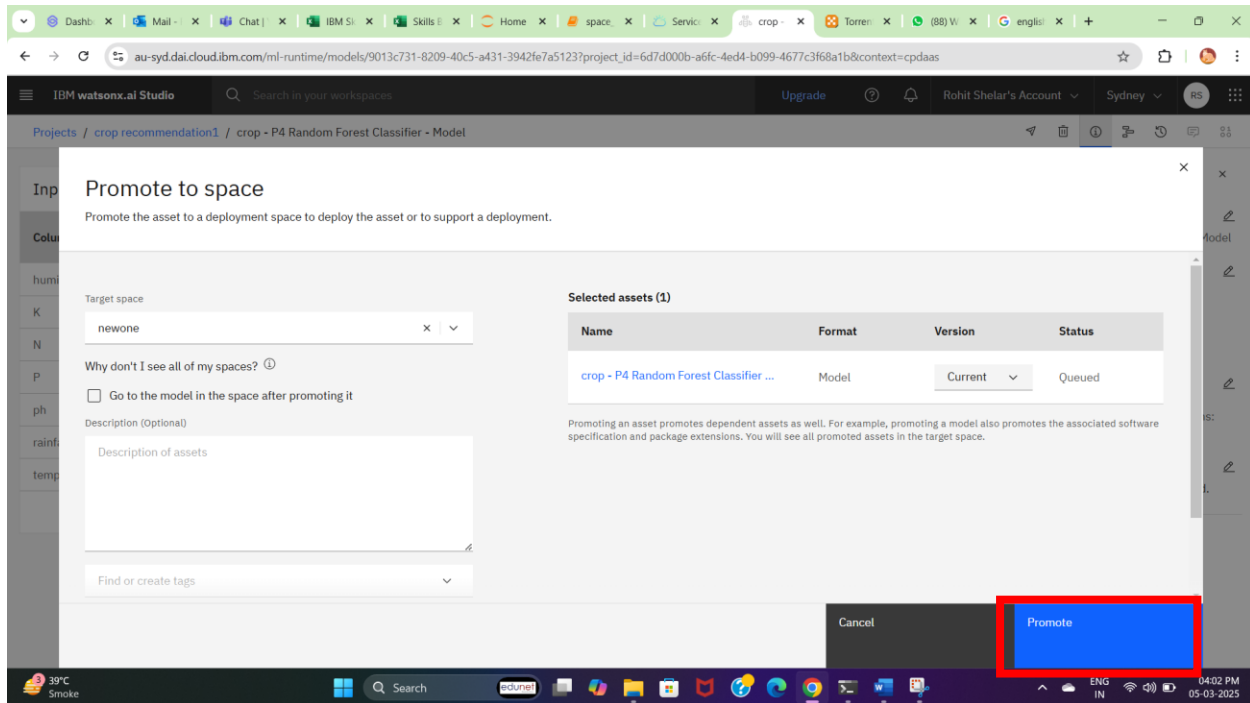
**Step34: it's preparing the deployment space.**



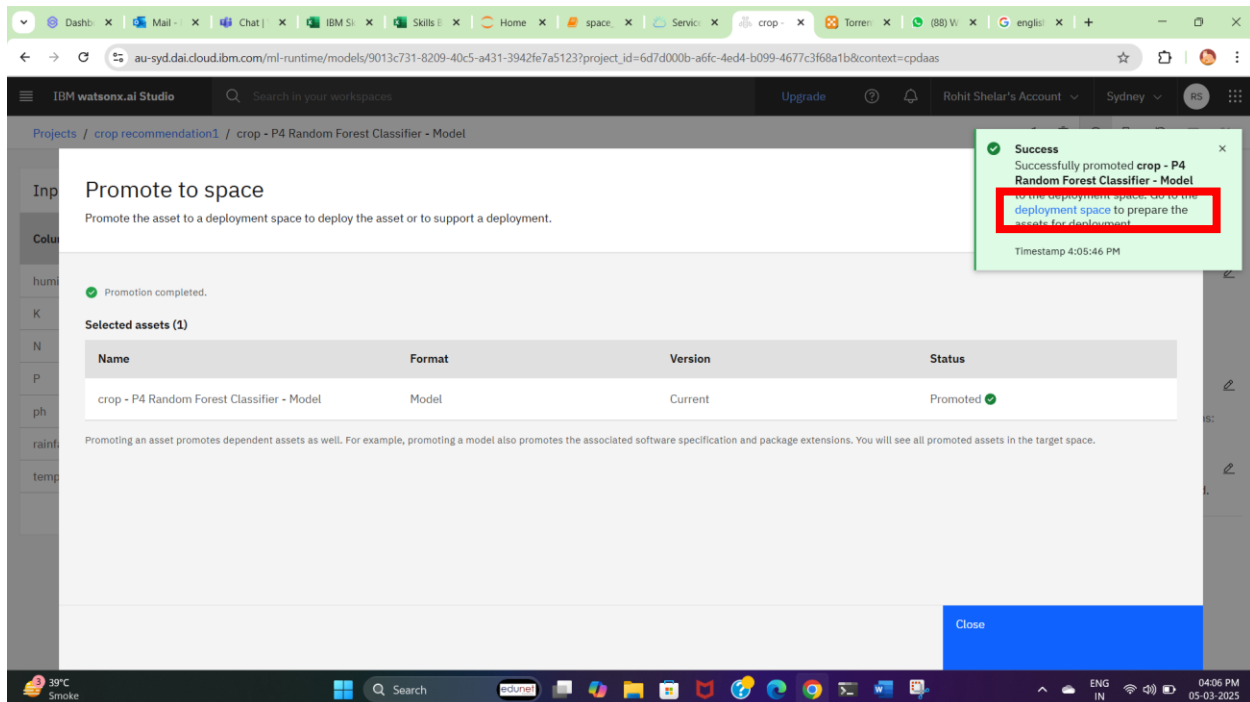
**Step35: Now the space is ready , close the dialog box**



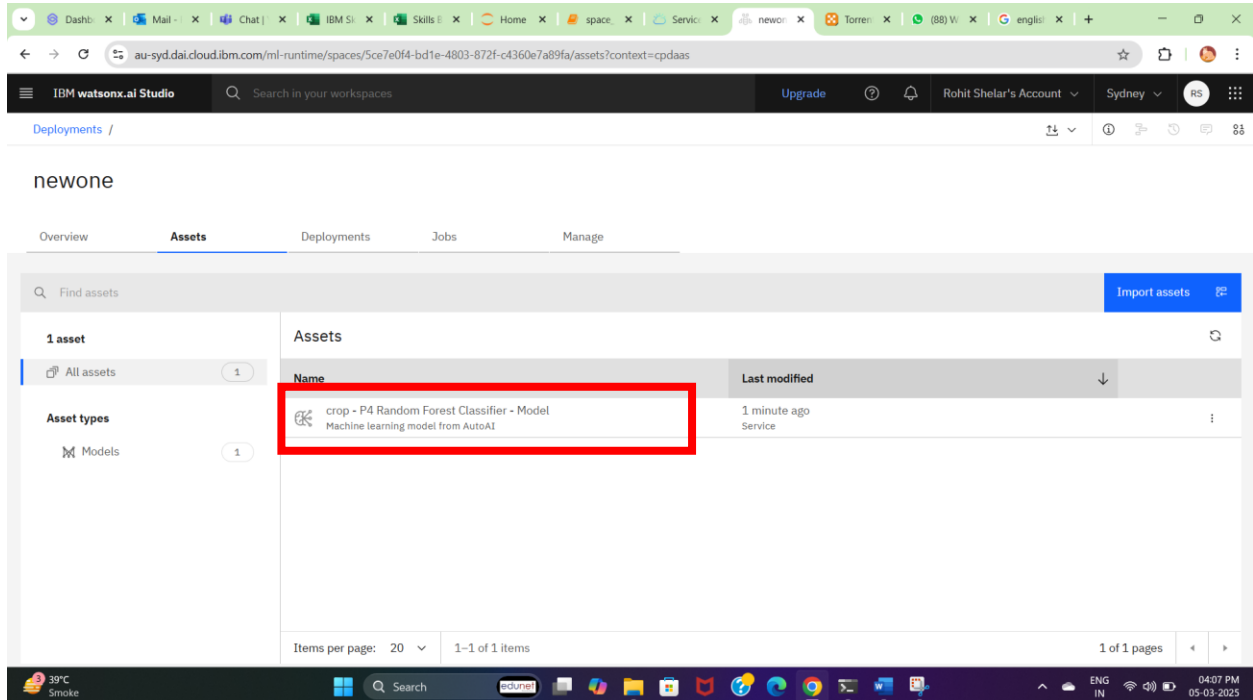
**Step36: Click on the promote.**



**Step37: it's promoted and click on deployment space.**

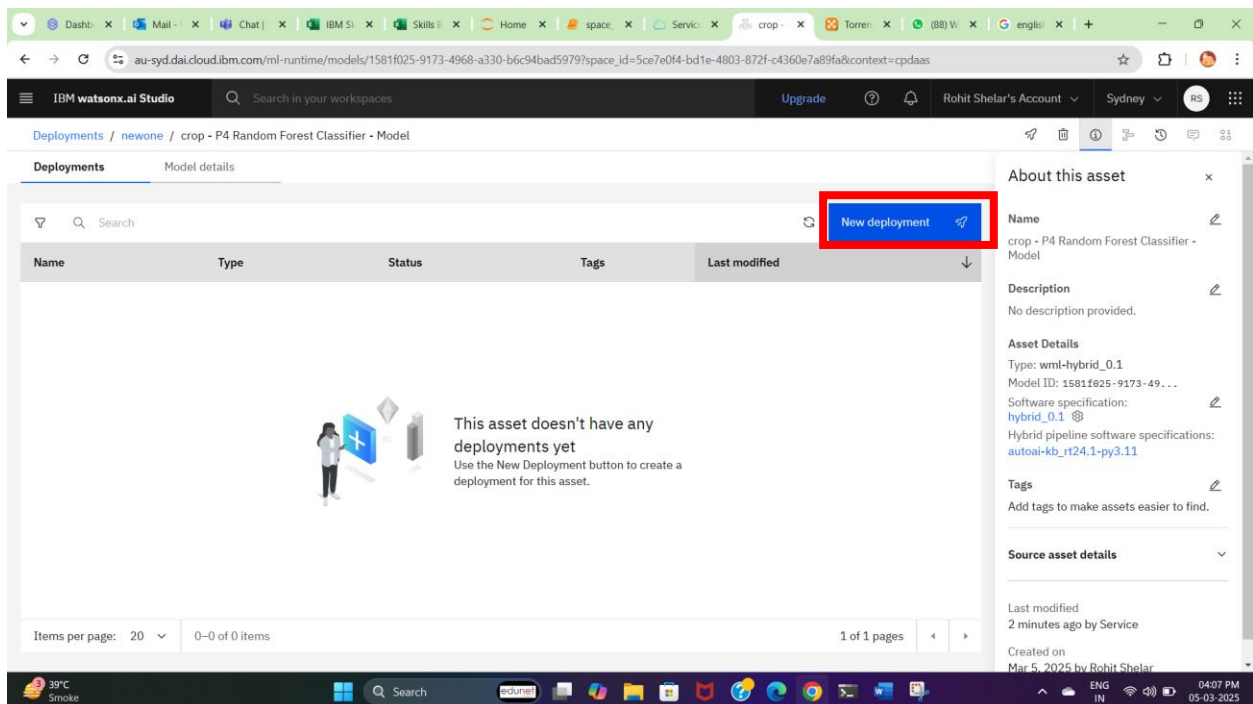


## Step38: Click on the Asset name.



The screenshot shows the IBM Watson AI Studio interface. The browser address bar displays the URL: `au-syd.dai.cloud.ibm.com/ml-runtime/spaces/5ce7e0f4-bd1e-4803-872f-c4360e7a89fa/assets?context=cpdaas`. The page title is "newone". The navigation bar includes "Overview", "Assets", "Deployments", "Jobs", and "Manage". The "Assets" tab is active, showing a list of assets. A red box highlights the asset name "crop - P4 Random Forest Classifier - Model" in the table. The table has columns for "Name" and "Last modified". The asset was modified "1 minute ago" by "Service". The left sidebar shows "1 asset" and "Asset types" with "Models" selected. The bottom status bar shows the system clock at 04:07 PM on 05-03-2025.

## Step39: Click on the New deployment



The screenshot shows the IBM Watson AI Studio interface for the "crop - P4 Random Forest Classifier - Model". The browser address bar displays the URL: `au-syd.dai.cloud.ibm.com/ml-runtime/models/1581f025-9173-4968-a330-b6c94bad5979?space_id=5ce7e0f4-bd1e-4803-872f-c4360e7a89fa&context=cpdaas`. The page title is "crop - P4 Random Forest Classifier - Model". The navigation bar includes "Deployments" and "Model details". The "Deployments" tab is active, showing a table with columns for "Name", "Type", "Status", "Tags", and "Last modified". A red box highlights the "New deployment" button. The table is empty, and a message states: "This asset doesn't have any deployments yet. Use the New Deployment button to create a deployment for this asset." The right sidebar shows "About this asset" details, including "Name", "Description", "Asset Details", "Tags", and "Source asset details". The bottom status bar shows the system clock at 04:07 PM on 05-03-2025.

**Step40: select deployment type and give the deployment name. Click on the Create.**

Create a deployment

Define details

Associated asset  
Crop recommendation - P2 LGBM Classifier - Model

Deployment type

**Online**  
Run the model on data in real-time, as data is received by a web service.

Batch  
Run the model against data as a batch process.

Name  
Crop\_Recommendation

Serving name ⓘ

Cancel Create

**Step41: Model is deployed.**

IBM Watson Studio

Deployments / Crop\_Recommendation\_01 / Crop recommendation - P2 LGBM Classifier - Model

Deployments Model details

New deployment

Name	Type	Status	Tags	Last modified
Crop_Recommendation	Online	Deployed		26 seconds ago Ashwani Kumar (You)

Items per page: 20 1-1 of 1 items 1 of 1 pages

About this asset

Name  
Crop recommendation - P2 LGBM Classifier - Model

Description  
No description provided.

Asset Details  
Type: wml-hybrid\_0.1  
Model ID: 88eb08d-fb7d-48...  
Software specification: hybrid\_0.1  
Hybrid pipeline software specifications: autoai-kb\_rt24.1-py3.11

Tags  
Add tags to make assets easier to find.

Source asset details

Last modified  
6 minutes ago by Ashwani Kumar

Created on  
Aug 10, 2024 by Ashwani Kumar

**Step42: Now click on Test to predict with new values.**

Deployments / Crop\_Recommendation\_01 / Crop recommendation - P2 LGBM ... /

Crop\_Recommendation Deployed Online

API reference **Test**

Enter input data

Text JSON

Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB.

[Download CSV template](#) [Browse local files](#) [Search in space](#) [Clear all](#) x

	N (double)	P (double)	K (double)	temperature (double)	humidity (double)	ph (double)	rainfall (double)
1	Start typing or drag and drop a CSV file...						
2							
3							
4							
5							

0 rows, 7 columns

Predict

**Step43: Enter the new values and click on predict**

IBM Watson Studio Search in your workspaces Upgrade ? Ashwani Kumar's Account Frankfurt AK

Deployments / Crop\_Recommendation\_01 / Crop recommendation - P2 LGBM ... /

Crop\_Recommendation Deployed Online

API reference **Test**

Enter input data

Text JSON

Enter data manually or use a CSV file to populate the spreadsheet. Max file size is 50 MB.

[Download CSV template](#) [Browse local files](#) [Search in space](#) [Clear all](#) x

	N (double)	P (double)	K (double)	temperature (double)	humidity (double)	ph (double)	rainfall (double)
1	30	79	75	18.820	16.10748	8.204862	89.73119
3							
4							
5							

1 row, 7 columns

Predict

**Step44: It's predicted label name with 99% confidence.**

