

Training the Model on IBM

Team ID	PNT2022TMID13012
Project Name	A Novel Method for Handwritten Digit Recognition System

The screenshot shows the IBM Cloud Catalog page for Watson Studio. The page is titled "Watson Studio" and describes it as a service to develop sophisticated machine learning models. The "Create" tab is selected, showing a "Select a location" dropdown set to "Dallas (us-south)" and a "Select a pricing plan" section. The "Lite" plan is highlighted, showing features like 1 authorized user, 10 capacity units, and 1 vCPU. The "Summary" panel on the right shows the plan is "Free" and lists details like location, plan name, and service name. A "Create" button is visible at the bottom right.

Watson Studio
Develop sophisticated machine learning models using Notebooks and code-free tools to infuse AI throughout your business.

Create | About

Type: Service
Provider: IBM
Last updated: 07/06/2022
Category: AI / Machine Learning
Compliance: HIPAA Enabled, IAM-enabled
Location: Frankfurt, London, Tokyo, Dallas
Related links: Docs

Select a location
Dallas (us-south)

Select a pricing plan
Displayed prices do not include tax. Monthly prices shown are for country or location: [United States](#)

Plan	Features	Pricing
Lite	<ul style="list-style-type: none">1 authorized user10 capacity units-monthly limitEnvironment = # of capacity units required per hour1 vCPU + 4 GB RAM = 0.52 vCPU + 8 GB RAM = 14 vCPU + 16 GB RAM = 2Decision Optimization + Watson NLP = Environment + 5	Free

Summary
Watson Studio **Free**
Location: Dallas
Plan: Lite
Service name: Watson Studio-Id
Resource group: Default

☒ I have read and agree to the following license agreements:
[Terms](#)

Create
Add to estimate

The screenshot shows the IBM Cloud resource page for Watson Studio-Id. The page is titled "Watson Studio in Cloud Pak for Data" and describes it as a core service in Cloud Pak for Data. The "Manage" tab is selected, showing a "Launch in IBM Cloud Pak for Data" button. The page includes a diagram illustrating the architecture of IBM Watson Studio in Cloud Pak for Data, showing its integration with IBM Cloud Pak for Data and IBM Cloud Base cloud infrastructure. The "Helpful links" section includes links to Documentation, Learning path, and Videos.

Watson Studio-Id **Active** Add tags

Manage | Plan

Watson Studio in Cloud Pak for Data

Watson Studio is one of the core services in Cloud Pak for Data as a Service. Build, deploy and manage AI models, and optimize decisions on IBM Cloud Pak for Data.

Launch in IBM Cloud Pak for Data

IBM Watson Studio in Cloud Pak for Data
IBM Cloud Pak for Data
Unifying platform
IBM Cloud Base cloud infrastructure


IBM Watson Studio is part of IBM Cloud Pak for Data and serves as the data science capability of the data fabric architecture.

Helpful links

- Documentation**
Learn about tools, features, and how to perform a wide variety of Data and AI tasks.
- Learning path**
Start a step-by-step tutorial to get up and running quickly.
- Videos**
Watch videos to learn about Watson Studio and Cloud Pak for Data as a Service.

https://datapatform.cloud.ibm.com/registration/steptwo/apps-data_science_experience&sync_account_id=30cd3363462484fb627cc3351f1ea1&redirectIfAccountExists=True&5_PKG=ov70815&uucid=0040c3bca90ede1&cm_mmca1=000038LA&cm_mmca2=10012457&utm_co...

Services catalog /

 **Watson Machine Learning**

Author: IBM SPSS • Date of last update: Nov 15, 2022 • [Docs](#) • [API Docs](#)

Create

About

Select a region

Select a region

Dallas

Pricing plan

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

Plan	Features	Pricing
Lite	Service instance 20 capacity unit-hours (CUH) included: Capacity Type: <ul style="list-style-type: none">• 1 vCPU and 4 GB RAM = 0.5 capacity units required per hour• 2 vCPU and 8 GB RAM = 1 capacity units required per hour• 4 vCPU and 16 GB RAM = 2 capacity units required per hour• 8 vCPU and 32 GB RAM = 4 capacity units required per hour	Free

Summary

Watson Machine Learning
Region: Dallas
Plan: Lite
Service name: Watson Machine Learning-ll
Resource group: Default

Create

[View terms](#)

IBM Watson Studio

Search in your workspaces


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Dallas

GD

Services catalog /

 **Cloud Object Storage**

Author: IBM • Date of last update: Jul 6, 2022 • [Docs](#) • [API Docs](#)

Create

About

COS on Satellite 96TB

COS on Satellite 96TB

Lite	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
Standard	Standard plan is our most popular Pay-as-You-Go pricing plan. There is no minimum fee. This plan meets the requirements of most of the enterprise workloads.	See pricing details

Configure your resource

Summary

Cloud Object Storage
Region: Global
Plan: Lite
Service name: Cloud Object Storage-sk
Resource group: Default

Create

[View terms](#)

IBM Watson Studio

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New project

Define details

Name

Handwritten_Digit_Classification_PNT2022TMD13012

Description

Project description

Choose project options

☐ Restrict who can be a collaborator ⓘ

☐ Mark as sensitive ⓘ

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

Storage

Cloud Object Storage-sk

Cancel

Create

New asset

Tool type

All types

Code editors

Component editors

Search

Code editors

Jupyter notebook editor

Create a notebook in which you run Python, R, or Scala code to prepare, visualize, and analyze data, or build a model.

Component editors

{#}

Parameter set

Show descriptions

New notebook

Blank

From file

From URL

Name

Handwritten_Digit_Classification

Description (optional)

Type your description here

Select runtime

Runtime 22.1 on Python 3.9 XS (2 vCPU 8 GB RAM)

The selected runtime has 2 vCPU and 8 GB RAM. It consumes 1 capacity unit per hour.

[Learn more](#) about capacity unit hours and Watson Studio pricing plans.

Notebook file

Upload only .ipynb files. 52 MB max file size.

Drag and drop files here or upload.

Handwritten_Digit_Classification.ipynb

Cancel

Create

IBM Deployment

```
In [43]: !tar -zcvf handwritten-digit-classification-model.tgz CNN_MNIST_v1.h5  
CNN_MNIST_v1.h5
```

IBM Cloud

Search resources and products...

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Resource list

Create resource +

Name	Group	Location	Product	Status	Tags
Filter by name or IP address...Filter by group or org...Filter...Filter...Filter...Filter...					
Compute (0)					
Containers (0)					
Networking (0)					
Storage (1+)					
AI / Machine Learning (2)					
Watson Machine Learning-av	Default	Dallas	Watson Machine Learning	Active	cpdaas
Watson Machine Learning-av	Default	Dallas	Watson Studio	Active	-
Analytics (0)					
Blockchain (0)					
Databases (0)					
Developer tools (0)					
Logging and monitoring (0)					

IBM Cloud

Search resources and products...

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IAM

Manage identities

Users

Trusted profiles

Service IDs

API keys

Identity providers

Manage access

Access groups

Authorizations

Roles

Gain insight

Inactive identities

Inactive policies

Settings

API keys

Create, view, and work with API keys that you have access to manage. IBM Cloud API keys are associated with a user's identity and can be used to access cloud platform and classic infrastructure APIs, depending on the access that is assigned to the user. The following table displays a list of API keys created in this account. Learn more.

Looking for more

Create IBM Cloud API key

View: My IBM

API keys associated with

No API keys

Looks like there aren't any API keys. Click Create to get started.

Quick start

Create data pipelines with DataStage

Build customer profiles with IBM Match 360 with Watson

Catalog and govern data with Watson Knowledge Catalog

Build and manage ML models with Watson Studio

Query data anywhere with Watson Query

What's new

Projects

Handwritten_Digit_Classification_P NT2022TMID13012 Today at 12:41 PM

New in gallery

NOTEBOOK

Use AutoAI and Lale to predict credit risk with...

Learn how to use AutoAI experiments in this notebook by getting a German credit data set and train the model to predict banking credit. Then, compare several trained models for quality and select best one for further refi

Notifications

No notifications

You will see your most recent notifications here.

Deployments

No deployment spaces

After you create spaces, you'll see them here.

New deployment space +

IBM Watson Studio

Search in your workspaces

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GD

New deployment space

Use a space to collect assets in one place to create, run, and manage deployments

Define details

Name

Description (Optional)

Deployment space tags (optional)

Select services

Select storage service

Cloud Object Storage-sk

Select machine learning service (optional)

Watson Machine Learning-av

Upload space assets (optional)

Populate your space with assets exported from a project or space to a .zip file. You can add more assets after the space is created.

Drop .zip file here or browse your files to upload

Cancel

Create

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Deployments /

NewSpace

Overview

Assets

Deployments

Jobs

Manage

Find assets

Import assets

1 asset

All assets

Asset types

Models

Name	Last modified
CNN Model Building Demo Model	1 minute ago Service

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

Drop files here or browse for files to upload.

Stay on the page until upload completes. Incomplete uploads are cancelled.

Model Deployed Successfully:

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Deployments /

NewSpace

Overview

Assets

Deployments

Jobs

Manage

Search

Name	Type	Status	Asset	Last modified
demo_deploy	Online	Deployed	CNN Model Building Demo	52 seconds ago Goutham D T (You)

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

Drop files here or browse for files to upload.

Stay on the page until upload completes. Incomplete uploads are cancelled.

Successful response from our model:

```
In [99]: import requests

# NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud account.
API_KEY = "qapmPAb5qn04b-hCLf6hEInnlSPpCFmwV0oknIdj0_D_"
token_response = requests.post('https://iam.cloud.ibm.com/identity/token', data={"apikey":
API_KEY, "grant_type": 'urn:ibm:params:oauth:grant-type:apikey'})
mltoken = token_response.json()["access_token"]

params = {'param0': 'param0', 'param1': 'param1'}

header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}

# NOTE: manually define and pass the array(s) of values to be scored in the next line
payload_scoring = {"input_data": [{"fields": [], "values": [xtest[0].tolist()]}]}

response_scoring = requests.post('https://us-south.ml.cloud.ibm.com/ml/v4/deployments/09c1b869-bd83-4a14-be5d-41b8924a91e6/predictions?version=2022-11-17', json=payload_scoring,
headers={'Authorization': 'Bearer ' + mltoken})

In [100]: response_scoring

Out[100]: <Response [200]>
```