



Inovação com dados em nuvem

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TheDevConf
Oracle

Machine Learning com SQL e Autonomous Database

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Inovação com dados em nuvem

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Oracle



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Inovação com dados em nuvem

**MACHINE LEARNING COM SQL
E ORACLE AUTONOMOUS
DATABASE**



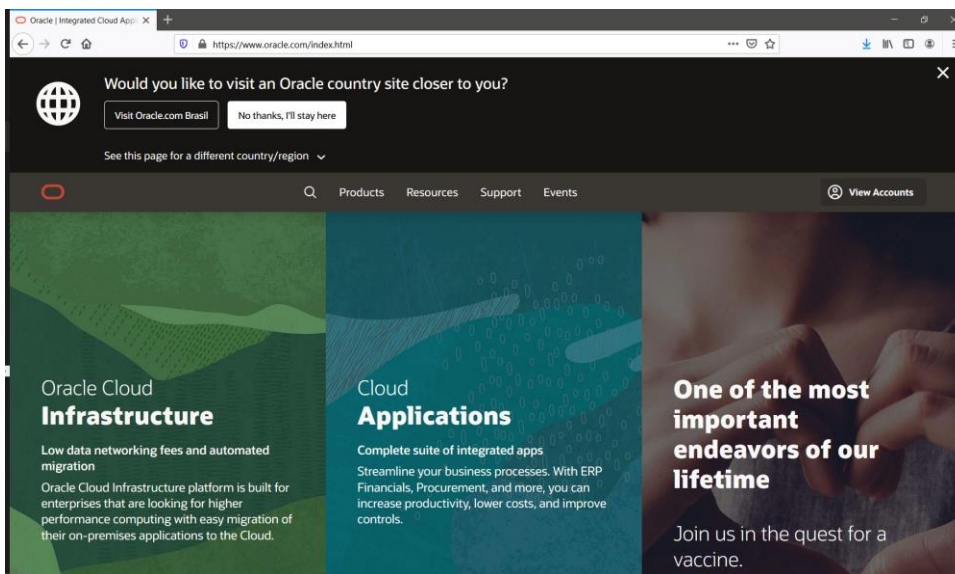
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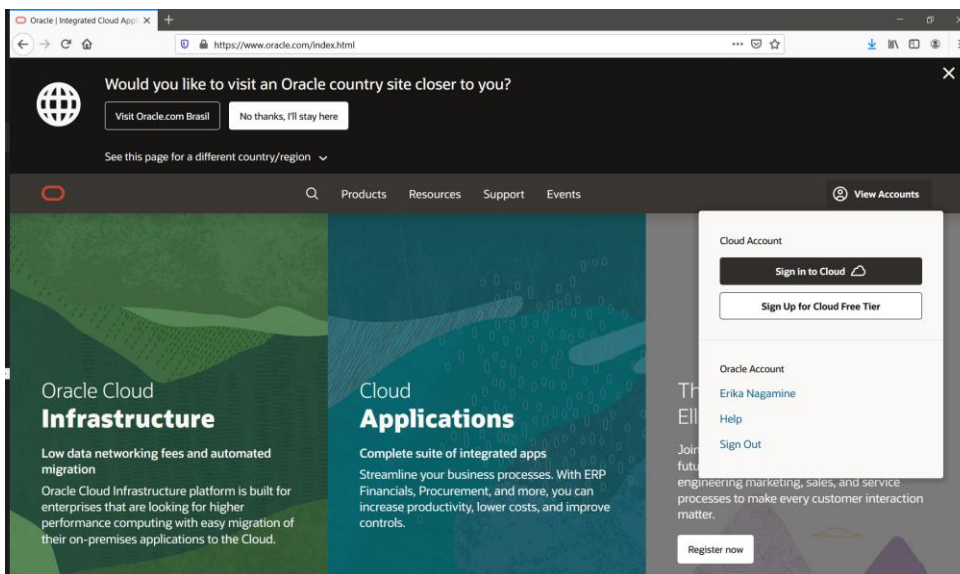
1. Oracle Cloud

A Oracle Cloud, também conhecida como OCI (oracle cloud infrastructure) pode ser acessada de algumas formas. Neste documento utilizaremos o acesso via console web. Tenha em mãos a sua conta cloud. Para acessar a console web, você deverá ir no site:

- www.oracle.com
- ou
- cloud.oracle.com



Ao acessar a console clique em “view accounts”:



Digite as informações da sua conta cloud:

Cloud Sign In

ORACLE Cloud

Cloud Account Name @

enagamine

Next

Forgot your cloud account name? Get help

Sign In using a Traditional Cloud Account

Not a Customer yet?
Sign up

Resources for
Developers
Startups
Students and Educators

Partners
Oracle PartnerNetwork
Find a Partner
Log in to OPN

Solutions
Artificial Intelligence
Internet of Things
Blockchain

What's New
How we're taking on COVID-19
Java SE Downloads
Try Oracle Cloud Free Tier

Contact Us
US Sales: +1.800.633.0738
How can we help?
Subscribe to emails

ORACLE Cloud Infrastructure

SIGN IN

Signing in to cloud tenant
enagamine
[Change tenant](#)

Single Sign-On (SSO)

We have detected that your tenancy has been federated to another Identity Provider.

Select your Identity Provider below.

IDENTITY PROVIDER
oracleidentitycloudservice

Continue

OR

Oracle Cloud Infrastructure ⓘ

The login is uncommon for federated accounts. If you have questions, please review the [FAQ](#) or contact your tenancy administrator.

USER NAME

PASSWORD

Sign In

[Forgot password?](#)

ORACLE Cloud

enagamine

Oracle Cloud Account Sign In

User Name

User name or email

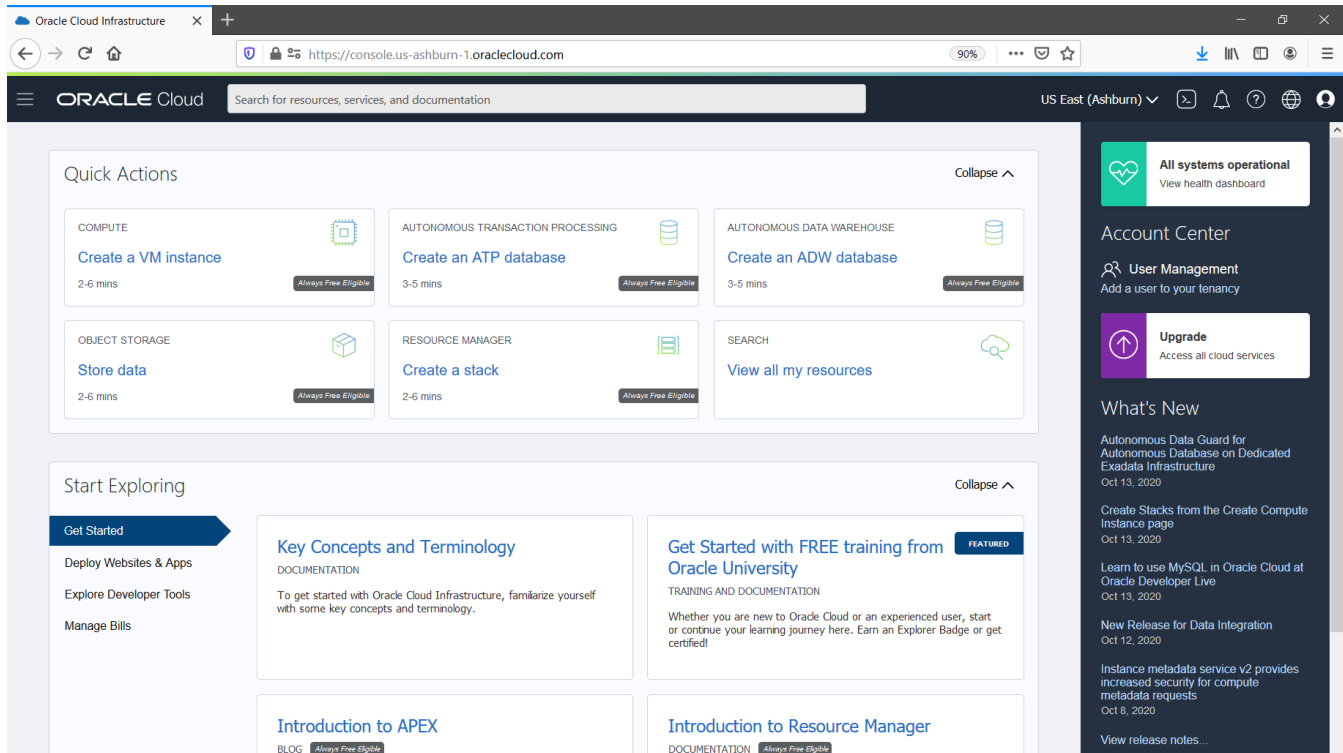
Password

Password

Sign In

Need help signing in? [Click here](#)

Após inserir suas credenciais, você estará na página inicial da console da Oracle cloud:



Note que do lado superior esquerdo temos o menu da oracle cloud. Nele iremos criar a maior parte das tarefas descritas aqui.

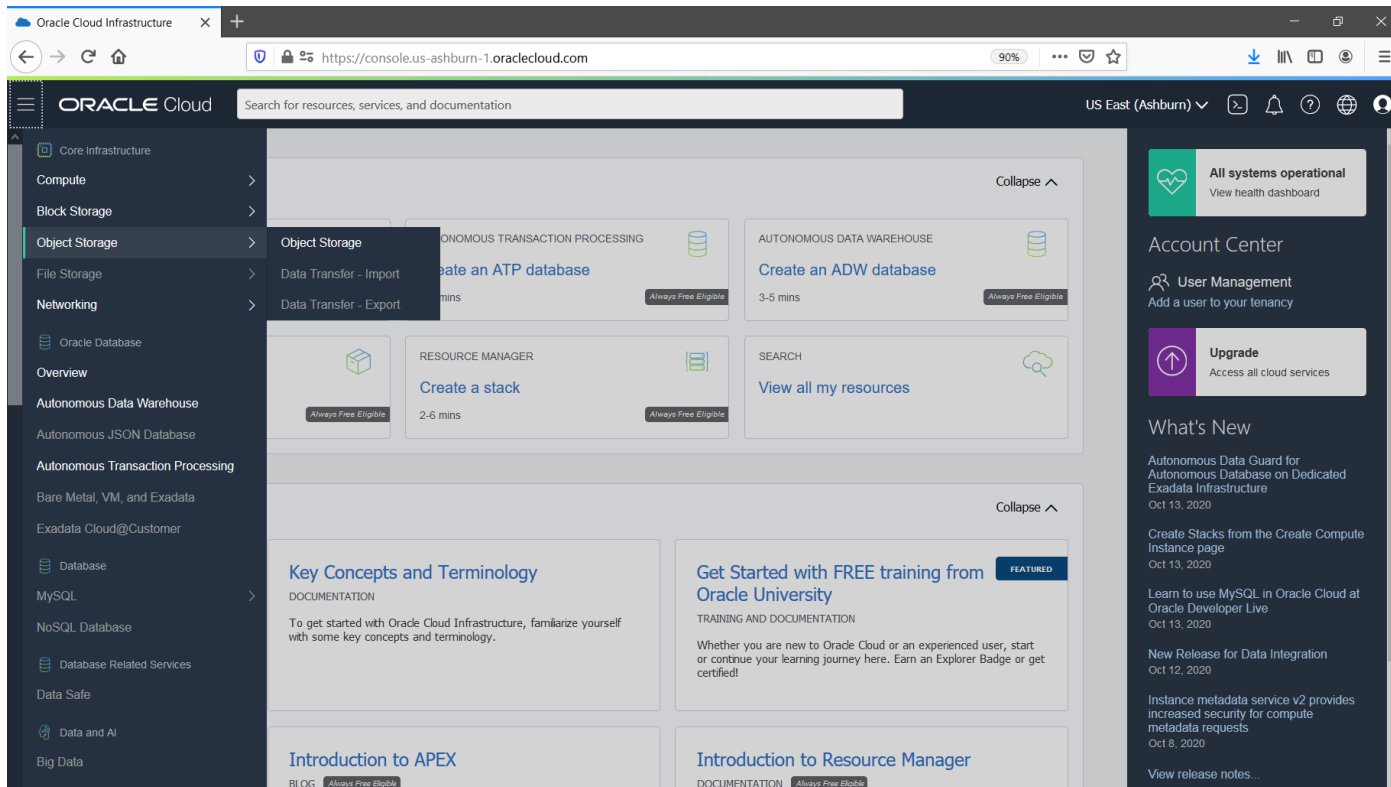
Obs: para uma melhor experiencia deste passo a passo as telas estarão em inglês. Para alterar a sua tela clique no globo presente no lado superior direito:

The screenshot displays the Oracle Cloud console interface. At the top, there's a navigation bar with the Oracle Cloud logo, a search bar, and the region 'US East (Ashburn)'. Below this, the 'Quick Actions' section is visible, featuring several cards for creating resources like VM instances, ATP databases, ADW databases, and stacks, each with an 'Always Free Eligible' badge. The 'Start Exploring' section below it offers documentation and training resources, including 'Key Concepts and Terminology', 'Get Started with FREE training from Oracle University' (marked as featured), 'Introduction to APEX', and 'Introduction to Resource Manager'. On the right side, a user menu is open, showing options for account management, user management, and language selection (including English, Spanish, French, etc.). A 'What's New' section at the bottom right lists recent updates and releases.

2. Criando um object storage

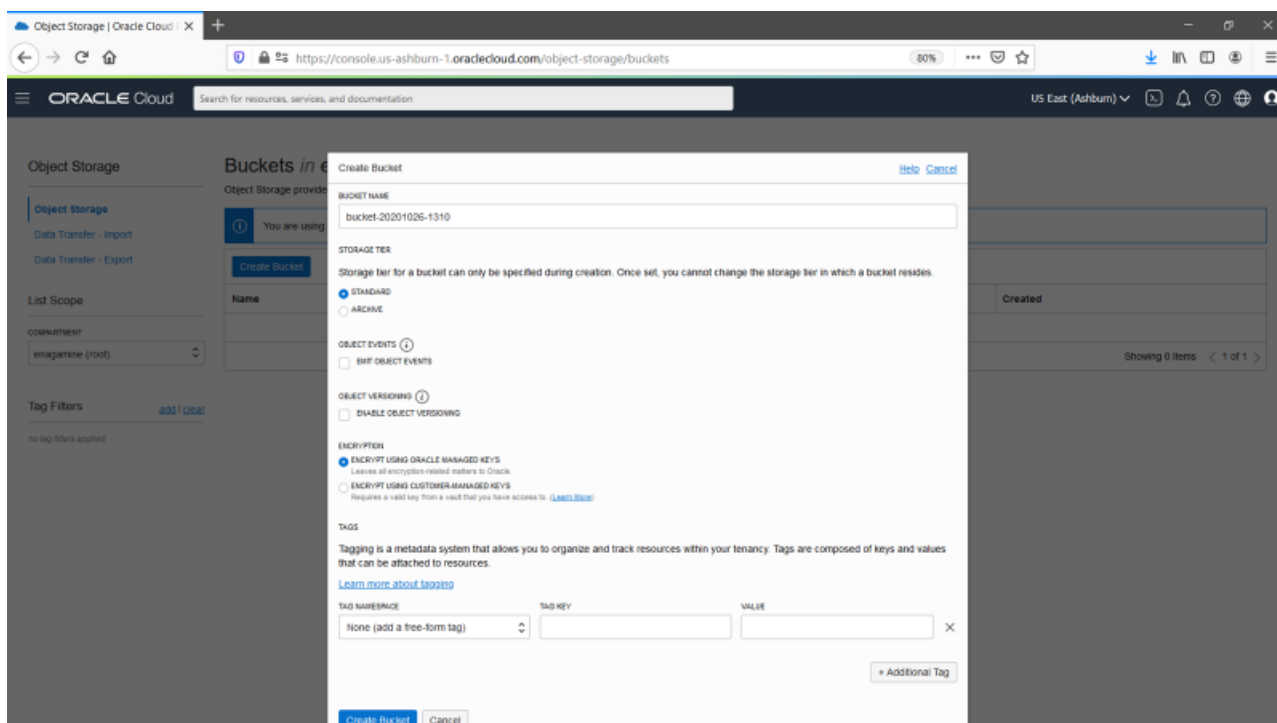
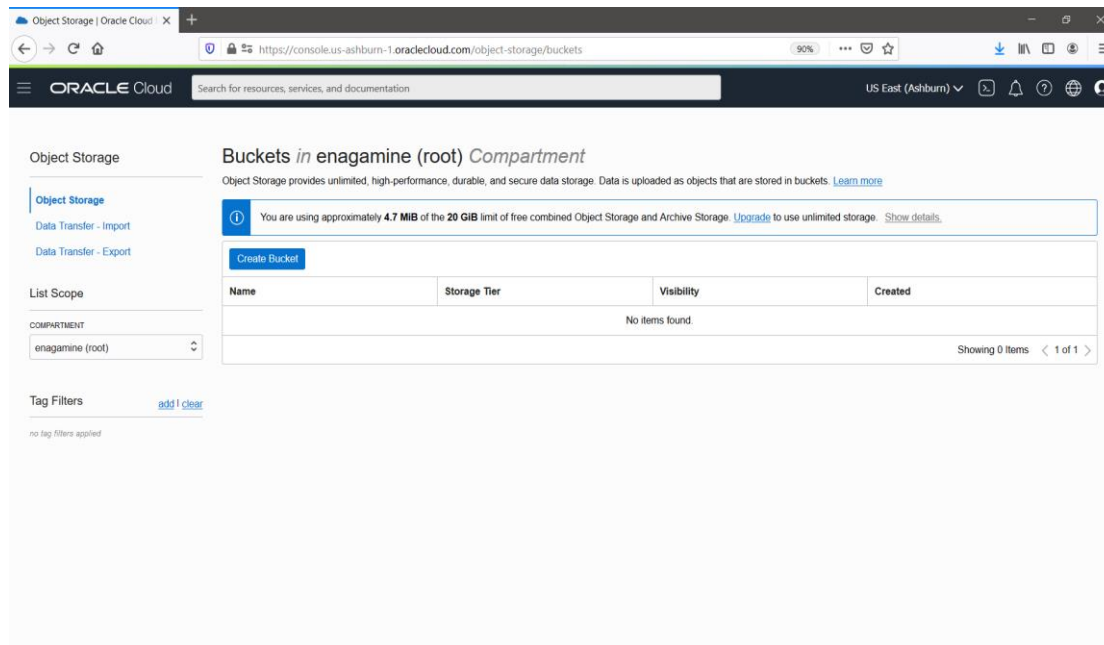
Object storage é uma das opções de armazenamento que possuímos na cloud. Ele oferece uma forma de armazenamento elástico, podendo ser utilizado para diversos tipos de dados não estruturados / semi-estruturados.

Para criar um object storage, vá no menu -> object storage -> object storage:



Clique em “create bucket” e insira as informações:

- Nome do bucket (caso queira alterar): meu_primeiro_bucket



Após a criação irá aparecer uma tela semelhante a essa:

Object Storage | Oracle Cloud

[←](#)
[→](#)
[↺](#)
[🏠](#)

<https://console.us-ashburn-1.oraclecloud.com/object-storage/buckets>

133%

[...](#)
[🔒](#)
[🌟](#)

[↓](#)
[🔍](#)
[📄](#)
[👤](#)

ORACLE Cloud

Search for resources, services, and documentation

US East (Ashburn) ▾

>

🔔

?

🌐

👤

Object Storage

Object Storage

Data Transfer - Import

Data Transfer - Export

List Scope

COMPARTMENT

enagamine (root) ▾

Tag Filters

add | clear

no tag filters applied

Buckets *in* enagamine (root) *Compartment*

Object Storage provides unlimited, high-performance, durable, and secure data storage. Data is uploaded as objects that are stored in buckets. [Learn more](#)

📘

You are using approximately **4.7 MiB** of the **20 GiB** limit of free combined Object Storage and Archive Storage. [Upgrade](#) to use unlimited storage. [Show details](#)

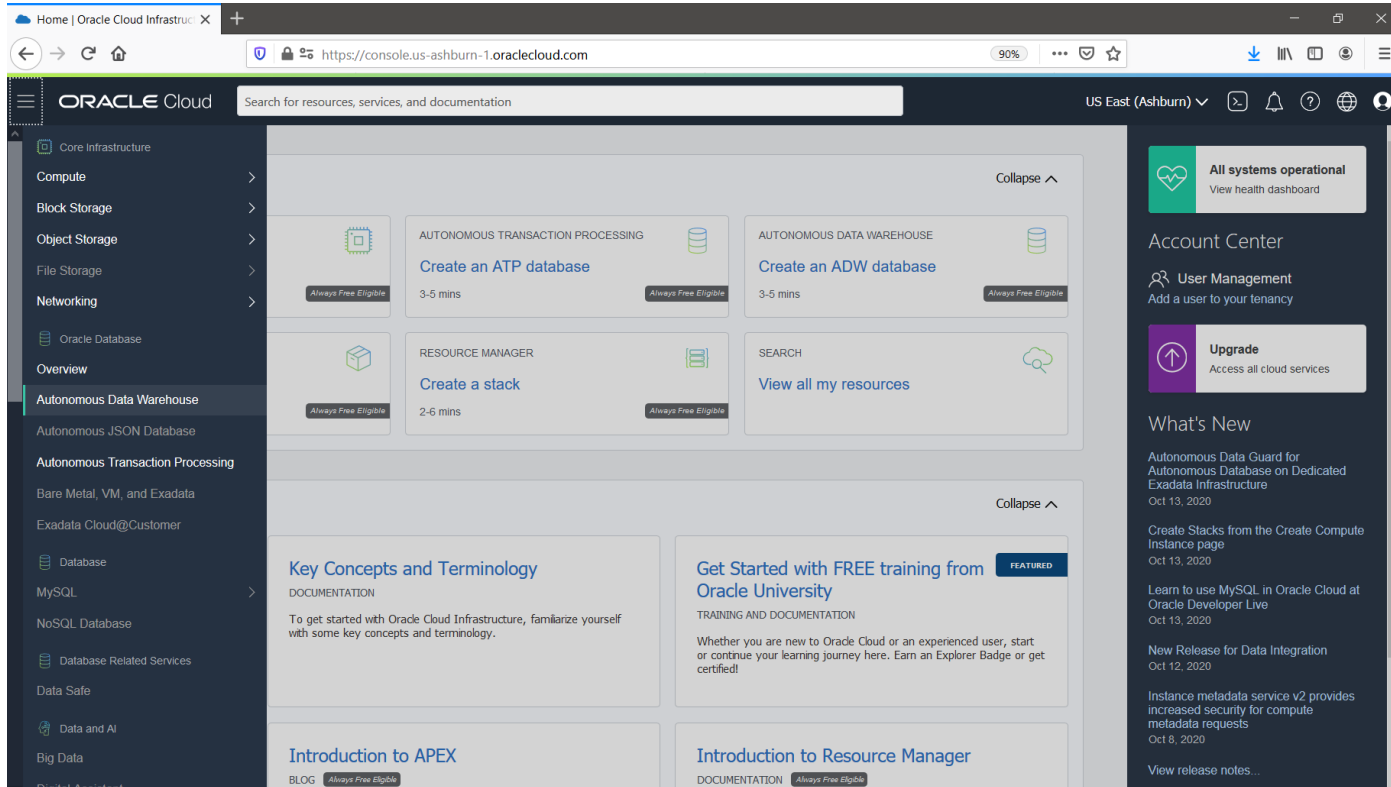
Create Bucket

Name ▲	Storage Tier	Visibility	Created
meu_primeiro_bucket	Standard	Private	Mon, Oct 26, 2020, 16:18:52 UTC

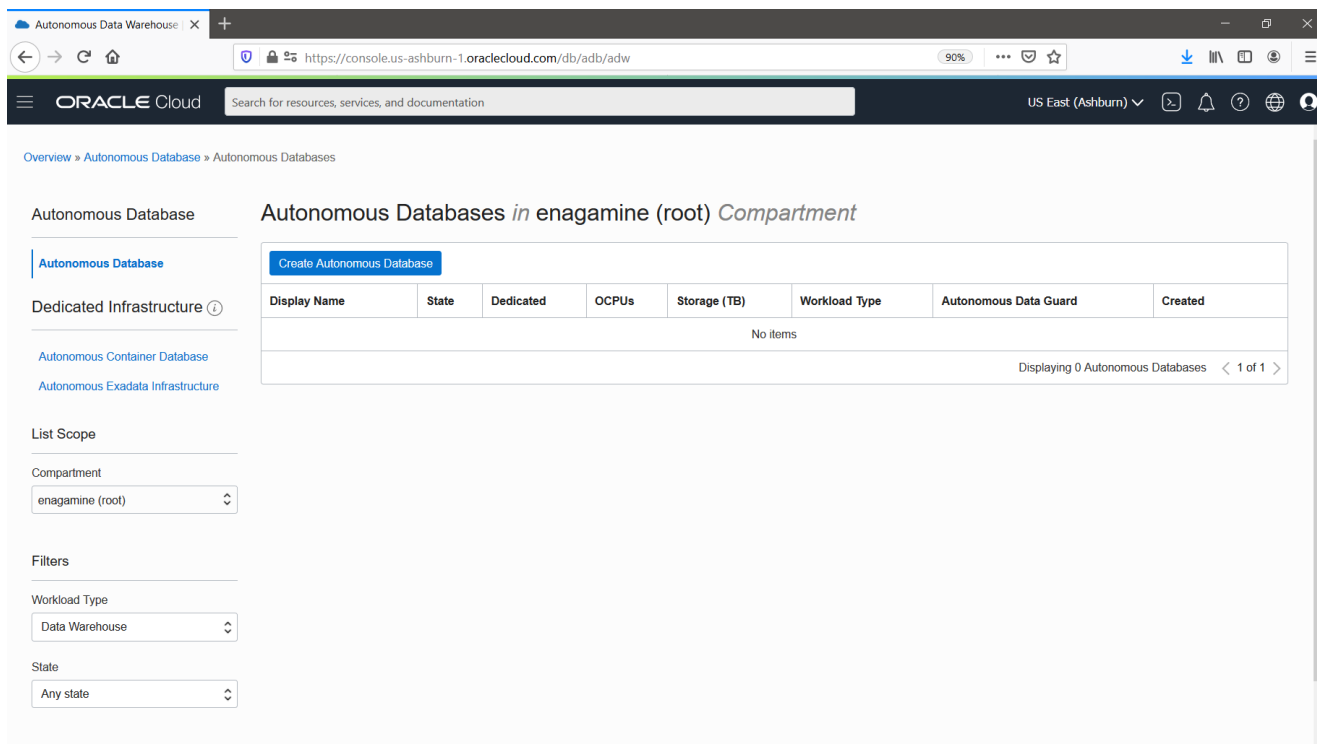
Showing 1 Item < 1 of 1 >

3. Criando um autonomous database

Para criar um autonomous database, vá no menu -> autonomous database



Clique em “create autonomous database”:



Preencha/selecione as seguintes informações:

- Display name: adw
- Database name: adw
- Workload type: data warehouse
- Deployment type: shared infrastructure
- OCPU: 1
- Storage: 1
- Coloque a senha de admin de sua preferencia
- Access type: allow secure from everywhere
- License included

E clique em “Create Autonomous Database”

Oracle Cloud Infrastructure

https://console.us-ashburn-1.oraclecloud.com/db/adw/create

US East (Ashburn)

Create Autonomous Database

Provide basic information for the Autonomous Database

Compartment
enagamine (root)

Display name
DB 202010261519
A user-friendly name to help you easily identify the resource.

Database name
DB202010261519
The name must contain only letters and numbers, starting with a letter. Maximum of 14 characters.

Choose a workload type

Data Warehouse
Built for decision support and data warehouse workloads. Fast queries over large volumes of data.

Transaction Processing
Built for transactional workloads. High concurrency for short-running queries and transactions.

JSON
Built for JSON-centric application development. Developer-friendly document APIs and native JSON storage.

Choose a deployment type

Shared Infrastructure
Run Autonomous Database on shared Exadata infrastructure.

Dedicated Infrastructure
Run Autonomous Database on dedicated Exadata infrastructure.

Dedicated Exadata infrastructure is not available for Always Free Oracle Autonomous Database.

Create Autonomous Database Cancel

Caso seu autonomous seja criado com sucesso você verá uma tela semelhante:

Oracle Cloud Infrastructure

https://console.us-ashburn-1.oraclecloud.com/db/adw/ocid1.autonomousdatabase.oc1.iad.abuwcljst77daljja2mdxhssn

US East (Ashburn)

Overview » Autonomous Database » Autonomous Database Details

ADW

AVAILABLE

adw **Always Free**

DB Connection Performance Hub Service Console Scale Up/Down More Actions

Autonomous Database Information Tools Tags

General Information

Database Name: adw
Workload Type: Data Warehouse
Compartment: enagamine (root)/enagamine-analytics
OCID: ...a22vpq [Show](#) [Copy](#)
Created: Mon, Sep 28, 2020, 19:40:58 UTC
OCPU Count: 1
Storage: 0.02 TB
License Type: License included
Database Version: 19c
Auto Scaling: Disabled ⓘ
Lifecycle State: Available
Instance Type: Free [Upgrade to Paid](#)
Mode: Read/Write [Edit](#)

Infrastructure

Dedicated Infrastructure: No

Autonomous Data Guard ⓘ

Status: Disabled ⓘ

Backup

Last Automatic Backup: Tue, Oct 27, 2020, 05:26:34 UTC

Network

Access Type: Allow secure access from everywhere
Access Control List: Disabled [Edit](#)

Maintenance ⓘ

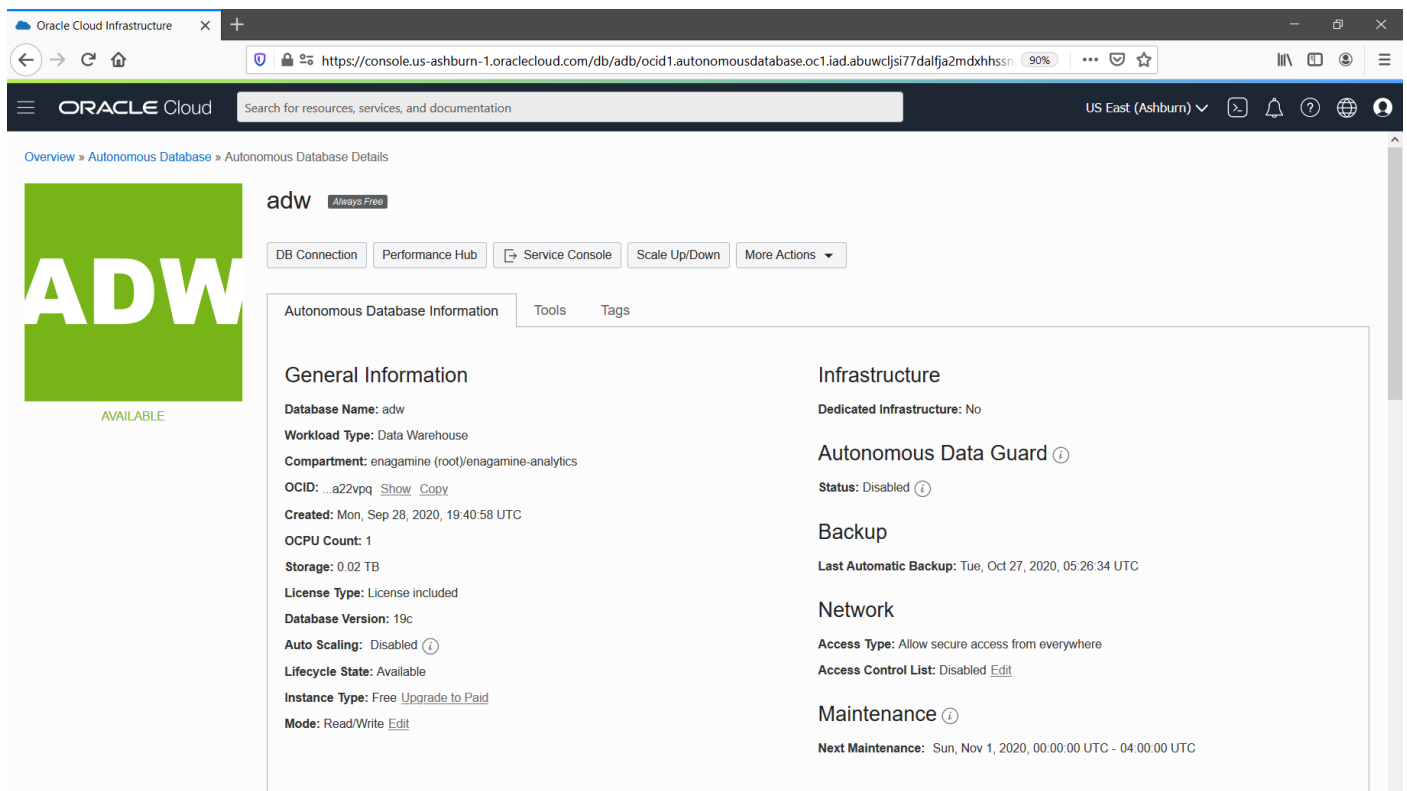
Next Maintenance: Sun, Nov 1, 2020, 00:00:00 UTC - 04:00:00 UTC

4. Oracle Machine Learning notebooks

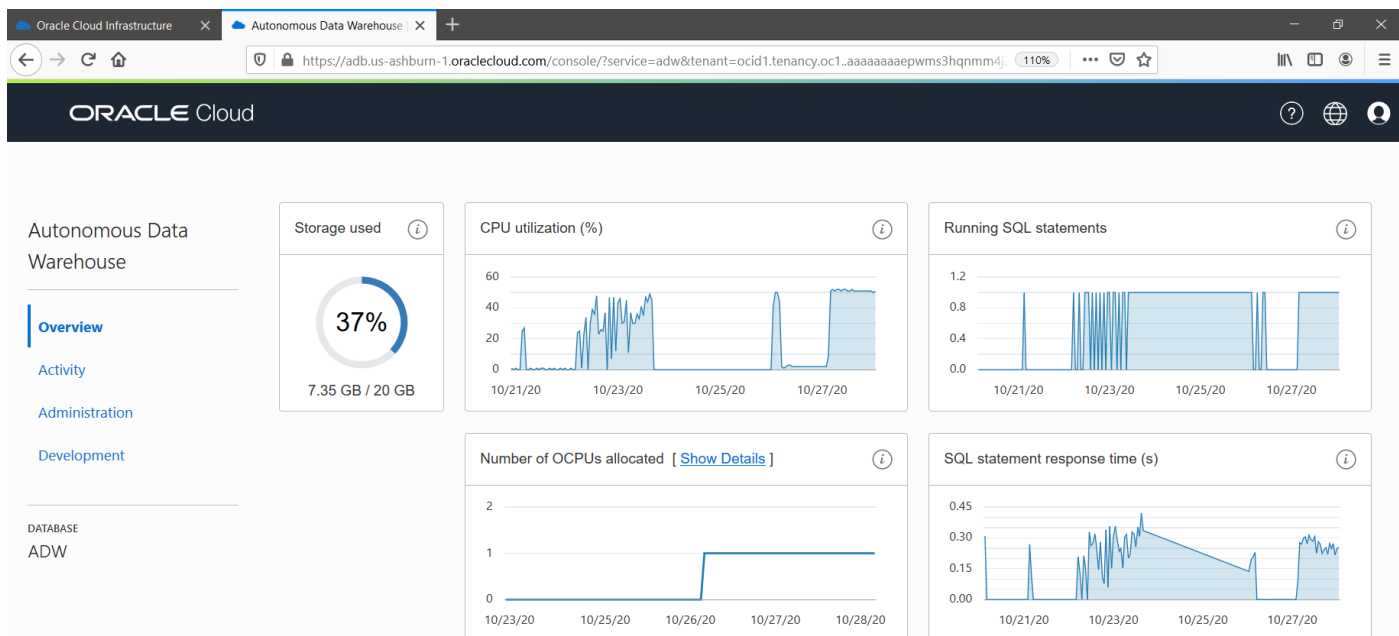
O Oracle Machine Learning notebooks é um ambiente colaborativo que pode ser utilizado para mineração de dados e/ou até mesmo para você fazer visualizações com dados.

Utilizaremos este ambiente no workshop para trabalharmos com nossos dados.

O primeiro passo é criar o usuário para acesso do Machine Learning Notebooks. Para isso, clique em service console na tela inicial do autonomous:



Ao acessar a service console, utilize o menu do lado esquerdo a opção administração:



Em administração clique em “Manage Oracle ML Users”


The screenshot displays the Oracle Cloud Autonomous Data Warehouse (ADW) Administration page. The left sidebar contains navigation links: Overview, Activity, Administration (selected), and Development. Below these are the labels 'DATABASE' and 'ADW'. The main content area features several administrative tasks:

- Download Client Credentials (Wallet):** A section with an information icon. It states: "Connections to Autonomous Data Warehouse use a secure connection. Your existing tools and applications will need to use this wallet file to connect to your Autonomous Data Warehouse instance. If you are familiar with using an Oracle Database within your own data center, you may not have previously used these secure connections."
- Set Resource Management Rules:** A section with an information icon. It states: "Set resource management rules to allocate CPU/IO shares to consumer groups and to cancel SQL statements based on their runtime and amount of IO."
- Set Administrator Password:** A section with an information icon. It states: "Set or reset your database administrator user's (ADMIN) password and when locked unlock your administrator user account on Autonomous Data Warehouse."
- Manage Oracle ML Users:** A section with an information icon. It states: "Create new Oracle Machine Learning user accounts and manage the credentials for existing Oracle Machine Learning users."
- Send Feedback to Oracle:** A section at the bottom.

https://adb.us-ashburn-1.oraclecloud.com/console/external/oml.html?tenant_name=OCID1.TENANCY.OC1.AAAAAAAEPWMS3HQNM4J2VKS5KZQ6SH234ALQFBKRTZIHCSZKJWX63SQQUQ&database_name=ADW&service_type=ADW or its affiliates. All rights reserved.

Na tela de criação clique em “create”:

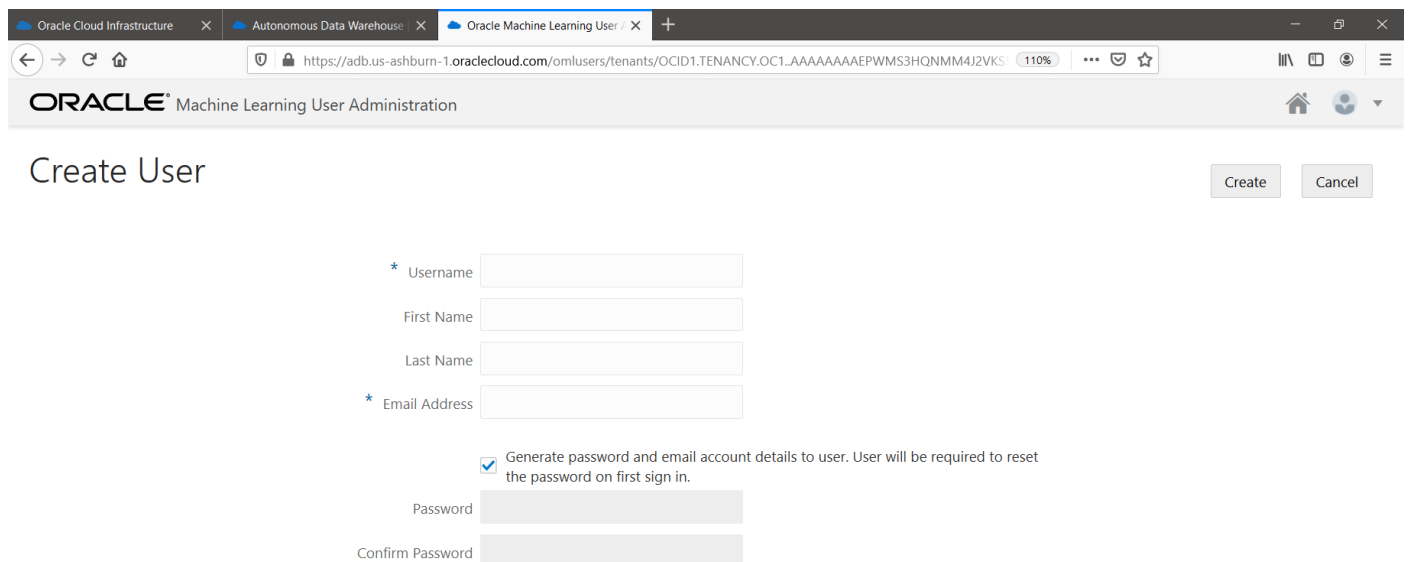
Users

+ Create	X Delete	<input type="checkbox"/> Show All Users	<input type="text" value="Search..."/> 			
User Name	Full Name	Role	Email	Created On	Status	
ADMIN		System Administrator		1/27/20 11:34 PM	Open	

Na página de criação do usuário, digite:

- Username: userml
- Email: um email válido
- Desmarque a opção de generate password
- Digite a senha desejada

E crie seu usuário



The screenshot shows the 'Create User' form in the Oracle Machine Learning User Administration interface. The form includes the following fields and options:

- Username:** A required field (marked with a blue asterisk) for the user's login name.
- First Name:** A field for the user's first name.
- Last Name:** A field for the user's last name.
- Email Address:** A required field (marked with a blue asterisk) for the user's email.
- Generate password and email account details to user. User will be required to reset the password on first sign in.** A checkbox that is currently checked.
- Password:** A field for the user's password.
- Confirm Password:** A field for confirming the password.

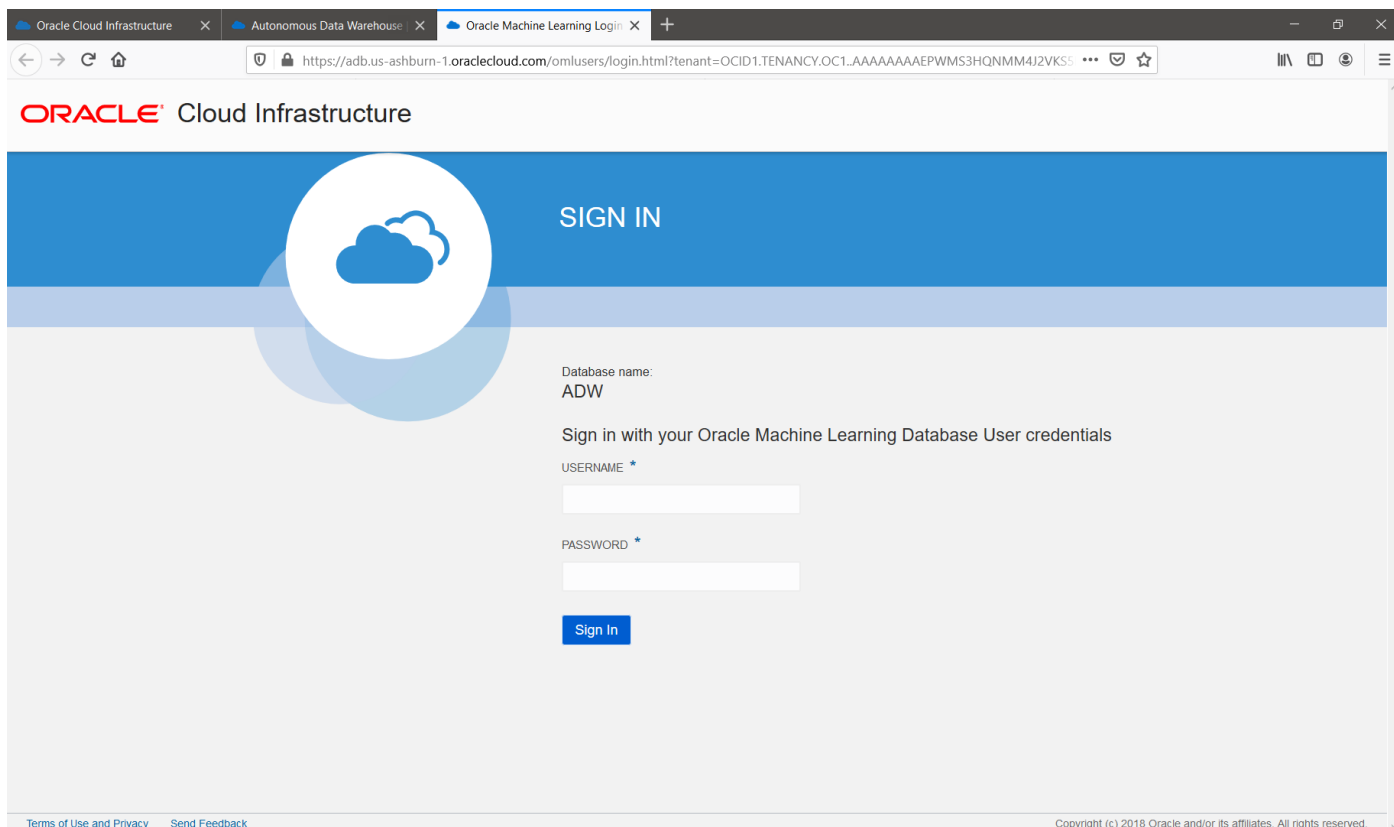
At the top right of the form, there are 'Create' and 'Cancel' buttons.

Após a criação você está apto a criar seu próprio notebook!

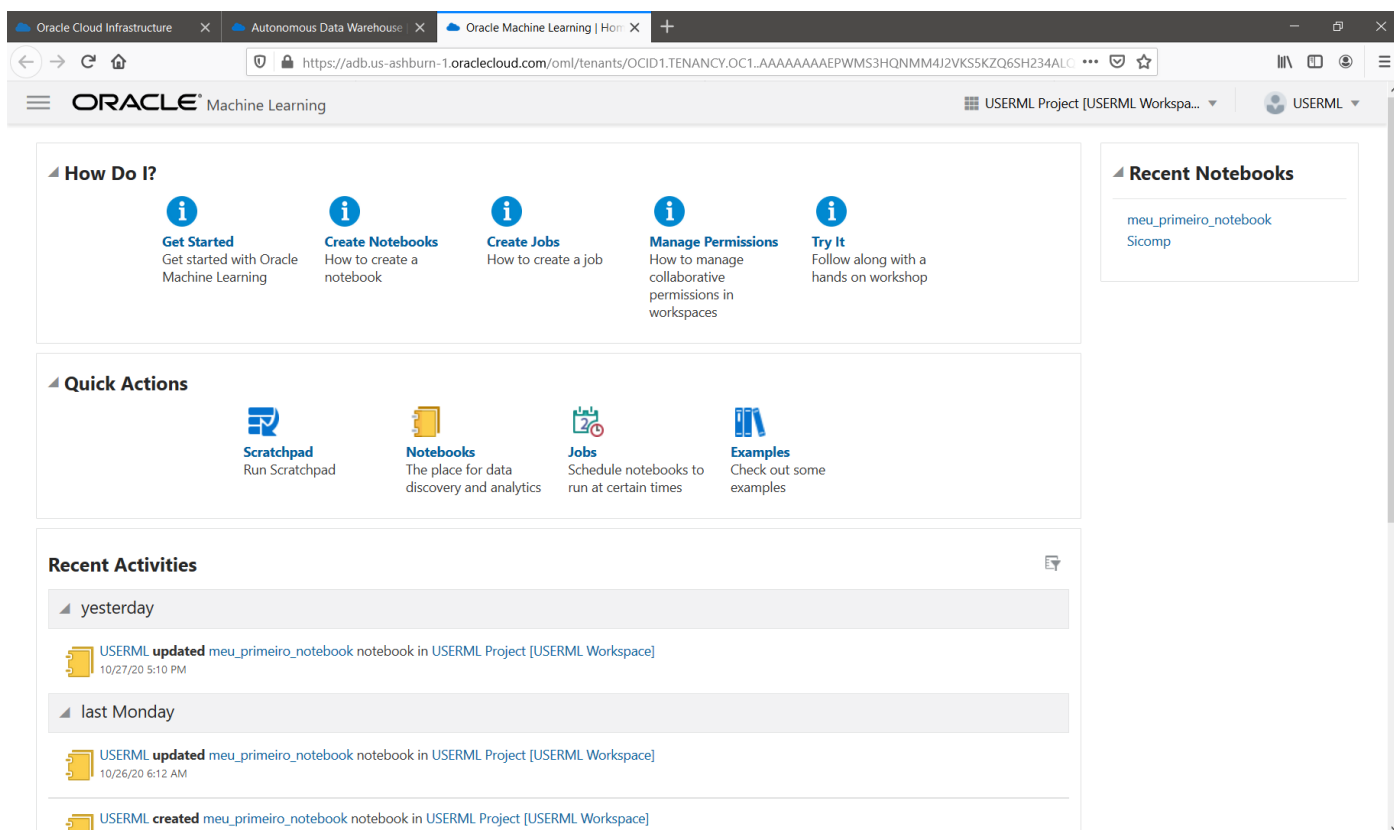
Para criar seu notebook, volte ao “service console” e clique na opção “Oracle Machine Learning Notebooks:”

The screenshot shows the Oracle Cloud console interface. On the left, there is a sidebar with the 'Autonomous Data Warehouse' section expanded, showing 'Overview', 'Activity', 'Administration', and 'Development' (which is highlighted). Below this, 'DATABASE' and 'ADW' are listed. The main content area displays several cards: 'Download Oracle Instant Client', 'Download SODA Drivers', 'Oracle APEX', 'SQL Developer Web', 'Oracle Machine Learning Notebooks' (which is highlighted with a blue border), and 'RESTful Services and SODA'. The 'Oracle Machine Learning Notebooks' card describes OML Notebooks as a collaborative, Apache Zeppelin-based user interface for data scientists and broader SQL users of Autonomous Database. At the bottom of the page, the URL 'https://adb.us-ashburn-1.oraclecloud.com/oml/tenants/OCID1.TENANCY.OC1.AAAAAAAEPWMS3HQNM4J2VKS5KZQ6SH234ALQFBKRTZIH5ZKJWX63SQUQ/databases/ADW/index.html' is visible, along with a copyright notice for 2020.

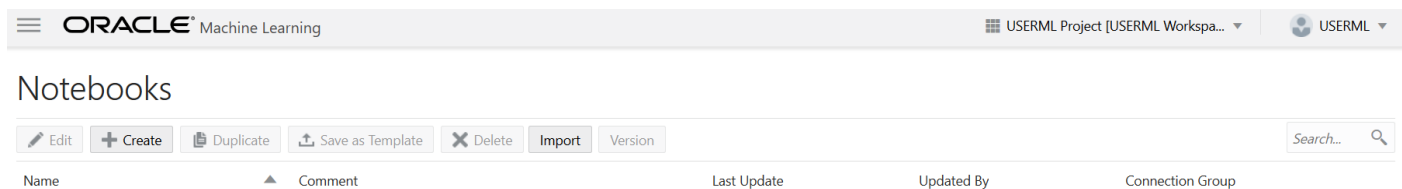
Digite os dados do usuário criado no passo anterior (userml/<senha da sua escolha>):



Na tela inicial do Oracle machine Learning notebooks clique no ícone “Notebooks”:



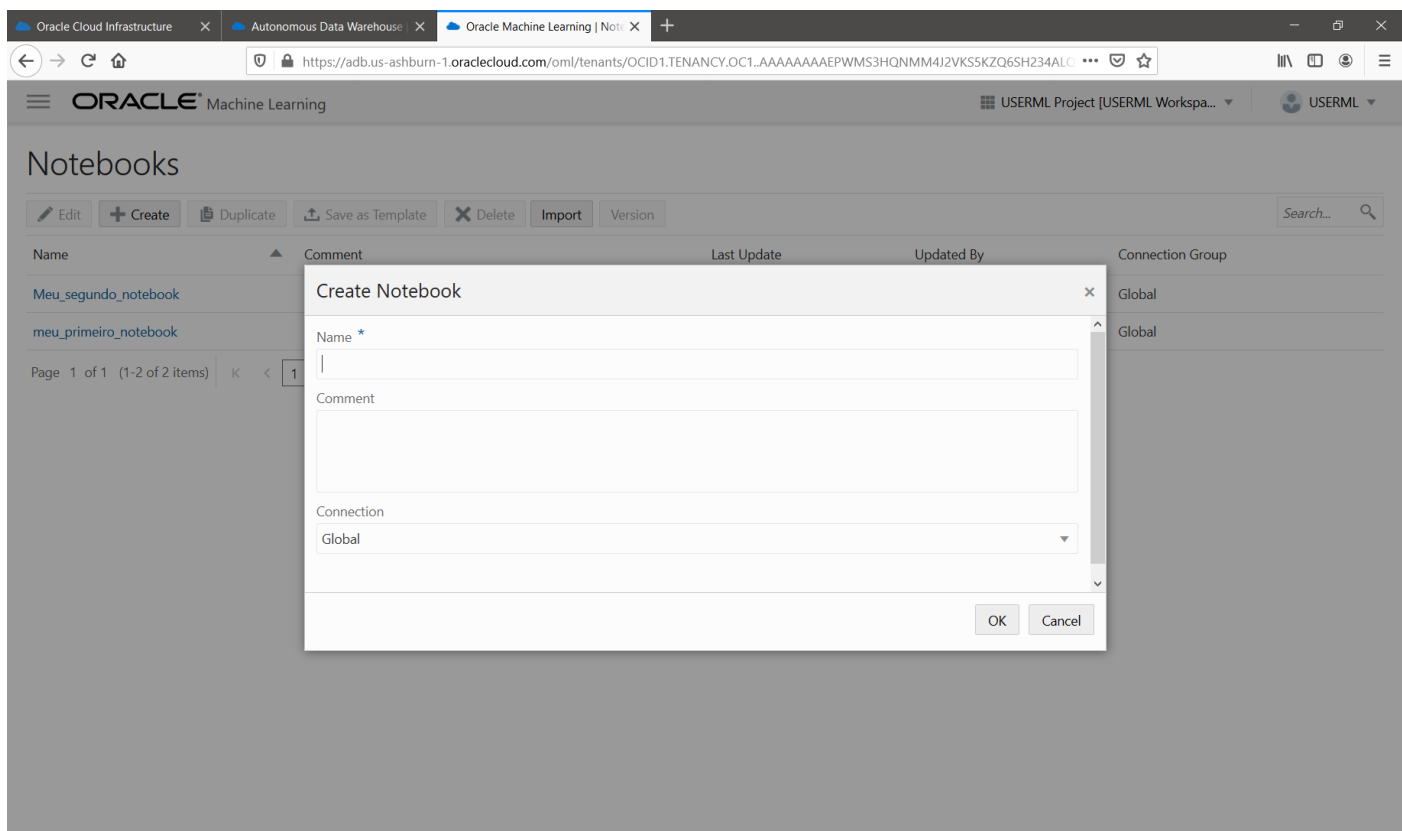
Na página de criação, clique em create:



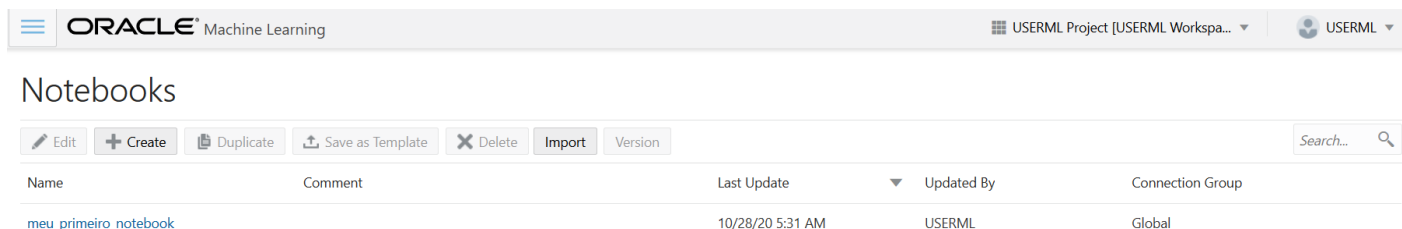
Preencha com as seguintes informações:

- Name: meu_primeiro_notebook

E clique em OK

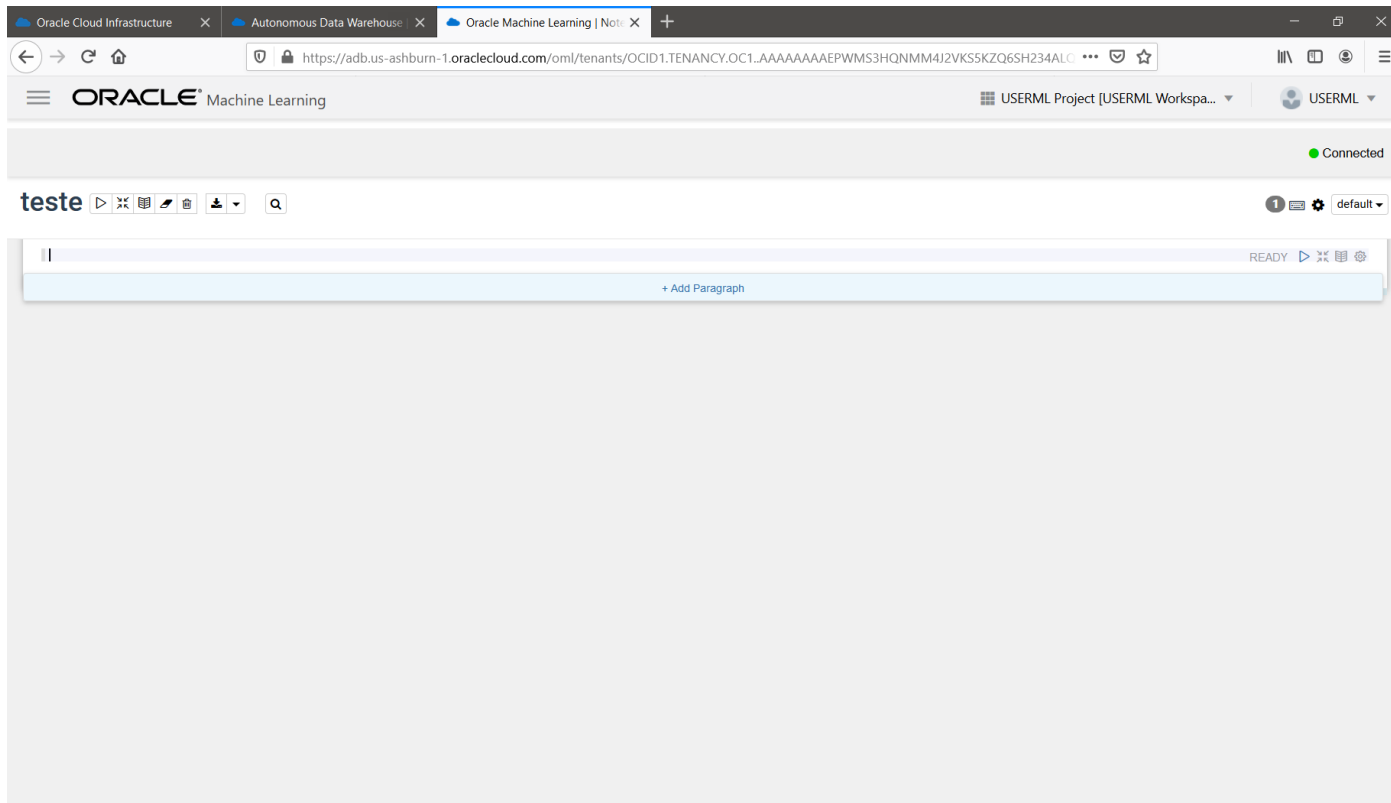


Clique no seu notebook:

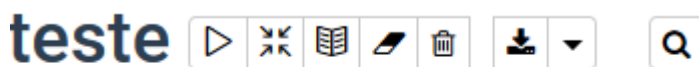


Seu notebook está pronto para ser utilizado, algumas dicas:

- Organização: o notebook é organizado em parágrafos. Em cada um deles você coloca seu trecho de código. Pense em como contar uma história com seus dados, explore!



- Todas as ações que você tomar no canto superior serão executadas para todos os parágrafos:



- As ações que você executar no paragrafo são isoladas (são executadas apenas no paragrafo selecionado):



- A primeira linha do paragrafo indica como você irá executar o parágrafo podendo ser: %sql ou %script

The screenshot displays the Oracle Machine Learning web interface. At the top, there are browser tabs for 'Oracle Cloud Infrastructure', 'Autonomous Data Warehouse', and 'Oracle Machine Learning | Note X'. The address bar shows a URL from 'adb.us-ashburn-1.oraclecloud.com'. The page header includes the 'ORACLE Machine Learning' logo and a 'USERML Project [USERML Workspa...]' dropdown. A 'Connected' status indicator is visible in the top right.

The main content area is titled 'teste' and contains two execution blocks. The first block, labeled '%sql', shows the command 'select sysdate from dual' and the result '2020-10-28 05:42:10'. The second block, labeled '%script', shows the same command and the result '28-OCT-20'. Both blocks indicate they were 'FINISHED' and provide a timestamp for when they were last updated.

SYSDATE
2020-10-28 05:42:10

SYSDATE
28-OCT-20

5.Exemplo de código no Oracle Machine Learning

O exemplo abaixo pode ser copiado / colado separadamente por parágrafos e tem o intuito de apenas você conhecer como minerar dados com SQL. Há um mundo a ser explorado e este é só um exemplo. Explore muito mais em links uteis.

Cada quadrado representa o que deve ser colocado em um paragrafo:

Acessando seu dataset no banco de dados:

```
%script
declare
  v_region      varchar2(30) := '<selecione sua region>';
  v_namespace   varchar2(30) := '<namespace do object storage>';
  v_bucket      varchar2(30) := '<nome do seu bucket>';
  v_table_name  varchar2(30) := 'CASAS';
  v_data_source varchar2(1000) := 'houses_to_rent.csv';
  v_credential   VARCHAR2(100) := 'CRED_OBJ_STORAGE';
  v_url         varchar2(4000);
begin

  v_url :=
'https://swiftobjectstorage.'||v_region||'.oraclecloud.com/v1/'||v_namespace|| '/'||v_bucket|| '/'||v_data_s
ource;

  begin
    execute immediate 'drop table '||v_table_name;
  exception
    when others then
      null;
  end;

  dbms_output.put_line(v_url);

  DBMS_CLOUD.CREATE_EXTERNAL_TABLE(
    table_name => v_table_name,
    credential_name => v_credential,
    file_uri_list => v_url,
    format => json_object('type' value 'csv','ignoremissingcolumns' value 'true', 'delimiter' value ',',
'skipheaders' value '1', 'dateformat' value 'YYYY-MM-DD'),
    column_list => 'id varchar2(4000),
                    city varchar2(4000),
                    area varchar2(4000),
                    rooms varchar2(4000),
                    bathroom varchar2(4000),
                    parking_spaces varchar2(4000),
                    floor varchar2(4000),
                    animal varchar2(4000),
                    furniture varchar2(4000),
                    hoa varchar2(4000),
                    rent_amount varchar2(4000),
                    property_tax varchar2(4000),
                    fire_insurance varchar2(4000),
                    total varchar2(4000)';

);

END;
```

Teste o seu dataset:

```
%sql
select * from casas
```

Configure os parâmetros para o seu modelo:

```
%script
```

```
BEGIN
EXECUTE IMMEDIATE 'CREATE TABLE CONFIG_MODELO (SETTING_NAME VARCHAR2(30), SETTING_VALUE VARCHAR2(4000))';
EXECUTE IMMEDIATE 'INSERT INTO CONFIG_MODELO (SETTING_NAME, SETTING_VALUE) VALUES
(''ALGO_NAME'', ''ALGO_DECISION_TREE'')';
EXECUTE IMMEDIATE 'CALL
DBMS_DATA_MINING.CREATE_MODEL(''MEU_PRIMEIRO_MODELO'', ''CLASSIFICATION'', ''DADOS_TREINO'', ''ID'', ''CITY'',
''CONFIG_MODELO'')';
END;
```

Crie seu modelo:

```
%script
declare
  v_accuracy NUMBER;
begin
  DBMS_DATA_MINING.APPLY(
    model_name => 'MEU_PRIMEIRO_MODELO',
    data_table_name => 'dados_treino',
    case_id_column_name => 'id',
    result_table_name => 'DADOS_TREINO_RESULTADO');

  EXECUTE IMMEDIATE('CREATE VIEW DADOS_TREINO_RESULTADO_view as select id, city from DADOS_TREINO');

  DBMS_DATA_MINING.COMPUTE_CONFUSION_MATRIX(
    accuracy => v_accuracy,
    apply_result_table_name => 'DADOS_TREINO_RESULTADO',
    target_table_name => 'DADOS_TREINO_RESULTADO_view',
    case_id_column_name => 'id',
    target_column_name => 'city',
    confusion_matrix_table_name => 'dados_treino_matriz_confusao'
  );
  DBMS_OUTPUT.PUT_LINE('Acuracia do modelo: ' || v_accuracy);
end;
```

Durante a sessão explicaremos com mais detalhes alguns modelos!

6. Links uteis

- Oracle cloud:
<https://www.oracle.com/cloud/>
- Autonomous Database:
<https://www.oracle.com/autonomous-database/>
- Oracle Machine Learning:
<https://www.oracle.com/data-science/machine-learning.html>
- Oracle Data Mining:
<https://docs.oracle.com/en/database/oracle/oracle-database/18/dmcon/data-mining-concepts.pdf>