



Oracle OpenWorld 2019

SAN FRANCISCO



HOL4721

Hands-on Lab Oracle Machine Learning

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Safe Harbor

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Our Goal

Provide machine learning technology that is automated, scalable, and high performance across Oracle Autonomous Database, Big Data, and broader Oracle On-Premises and Cloud environments

Enable fast and easy machine learning model deployment for applications and dashboards

Leverage modern, powerful APIs including REST, SQL, R, and Python

HOL4721 Hands-on Lab

Oracle Machine Learning

In this introductory hands-on-lab, try out the new Oracle Machine Learning Zeppelin-based notebooks that come with Oracle Autonomous Database. Oracle Machine Learning extends Oracle's offerings in the cloud with its collaborative notebook environment that helps data scientist teams build, share, document, and automate data analysis methodologies that run 100% in Oracle Autonomous Database. Interactively work with your data, and build, evaluate, and apply machine learning models. Import, export, edit, run, and share Oracle Machine Learning notebooks with other data scientists and colleagues. Share and further explore your insights and predictions using the Oracle Analytics Cloud.

SPEAKERS: Mark Hornick, Senior Director, Data Science and Machine Learning, Oracle
Marcos Arancibia Coddou, Product Manager, Oracle Data Science and Big Data, Oracle
Charlie Berger, Sr. Director Product Management, Machine Learning, AI and Cognitive Analytics, Oracle

Session Code: HOL4721

Topic: Innovate in the Cloud

Job Role: Data Scientist

Products and Solutions A–Z: Big Data, Autonomous Database, Internet of Things (IoT)

Session Type: HOL (Hands-on Lab) Session

Monday, September 16, 02:30 PM - 03:30 PM

Tuesday, September 17, 11:15 AM - 12:15 PM

Wednesday, September 18, 09:00 AM - 10:00 AM

Thursday, September 19, 01:30 PM - 02:30 PM



Oracle Machine Learning Notebooks

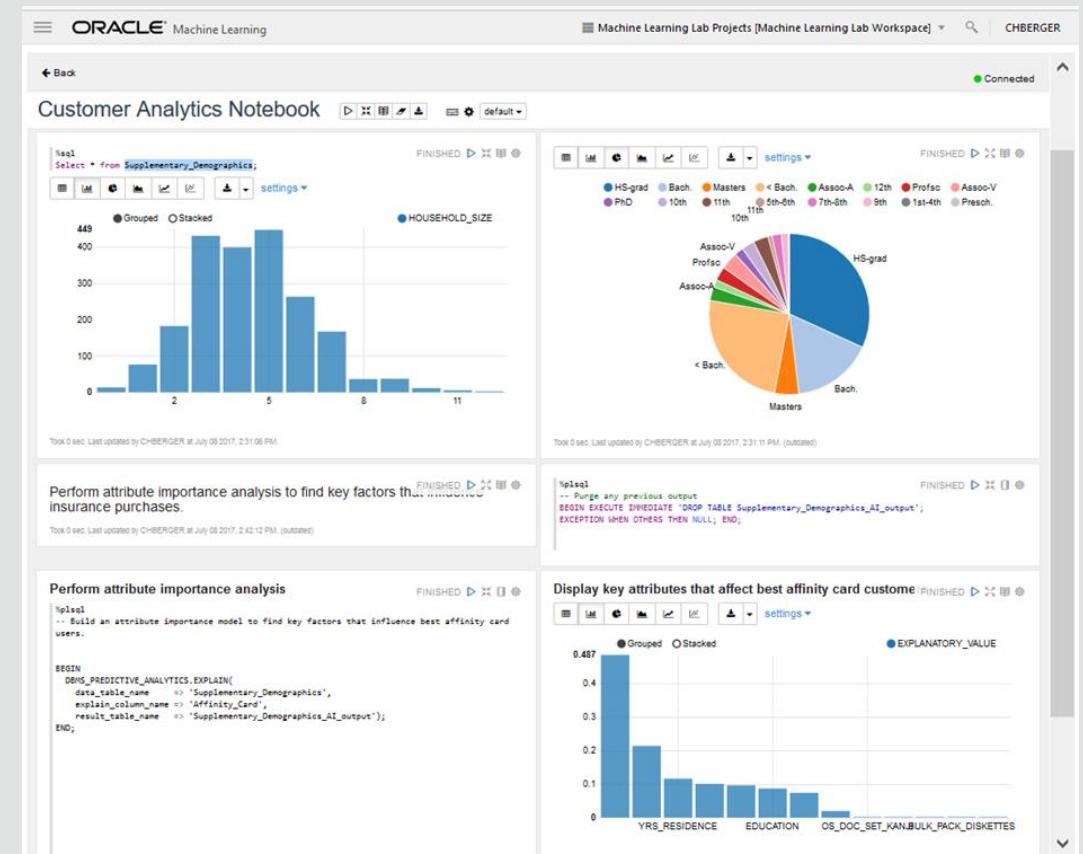
Autonomous Database + Machine Learning Platform

Collaborative UI

- Based on Apache Zeppelin
- Supports data scientists, data analysts, application developers, DBAs
- Easy sharing of notebooks and templates
- Permissions, versioning, and execution scheduling

Included with Autonomous Database

- Automatically provisioned, managed, backed up
- In-database SQL algorithms and analytics functions
- Supports deployment of ML analytics via ORDS (Oracle REST Data Services)
- Soon to be augmented with Python and R



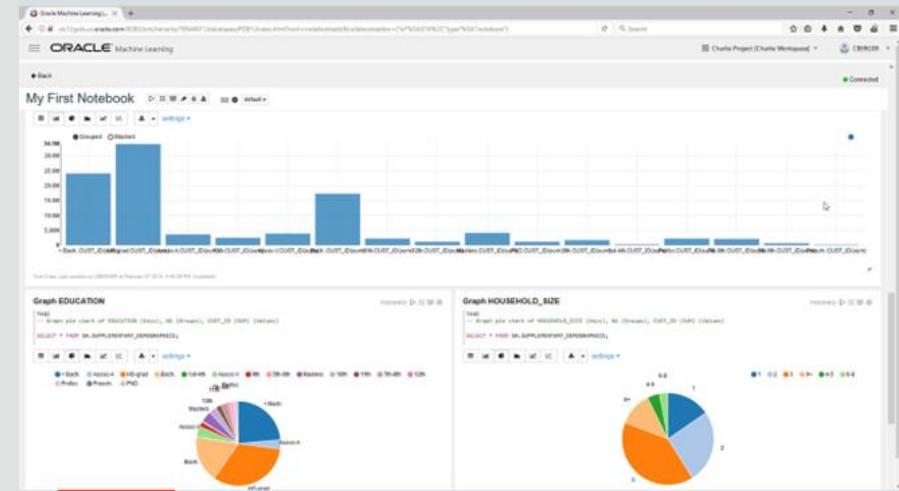
HOL: Oracle Machine Learning



HOL Environments

- VM instances on laptops + Firefox browser
- Oracle Autonomous Database + Oracle Machine Learning
- https://dgcameron.github.io/adwcml_oow/?page=README.md

Quick Oracle Machine Learning Demo

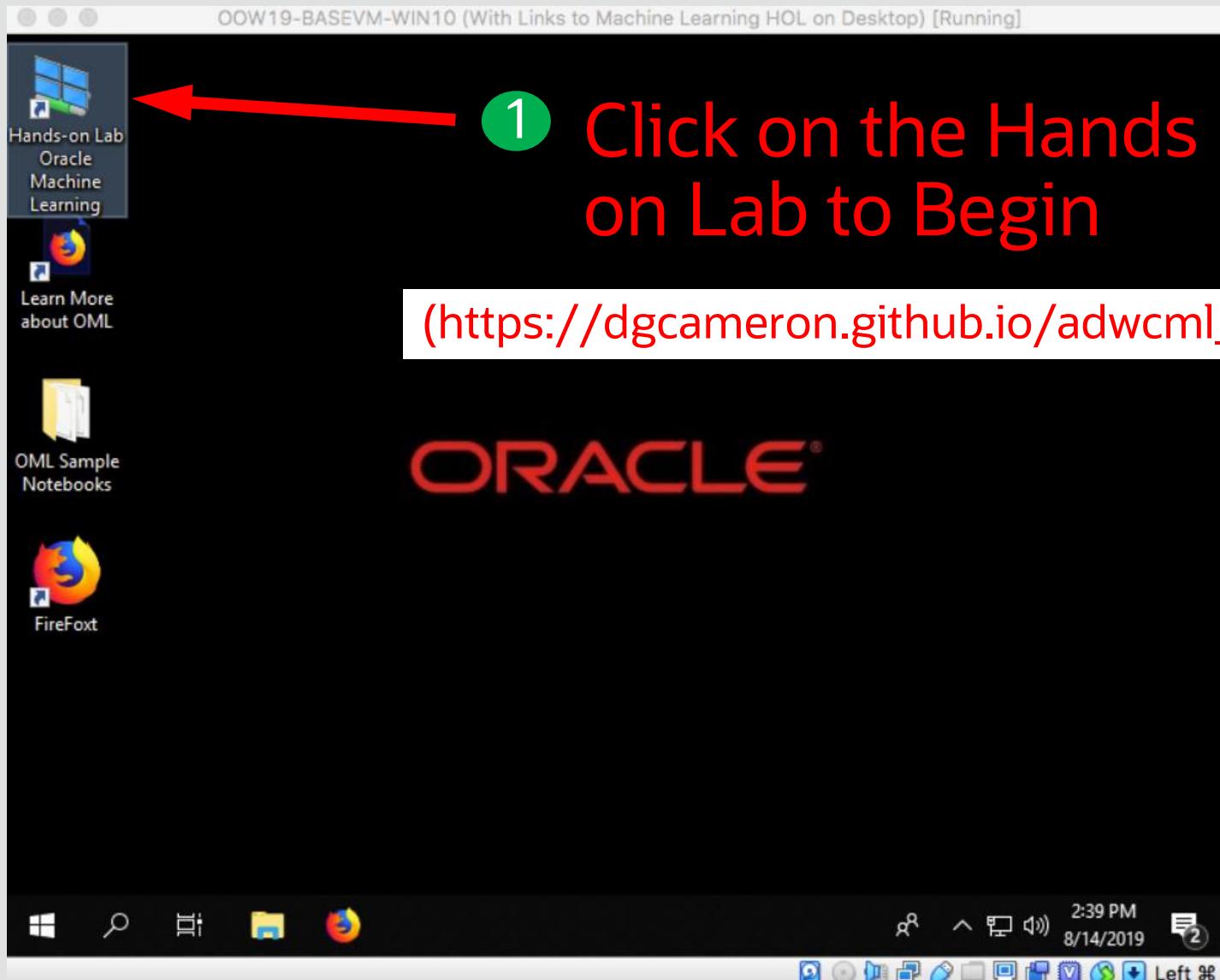


Review and run the Notebooks

- Review OML Example Notebooks
- Do the Credit Scoring Workshop (link from desktop)
- <https://oracle.github.io/learning-library/workshops/adwc4dev/?version=Self-Guided&page=L300.md&elqTrackId=e57daae9db8d44bfac4a9e6614175e5a&elqaid=82487&elqat=2>
- Instructors available to help with HOL and to answer any ML questions



Start the OML Hands on Lab to Begin



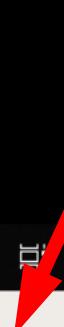


OML Sample Notebooks

FireFox

ORACLE®

- 1 If you don't see "Hands on Lab Oracle Machine Learning" Firefox bookmark on desktop, scroll to bottom and launch the HOL4721 VM image.



HOL4721 [Running] - Oracle VM Vir...

Oracle OpenWorld 2019 - Mozilla Fi...

Oracle VM VirtualBox Manager

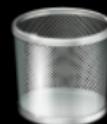
Oracle VM VirtualBox Manager



Applications Places



Home



Trash



Oracle VM VirtualBox

- 1 If you don't see "Hands on Lab Oracle Machine Learning" Firefox bookmark on desktop, launch Oracle VM and click on HOL4721 image.



Applications Places Oracle VM VirtualBox

1 If you don't see "Hands on Lab Oracle Machine Learning" Firefox bookmark on desktop, launch the HOL4721 VM image.

Oracle VM VirtualBox Manager

File Machine Help

Tools

Trash

ROOM3021-BAS VM Powered Off

HOL4721 Running

HOL4722 Powered Off

HOL4723 Powered Off

New Settings Discard Show

General

Name: HOL4721
Operating System: Windows 10 (64-bit)
Settings File Location: /home/lab/VirtualBox VMs/HOL4721

System

Base Memory: 8192 MB
Processors: 2
Boot Order: Floppy, Optical, Hard Disk
Acceleration: VT-x/AMD-V, Nested Paging, Hyper-V Paravirtualization

Display

Video Memory: 128 MB
Graphics Controller: VBoxSVGA
Remote Desktop Server: Disabled
Recording: Disabled

Storage

Controller: SATA
SATA Port 0: OOW19-BASEVM-WIN10-disk001.vdi (Normal, 50.00 GB)
SATA Port 1: [Optical Drive] Empty

Audio

Host Driver: PulseAudio
Controller: Intel HD Audio

Preview

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lab@events21.oracleworld.com - TightVNC Viewer

Oracle Workshops

https://dgcameron.github.io/adwcml_oow/?page=README.md

HOL4721 Hands-on Lab Oracle Machine Learning - README.md

https://dgcameron.github.io/adwcml_oow/?page=README

HOL4721 Hands-on Lab Oracle Machine Learning

Welcome to the OOW'19 HOL4721 Hands-on Lab Oracle Machine Learning. This one hour workshop provides an introduction to Oracle Machine Learning in the AI Cloud. However we encourage you to get a FREE trial account that comes with ALL the Oracle Cloud Services, and run through a more comprehensive hands on workshop. Instructions on how to get a trial account AFTER this workshop.

Presentation

[Click to Download](#)

[Machine Learning HOL Presentation](#)

Navigate to Machine Learning Lab

- Once the setup is complete you can move on to the Machine Learning lab by clicking on the Menu Icon in the upper left corner of the browser window and then selecting Oracle Machine Learning. You're now ready to continue with the Machine Learning Lab.

Session Catalog | Oracle OpenW... x | Machine Learning x | Machine Learning for R x | Oracle Workshops x +

dgcameron.github.io/adwclm_oow/?page=README.md

Paused

Apps OTN ADWC4PM Oracle... Oracle Machine Lea... ADWC4PM Charlie... Machine Learning Go to ADWC Trial... Oracle Machine Lea... oracle-db-example... Other bookmarks

https://cloud.oracle.com/en_US/sign-in

Workshop Contents

1 Click on Oracle Machine Learning Lab

721 Hands-on Lab Oracle Machine Learning

The OOW'19 HOL4721 Hands-on Lab Oracle Machine Learning. This one hour workshop provides an introduction to Oracle Machine Learning in the Autonomous Database. However we encourage you to get a **FREE** trial account that comes with ALL the Oracle Database features, and run through a more comprehensive hands on workshop (see below for instructions on how to get a trial account **AFTER** completing this workshop).

Introduction
Landing Page

Oracle Machine Learning
Oracle Machine Learning Lab

CLOSE MENU

ation

ownload

ning HOL Presentation

Get Started with Oracle Machine Learning Lab

Once the setup is complete you can move on to the Machine Learning lab by clicking on the Menu Icon in the upper left corner of the window and then selecting Oracle Machine Learning. You're now ready to continue with the Machine Learning Lab.

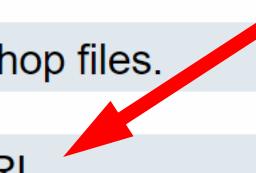
Instructions

+ Expand All Steps

- + Download your workshop files.
- + Retrieve your login URL.
- Log into Oracle Machine Learning.
 - Enter your userid with password xxxxxxxx.
 - Note that you can run sql statements, run sql scripts (pl/sql blocks), work with Apache Zeppelin Notebooks, schedule notebooks to run at specified times, and review examples of notebooks. Note that the examples are review only. To work with the examples you need to first export and then import them to be updatable. Lets take a look at the examples. Select Examples to review sample content.

1

Expand to see your login URL



The screenshot shows the Oracle Machine Learning web interface. At the top, there's a navigation bar with the Oracle logo and 'Machine Learning'. Below it is a main dashboard area with several sections:

- Quick Actions:** Includes 'Run SQL Statements' (with a note about running SQL statements), 'Run SQL Scripts' (with a note about entering and running SQL scripts), 'Notebooks' (with a note about data discovery and analytics), 'Jobs' (with a note about scheduling notebooks to run at certain times), and 'Examples' (with a note about checking out sample content).
- Learning Resources:** A section for learning resources.
- Recent Notebook:** A section showing 'Nothing to Display'.

A red arrow points from the 'Examples' button in the 'Quick Actions' section towards the 'Expand to see your login URL' text above.

Instructions

+ Expand All Steps

+ Download your workshop files.

- Retrieve your login URL.

- To support this workshop we have pre-provisioned several Autonomous Data Warehouse instances, and have allocated userids user01 - user80. Use your assigned login url and userid to sign into Machine Learning. The password for everyone will be `xxxxxx`. Locate your assigned Machine Learning URL and click on that.

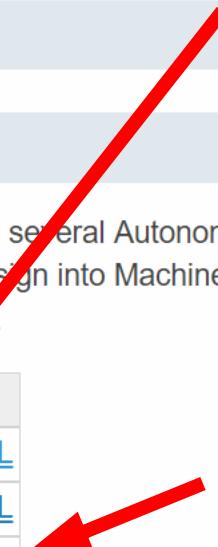
Machine Learning userid	Machine Learning Login
user01 - user15	Machine Learning Login URL
user16 - user30	Machine Learning Login URL
user31 - user45	Machine Learning Login URL
user46 - user60	Machine Learning Login URL

- Log into Oracle Machine Learning.

- Enter your userid with password `xxxxxx`.
- Note that you can run sql statements, run sql scripts (pl/sql blocks), work with Apache Zeppelin Notebooks, schedule notebooks to run at specified times, and review examples of notebooks. Note that the examples are review only. To work with the examples you need to

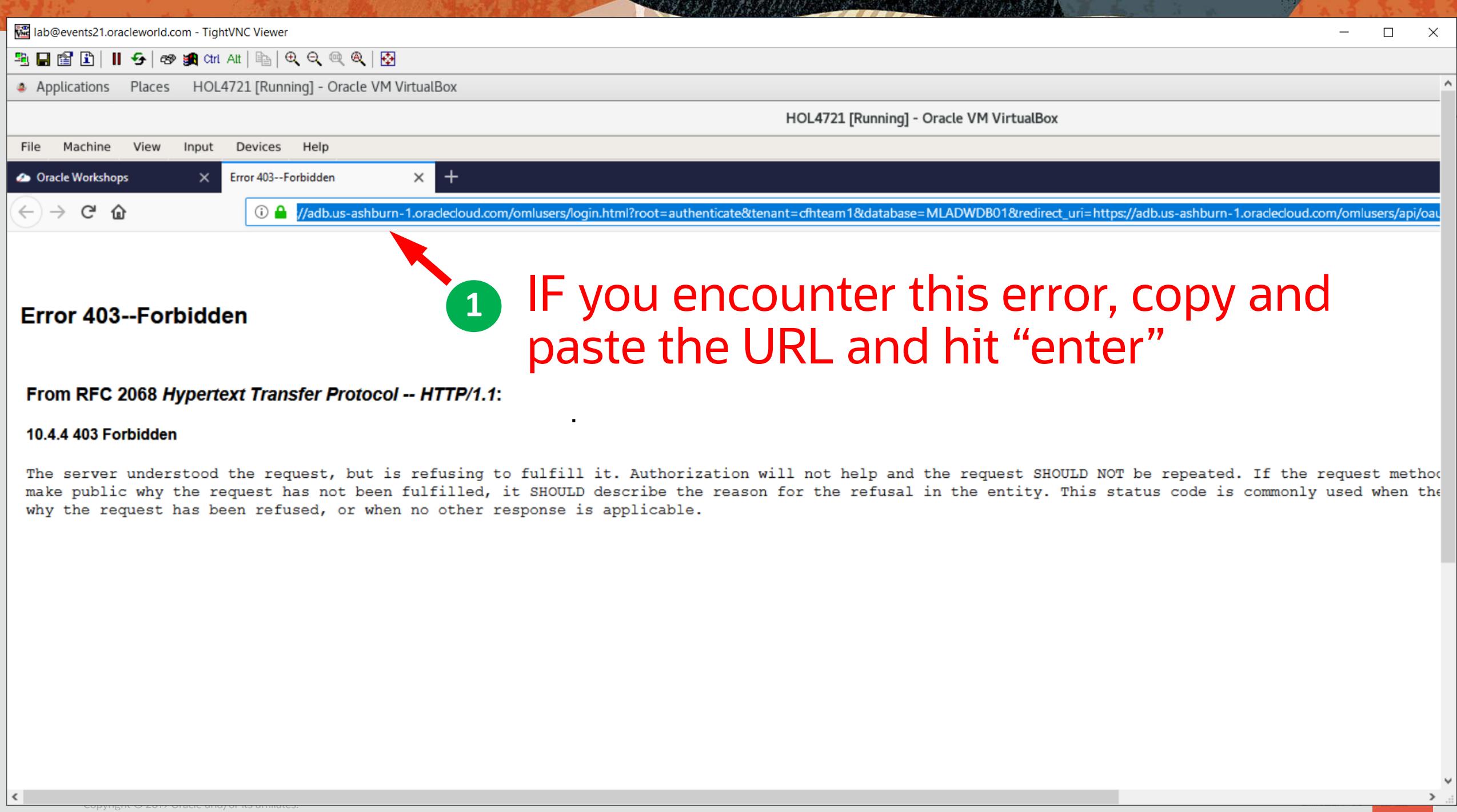
You will count off in your seats from 1-60 and be assigned a number.

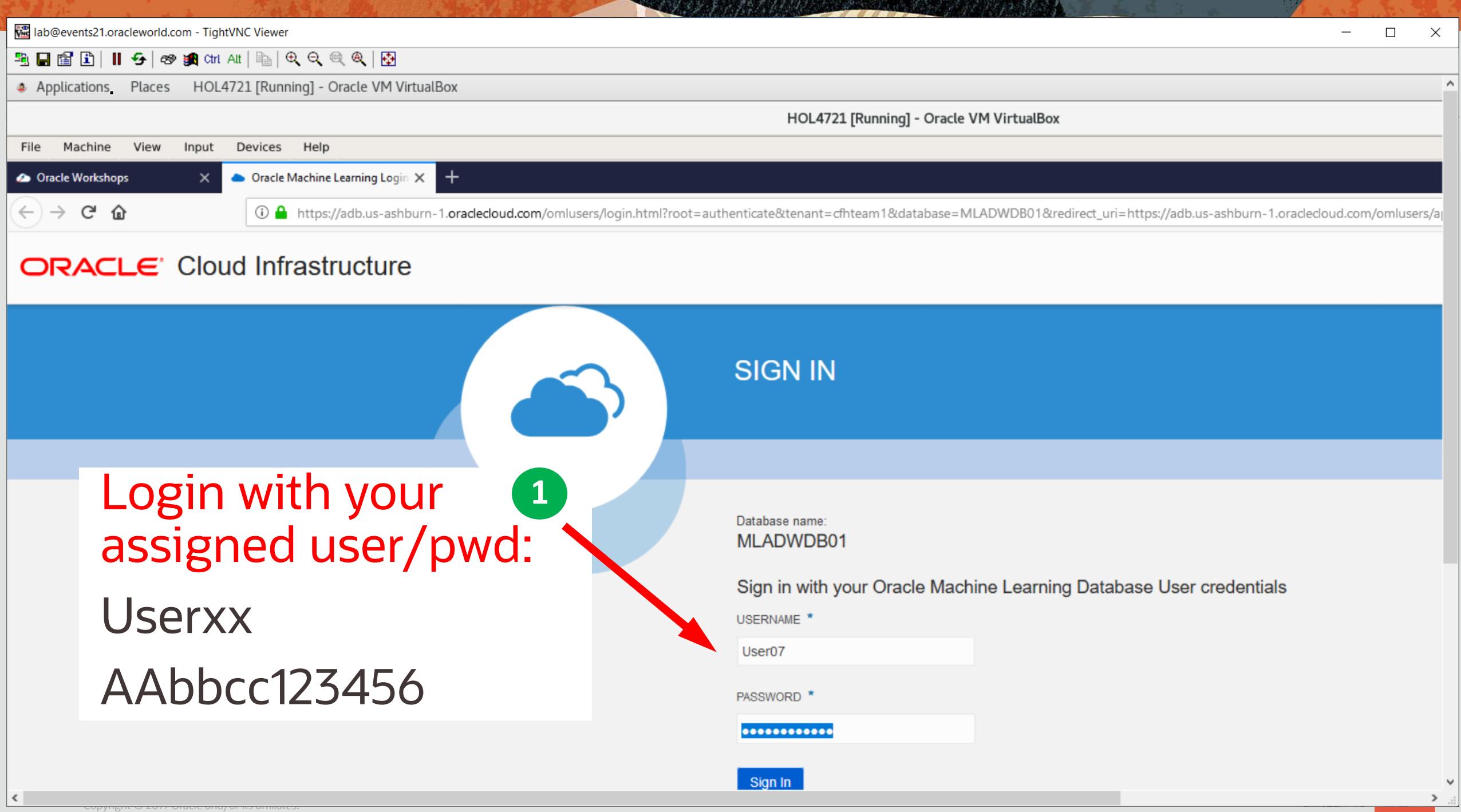
1



2

Based on your assigned seat number, go to the shared ADW and OML instances





Oracle Cloud Infrastructure X Oracle Cloud Infrastructure X Autonomous Data Ware... Oracle Machine Learning X Oracle Machine Learning X Oracle Machine Learning X Oracle Machine Learning X

https://adb.us-ashburn-1.oraclecloud.com/oml/tenants/OCID1.TENANCY.OC1.AAAAAAA/ 90% ... Search

Most Visited Oracle Data Mining 17... Oracle Cloud Infrastru... Autonomous Data Wa... Oracle Machine Learnin...

ORACLE Oracle Data Mining 17.2 OBE Series https://apexapps.oracle.com/pls/apex/f?p=...O:P24_CONTENT_ID,P24_PREV_PAGE:11925,1

USER007 Project [USER007 Works... USER007 Connected

My First Notebook

Oracle Machine Learning Notebooks: My First Notebook Example

In this notebook you will learn basic notebook behavior and SQL functions using the Sales History (SH) schema data. These examples highlight basic data selection and data viewing using Oracle Machine Learning.

Updated August 2019 By Charlie Berger, Dhvani Sheth, Siddeshwari Patel
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Took 0 sec. Last updated by USER07 at August 13 2019, 12:36:08 PM.

Select Project

1 Select (or Create new) Project

OML Projects

+ Create Edit Delete

Name	Created By	Type	Comment
USER007 Workspace	USER007	Workspace	
USER007 Project	USER007	Project	

Search... OK Cancel

List all tables in the SH schema

```
%sql
```

```
SELECT OWNER, TABLE_NAME, TABLESPACE_NAME, STATUS FROM ALL_TABLES WHERE OWNER = 'SH';
```

OWNER TABLE_NAME TABLESPACE_NAME STATUS

OWNER	TABLE_NAME	TABLESPACE_NAME	STATUS
SH	SALES	SAMPLESCHEMA	VALID
		SAMPLESCHEMA	VALID

https://apexapps.oracle.com/pls/apex/f?p=44785:24:101833940762517::NO:P24_CONTENT_ID,P24_PREV_PAGE:11925,1

Oracle Machine Learning |... +

slc12gwb.us.oracle.com:8080/oml/tenants/TENANT1/databases/PDB1/index.html

Search

ORACLE® Machine Learning Charlie Project [Charlie Workspace] CBERGER

OML Home Page

Quick Actions

- Run SQL Statement**
Enter and run SQL statements.
- Create a SQL Script**
Create and run SQL scripts.
- Go to Notebooks**
The place for data discovery and analytics.

- Go to Jobs**
Automate notebooks to run at certain times.
- Go to Gallery**
Check some notebooks.

Recent Activities

Nothing to Display

Learning Resources

- How to create a Notebook
- How to create a Job
- How to manage collaborative permissions in Workspaces

Recent Notebook

- My First Notebook
- Classification Prediction Model
- Clustering
- Attribute Importance
- Association Rules
- Anomaly Detection
- SQL Statistical Functions
- Regression _1

1 Click on “Go to Notebooks”

OML Home Page After Usage

Quick Actions



Run SQL Statements
Enter and run SQL statements



Run SQL Scripts
Enter and run SQL scripts



Notebooks
The place for data discovery and analytics



Jobs
Schedule notebooks to run at certain times



Examples
Check out some examples

Recent Activities

today

Charlie Berger updated My First Notebook notebook in Charlie Project [Charlie Workspace]
1/20/19 10:09 PM

last Friday

Charlie Berger updated Credit Score Predictions notebook in Charlie Project [Charlie Workspace]

last Thursday

Charlie Berger updated LTV Targeting using Credit Score 100K data notebook in Charlie Project [Charlie Workspace]
1/17/19 7:52 PM

Charlie Berger updated Credit Score Predictions notebook in Charlie Project [Charlie Workspace]
1/17/19 6:54 PM

Charlie Berger updated Time Series Forecasting notebook in Charlie Project [Charlie Workspace]
1/17/19 6:36 PM

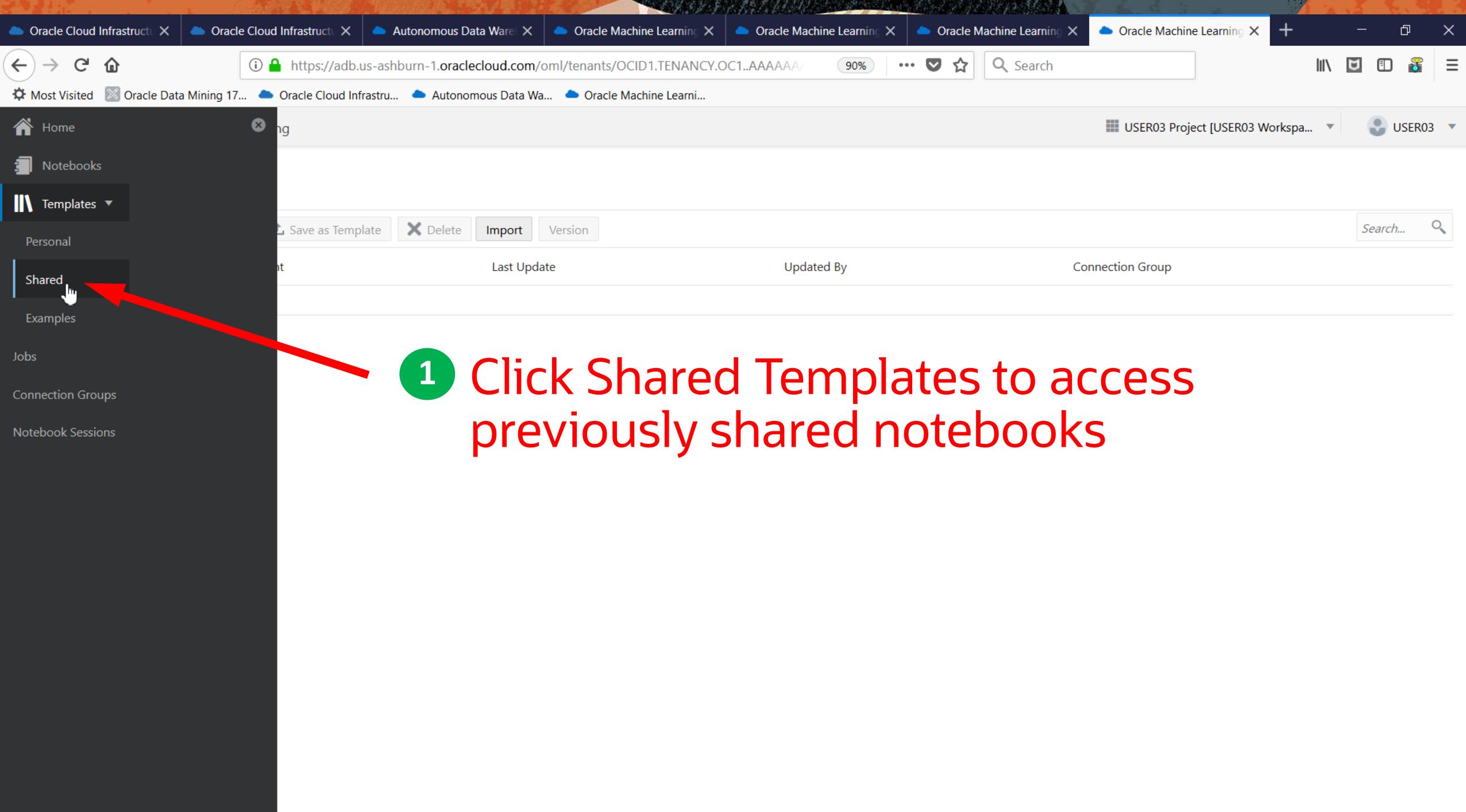
Learning Resources

Recent Notebook

My First Notebook
Credit Score Predictions
LTV Targeting using Credit Score 100K data
Time Series Forecasting
OML Microservices
[See More...](#)

1

Click on the 3 horizontal “hamburger” icon



- 1 Click Shared Templates to access previously shared notebooks

Oracle Cloud Infrastructure X Oracle Cloud Infrastructure X Autonomous Data Ware... Oracle Machine Learning X Oracle Machine Learning X Oracle Machine Learning X Oracle Machine Learning X

https://adb.us-ashburn-1.oraclecloud.com/oml/tenants/OCID1.TENANCY.OC1.AAAAAAA/ 80% ... Search

Most Visited Oracle Data Mining 17... Oracle Cloud Infrastr... Autonomous Data Wa... Oracle Machine Learnin...

ORACLE® Machine Learning USER03 Project [USER03 Workspa... USER03

Shared Templates

2 Click Create Notebook to add a copy of that notebook into your own Project space.

+ Create Notebook Edit Delete Search by ...

Anomaly Detection
Author: USER07 Date Added: 8/13/19 11:31 PM 0 Likes 0 0

Association Rules
Author: USER07 Date Added: 8/13/19 11:32 PM 0 Likes 1 1

Attribute Importance
Author: USER07 Date Added: 8/14/19 6:00 PM 1 Likes 3 4

Classification Prediction M...
Author: USER07 Date Added: 8/13/19 11:32 PM 1 Likes 0 0

Clustering
Author: USER07 Date Added: 8/13/19 11:33 PM 1 Likes 0 0

Credit Score Predictions W...
Author: USER07 Date Added: 8/14/19 7:31 PM 0 Likes 0 0

Credit Score Predictions W...
10k version Author: USER07 Date Added: 8/16/19 8:03 PM 0 Likes 0 1

Credit Score Predictions W...
10k version Author: USER07 Date Added: 8/16/19 7:55 PM 0 Likes 0 2

My First Notebook
Author: USER07 Date Added: 8/13/19 11:37 PM 0 Likes 3 4

Regression
Author: USER07 Date Added: 8/13/19 11:34 PM 0 Likes 1 0

SQL Query Scratchpad
Author: USER07 Date Added: 8/13/19 11:51 PM 0 Likes 0 0

SQL Script Scratchpad
Author: USER07 Date Added: 8/13/19 11:35 PM 0 Likes 0 0

SQL Statistical Functions
Author: USER07

Targeting Top Customers 1...
100K version Author: USER07

Time Series Forecasting
Author: USER07

1 Select a notebook (one at a time)

The screenshot shows the Oracle Machine Learning Shared Templates page. At the top, there's a navigation bar with tabs for Oracle Cloud Infrastructure, Oracle Machine Learning, and Oracle Data Mining. Below the navigation is a search bar and a user profile for 'USER03'. The main content area displays a grid of shared notebooks. One specific notebook, 'My First Notebook', is highlighted with a red box and a red arrow pointing to it from a green circle labeled '1'. Another red arrow points from a green circle labeled '2' to the 'Create Notebook' button in the top left of the page. The notebooks listed include 'Anomaly Detection', 'Association Rules', 'Attribute Importance', 'Classification Prediction M...', 'Clustering', 'Credit Score Predictions W...', 'Credit Score Predictions W...', 'Credit Score Predictions W...', 'Regression', 'SQL Query Scratchpad', 'SQL Script Scratchpad', 'SQL Statistical Functions', 'Targeting Top Customers 1...', and 'Time Series Forecasting'. Each notebook card shows its title, author (USER07), date added, and interaction metrics like likes, comments, and file attachments.

Notebooks

OML Notebooks you should explore

 Edit  Create  Duplicate  Save as Template  Delete  Import Version

Search...

Name	Comment	Last Update	Updated By	Connection Group
Anomaly Detection		8/30/19 5:42 PM	USER07	Global
Association Rules		8/15/19 5:17 PM	USER07	Global
Attribute Importance		8/15/19 5:19 PM	USER07	Global
Classification Prediction Model		8/16/19 10:57 AM	USER07	Global
Clustering		8/16/19 10:58 AM	USER07	Global
Credit Score Predictions Workshop 300	OOW19 HOL notebook	8/15/19 6:30 PM	USER07	Global
Credit Score Predictions Workshop 300 10K Samp...	10K version	8/31/19 12:39 PM	USER07	Global
My First Notebook		8/30/19 10:24 PM	USER07	Global
Regression		8/16/19 11:00 AM	USER07	Global
SQL Query Scratchpad		8/13/19 6:52 PM	USER07	Global
SQL Script Scratchpad		8/13/19 6:52 PM	USER07	Global
SQL Statistical Functions		8/16/19 11:01 AM	USER07	Global
Targeting Top Customers	100K version	8/16/19 11:13 AM	USER07	Global
Targeting Top Customers 10K	10K version	8/22/19 9:58 AM	USER07	Global
Time Series Forecasting		8/16/19 11:02 AM	USER07	Global

Autonomous Data Warehouse | X Oracle Machine Learning User / X Oracle Machine Learning | Note X

https://adb.us-ashburn-1.oraclecloud.com/oml/tenants/OCID1.TENANCY.OC1.AAAE... 90% ... Search

Most Visited Oracle Data Mining 17... Autonomous Data Wa... Oracle Machine Learn...

ORACLE® Machine Learning Oracle Machine Learning Hands ... CHARLIE

Notebooks

Name	Comment	Last Update	Updated By	Connection Group
Attribute Importance		8/16/19 8:06 PM	CHARLIE	Global
Credit Score Predictions Workshop 300 10K Samp...	10k version	8/16/19 8:07 PM	CHARLIE	Global
My First Notebook		8/16/19 8:06 PM	CHARLIE	Global

At end, please clean up for the next student.
Select all and DELETE your notebooks

Autonomous Data Warehouse | X Oracle Machine Learning User / X Oracle Machine Learning | Note X

https://adb.us-ashburn-1.oraclecloud.com/oml/tenants/OCID1.TENANCY.OC1.AAAE... 90% ... Search

Most Visited Oracle Data Mining 17... Autonomous Data Wa... Oracle Machine Learni...

ORACLE® Machine Learning Oracle Machine Learning Hands ... CHARLIE

Notebooks

Edit Create Duplicate Save as Template Delete Import Version Search...

Name	Comment	Last Update	Updated By	Connection Group
Attribute Importance		8/16/19 8:06 PM	CHARLIE	Global
Credit Score Predictions Workshop 300 10K Samp... 10k version		8/16/19 8:07 PM	CHARLIE	Global
My First Notebook		8/16/19 8:06 PM	CHARLIE	Global

Delete Selected

Do you want to delete the selected (3) Notebooks?

OK Cancel

At end, please clean up for the next student.
Select all and DELETE your notebooks



Note: Example Templates are READ ONLY

Example Templates

[+ Create Notebook](#)

Search by...

Two options for use:

- 1) Export and import into your own workspace
- 2) Use shared templates

Anomaly Detection

This notebook shows how to detect...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'Anomaly Detection' 'Machine...

5 Likes 1601 76

Association Rules

Notebook to show the use of Assoc...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'SQL' 'Associations' 'Rules' 'M...

2 Likes 772 106

Attribute Importance

Notebook to identify key attributes...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'SQL' 'Attribute Importance' 'K...

2 Likes 530 29

Classification Prediction M...

Example notebook to predict custo...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'Classification' 'Prediction' 'De...

3 Likes 1024 97

Clustering

This notebook shows how to identi...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'Clustering' 'K-Means' 'Expect...

1 Likes 598 35

My First Notebook

Oracle Machine Learning example ...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'SQL' 'Data' 'Graph'

4 Likes 914 27

Regression

This notebook shows how to predic...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'Regression' 'SVM' 'GLM' 'Logi...

1 Likes 838 31

Statistical Function

Oracle Machine Learning example ...

Author:

Date Added: 2/13/18 11:16 PM

Tags: 'Statistics' 'ANOVA' 'T-test' 'F...

2 Likes 356 11

Time Series Forecasting

Oracle Machine Learning supports ...

Author:

Date Added: 9/5/19 4:14 AM

Tags: 'Prediction' 'Time Series' 'ESM'

0 Likes 1 0

Autonomous Data Warehouse | X Oracle Machine Learning User / X Oracle Machine Learning User / X Oracle Machine Learning | Shar X

https://adb.us-ashburn-1.oraclecloud.com/oml/tenants/OCID1.TENANCY.OC1.AAAAA/ 90% ... Search

Most Visited Oracle Data Mining 17... Autonomous Data Wa... Oracle Machine Learni...

Shared Ten Oracle Data Mining 17.2 OBE Series https://apexapps.oracle.com/pls/apex/f?p=44785:24:101833940762517::NO:P24_CONTENT_ID,P24_PREV_PAGE:11925,1

+ Create Notebook Edit Delete

Better method: Use Shared Templates

Search by...

Anomaly Detection Author: USER07 Date Added: 8/13/19 11:31 PM 0 Likes 0 0 2

Association Rules Author: USER07 Date Added: 8/13/19 11:32 PM 0 Likes 1 1 1 1

Attribute Importance Author: USER07 Date Added: 8/14/19 6:00 PM 1 Likes 3 2

Classification Prediction M... Author: USER07 Date Added: 8/13/19 11:32 PM 1 Likes 0 0

Clustering Author: USER07 Date Added: 8/13/19 11:33 PM 1 Likes 0 0

Credit Score Predictions W... Author: USER07 Date Added: 8/14/19 7:31 PM 0 Likes 0 0

My First Notebook Author: USER07 Date Added: 8/13/19 11:37 PM 0 Likes 0 1 1 (highlighted)

Regression Author: USER07 Date Added: 8/13/19 11:34 PM 0 Likes 1 0

SQL Query Scratchpad Author: USER07 Date Added: 8/13/19 11:51 PM 0 Likes 0 0

SQL Script Scratchpad Author: USER07 Date Added: 8/13/19 11:35 PM 0 Likes 0 0

SQL Statistical Functions Targeting Top Customers 1... 100K version Targeting Top Customers 1... 10k sample version Time Series Forecasting

Then hit “Create Notebook”

First, select a Notebook

https://apexapps.oracle.com/pls/apex/f?p=44785:24:101833940762517::NO:P24_CONTENT_ID,P24_PREV_PAGE:11925,1

Autonomous Data Warehouse | X Oracle Machine Learning User / X Oracle Machine Learning User / X Oracle Machine Learning | Shar X /C/Program%20Files%20(x86)/Hyp X +

https://adb.us-ashburn-1.oraclecloud.com/oml/tenants/OCID1.TENANCY.OC1.AAA 90% ... Search

Most Visited Oracle Data Mining 17... Autonomous Data Wa... Oracle Machine Learni...

Create Notebook Edit Delete Search by... Filter

Anomaly Detection Association Rules Attribute Importance Classification Prediction M... Clustering

Author: USER07 Date Added: 8/13/19 11:31 PM 0 Likes 0 0

Author: USER07 Date Added: 8/13/19 11:31 PM 0 Likes 0 0

Credit Score Predictions W... My First Notebook

Author: USER07 Date Added: 8/14/19 7:31 PM 0 Likes 0 0

Author: USER07 Date Added: 8/13/19 11:31 PM 0 Likes 0 0

SQL Statistical Functions Targeting Top Customers 1... Targeting Top Customers 1... Time Series Forecasting

Author: USER07 100K version Author: USER07 10k sample version Author: USER07 Author: USER07

Date Added: 8/13/19 11:36 PM Date Added: 8/15/19 9:46 PM Date Added: 8/16/19 5:12 PM Date Added: 8/13/19 11:35 PM

Create Notebook

Name * Attribute Importance

Comment

Project USER06 Project [USER06 Workspace]

Connection Global

OK Cancel

3 Save notebook

3 Save notebook

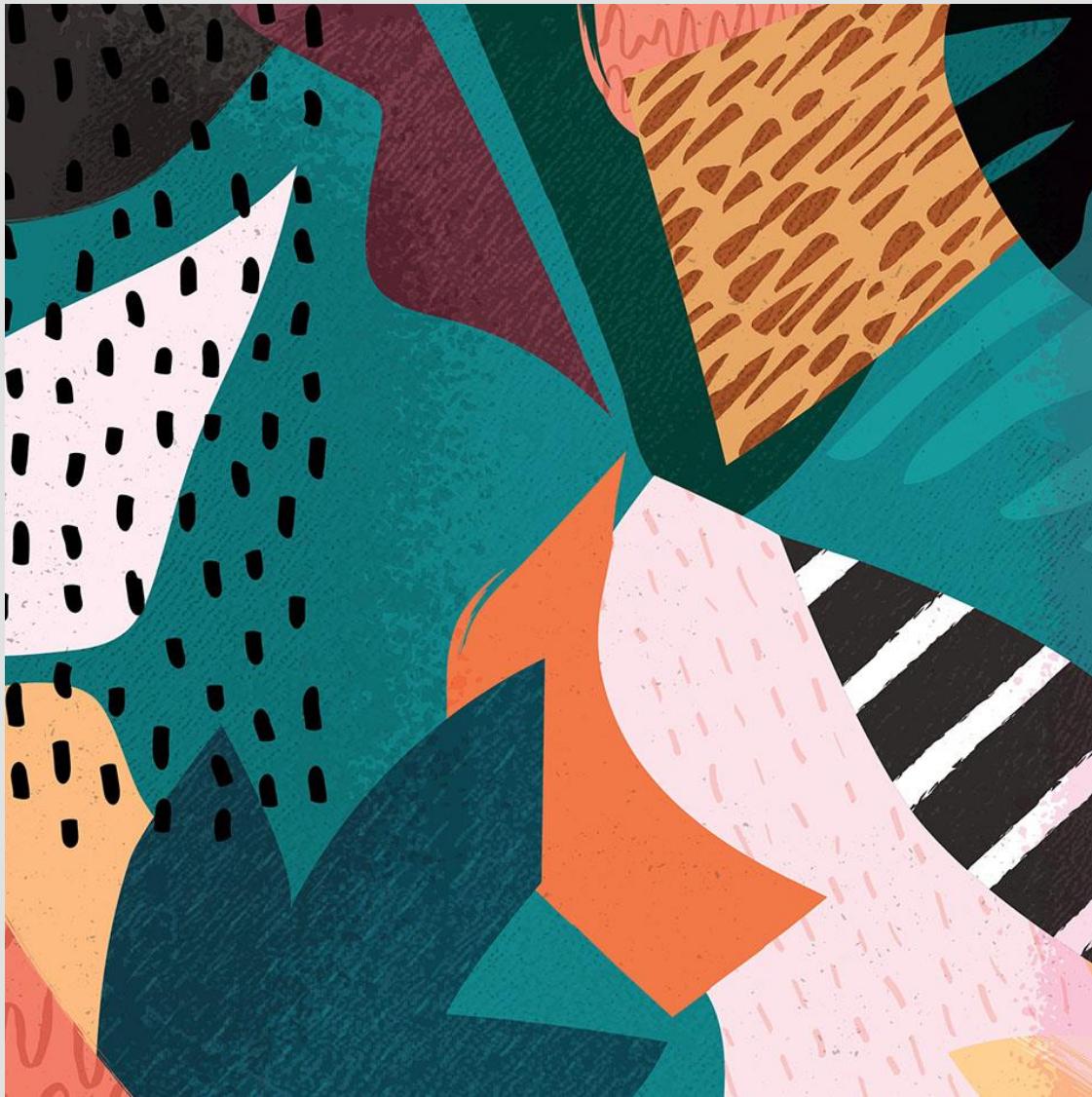
OML Notebook Settings

The screenshot shows the 'My First Notebook' settings page. At the top, there are several icons: a play button, a red X, a blue square, a green square, a yellow square, a trash can, a plus sign, and a dropdown menu. To the right of these is a search bar and a 'default' dropdown. Below the header, the title 'Settings' is displayed. Under 'Interpreter binding', it says: 'Bind interpreter for this note. Click to Bind/Unbind interpreter. Drag and drop to reorder interpreters. The first interpreter on the list becomes default.' A list of interpreters is shown: 'md %md (default)' (highlighted in blue), 'mladwdb01_medium %sql (default), %script' (highlighted in blue), 'mladwdb01_low %sql (default), %script', and 'mladwdb01_high %sql (default), %script'. At the bottom are 'Save' and 'Cancel' buttons.

Show/Hide Editor and Output

Exports notebook

1 Make sure your Settings have these bindings set:
‘md’ and
‘mladwdb01_medium’



Let's Review a Few OML Notebooks

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My First Notebook

FINISHED

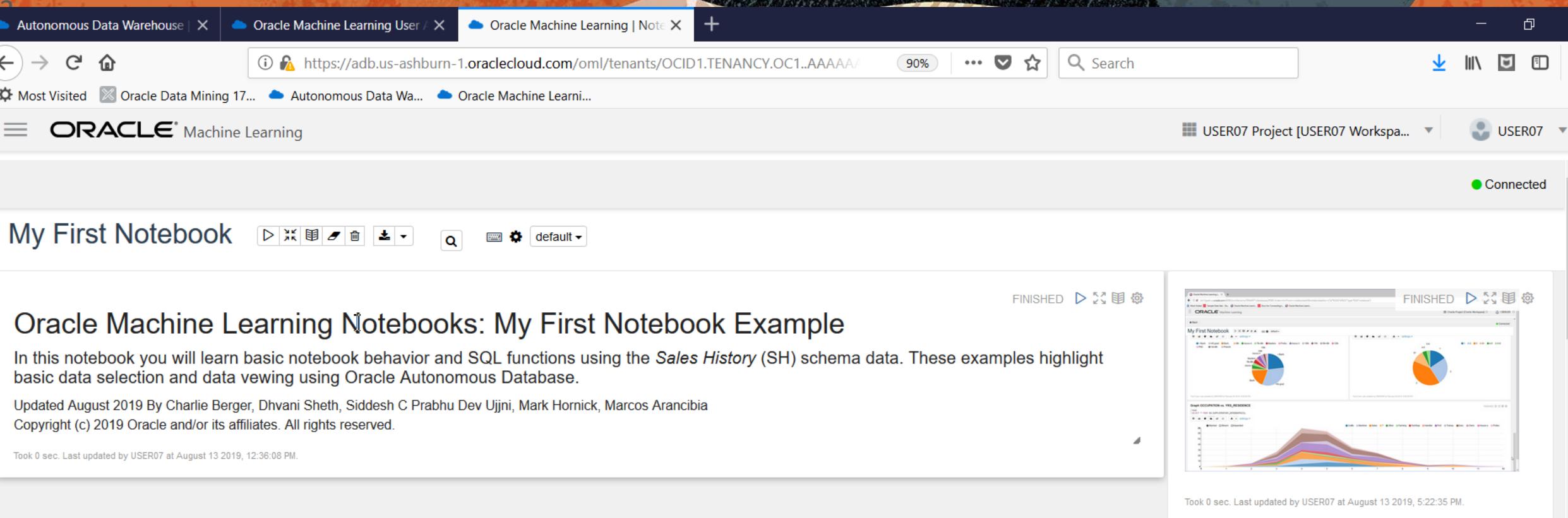
Oracle Machine Learning Notebooks: My First Notebook Example

In this notebook you will learn basic notebook behavior and SQL functions using the *Sales History* (SH) schema data. These examples highlight basic data selection and data viewing using Oracle Autonomous Database.

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Took 0 sec. Last updated by USER07 at August 13 2019, 5:22:45 PM.

FINISHED

List all tables in the SH schema

```
%sql
```

```
SELECT OWNER, TABLE_NAME, TABLESPACE_NAME, STATUS FROM ALL_TABLES WHERE OWNER = 'SH';
```

OWNER TABLE_NAME TABLESPACE_NAME STATUS

OWNER	TABLE_NAME	TABLESPACE_NAME	STATUS
SH	SALES	SAMPLESCHEMA	VALID
SH	SUPPLEMENTARY DEMOGRAPHICS	SAMPLESCHEMA	VALID

https://apexapps.oracle.com/pls/apex/f?p=11925:1:11925:P24_PREV_PAGE:11925,1

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Attribute Importance

Identify Key Factors

Notebook to identify key attributes that have the most influence on a target attribute (high AFFINITY_CARD responders). We build an Attribute Importance model (minimum description length algorithm) using the SH schema data all performed inside the Oracle Autonomous Database.

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Took 0 sec. Last updated by CHARLIE at August 12 2019, 5:47:27 PM.

Display the SH.SUPPLEMENTARY_DEMOGRAPHICS table

```
%sql
--Display Demographics table
SELECT * FROM SH.SUPPLEMENTARY_DEMOGRAPHICS;
```

CUST_ID	EDUCATION	OCCUPATION	HOUSEHOLD_SIZE	YRS_RESIDENCE	AFFINITY_CARD	BULK_PACK_DISKETTES	FLAT_PANEL_MONITOR	HOME_THEATER_PACKAGE	BOOKKEEPING_APPLICATION	PRINTER_SUPPLIES	Y_BOX_GAMES	OS_DOC_SET_K
102547	10th	Other	1	0	0	1	1	0	0	1	1	0
101050	10th	Other	1	0	0	1	1	0	0	1	1	0
100040	11th	Sales	1	0	0	1	1	0	0	1	1	0
102117	HS-grad	Farming	1	0	0	0	0	0	1	1	1	0
101074	10th	Handler	1	1	0	1	1	0	0	1	1	0
104179	10th	Handler	1	1	0	1	1	0	0	1	1	0
100417	11th	Handler	1	1	0	0	0	0	0	1	1	0
101146	Pack	2	1	1	0	1	1	0	1	1	1	0

Took 0 sec. Last updated by CHARLIE at August 12 2019, 5:47:29 PM.

Classification Prediction Model



Predicting Target Customers using Classification

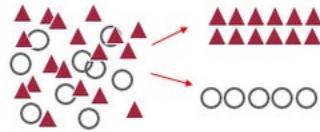
In this notebook, we predict customers most likely to be positive responders to an Affinity Card loyalty program. High Affinity Card responders (target value = 1) are defined as those customers who when given a loyalty or affinity card hyper-respond i.e. they increase their purchasing higher than the Affinity Card program's offered discount percentage. This notebook builds and applies classification models (decision tree) using the SH schema data. All processing occurs inside Oracle Autonomous Database.

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Took 2 sec. Last updated by USER07 at August 15 2019, 6:12:03 PM.

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Took 0 sec. Last updated by USER07 at August 13 2019, 5:25:01 PM.

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Display the SH.SUPPLEMENTARY_DEMOGRAPHICS data

FINISHED > ✎ 📄⚙️

%sql

```
SELECT * FROM SH.SUPPLEMENTARY_DEMOGRAPHICS;
```



CUST_ID	EDUCATION	OCCUPATION	HOUSEHOLD_SIZE	YRS_RESIDENCE	AFFINITY_CARD	BULK_PACK_DISKETTES	FLAT_PANEL_MONITOR	HOME_THEATER_PACKAGE	BOOKKEEPING_APPLICATION
102547	10th	Other	1	0	0	1	1	0	0
101050	10th	Other	1	0	0	1	1	0	0

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Anomaly Detection

FINISHED Anomaly Detection to Detect Suspicious or Rare Occurrences

This notebook shows how to detect rare records, customers or transactions using the unsupervised learning algorithm called 1 Class Support Vector Machine. In this notebook, you will first build a 1 Class SVM model and then apply the model to flag unusual or suspicious records. The anomaly detection model can also be used to score new records. The entire machine learning methodology runs inside Oracle Autonomous Database (ADB).

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Took 1 sec. Last updated by USER07 at August 15 2019, 4:48:49 PM.

FINISHED Toxins vs. Non-toxins

X2

X1

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Took 0 sec. Last updated by CHARLIE at August 12 2019, 2:52:58 PM. (outdated)

FINISHED Create SUPPLEMENTARY_DEMOGRAPHICS2_V view that excludes the unstructured text COMMENTS column

```
%sql
```

```
CREATE OR REPLACE VIEW SUPPLEMENTARY_DEMOGRAPHICS2_V AS
SELECT AFFINITY_CARD, BOOKKEEPING_APPLICATION, BULK_PACK_DISKETTES, CUST_ID, EDUCATION, FLAT_PANEL_MONITOR,
HOME_THEATER_PACKAGE, HOUSEHOLD_SIZE, OCCUPATION, OS_DOC_SET_KANJI, PRINTER_SUPPLIES, YRS_RESIDENCE, Y_BOX_GAMES
FROM SH.SUPPLEMENTARY_DEMOGRAPHICS;
```

Updated 0 row(s).

Took 0 sec. Last updated by CHARLIE at August 12 2019, 2:53:08 PM.

FINISHED Display SUPPLEMENTARY DEMOGRAPHICS2_V data

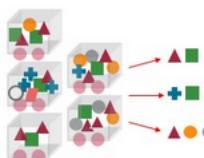
Association Rules

Association Rules (Market Basket Analysis)

In this notebook, you will use the Association Rules machine learning technique, also known as Market Basket Analysis. Association Rules can also be used in manufacturing when looking for co-occurring items, states that lead to failures, or non-obvious events. In this notebook, you will build associations rules models using the A Priori algorithm with data from the SH schema (SH.SALES). All computation occurs inside Oracle Autonomous Database.

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FINISHED

Display the SH.SALES data

```
%sql
-- Note that a transaction is defined by a set of products purchased for a given customer at a given time.
SELECT CUST_ID, TIME_ID, PROD_ID, QUANTITY_SOLD, AMOUNT_SOLD, CHANNEL_ID, PROMO_ID FROM SH.SALES
ORDER BY CUST_ID, TIME_ID, PROD_ID;
```

FINISHED

CUST_ID	TIME_ID	PROD_ID	QUANTITY_SOLD	AMOUNT_SOLD	CHANNEL_ID	PROMO_ID
2	1998-01-02 00:00:00.0	31	1	9.71	3	999
2	1998-01-02 00:00:00.0	140	1	41.99	3	999
2	1998-01-02 00:00:00.0	146	1	16.79	3	999
2	1998-01-02 00:00:00.0	148	1	29.39	3	999
2	1998-01-04 00:00:00.0	130	1	125.99	3	999
2	1998-01-05 00:00:00.0	14	1	1259.99	3	999
2	1998-01-05 00:00:00.0	14	1	1259.99	2	999
2	1998-01-05 00:00:00.0	123	1	64.99	3	999
2	1998-01-05 00:00:00.0	125	1	16.63	3	999

https://apexapps.oracle.com/pls/apex/f?p=44785:24:101833940762517::NO::P24_CONTENT_ID,P24_PREV_PAGE:11925,1

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Clustering

Identifying Customer Segments using Clustering

In this notebook, we illustrate how to identify natural clusters of customers using the CUSTOMERS dataset from the SH schema. The unsupervised learning k-means algorithm will provide the clustering analysis. The data exploration, preparation, and machine learning executes inside Oracle Autonomous Database.

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Took 0 sec. Last updated by CHARLIE at August 12 2019, 5:52:20 PM. (outdated)

FINISHED

Drop existing tables and create a CUSTOMERS360 table

```
%script
-- Drop the CUSTOMERS360 table if it exists for notebook reproducibility

BEGIN
| EXECUTE IMMEDIATE 'DROP TABLE CUSTOMERS360';
| EXCEPTION
| WHEN OTHERS THEN NULL;
END;
/

-- Join relevant attributes from SH.CUSTOMERS and SH.SUPPLEMENTARY_DEMOGRAPHICS tables to create better 360 degree customer table

CREATE TABLE CUSTOMERS360 AS
SELECT A.CUST_ID, A.CUST_GENDER, A.CUST_MARITAL_STATUS, A.CUST_YEAR_OF_BIRTH, A.CUST_INCOME_LEVEL,
```

FINISHED

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Regression

Regression Modeling to Predict Numerical Values

This notebook shows how to predict numerical values using a multiple regression. Given demographic, purchase, and affinity card data for a set of customers, predict the number of years a customer remains at the same residence, as found in column YRS_RESIDENCE. Since YRS_RESIDENCE is a continuous variable, we will use the Generalized Linear Model algorithm.

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Took 0 sec. Last updated by MARK at August 13 2019, 11:56:28 AM. (outdated)

FINISHED

FINISHED

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Introducing Oracle Machine Learning blog post: <https://blogs.oracle.com/datamining/introducing-oracle-machine-learning-sql-notebooks-for-the-oracle-autonomous-data-warehouse-cloud>
Generalized Linear Model (GLM), see documentation at: https://docs.oracle.com/en/database/oracle/oracle-database/19/arpls/DBMS_DATA_MINING.html#GUID-4E3665B9-B1C2-4F6B-AB69-A7F353C70F5C

Took 0 sec. Last updated by USER07 at August 13 2019, 11:09:15 AM.

Drop previous tables and create CUSTOMERS360 table

```
%script
-- Drop any previously existing CUSTOMERS360 table for notebook repeatability
BEGIN
    EXECUTE IMMEDIATE 'DROP TABLE CUSTOMERS360';
EXCEPTION
    WHEN OTHERS THEN NULL;
END;
/
-- JOIN selected attributes from SH.CUSTOMERS and SH.SUPPLEMENTARY_DEMOGRAPHICS tables to create better 360 view of customer
CREATE TABLE CUSTOMERS360 AS
```

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SQL Statistical Functions



Oracle Machine Learning notebook for SQL Statistical Functions.

Oracle Machine Learning example notebook using SH schema data to show several use cases of descriptive and comparative statistics performed inside the Oracle Autonomous Database.

Updated August 2019 By Charlie Berger, Dhvani Sheth, Siddesh C Prabhu Dev Ujjni, Mark Hornick, Marcos Arancibia

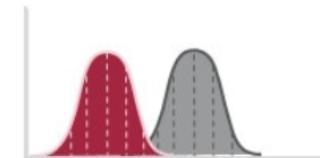
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Took 0 sec. Last updated by CHARLIE at August 12 2019, 4:33:56 PM.



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FINISHED >

For statistical functions in the Documentation https://docs.oracle.com/en/database/oracle/oracle-database/19/sqlrf/STATS_T_TEST_.html

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Took 0 sec. Last updated by USER07 at August 13 2019, 12:16:51 PM. (outdated)

Display the SH.CUSTOMERS data

FINISHED >

```
%sql
```

```
SELECT * FROM SH.CUSTOMERS;
```



CUST_ID	CUST_FIRST_NAME	CUST_LAST_NAME	CUST_GENDER	CUST_YEAR_OF_BIRTH	CUST_MARITAL_STATUS	CUST_STREET_ADDRESS	CUST_POSTAL_CODE	CUST_CITY	CUST_CITY_ID
48262	Josh	Rodgers	M	1982	single	27 West Hampshire Boulevard	66437	Asten	51075
1818	Josh	Rodgers	M	1951	married	37 Vilas Street	40365	Tralee	52379

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Time Series Forecasting



Forecasting Sales Using Exponential Smoothing Algorithm for Time Series Data

Oracle Machine Learning supports time series forecasting via the Exponential Smoothing algorithm inside the Oracle Autonomous Database (ADB). This sales forecasting example is based on the SH.SALES example data.

Updated August 2019 by Charlie Berger , Dhvani Sheth, Siddesh C Prabhu Dev Ujjni, Mark Hornick, Marcos Arancibia

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Took 0 sec. Last updated by MARCOS at August 12 2019, 2:31:40 AM. (outdated)

FINISHED

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Took 0 sec. Last updated by MARCOS at August 12 2019, 2:32:09 AM. (outdated)

Drop previous models, model settings and create a new forecast model to predict AMOUNT_SOLD

FINISHED

```
%script
-- Cleanup old settings table
BEGIN EXECUTE IMMEDIATE 'DROP TABLE esm_sh_settings';
EXCEPTION WHEN OTHERS THEN NULL; END;
/
-- Cleanup old model with the same name
BEGIN DBMS_DATA_MINING.DROP_MODEL('ESM_SH_SAMPLE');
EXCEPTION WHEN OTHERS THEN NULL; END;
/
-- Create input time series
CREATE OR REPLACE VIEW ESM_SH_DATA
AS SELECT TIME_ID, AMOUNT_SOLD
```

Targeting Top Customers



Finding "BEST" Lifetime Value (LTV) Customers using Oracle Machine Learning

Heather has spent most of her time over the past couple of years extracting and preparing data for analysis. The large volumes of data need extracting and processing mean she spends most of her time waiting for jobs to finish and very little of her time analyzing the data. Demands from marketing are forcing a new approach whereby the data remains in the data warehouse and is processed there. The alternative cloud solution is more complex, and has no direct out of the box processes to analyze the data in place. She started taking a look at Oracle, and found the simple SQL commands in ADW are familiar, and execute extremely fast, leveraging all the performance features of the platform. Further once she is done can apply the learning models to incoming data on the fly, and allow end user analysts to immediately see mining results. This drastically reduces the cycle of data preparation, analysis, and publishing. It also means there is no change to analysis/reporting Data Visualization toolset that users are familiar with.

Scroll down this notebook and learn how to use OML to create predictive perspectives on data in ADW, WITHOUT moving it. We will process a small 100k data set, but could use a 100M or billion row data set without worrying about processing time.

This is an extract of Alphaoffice customer information. We will first get acclimated to Apache Zeppelin, the open source interface for interactive collaboration in a team environment.

Updated August 2019 By: Sidduesh Ujjini, Dhvani Sheth, Charlie Berger

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Took 0 sec. Last updated by USER07 at August 15 2019, 2:25:23 PM.

FINISHED



FINISHED

The Business Problem:

Increase Sales by Targeting our Best Customers; High Lifetime Value Customers!

Heather has a hunch that weakening sales may be due to the company selling to non-optimal customers; customers who perhaps have poor credit and fail to make their payments for their purchases. Heather has over 100 variables to consider so wants to first explore her data using simple charts and graphs, but then move onto using Oracle Machine Learning's powerful algorithms to automatically sift through her data to find patterns, new insights and to make predictions that target her best customers-those who have good credit.

Took 0 sec. Last updated by USER07 at August 15 2019, 2:25:26 PM.

FINISHED

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FINISHED

About the data

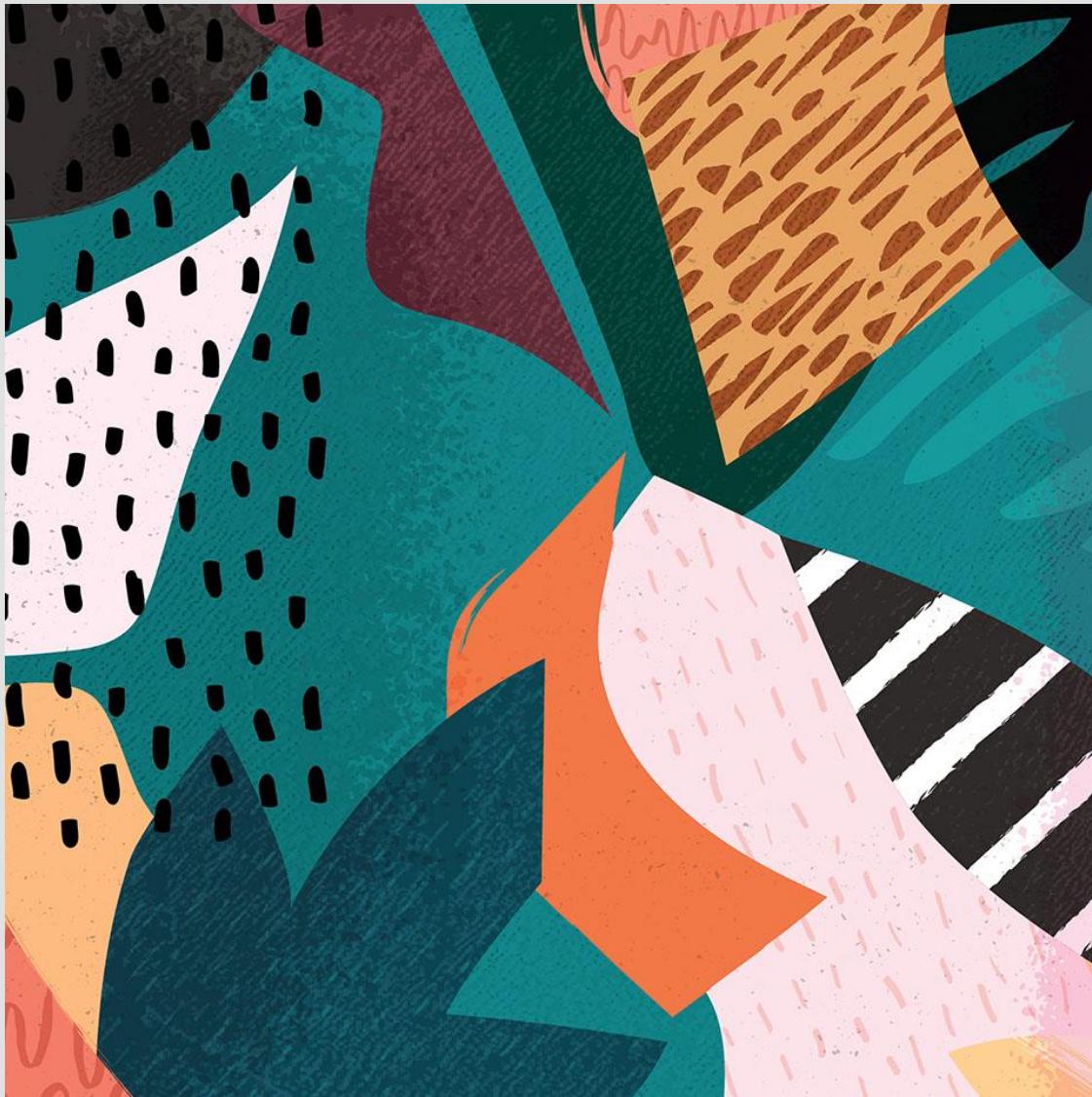
FINISHED

We have data of customers in table credit_scoring_100k with CUSTOMER_LIFETIME_VALUE as a numeric field. We would like to predict customer's lifetime value as High, Medium or Low and not as a numerical value. This gives us flexibility to easily identify High Lifetime Value Customers and a company can focus on them. We will use this field to create a categorical field LIFETIME_VALUE_CATEGORY with values High/Medium/Low.

<https://go.oracle.com/adwc>

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FINISHED



Let's Start the Credit_Scoring_100K Workshop

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Credit Score Predictions Workshop 300 10K Sample

Targeting Likely Good Credit Customers using Oracle Machine Learning Classification Models

Heather has spent most of her time over the past couple of years extracting and preparing data for analysis. The large volumes of data need extracting and processing mean she spends most of her time waiting for jobs to finish and very little of her time analyzing the data. Demands from marketing are forcing a new approach whereby the data remains in the data warehouse and is processed there. The alternative cloud solution is more complex, and has no direct out of the box processes to analyze the data in place. She started taking a look at Oracle, and found the simple SQL commands in ADW are familiar, and execute extremely fast, leveraging all the performance features of the platform. Further once she is done can apply the learning models to incoming data on the fly, and allow end user analysts to immediately see mining results. This drastically reduces the cycle of data preparation, analysis, and publishing. It also means there is no change to analysis/reporting Data Visualization toolset that users are familiar with.

Scroll down this notebook and learn how to use OML to create predictive perspectives on data in ADW, WITHOUT moving it. We will process a small 100k data set, but could use a 100M or billion row data set without worrying about processing time.

This is an extract of Alphaoffice customer information. We will first get acclimated to Apache Zeppelin, the open source interface for interactive collaboration in a team environment.

The Business Problem:

Increase Sales by Targeting our Best Customers; Good Credit Customers!

Heather has a hunch that weakening sales may be due to the company selling to non-optimal customers; customers who perhaps have poor credit and fail to make their payments for their purchases. Heather has over 100 variables to consider so wants to first explore her data using simple charts and graphs, but then move onto using Oracle Machine Learning's powerful algorithms to automatically sift through her data to find patterns, new insights and to make predictions that target her best customers—those who have good credit.

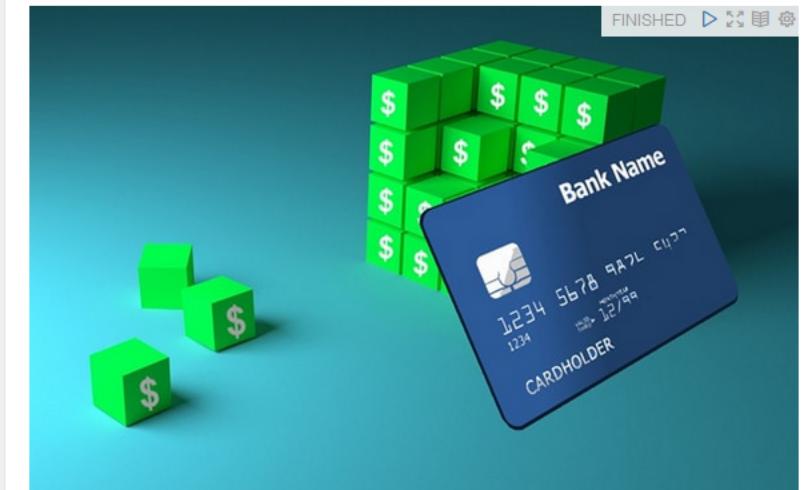
Took 1 sec. Last updated by USER07 at August 29 2019, 4:45:57 PM.

For more information, check the Oracle ADW Documentation <https://docs.oracle.com/en/cloud/paas/autonomous-data-warehouse-cloud/index.html>
Oracle Machine Learning folder on Oracle on Github <https://github.com/oracle/oracle-db-examples/tree/master/machine-learning>
Oracle Machine Learning web page: <https://www.oracle.com/database/technologies/datawarehouse-bigdata/machine-learning.html>
Introducing Oracle Machine Learning blog post: <https://blogs.oracle.com/datamining/introducing-oracle-machine-learning-sql-notebooks-for-the-oracle-autonomous-data-warehouse-cloud>

Took 0 sec. Last updated by USER07 at August 14 2019, 2:20:38 PM.

Review Zeppelin Basics**

- Note the page is made up of paragraphs such as this one where the text is sitting See [Apache Zeppelin Documentation](#). Also note that are four icons in the top left of this panel. Click on each icon to see what happens. Note that the first icon (arrow) runs the panel. This one is %md, which is markdown, or formatted text. Other panels will be of different types (%sql for SQL, %script for PL/SQL).
- Also see [Oracle Machine Learning documentation](#)



Took 0 sec. Last updated by USER07 at August 14 2019, 2:20:19 PM.

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Credit Score Predictions Workshop 300 10K Sample

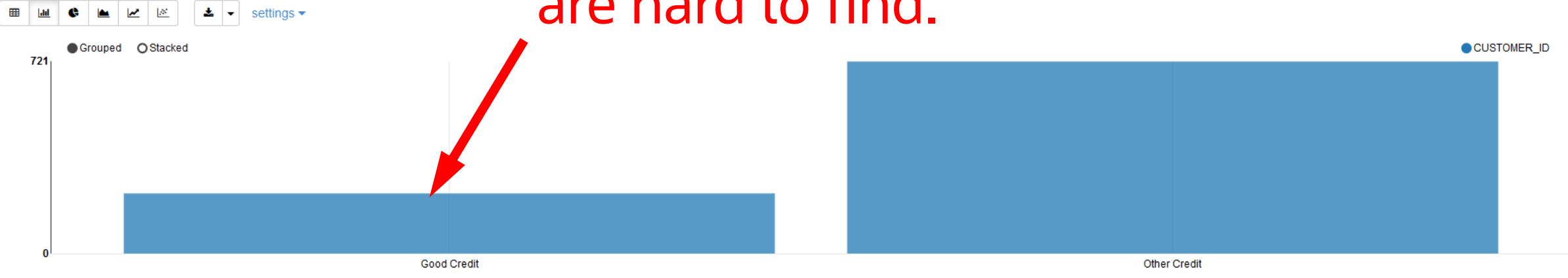
Good Credit customers
are hard to find.

Notice that Good Credit Customers are Hard to Find!

FINISHED

%sql

```
-- Create a Bar chart with CREDIT_SCORE_BIN (Keys), CUSTOMER_ID (COUNT) (Values); No Gr  
-- Hint: Notice that we utilize a 10% sample using the SAMPLE (n) function. Try cha  
SELECT CUSTOMER_ID, CREDIT_SCORE_BIN FROM CREDIT_SCORING_100K_V SAMPLE (10);
```

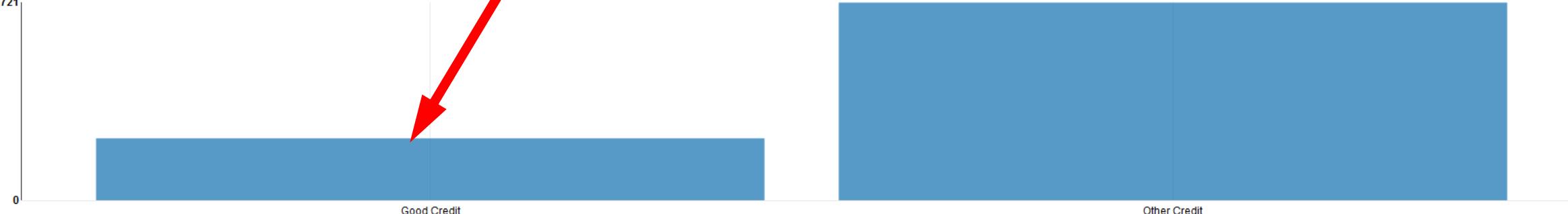


A bar chart titled 'Credit Score Predictions Workshop 300 10K Sample' showing the count of customers by credit score bin. The Y-axis represents the count, ranging from 0 to 721. The X-axis categories are 'Good Credit' and 'Other Credit'. The 'Good Credit' bar is significantly shorter than the 'Other Credit' bar, illustrating that good credit customers are harder to find. A red arrow points to the 'Good Credit' bar.

Grouped Stacked settings ▾

 Grouped Stacked

CUSTOMER_ID



Took 1 sec. Last updated by USER07 at August 10 2019, 2:29:18 PM.

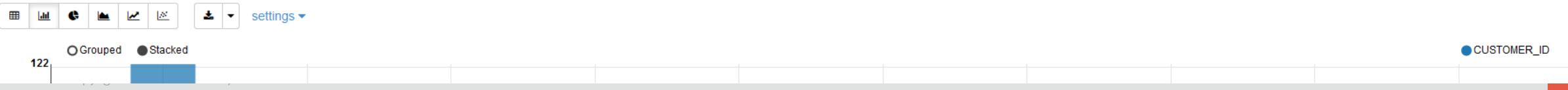
FINISHED

STEP 6: Graph Data by LOAN_AMOUNT

%sql

```
-- This is a basic example of a chart visualization in Zeppelin. This particular one is a column graph. Click on the 'settings' link below. That will show you the fields in the query that were used to create the chart. After you review the settings you can click on the link again to hide the settings.  
-- Bar chart with LOAN_AMOUNT (Keys), CUSTOMER_ID (count) (Values)
```

```
SELECT CUSTOMER_ID, AGE, INCOME, TENURE, LOAN_TYPE, LOAN_AMOUNT, OCCUPATION, NUMBER_OF_CURRENT_ACCOUNTS, MAX_CC_SPENT_AMOUNT, MODE_JOB_OF_CONTACTS  
FROM CREDIT_SCORING_100K_V
```



A bar chart titled 'Graph Data by LOAN_AMOUNT' showing the count of customers by loan amount. The Y-axis represents the count, ranging from 0 to 122. The X-axis categories are represented by blue bars. A red arrow points to the first bar on the left.

Grouped Stacked settings ▾

 Grouped Stacked

CUSTOMER_ID

122

Credit Score Predictions Workshop 300 10K Sample



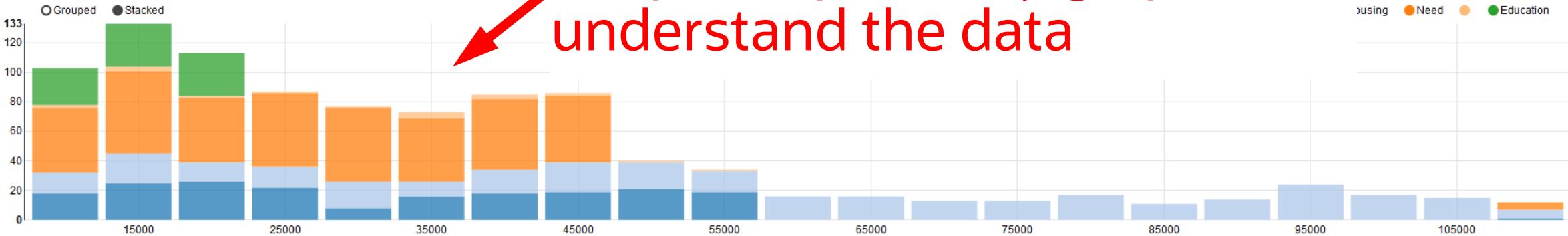
STEP 6: Graph Data by LOAN_AMOUNT Grouped By LOAN_TYPE

FINISHED

%sql

```
-- This is a basic example of a chart visualization in Zeppelin. This particular one is a column graph. Click on the 'settings' link below. That will show you the fields in the query that were used to create the chart. After you review the settings you can click on the link again to hide the settings.
-- Bar chart with LOAN_AMOUNT (Keys), CUSTOMER_ID (count) (Values), LOAN_TYPE (Groups)
```

```
SELECT CUSTOMER_ID, AGE, INCOME, TENURE, LOAN_TYPE, LOAN_AMOUNT, OCCUPATION, NUMBER_OF_CURRENT_ACCOUNTS, MAX_CC_SPENT_AMOUNT, MODE_JOB_OF_CONTACTS
FROM CREDIT_SCORING_100K_V
```



Took 0 sec. Last updated by USER07 at August 16 2019, 2:29:30 PM.

Simple, exploratory graphs to understand the data

STEP 7: Graph Data by Occupation

FINISHED

%sql

```
-- This shows an alternative presentation style - a pie chart. Note that Zeppelin visualizations are limited. In lab 400 we will use Oracle Data Visualization to create more interesting perspectives.
-- Pie chart with OCCUPATION (Keys), CUSTOMER_ID (COUNT) (Values); No Groups
```

```
SELECT CUSTOMER_ID, AGE, INCOME, TENURE, LOAN_TYPE, LOAN_AMOUNT, OCCUPATION, MARITAL_STATUS
FROM CREDIT_SCORING_100K_V
WHERE ROWNUM < 1000;
```



STEP 7: Graph Data by LOAN_TYPE

FINISHED

%sql

```
-- This shows an alternative presentation style - a pie chart (grouped by loan type). Note that Zeppelin visualizations are limited. In lab 400 we will use Oracle Data Visualization to create more interesting perspectives.
-- Pie chart with LOAN_TYPE (Keys), CUSTOMER_ID (COUNT) (Values); No Groups
```

```
SELECT CUSTOMER_ID, AGE, INCOME, TENURE, LOAN_TYPE, LOAN_AMOUNT, OCCUPATION, MARITAL_STATUS
FROM CREDIT_SCORING_100K_V
WHERE ROWNUM < 1000;
```



Credit Score Predictions Workshop 300 10K Sample

STEP 7: Graph Data by Occupation

FINISHED

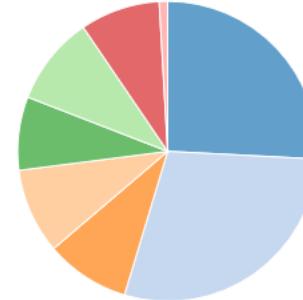
%sql

```
-- This shows an alternative presentation style - a pie chart. Note that Zeppelin visualizations are limited. In lab 400 we will use Oracle Data Visualization to create more more interesting perspectives.  
-- Pie chart with OCCUPATION (Keys), CUSTOMER_ID (COUNT) (Values); No Groups
```

```
SELECT CUSTOMER_ID, AGE, INCOME, TENURE, LOAN_TYPE, LOAN_AMOUNT, OCCUPATION, MARITAL_STATUS  
FROM CREDIT_SCORING_100K_V  
WHERE ROWNUM < 1000;
```



Professional Manager Army Clerical Worker Technician Farmer NaN



STEP 7: Graph Data by LOAN_TYPE

FINISHED

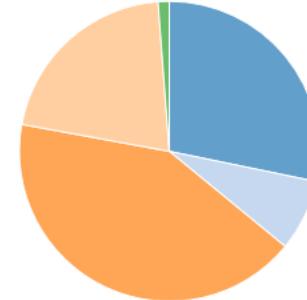
%sql

```
-- This shows an alternative presentation style - a pie chart (grouped by loan type). Note that Zeppelin visualizations are limited. In lab 400 we will use Oracle Data Visualization to create more more interesting perspectives.  
-- Pie chart with LOAN_TYPE (Keys), CUSTOMER_ID (COUNT) (Values); No Groups
```

```
SELECT CUSTOMER_ID, AGE, INCOME, TENURE, LOAN_TYPE, LOAN_AMOUNT, OCCUPATION, MARITAL_STATUS  
FROM CREDIT_SCORING_100K_V  
WHERE ROWNUM < 1000;
```



Housing Education Need Auto NaN



More, simple, exploratory graphs to understand the data

STEP 8: Graph AGE, TENURE, LOAN_TYPE and LOAN

FINISHED

%sql

```
-- Create a Scatter chart with AGE (xAxis), TENURE (yAxis), LOAN_TYPE (group), LOAN_AMOUNT (size)  
-- Hint: We use WHERE ROWNUM < 600 for improved notebook graph display performance.
```

RING_100K_V WHERE ROWNUM < 600;

Credit Score Predictions Workshop 300 10K Sample

```
BEGIN  
DBMS_DATA_MINING.CREATE_MODEL(  
    MODEL_NAME          => 'AI_EXPLAIN_OUTPUT_CREDIT_SCORE_BIN',  
    MINING_FUNCTION     => DBMS_DATA_MINING.ATTRIBUTE_IMPORTANCE,  
    DATA_TABLE_NAME     => 'CREDIT_SCORING_100K_V',  
    CASE_ID_COLUMN_NAME=> 'CUSTOMER_ID',  
    TARGET_COLUMN_NAME  => 'CREDIT_SCORE_BIN',  
    SETTINGS_TABLE_NAME=> 'ATT_IMPORT_MODE_SETTINGS');  
END;  
END;  
/  
/
```

Display the Top 6 Attributes for Good Credit Customers

```
%sql  
  
-- Create a Bar chart with ATTRIBUTE_NAME (Keys), ATTRIBUTE_IMPORTANCE_VALUE (AVG) (Values); No Groups  
-- Hint: Note that you can change the ROWNUM value to see fewer or more key attributes displayed.  
  
SELECT * FROM DM$VAATI_EXPLAIN_OUTPUT_CREDIT_SCORE_BIN WHERE ROWNUM < 7;
```

Grouped Stacked settings ▾



Attribute Importance to identify key variables that most influence the target attribute

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STEP 12: Create Predictive Model to Target Good Credit Customers FINISHED

Now that Heather has found the key attributes that most influence finding more Good Credit customers and also making better Maximum Credit Card Amount decisions, she wants to leverage Oracle Machine Learning's powerful in-Database, parallelized algorithms to build predictive models that help her company to better target "the right customers" with the "right offers".

Lets' quickly review the machine learning process:

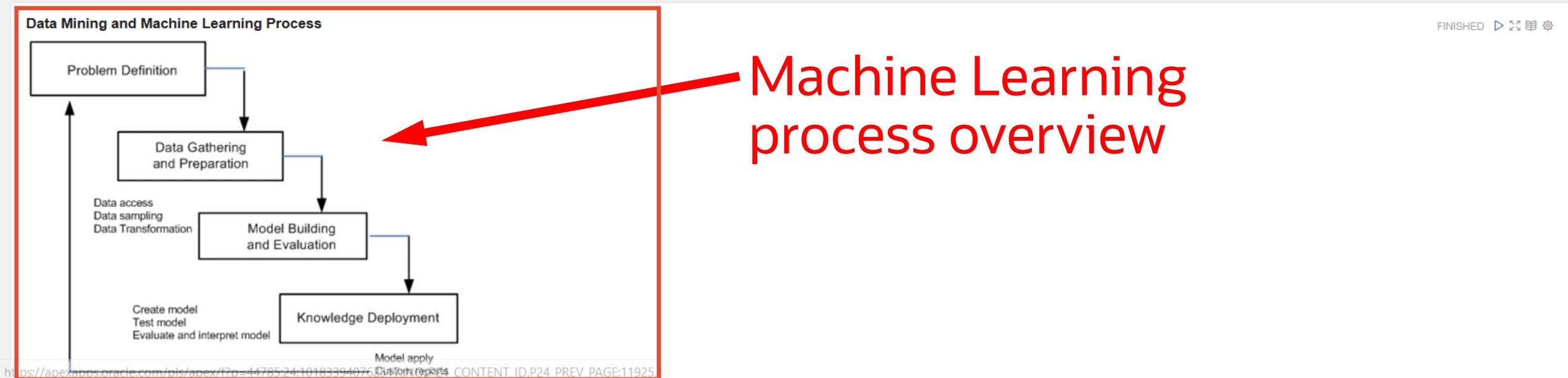
Problem Definition: Target Good Credit Customers

Data Gathering and Preparation: We've assembled 100K records with 100+ variable about each customer and have created a target field (Good Customer/Other Customer) so we can use OML's Supervised Algorithms, specifically let's start by using a decision tree algorithm.

Model Building and Evaluation: We'll create a randomly selected sample from our Credit_Scoring_100k historical data and use 60% as training data for the machine learning model building phase. Then, we'll use the remaining 40% as a holdout sample to test our model's accuracy using various model evaluation tools such as a "lift chart".

Knowledge Deployment: Once we're satisfied that we have a useful ML model that can predict with some accuracy which customers we should target (Good Credit customers), we want to apply our OML model to new customer data inside ADWC and then take a deeper look at them. Lastly, we'll jump over to Oracle Analytics Cloud for a more interactive, exploratory data analysis experience but now focusing on our customers of interest (Good Credit customers).

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```
-- drop lift result
BEGIN
    v_sql := 'DROP TABLE N1_LIFT_TABLE PURGE';
    EXECUTE IMMEDIATE v_sql;
    DBMS_OUTPUT.PUT_LINE (v_sql ||': succeeded');
EXCEPTION
    WHEN OTHERS THEN
        DBMS_OUTPUT.PUT_LINE (v_sql ||': drop unnecessary - no table exists');
END;

-- Split the Data into N1_TRAIN_DATA and N1_TEST_DATA
EXECUTE IMMEDIATE 'CREATE OR REPLACE VIEW N1_TRAIN_DATA AS SELECT * FROM CREDIT_SCORING_100K_v SAMPLE (60) SEED (1)';
DBMS_OUTPUT.PUT_LINE ('Created N1_TRAIN_DATA');
EXECUTE IMMEDIATE 'CREATE OR REPLACE VIEW N1_TEST_DATA AS SELECT * FROM CREDIT_SCORING_100K_v MINUS SELECT * FROM N1_TRAIN_DATA';
DBMS_OUTPUT.PUT_LINE ('Created N1_TEST_DATA');

-- Create a Build Setting (DT) for Model Build
EXECUTE IMMEDIATE 'CREATE TABLE N1_BUILD_SETTINGS (SETTING_NAME VARCHAR2(30),SETTING_VALUE VARCHAR2(4000))';
EXECUTE IMMEDIATE 'INSERT INTO N1_BUILD_SETTINGS (SETTING_NAME, SETTING_VALUE) VALUES (''ALGO_NAME'', ''ALGO_DECISION_TREE'')';
EXECUTE IMMEDIATE 'INSERT INTO N1_BUILD_SETTINGS (SETTING_NAME, SETTING_VALUE) VALUES (''PREP_AUTO'', ''ON'')';

DBMS_OUTPUT.PUT_LINE ('Created model build settings table: N1_BUILD_SETTINGS ');

-- Populate and Adjust Model Setting (DT) for Model Build
-- EXECUTE IMMEDIATE 'INSERT INTO N1_BUILD_SETTINGS VALUES (''TREE_TERM_MAX_DEPTH'', 7)';
-- EXECUTE IMMEDIATE 'INSERT INTO N1_BUILD_SETTINGS VALUES (''TREE_TERM_MINREC_SPLIT'', 20)';
-- EXECUTE IMMEDIATE 'INSERT INTO N1_BUILD_SETTINGS VALUES (''TREE_TERM_MINPCT_SPLIT'', .1)';
-- EXECUTE IMMEDIATE 'INSERT INTO N1_BUILD_SETTINGS VALUES (''TREE_TERM_MINREC_NODE'', 10)';
-- EXECUTE IMMEDIATE 'INSERT INTO N1_BUILD_SETTINGS VALUES (''TREE_TERM_MINPCT_NODE'', 0.05)'';

-- Build a Classification Model
EXECUTE IMMEDIATE 'CALL DBMS_DATA_MINING.CREATE_MODEL('''N1_CLASS_MODEL''', ''CLASSIFICATION'', ''N1_TRAIN_DATA'', ''CUSTOMER_ID'', ''CREDIT_SCORE_BIN'', ''N1_BUILD_SETTINGS'')';
DBMS_OUTPUT.PUT_LINE ('Created model: N1_CLASS_MODEL ');

-- Test the Model by generating a apply result and then create a lift result
EXECUTE IMMEDIATE 'CALL DBMS_DATA_MINING.APPLY('''N1_CLASS_MODEL''', ''N1_TEST_DATA'', ''CUSTOMER_ID'', ''N1_APPLY_RESULT'')';
DBMS_OUTPUT.PUT_LINE ('Created apply result: N1_APPLY_RESULT ');
EXECUTE IMMEDIATE 'CALL DBMS_DATA_MINING.COMPUTE_LIFT('''N1_APPLY_RESULT''', ''N1_TEST_DATA'', ''CUSTOMER_ID'', ''CREDIT_SCORE_BIN'', ''N1_LIFT_TABLE'', ''Good Credit'', ''PREDICTION'', ''PROBABILITY'', 100)';
DBMS_OUTPUT.PUT_LINE ('Created lift result: N1_LIFT_TABLE '');
```

Split the data into Train and Test datasets

Build the Classification Model

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STEP 13: View Model's Cumulative Gains Chart To Verify That the Model is Good

%sql

```
-- Create a Line chart with QUANTILE_NUMBER (Keys), GAIN_CUMULATIVE (SUM) (Values); No Groups
-- Hint: Try changing the graph from a line chart to a bar chart.

SELECT QUANTILE_NUMBER, GAIN_CUMULATIVE FROM N1_LIFT_TABLE WHERE ROWNUM < 101
```

View model outputs e.g. Cumulative Gains chart to assess model quality

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STEP 14: Apply the Model to New Customers to View Each Customer's Probability to Have Good Credit

%sql

```
-- This will show the top predictive attributes

SELECT A.CUSTOMER_ID
, A.PROB_CREDIT_SCORE_BIN
, B.AGE, B.INCOME, B.TENURE, B.LOAN_TYPE, B.LOAN_AMOUNT, B.OCCUPATION, B.EDUCATION_LEVEL, B.MARITAL_STATUS
FROM (SELECT * FROM (SELECT CUSTOMER_ID, ROUND(PROB_CREDIT_SCORE_BIN *100,2) PROB_CREDIT_SCORE_BIN FROM (SELECT CUSTOMER_ID, PREDICTION_PROBABILITY(N1_CLASS_MODEL, NULL USING *) PROB_CREDIT_SCORE_BIN FROM CREDIT_SCORING_NEW_CUST_V)) A
CREDIT_SCORING_100K_V_B
```

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STEP 14: Apply the Model to New Customers to View Each Customer's Probability to Have Good Credit

FINISHED

```
%sql  
-- This will show the top predictive attributes  
  
SELECT A.CUSTOMER_ID  
, A.PROB_CREDIT_SCORE_BIN  
, B.AGE, B.INCOME, B.TENURE, B.LOAN_TYPE, B.LOAN_AMOUNT, B.OCCUPATION, B.EDUCATION_LEVEL, B.MARITAL_STATUS  
FROM (SELECT * FROM (SELECT CUSTOMER_ID, ROUND(PROB_CREDIT_SCORE_BIN *100,2) PROB_CREDIT_SCORE_BIN FROM (SELECT CUSTOMER_ID, PREDICTION_PROBABILITY(N1_CLASS_MODEL, NULL USING *) PROB_CREDIT_SCORE_BIN FROM CREDIT_SCORING_NEW_CUST_V)) A  
, CREDIT_SCORING_100K_V B  
WHERE A.CUSTOMER_ID = B.CUSTOMER_ID;
```

Apply the model to make predictions

CUSTOMER_ID	PROB_CREDIT_SCORE_BIN	AGE	INCOME	TENURE	LOAN_TYPE	LOAN_AMOUNT	OCCUPATION	EDUCATION_LEVEL	MARITAL_STATUS
81028	98.8	34	2750	9	Auto	45000	Army	Master's Degree	Married
48919	98.8	42	2150	10	Housing	35000	Professional		Single
5854	98.8	68	2150	30	Housing	100000	Farmer	Bachelor's Degree	Married
54674	50.57	30	5250	11	Need	25000	Manager	Bachelor's Degree	Divorced
88724	98.8	34	500	4	Need	35000	Clerical	Primary School Grad	Single
58417	50.57	57	5250	4	Auto	15000	Professional	Bachelor's Degree	Single
87926	100	30	4250	14	Need	10000	Professional	Bachelor's Degree	Single
69288	98.8	55	2750	14	Need	45000	Farmer	Bachelor's Degree	Married
79289	98.8	36	2150	12	Housing	100000	Professional	Master's Degree	Married

Took 0 sec. Last updated by USER07 at August 16 2019, 2:31:55 PM.

STEP 15: Drop Table CREDIT_SCORE_NEW_PREDICTIONS From Previous Run (If Exists for Notebook Repeatability)

FINISHED

```
%script  
BEGIN  
EXECUTE IMMEDIATE 'DROP TABLE CREDIT_SCORE_NEW_PREDICTIONS';
```

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STEP 18: Apply a ML Model to a Single Record in a Transactional Application

FINISHED

```
%sql  
-- Try running this query, and then change customer_value_segment to 'Silver' and re-run the query to see lower probability of customer having good credit.  
-- Hint: Try changing Wealth to 'Very Rich'  
-- Hint: You can imagine building interactive applications far more involved than this simple interactive scoring demo below.  
  
SELECT PREDICTION_PROBABILITY(N1_CLASS_MODEL, 'Good Credit'  
    USING ${WEALTH = 'Very Rich', 'Very Rich' | 'Rich' | 'Average' | 'Poor' | 'Very Poor'} AS WEALTH, 5000 AS INCOME, 'Silver' AS CUSTOMER_VALUE_SEGMENT) PREDICTION_PROBABILITY  
FROM DUAL;  
  
WEALTH  
'Average'  
  
PREDICTION_PROBABILITY  
0.012038934426229508
```

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STEP 19: Update CUSTOMER_SCORING_100_V View

FINISHED

```
%sql  
-- NOTE: You must do this prior to starting lab 400.  
-- Since we will be doing some analysis using some of the variable in the larger source credit_scoring_100k_v view and referencing the probability of good credit, we'll update the view to add that column.  
  
CREATE OR REPLACE VIEW CREDIT_SCORING_100K_V AS SELECT A.PROB_GOOD_CREDIT, B.*  
FROM CREDIT_SCORE_NEW_PREDICTIONS A, ADMIN.CREDIT_SCORING_100K B  
WHERE A.CUSTOMER_ID = B.CUSTOMER_ID;  
  
Updated 0 row(s).
```

Took 0 sec. Last updated by USER07 at August 16 2019, 2:36:28 PM.

Let's View the Predictive Results Which Will Be Further Explored Using Oracle Analytics Cloud in Workshop 400

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STEP 19: Update CUSTOMER_SCORING_100_V View

FINISHED

```
%sql  
-- NOTE: You must do this prior to starting lab 400.  
-- Since we will be doing some analysis using some of the variable  
  
CREATE OR REPLACE VIEW CREDIT_SCORING_100K_V AS SELECT A.PROB_GOOD  
FROM CREDIT_SCORE_NEW_PREDICTIONS A, ADMIN.CREDIT_SCORING_100K B  
WHERE A.CUSTOMER_ID = B.CUSTOMER_ID;  
  
Updated 0 row(s).  
Took 0 sec. Last updated by USER07 at August 16 2019, 2:36:28 PM.
```

Leave ML insights & predictions in Autonomous Database for access by Oracle Analytics Cloud

Let's View the Predictive Results Which Will Be Further Explored Using Oracle Analytics Cloud in Workshop 400

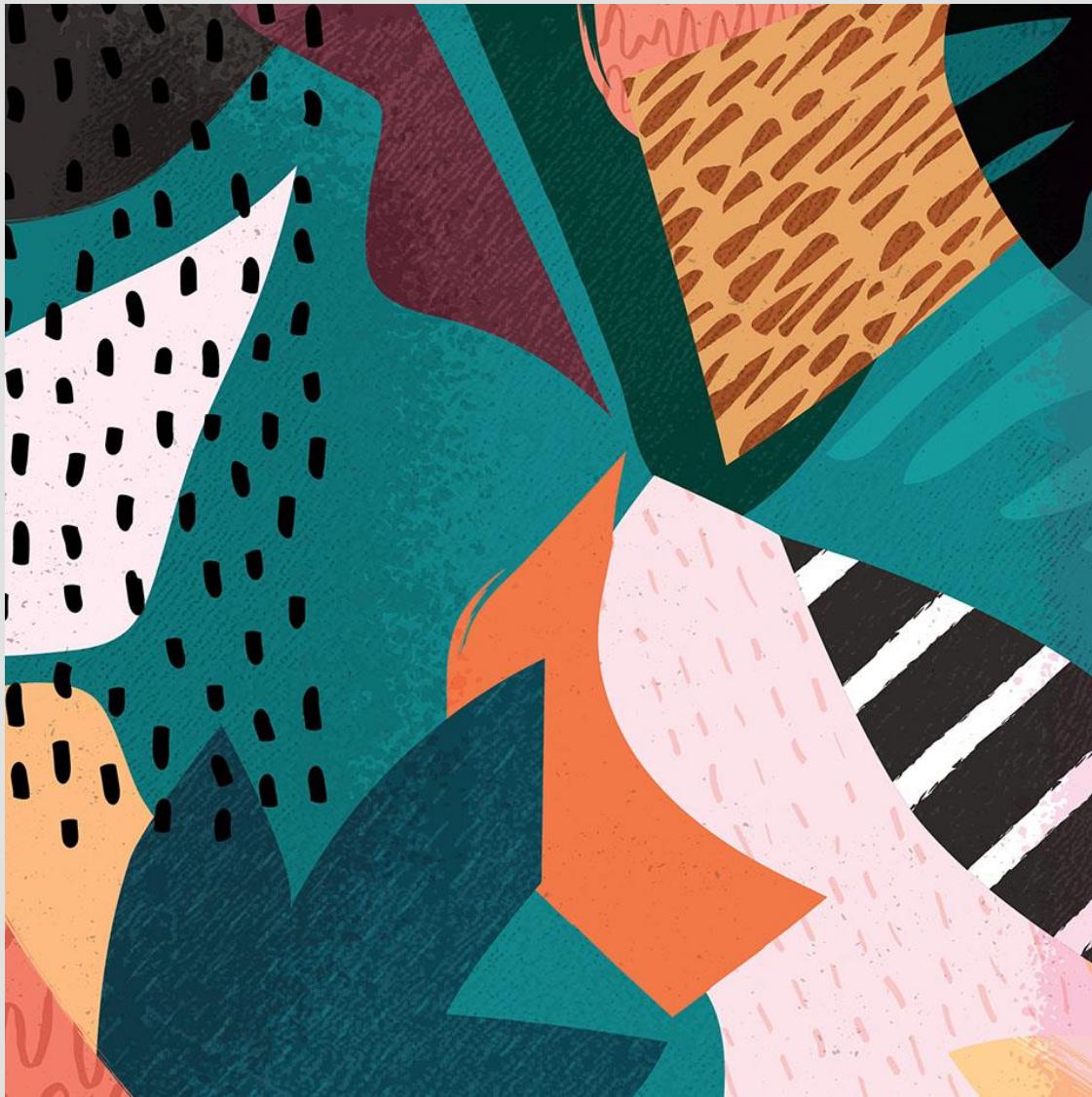
FINISHED

```
%sql  
SELECT * from CREDIT_SCORING_100K_V;
```

PROB_GOOD_CREDIT	CUSTOMER_ID	AGE	INCOME	MARITAL_STATUS	NUMBER_OF_LIABLES	WEALTH	EDUCATION_LEVEL	TENURE	LOAN_TYPE	LOAN_AMOUNT	LOAN_LENGTH	GENDER	REGION	CURRENT_ADDRESS
1.2	45879	64	2750	Married	2	Average	Master's Degree	10	Auto	15000	24	Female	Black Sea	46
1.2	36615	18	500	Single	3	Very Poor	Primary School Grad	15	Need	15000	24	Male	Aegean	8
49.43	4109	56	4250	Single	3	Rich	Bachelor's Degree	1	Education	10000	24	Male	Black Sea	77
100	44429	18	4250	Single	1	Very Rich	Bachelor's Degree	63	Auto	40000	48	Female	Black Sea	10
100	45956	19	5250	Married	2	Very Rich	Bachelor's Degree	7		20000	12	Female	Black Sea	97
1.2	50925	26	3750	Divorced	3	Average	Master's Degree	26	Need	40000	24	Male	Mediterranean	8
1.2	18868	26	2150	Single	1	Average	Master's Degree	19	Need	40000	12	Female	Eastern Anatolia	7
49.43	88652	34	4250	Married	3	Rich	Bachelor's Degree	82	Need	25000	24	Male	Marmara	55

Took 1 sec. Last updated by USER07 at August 16 2019, 2:36:34 PM.

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Let's Further Investigate Oracle Machine Learning's Insights and Predictions using Oracle Analytics Cloud

 Targeting High Credit Customers - Project

Prepare

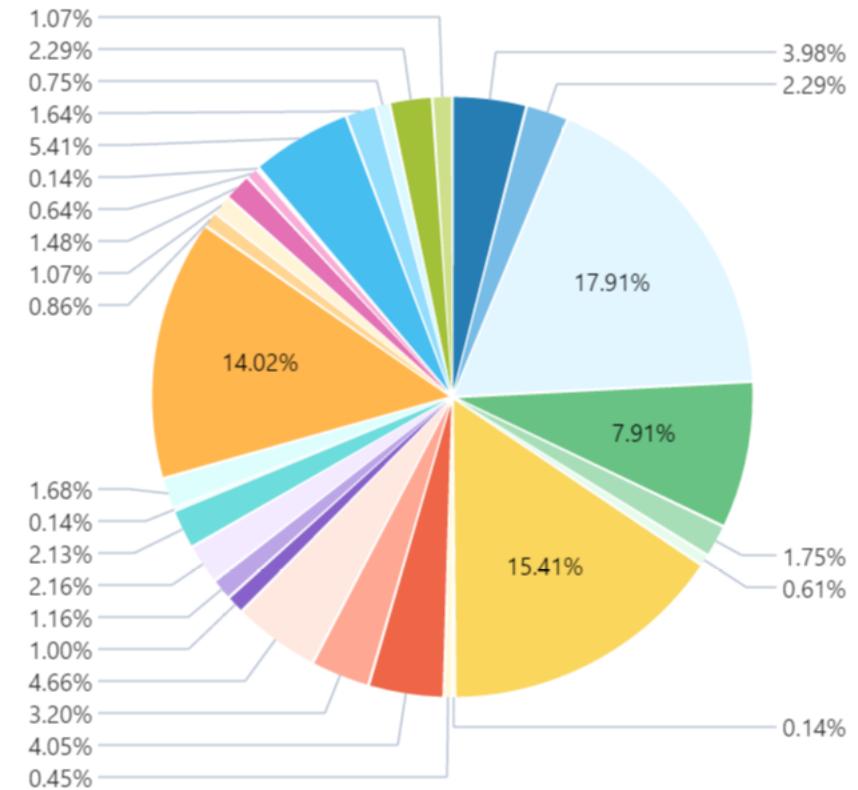
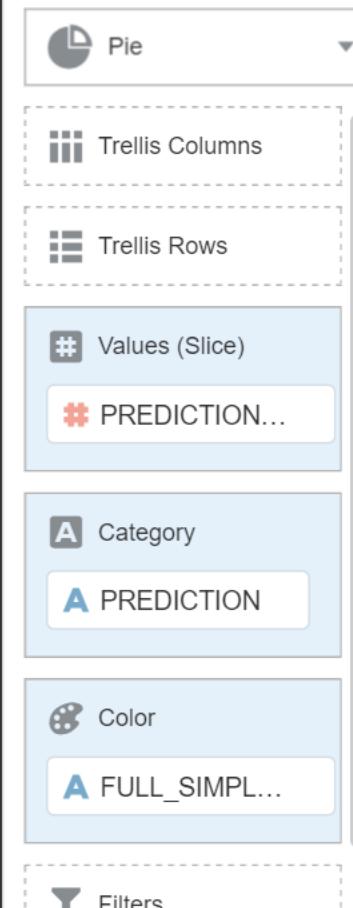
Visualize

Narrate

Save

1

 Click here or drag data to add a filter



- (WEALTH in ("Average..."))
- (WEALTH in ("Rich" "V..."))
- (WEALTH in ("Rich" "V..."))
- (WEALTH in ("Rich" "V..."))

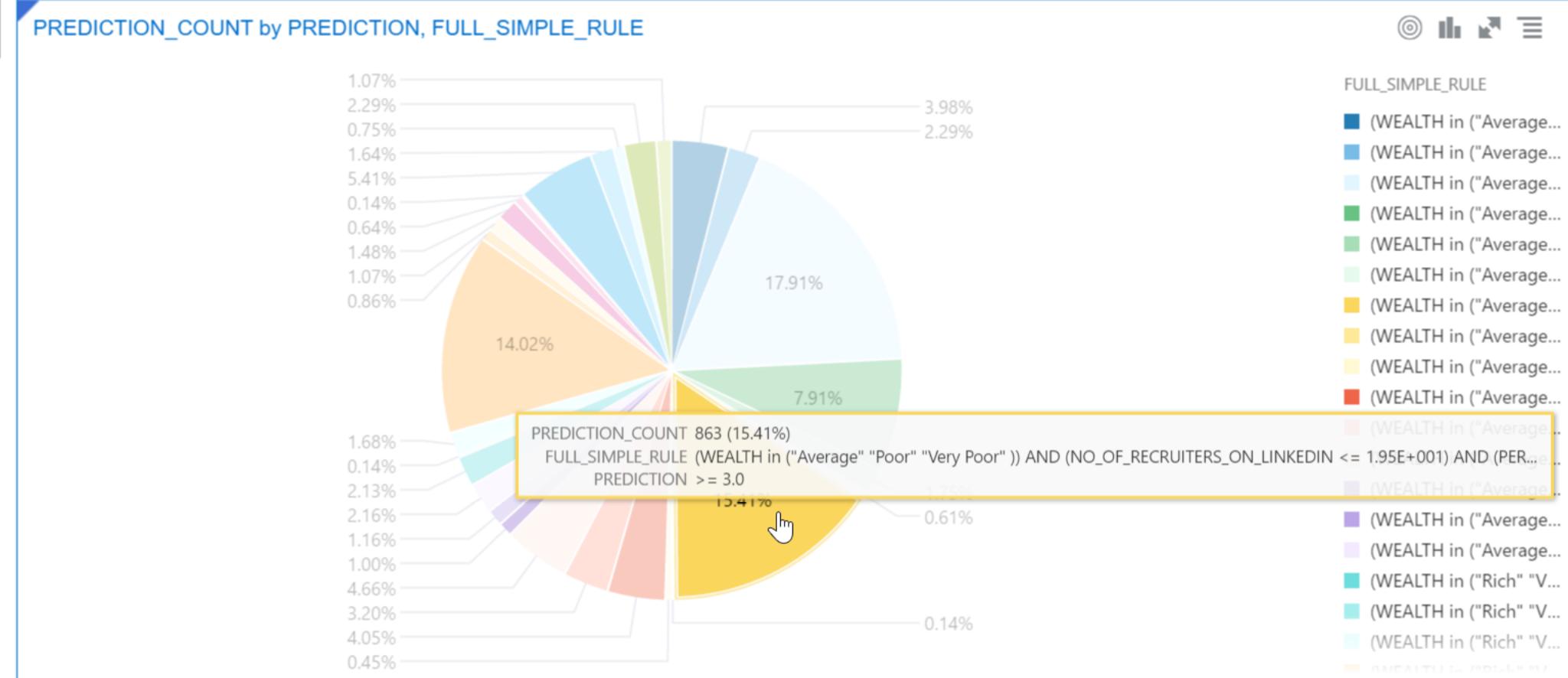
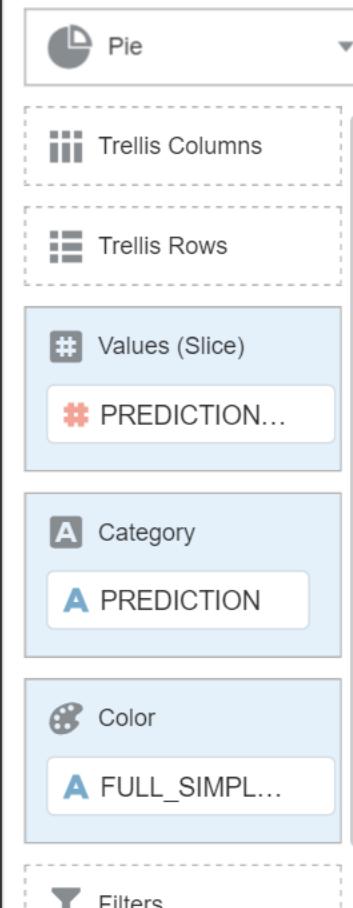


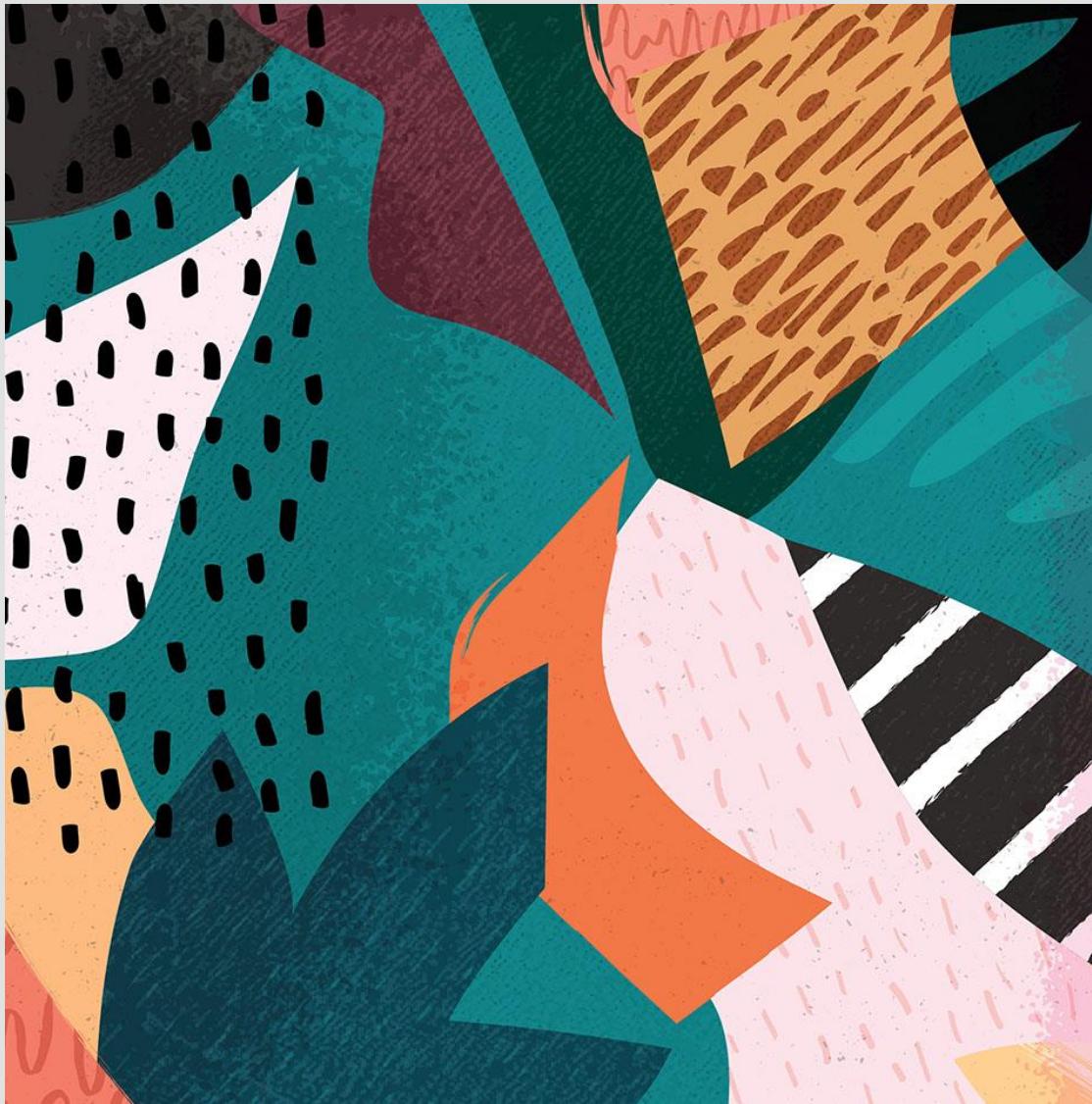
Targeting High Credit Customers - Project

Prepare Visualize Narrate

Save ▾

 Click here or drag data to add a filter





That's it! Congratulations!

**You are now an
“Oracle Data Scientist”!**



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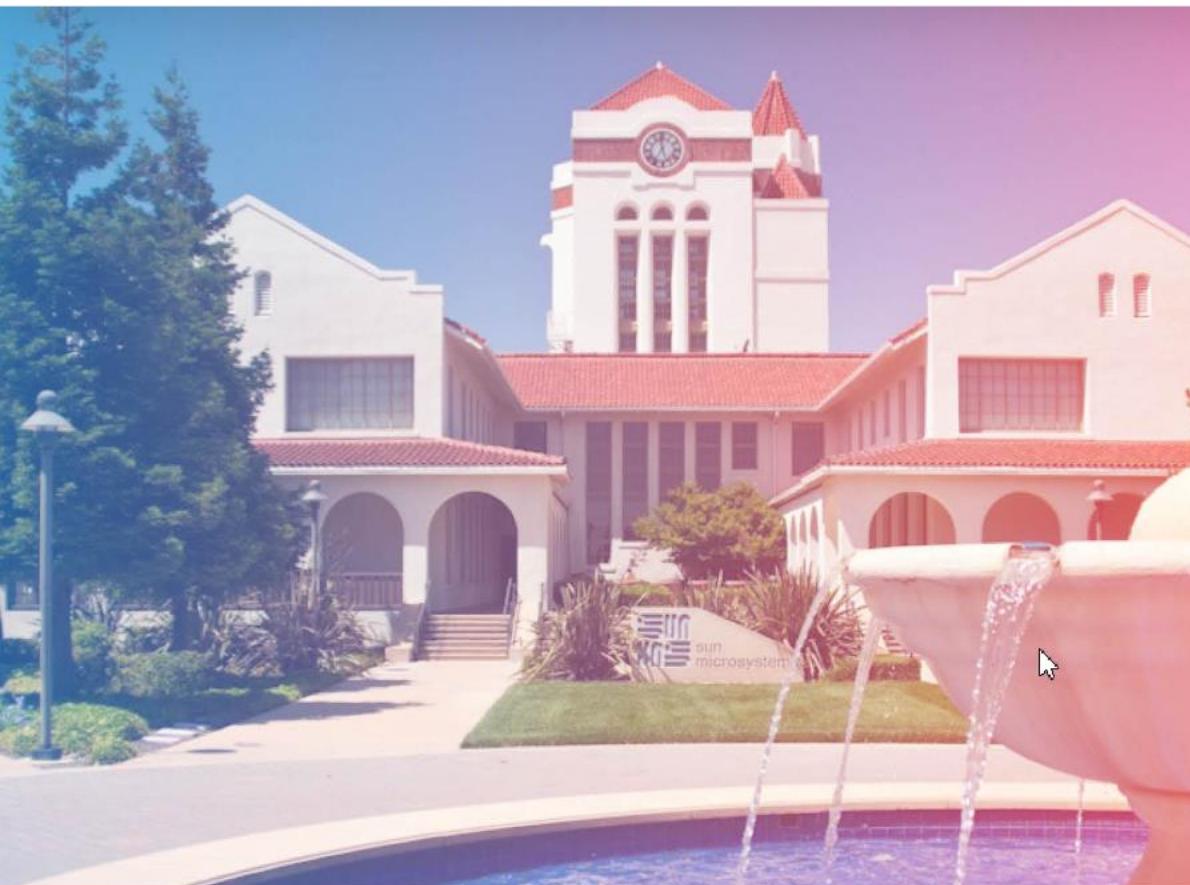
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