Safe Harbor Statement

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Introducing Oracle Autonomous Data Warehouse Cloud

Value Proposition

**Easy**
- Provision a data warehouse in as little as 15-seconds
- Automated management of database administration
- Simple Load and Go with Automated Tuning
- Dedicated cloud-ready migration tools including Redshift

**Fast**
- Up to 14x performance advantage than Redshift\(^1\)
- High concurrency supports multi-user access and workloads
- Based on Exadata for extreme performance

**Elastic**
- Only Pay for What you Use with user defined sizing, on-demand scaling & idle shut-off
- Independent scaling of compute and storage
- Instant scaling with zero downtime
Oracle Autonomous Data Warehouse Cloud Key Features

- **High-Performance Queries and Concurrent Workloads**
  Optimized query performance with preconfigured resource profiles for different types of users

- **Oracle SQL**
  Autonomous DW Cloud is compatible with all business analytics tools that support Oracle Database

- **Self Driving**
  Fully automated database for self-tuning patching and upgrading itself while the system is running

- **Cloud-Based Data Loading**
  Fast, scalable data-loading from Oracle Object Store, AWS S3, or on-premises

- **Highly Elastic**
  Independently scale compute and storage, without having to overpay for fixed blocks of resources

  **Oracle Machine Learning**

- **Built-in Web-Based SQL ML Tool**
  Apache Zeppelin Oracle Machine Learning notebooks ready to run ML from browser

- **Database migration utility**
  Dedicated cloud-ready migration tools for easy migration from Amazon Redshift, SQL Server and other databases

- **Enterprise Grade Security**
  Data is encrypted by default in the cloud, as well as in transit and at rest
Architecture for Modern Cloud Data Warehousing

Autonomous Data Warehouse Cloud

- Service Management
- Built-in Access Tools
- Oracle Machine Learning

Autonomous Database Cloud

- Service Console

Oracle Object Storage Cloud
- Flat Files and Staging

Developer Tools
- Oracle SQL Developer

Data Integration Services
- Oracle Data Integration Platform Cloud

3rd Party DI on Oracle Cloud Compute
- 3rd Party DI On-premises

Advanced Analytics
- Oracle Analytics Cloud
- 3rd Party Analytics on Oracle Cloud Compute
- 3rd Party Analytics On-premises

Oracle Database Cloud Service

Express Cloud Service

Data Warehouse Services
- (EDWs, DW, departmental marts and sandboxes)

Oracle SQL Developer

Developer Tools

Oracle Machine Learning

Oracle Management

Oracle Analytics Cloud

Oracle Object Storage Cloud

Flat Files and Staging

Oracle Data Integration Platform Cloud

3rd Party DI on
Oracle Cloud Compute

3rd Party DI On-premises

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Introducing: Oracle Machine Learning SQL Notebook
Oracle Machine Learning
Machine Learning Notebook for Autonomous Data Warehouse Cloud

Key Features

• Collaborative UI for data scientists
  – Packaged with Autonomous Data Warehouse Cloud (V1)
  – Easy access to shared notebooks, templates, permissions, scheduler, etc.
  – SQL ML algorithms API (V1)
  – Supports deployment of ML analytics
Oracle Machine Learning
Machine Learning Notebook for Autonomous Data Warehouse Cloud

Key Features

• Collaborative UI for data scientists
  – Packaged with Autonomous Data Warehouse Cloud (V1)
  – Easy access to shared notebooks, templates, permissions, scheduler, etc.
  – SQL ML algorithms API (V1)
  – Supports deployment of ML analytics
### Classification
- Naïve Bayes
- Logistic Regression (GLM)
- Decision Tree
- Random Forest
- Neural Network
- Support Vector Machine
- Explicit Semantic Analysis

### Clustering
- Hierarchical K-Means
- Hierarchical O-Cluster
- Expectation Maximization (EM)

### Anomaly Detection
- One-Class SVM

### Time Series
- Holt-Winters, Regular & Irregular, with and w/o trends & seasonal
- Single, Double Exp Smoothing

### Regression
- Linear Model
- Generalized Linear Model
- Support Vector Machine (SVM)
- Stepwise Linear regression
- Neural Network

### Attribute Importance
- Minimum Description Length
- Principal Comp Analysis (PCA)
- Unsupervised Pair-wise KL Div

### Association Rules
- A priori/ market basket

### Predictive Queries
- Predict, cluster, detect, features

### Statistical Functions
- Basic statistics: min, max, median, stdev, t-test, F-test, Pearson’s, Chi-Sq, ANOVA, etc.

### Feature Extraction
- Principal Comp Analysis (PCA)
- Non-negative Matrix Factorization
- Singular Value Decomposition (SVD)
- Explicit Semantic Analysis (ESA)

### SQL Analytics
- SQL Windows, SQL Patterns, SQL Aggregates

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*OAA includes support for Partitioned Models, Transactional, data, etc.*

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Sign In

Tenant: TENANT1
Database: PDB1

* Username: CBERGER
* Password: **********

Sign In
## Notebooks

<table>
<thead>
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<td>8,612</td>
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<td>Wright</td>
<td>M</td>
</tr>
</tbody>
</table>
# Simple Oracle Machine Learning notebook example

Oracle Machine Learning example notebook for learning basic functions using SH schema data and highlights basic data selection and data viewing using the Oracle Autonomous Data Warehouse Cloud (ADWC).

By Charlie Berger

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---

### Show all tables

```sql
SELECT * FROM all_tables WHERE owner = 'SH';
```

| OWNER  | TABLE_NAME | TABLESPACE_NAME | CLUSTER_NAME | IOT_NAME | STATUS | PCT_FREE | PCT_USED | IN_TRANS | MAX_TRANS | INITIAL_EXTENT | NEXT_EXTENT | MIN_EXTENTS | MAX_EXTENTS | PCT_INCREASE | FREELISTS | FREELIST_GROUPS | LOGGING | BACKED_UP |
|--------|------------|-----------------|--------------|----------|--------|----------|----------|----------|-----------|-------------|-------------|------------|-------------|-------------|------------|-----------|-------------|
| SH     | SALES      | SYSTEM          |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
| SH     | TIMES      | SYSTEM          |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
| SH     | CHANNELS   | SYSTEM          |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
| SH     | PROMOTIONS | SYSTEM          |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
| SH     | CUSTOMERS  | SYSTEM          |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
| SH     | COUNTRIES  | SYSTEM          |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
| SH     | SUPPLEMENTARY_DEMOGRAPHICS | SYSTEM |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
| SH     | SALES_TRANSACTIONS | SYSTEM |              |          | VALID  | 10%      | 90%      | 1        | 255       | 65,536      | 1,048,576   | 1          | 1          | 1           |            |            | YES         |
Anomaly Detection to Detect Suspicious or Rare Occurrences

This notebook shows how to detect rare records, customers or transactions using an unsupervised learning algorithm (1-Class Support Vector Machine). The notebook first builds a 1-Class SVM model and then applies the model to flag unusual or suspicious records. The anomaly detection model can also be applied to “score” new records. The entire machine learning methodology runs inside the Oracle Autonomous Data Warehouse Cloud (ADWC).

By Charlie Berger


Clean up and drop any table if previously exists for notebook reproducibility

```sql
BEGIN
EXECUTE IMMEDIATE 'DROP Table SUPPLEMENTARY_DEMOGRAPHICS2';
EXCEPTION
WHEN OTHERS THEN NULL;
END;
PL/SQL procedure successfully completed.
```

Create SUPPLEMENTARY_DEMOGRAPHICS2 table that remove COMMENTS unstructured data for simplicity.

```sql
CREATE Table SUPPLEMENTARY_DEMOGRAPHICS2 AS (SELECT AFFINITY_CARD, BOOKEEPING_APPLICATION, BULK_PACK_DISKETTES, CUST_ID, EDUCATION, FLAT_PANEL_MONITOR, HOME_THEATER_PACKAGE, HOUSEHOLD_SIZE, OCCUPATION, OS_DOC_SET_KANJI, PRINTER_SUPPLIES, YS_RESIDENCE, Y_BOX_GAMES FROM SH.SUPPLEMENTARY_DEMOGRAPHICS);
Updated 4500 row(s).
```
Anomaly Detection

Build Anomaly Detection Model (1-Class SVM)

```sql
--- Build Anomaly Detection Model (1-Class SVM) on SUPPLEMENTARY_DEMOGRAPHICC2 data

DECLARE
  v_sql VARCHAR2(100);

BEGIN
  v_sql := 'DROP TABLE CUSTOMERS360_SET';
  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;

  v_sql := 'CALL DBMS_DATA_MINING.DROP_MODEL(:CUSTOMERS360MODEL)';
  EXECUTE IMMEDIATE v_sql;
  DBMS_OUTPUT.PUT_LINE (v_sql || ' succeeded');
  EXCEPTION
  WHEN OTHERS THEN
    DBMS_OUTPUT.PUT_LINE (v_sql || ' drop unnecessary - no model exists');
  END;

  -- Create a Build Setting table for Model Build
  EXECUTE IMMEDIATE 'CREATE TABLE CUSTOMERS360_SET (setting_name VARCHAR2(38), setting_value VARCHAR2(4000))';
  EXECUTE IMMEDIATE 'INSERT INTO CUSTOMERS360_SET (setting_name, setting_value) VALUES (:ALGO_NAME, :ALGO_SUPPORT_VECTOR_MACHINES)';
  EXECUTE IMMEDIATE 'INSERT INTO n1_build_settings (setting_name, setting_value) VALUES (:PREP_AUTO, :ON)';
  DBMS_OUTPUT.PUT_LINE ('Created model build settings table: CUSTOMERS360_SET');

  -- Build the 1-Class SVM model.
  EXECUTE IMMEDIATE 'CALL DBMS_DATA_MINING.CREATE_MODEL(:CUSTOMERS360MODEL, :CLASSIFICATION, :CUSTOMERS360, :CUST_ID, null, :CUSTOMERS360SET)';
  DBMS_OUTPUT.PUT_LINE ('Created model: CUSTOMERS360MODEL');
END;

DROP TABLE CUSTOMERS360SET; succeeded
CALL DBMS_DATA_MINING.DROP_MODEL('CUSTOMERS360MODEL'); succeeded
Created model build settings table: CUSTOMERS360_SET
Created model: CUSTOMERS360MODEL
PL/SQL procedure successfully completed.
```
Display CUSTOMERS360 table

```sql
-- CUST_YEAR_OF_BIRTH vs. YRS_RESIDENCE grouped by CUST_MARITAL_STATUS
SELECT * from CUSTOMERS360;
```

Build Anomaly Detection Model (1-Class SVM)

```sql
-- Build Anomaly Detection Model (1-Class SVM) on SUPPLEMENTARY_DEMOGRAPHIC362 data
DECLARE v_sql varchar2(100);
BEGIN
    v_sql := 'DROP TABLE CUSTOMERS360_SET';
    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');
```
## Anomaly Detection

**Graph Customers and probability of being Anomalous**

![Graph customers and probability of being anomalous](image)

**Display the Top 5 Most Anomalous Customers**

```sql
SELECT *
FROM (SELECT CUST_ID, HOUSEHOLD_SIZE, YRS_RESIDENCE, CUST_GENDER, CUST_MARITAL_STATUS, round(prob_fraud*100, 1) percent_fraud,
       rank() OVER (ORDER BY prob_fraud DESC) rk FROM CUSTOMERS)
WHERE rk <= 5
ORDER BY percent_fraud DESC
```

<table>
<thead>
<tr>
<th>CUST_ID</th>
<th>HOUSEHOLD_SIZE</th>
<th>YRS_RESIDENCE</th>
<th>CUST_GENDER</th>
<th>CUST_MARITAL_STATUS</th>
<th>PERCENT_FRAUD</th>
</tr>
</thead>
<tbody>
<tr>
<td>100.199</td>
<td>2</td>
<td>2</td>
<td>F</td>
<td>Widowed</td>
<td>75.73</td>
</tr>
<tr>
<td>103.154</td>
<td>2</td>
<td>2</td>
<td>F</td>
<td>Widowed</td>
<td>75.73</td>
</tr>
<tr>
<td>102.048</td>
<td>9+</td>
<td>2</td>
<td>F</td>
<td>Widowed</td>
<td>73.32</td>
</tr>
<tr>
<td>101.127</td>
<td>9+</td>
<td>3</td>
<td>F</td>
<td>Widowed</td>
<td>66.66</td>
</tr>
</tbody>
</table>
Classification Prediction Model

Predicting Target Customers using Classification

Example notebook to predict customers most likely to be positive responders to an Affinity Card loyalty program. This notebook builds and applies classification models (decision tree) using the SH schema data and processed inside the Oracle Autonomous Data Warehouse Cloud (ADWC).

By Charlie Berger


Display the SH.SUPPLEMENTARY_DEMOGRAPHICS data

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

<table>
<thead>
<tr>
<th>CUST_ID</th>
<th>EDUCATION</th>
<th>OCCUPATION</th>
<th>HOUSEHOLD_SIZE</th>
<th>YRS_RESIDENCE</th>
<th>AFFINITY_CARD</th>
<th>BULK_PACK_DISKETTES</th>
<th>FLAT_PANEL_MONITOR</th>
<th>HOME_THEATER_PACKAGE</th>
<th>BOOKKEEPING_APPLICATION</th>
<th>PRINTER_SUPPLY</th>
<th>Y_BOX_GAMES</th>
<th>OS_DOC_SET_KANJI</th>
</tr>
</thead>
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<td>100.001</td>
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<td>3</td>
<td>6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>100.002</td>
<td>HS-grad</td>
<td>Machine</td>
<td>3</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>1</td>
<td>0</td>
<td>0</td>
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<td>?</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>0</td>
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<td>1</td>
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<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Sh
Al   Gr   iA   iA   iA
### Classification Prediction Model

**Real-time prediction**

```sql
Select prediction_probability(ML_CLASS_MODEL, 'I'
USING '3' as HOUSEHOLD_SIZE, 5 as YRS_RESIDENCE, 1 as Y_BOX_GAMES)
From dual
```

**PREDICTION_PROBABILITY(M1_CLASS_MODEL,'I'USING'3'AS HOUSEHOLD_SIZE,5AS YRS_RESIDENCE,1AS Y_BOX_GAMES)**

0.40058

```sql
INTERACTIVE SELECTION OF LIKELY AFFINITY_CARD RESPONDERS SELECTED BY HOUSEHOLD_SIZE
```  

**Household Size**

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<thead>
<tr>
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<th>PROBABILITY</th>
<th>COST</th>
<th>CUSTOM_ID</th>
<th>CUSTOM_GENDER</th>
<th>CUSTOM_MARITAL_STATUS</th>
<th>CUSTOM_YEAR_OF_BIRTH</th>
<th>CUSTOM_INCOME_LEVEL</th>
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<th>AFFINITY_CARD</th>
<th>HOUSEHOLD_SIZE</th>
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<td>1</td>
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<td>1.975</td>
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<td>10th</td>
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<td>0.4625</td>
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How to Get Started with Oracle Machine Learning

Here is how you can get started with Oracle Machine Learning.

1. Request access to Oracle Machine Learning. Contact your Service Administrator to provide access to your Oracle Machine Learning account.

2. Access the Oracle Machine Learning account by using your credentials. In case you forget your password, then request the Administrator to reset it.

   **Note:**
   Once you receive your new password, you must change it immediately. Refer to the Oracle Machine Learning password policy for more information.

3. Once you log in for the first time, a workspace and project will be created for you. You can start creating your notebook and assign it to the default project and workspace. You can also create your own project and workspace.

Related Topics:
- Password Policy

Accessing Oracle Machine Learning User Management Page

From Autonomous Data Warehouse Cloud you can access the Oracle Machine Learning **Manage Oracle ML Users** page.

To access Oracle Machine Learning **Manage Oracle ML Users** page:

1. Sign in to your Cloud Account and navigate to the **My Services** Dashboard.

2. Click the navigation menu icon in the top corner of the **My Services** Dashboard and then click **Autonomous Data Warehouse Cloud**.

3. Select a service and click the **i** and select **Service Console**.

4. At the prompt, enter ADMIN for the username and enter the password for the ADMIN user.
Creating Projects and Workspaces

A project is a container for your notebooks, and a workspace is a container for your projects. You can own multiple projects in a workspace.

The initial workspace and the default project is created by the Oracle Machine Learning service automatically when you log in to Oracle Machine Learning for the first time. To create a new project and workspace:

1. On the top right corner of Oracle Machine Learning home page, click the project workspace drop-down list. The project name and the workspace, in which the project resides, are displayed here. In this screenshot, the project name is Project A, and the workspace name is Admin. If a default project exists, then the default project name is displayed here. To choose a different project, click **Select Project**.

![Select Project](image)

2. To create a new project, click **New Project**.
   The Create Project dialog box opens.
3. In the **Name** field, provide a name for your project.
4. In the **Comments** field, enter comments, if any.
5. In the **Select Workspace** field, select a workspace from the drop-down list. Your project is assigned to the selected workspace. If you want to create a new workspace, then click .
6. In the Create Workspace dialog box, enter a name for the workspace in the **Name** field.
7. In the **Comments** field, enter comments, if any.
8. Click **OK**. This creates your workspace, and navigates back to the Create Project dialog box. The project that you are creating is now assigned to the newly created workspace.
9. Click **OK**.
Manage and Analyze All Your Data

Data Scientists, R Users, Citizen Data Scientists

Architecturally, Many Options and Flexibility

SQL / R

Boil down the Data Lake

“Engineered Features”
– Derived attributes that reflect domain knowledge—key to best models e.g:
  • Counts
  • Totals
  • Changes over time

Big Data SQL / R

Object Store
NoSQL
ORACLE
kafka

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ANALYTICS AND DATA SUMMIT 2018

All Analytics. All Data. No Nonsense.
March 20-22, 2018
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We've changed our name! Formerly called the BIWA Summit with the Spatial and Graph Summit.
Same great technical content – great new name!