Art of Possible with AI & Data Science

Leveraging Procurement Vendor Segmentation, Anomaly Detection and Forecasting

August 2023

EMEA Data Science Specialists

Demo Inspiration

This demonstration will showcase the capabilities of Oracle Data Science/Machine Learning Platform in aiding procurement teams with data-driven decision-making.

Objective is:

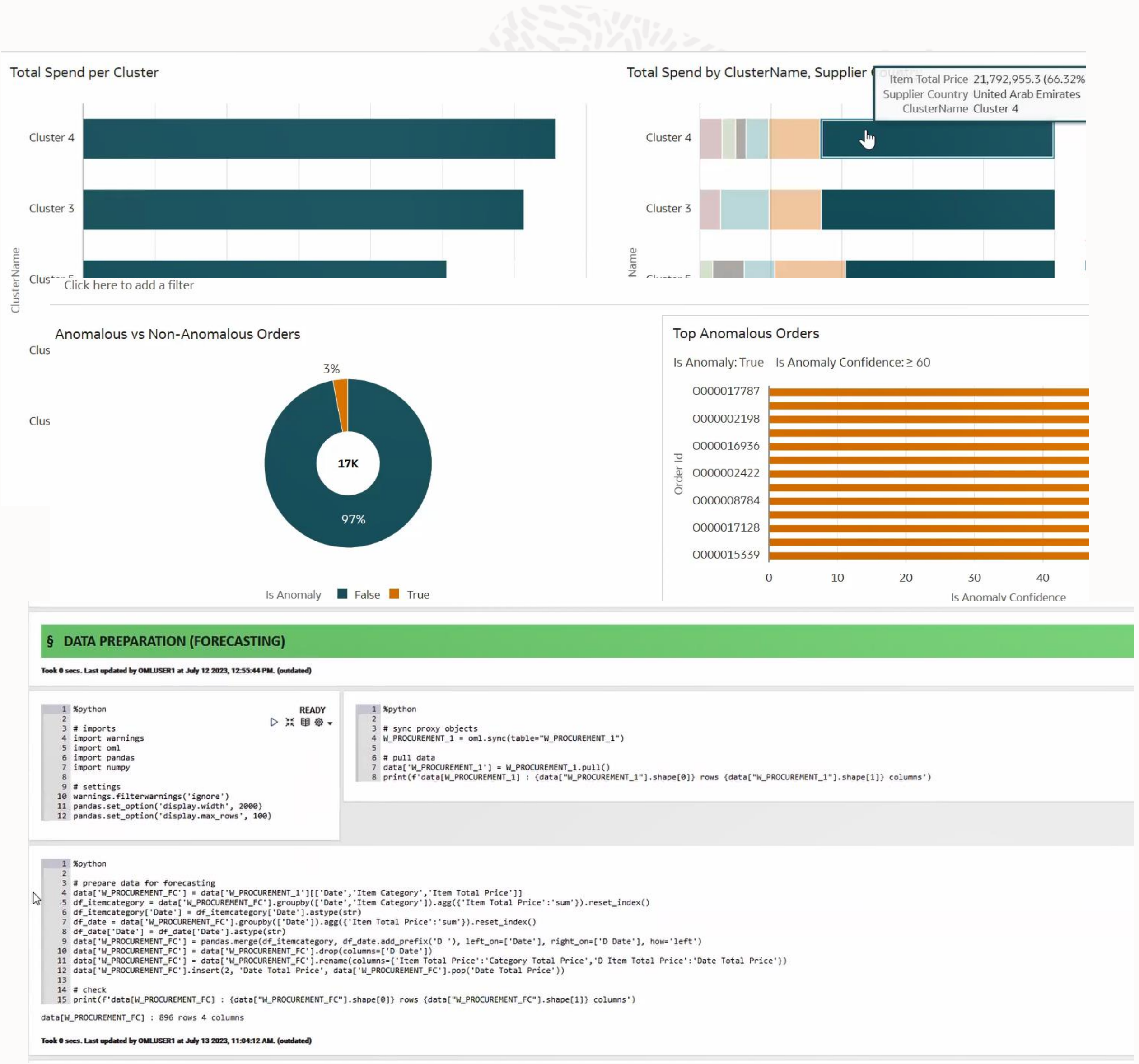
- **Classifying vendors** or suppliers into different categories based on various criteria to streamline procurement processes
- Identifying unusual or **abnormal patterns** in spending data
- **Forecasting** total daily/weekly/monthly procurement spending for each vendor.

Demo Flow

1. Summary

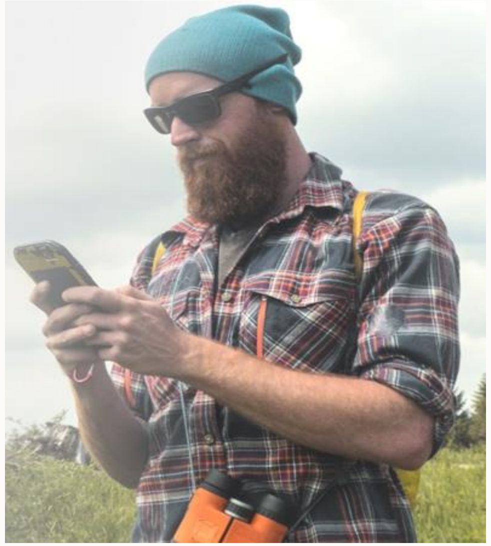
2. How did we achieve this?
   - Data Discovery & Preparation
   - Modeling
   - Actionable Insights for Business

3. Behind the Scenes
   - Oracle Data Science/ML Platform



Target Personas

Procurement manager wants to understand future procurement spendings, any anomalies in spendings and different vendor categories to manage relationships with suppliers effectively



Data scientists wants an end-to-end platform to address data science lifecycle and help procurement decision making process with ML

Summary

At the end of this demo, the questions that procurement manager will be able to answer are:

Vendor Segmentation

How can we categorize and segment our vendors based on their characteristics, performance, or strategic importance?

Which vendors are most suitable for specific procurement needs or categories?

Understanding Anomalies in Procurement Spendings

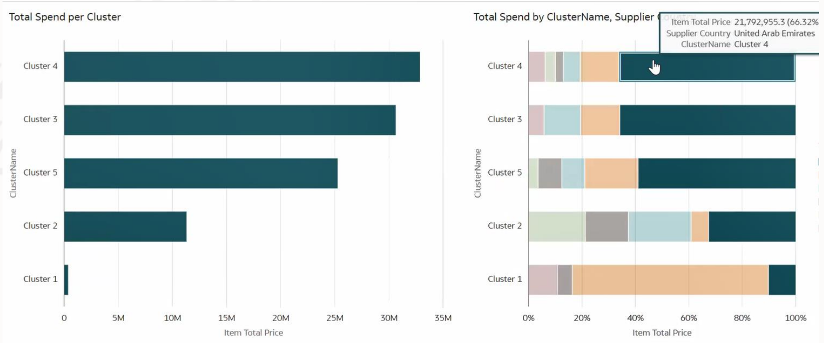
Are there any unusual or suspicious spending patterns that might indicate abnormal spending?

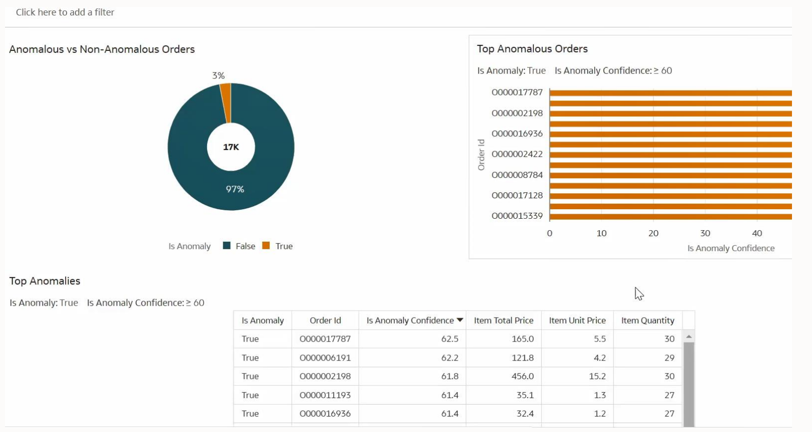
Which procurement transactions exhibit spending patterns that deviate significantly from the norm?

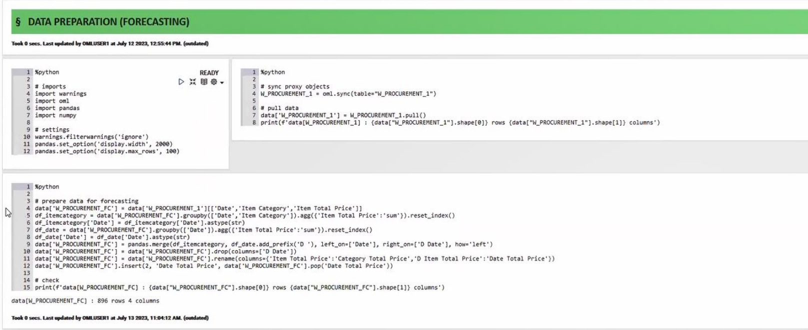
Procurement Spending Forecasting

What will be the expected spending levels for specific procurement categories in the future?

Can we identify potential cost-saving opportunities by analyzing historical spending patterns?





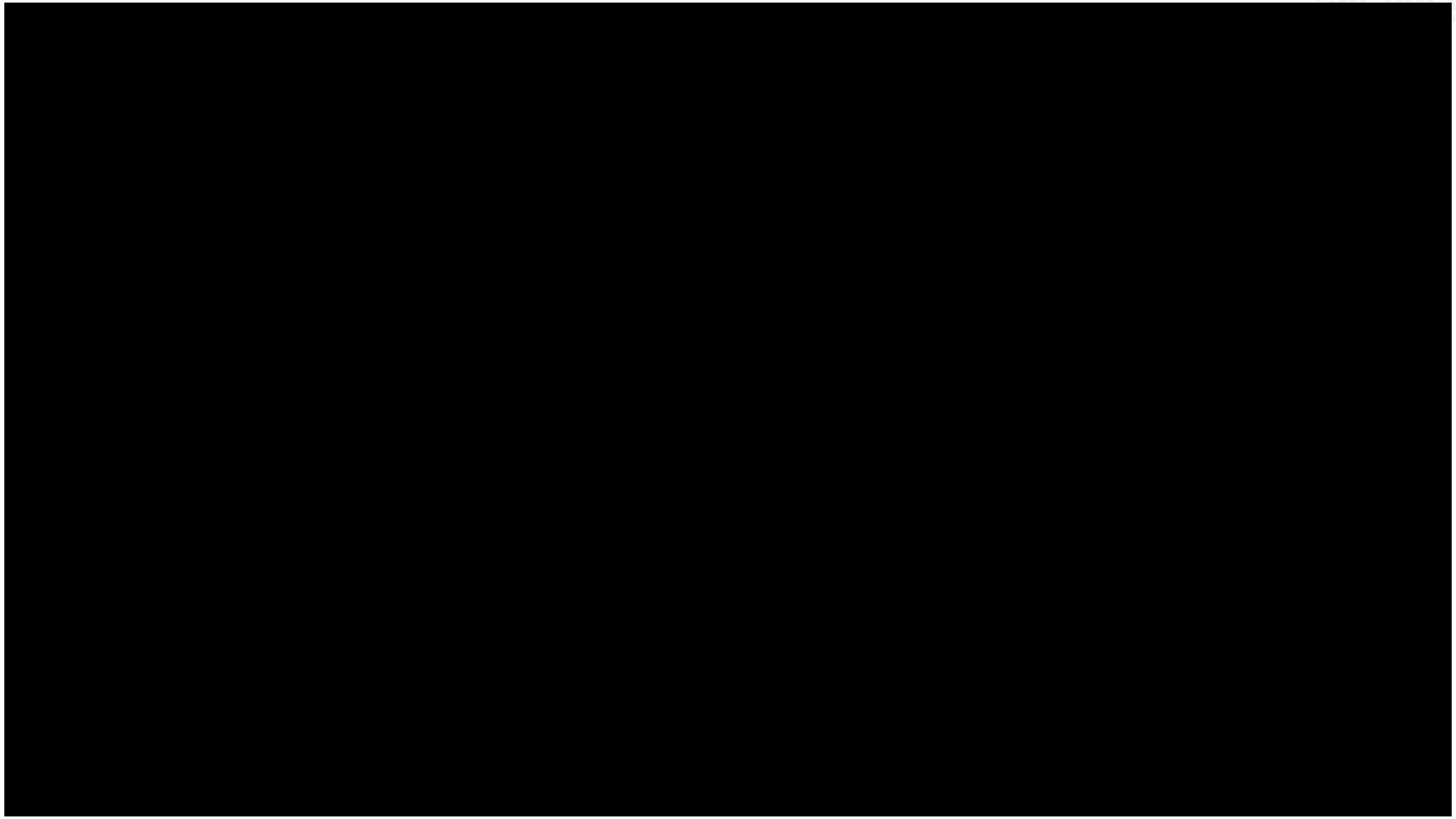


How have we achieved this?

Initial Data Discovery & Preprocessing

Procurement manager imports data to OAC. Discovers data that can provide an initial insight about procurement spendings and improves data with her business expertise

Initial Data Discovery & Preprocessing

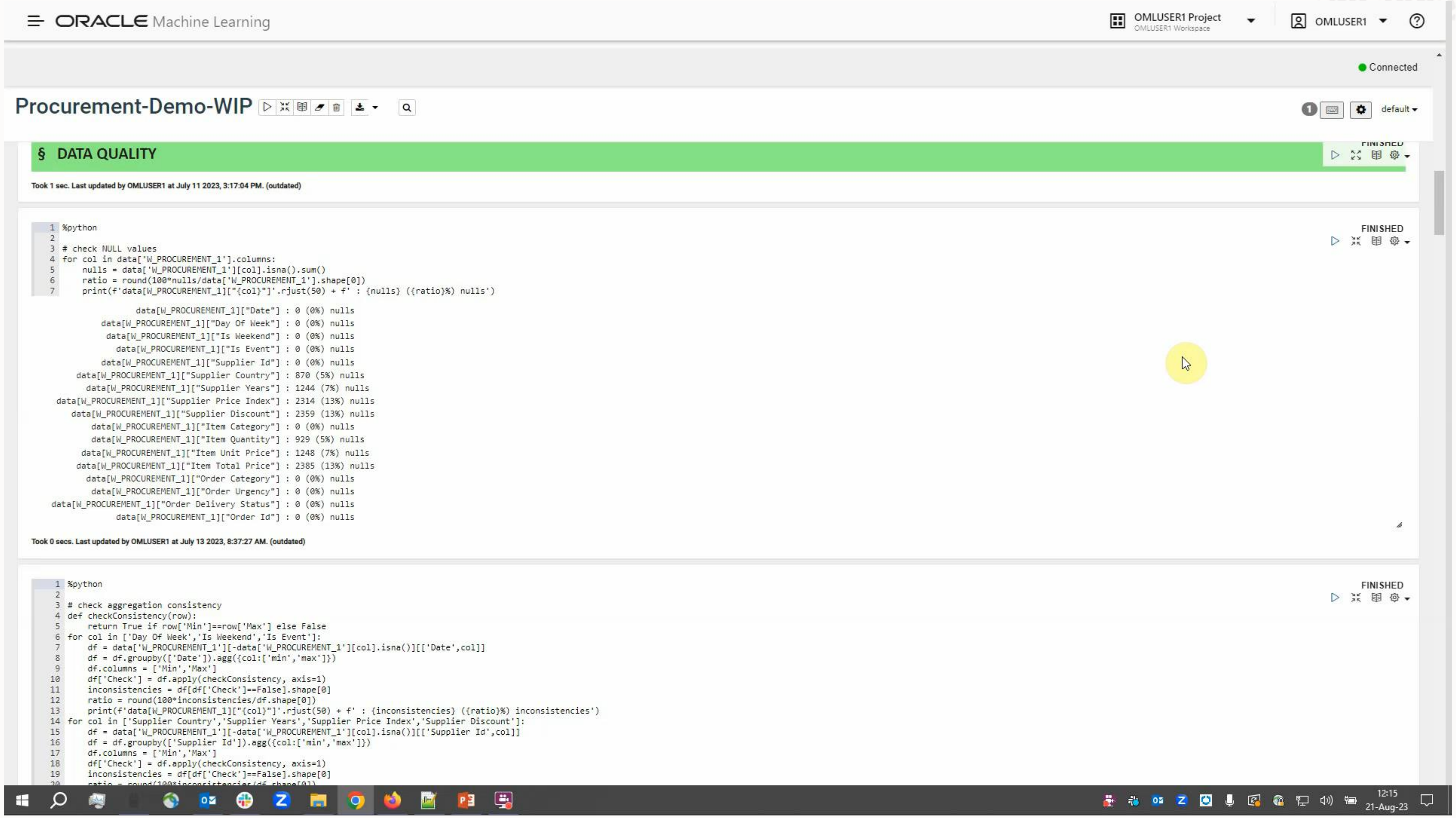


Data Preprocessing Cont'd

Procurement manager wants to have a high-quality time series data to predict future spendings as a citizen data scientist

Data scientist assesses data quality issues, fix them and shares final time series procurement data with procurement manager

Data Preprocessing Cont'd



Anomaly Detection in Procurement Spendings

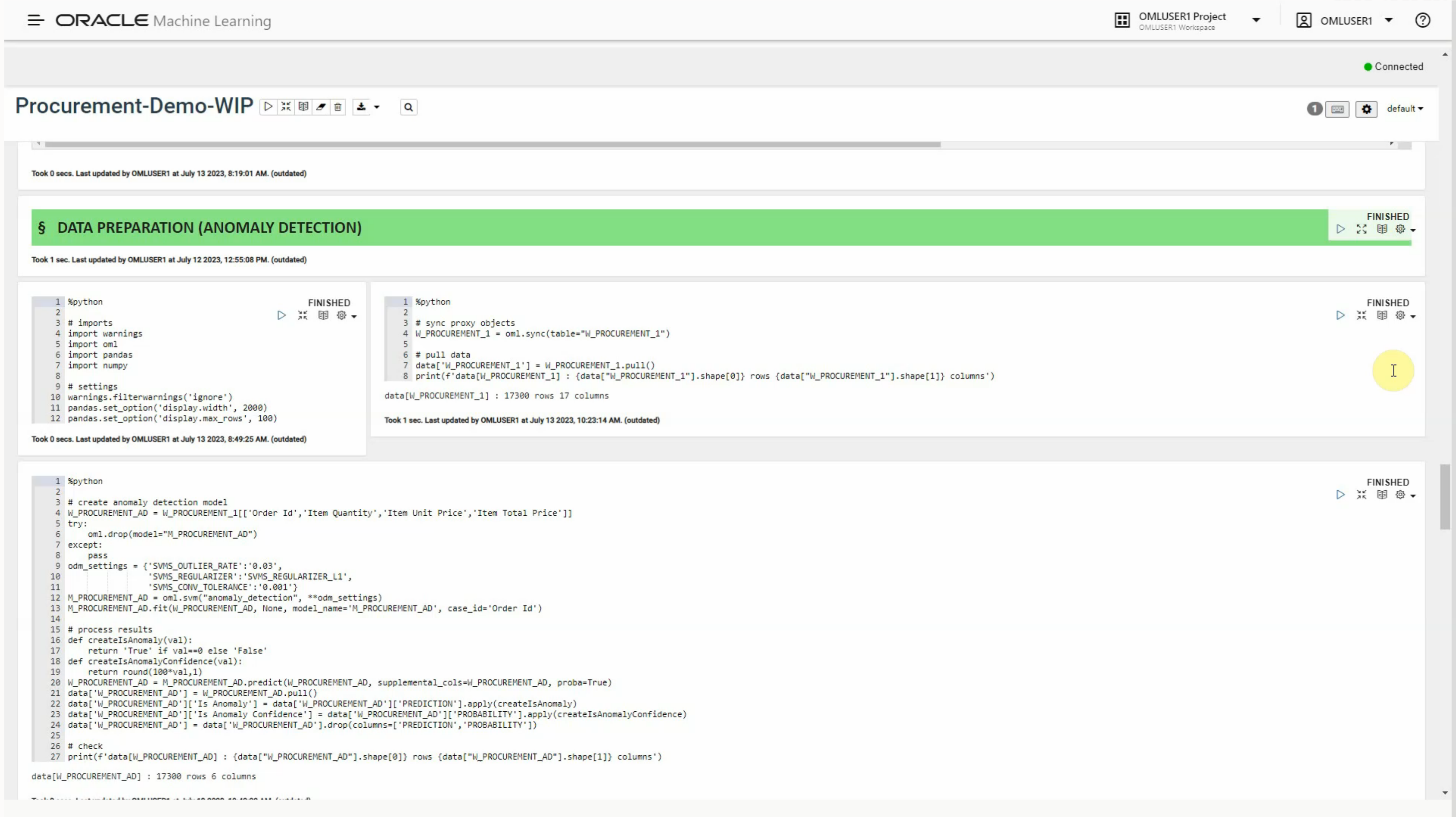
Anomaly Detection in Procurement Spendings

Procurement manager wants to understand anomalies in procurement spendings

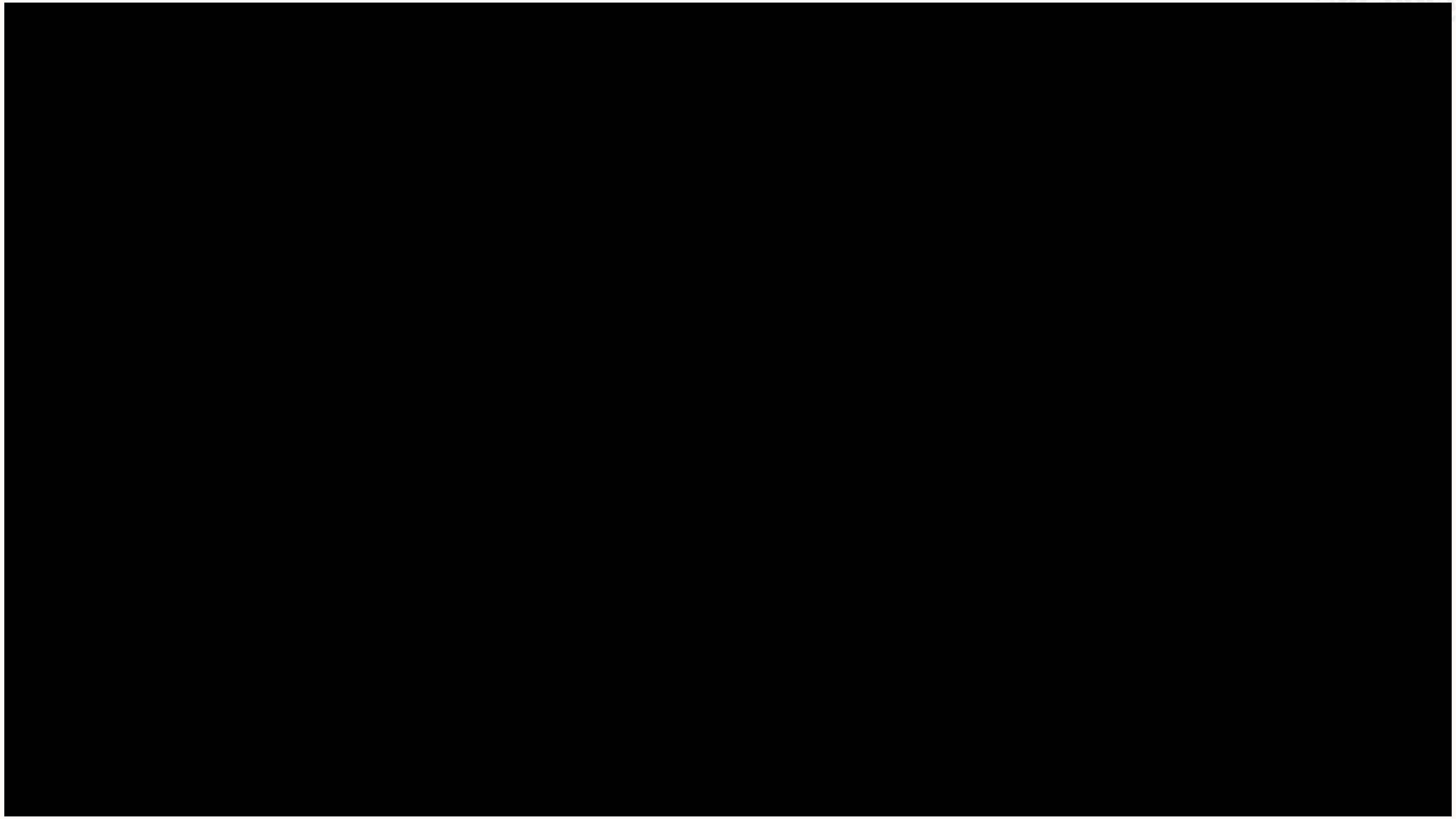
Data scientist creates an Anomaly Detection Model and shares spending anomalies data with procurement manager

Procurement manager analyses anomalies to take immediate action.

Anomaly Detection in Procurement Spendings - Modeling



Anomaly Detection in Procurement Spendings – Business Insights



Supplier Segmentation

Supplier Segmentation

Procurement manager wants to segment suppliers based on their characteristics. She talks to data scientist to create an aggregated data at supplier level.

Data scientist aggregates data at supplier level and shares this final data with procurement manager

Procurement manager builds supplier segments and discovers different suppliers and optimize procurement strategies

Supplier Segmentation - Data Preparation

ORACLE Machine Learning | OMLUSER1 Project | OMLUSER1 Workspace | OMLUSER1

Took 0 secs. Last updated by OMLUSER1 at July 13 2023, 10:42:31 AM. (outdated)

§ DATA PREPARATION (CLUSTERING)

FINISHED

Took 0 secs. Last updated by OMLUSER1 at July 12 2023, 12:55:31 PM. (outdated)

FINISHED

```python
%python

# imports
import warnings
import oml
import pandas
import numpy

# settings
warnings.filterwarnings('ignore')
pandas.set_option('display.width', 2000)
pandas.set_option('display.max_rows', 100)
```

Took 0 secs. Last updated by OMLUSER1 at July 13 2023, 11:21:10 AM. (outdated)

FINISHED

```python
%python

# sync proxy objects
W_PROCUREMENT_1 = oml.sync(table="W_PROCUREMENT_1")

# pull data
data['W_PROCUREMENT_1'] = W_PROCUREMENT_1.pull()
print(f'data[W_PROCUREMENT_1] : {data["W_PROCUREMENT_1"].shape[0]} rows {data["W_PROCUREMENT_1"].shape[1]} columns')
```

```
data[W_PROCUREMENT_1] : 17300 rows 17 columns
```

Took 1 sec. Last updated by OMLUSER1 at July 13 2023, 12:22:00 PM. (outdated)

FINISHED

```python
%python

# prepare data for clustering
data['W_PROCUREMENT_CL'] = data['W_PROCUREMENT_1'][['Supplier Id','Supplier Country','Supplier Years','Supplier Price Index','Supplier Discount',
    'Date','Is Weekend','Is Event','Item Category','Item Total Price','Order Category','Order Urgency','Order Delivery Status']]
def agg_isval(val):
    def custom_count(ser):
        return ser.value_counts().get(val, 0)
    return custom_count
def agg_rndavg():
    def custom_average(ser):
        return round(ser.mean())
    return custom_average
data['W_PROCUREMENT_CL'] = data['W_PROCUREMENT_CL'].groupby(['Supplier Id','Supplier Country','Supplier Years','Supplier Price Index','Supplier Discount']).agg(**{'Orders':('Date','count'),
    'Orders Is Weekend':('Is Weekend',agg_isval('Yes')),'Orders Not Weekend':('Is Weekend',agg_isval('No')),
    'Orders Is Event':('Is Event',agg_isval('Yes')),'Orders Not Event':('Is Event',agg_isval('No')),
    'Orders ItemCat Fashion':('Item Category',agg_isval('Fashion')),'Orders ItemCat Beauty':('Item Category',agg_isval('Beauty')),'Orders ItemCat Electronics':('Item Category',agg_isval('Electronics')),
    'Orders ItemCat Marketing':('Item Category',agg_isval('Marketing')),'Orders ItemCat FinServices':('Item Category',agg_isval('Financial Services')),'Orders ItemCat InfTechnology':('Item Category',agg_isval('Information Technology')),
    'Orders ItemCat Facility':('Item Category',agg_isval('Facility')),'Orders ItemCat Entertainment':('Item Category',agg_isval('Entertainment')),'Orders ItemCat Supermarket':('Item Category',agg_isval('Supermarket')),
    'Orders Avg Total Price':('Item Total Price',agg_rndavg()),'Orders Category Product':('Order Category',agg_isval('Product')),'Orders Category Service':('Order Category',agg_isval('Service')),
    'Orders Urgency Low':('Order Urgency',agg_isval('Low')),'Orders Urgency Medium':('Order Urgency',agg_isval('Medium')),'Orders Urgency High':('Order Urgency',agg_isval('High')),
    'Orders Delivery OnTime':('Order Delivery Status',agg_isval('On-Time')),'Orders Delivery Late':('Order Delivery Status',agg_isval('Late')),'Orders Delivery Rejected':('Order Delivery Status',agg_isval('Rejected'))}).reset_index()

# show
print(f'data[W_PROCUREMENT_CL] : {data["W_PROCUREMENT_CL"].shape[0]} rows {data["W_PROCUREMENT_CL"].shape[1]} columns')
```

```
data[W_PROCUREMENT_CL] : 98 rows 28 columns
```

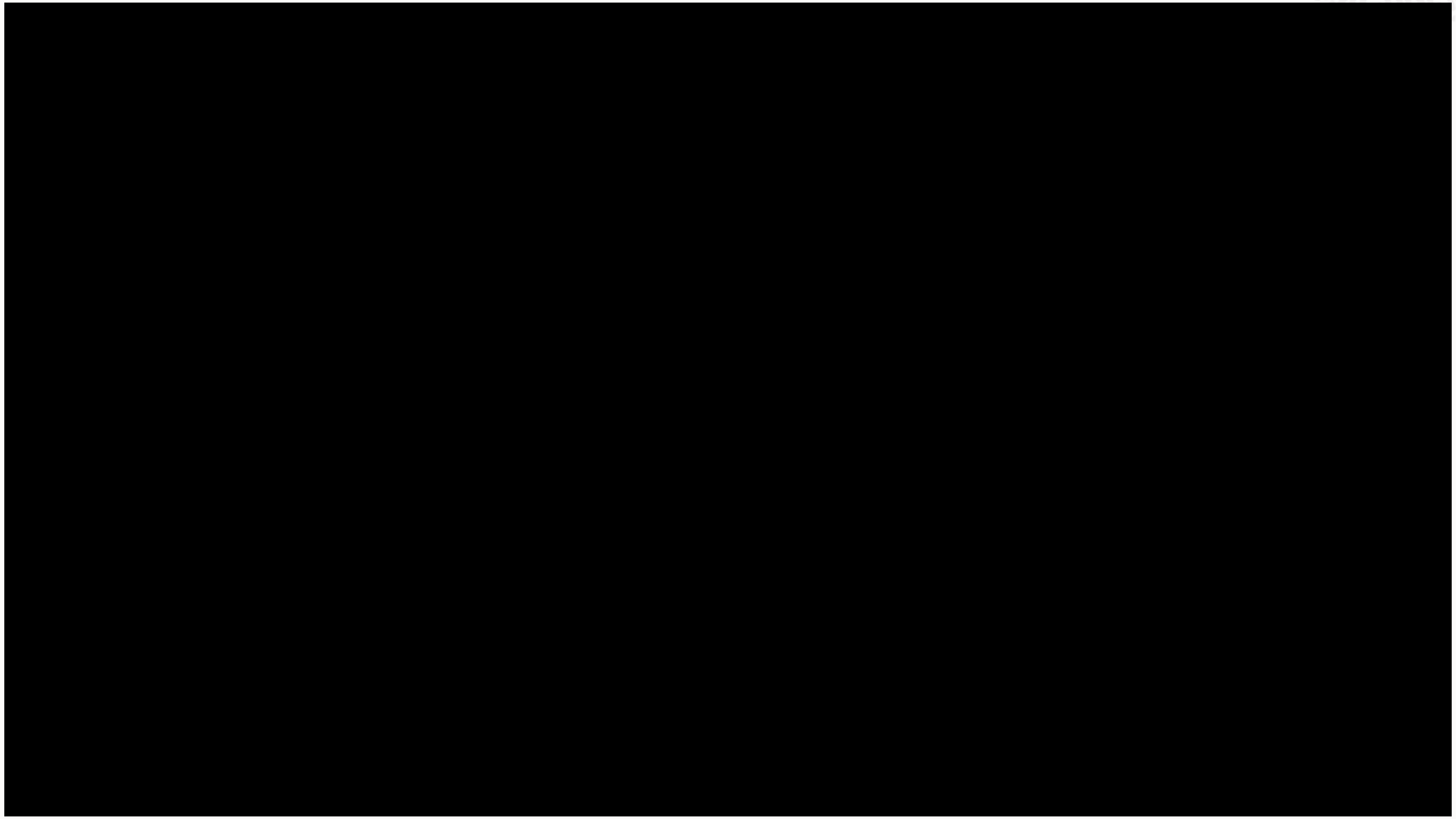
Took 0 secs. Last updated by OMLUSER1 at July 13 2023, 12:37:26 PM. (outdated)

FINISHED

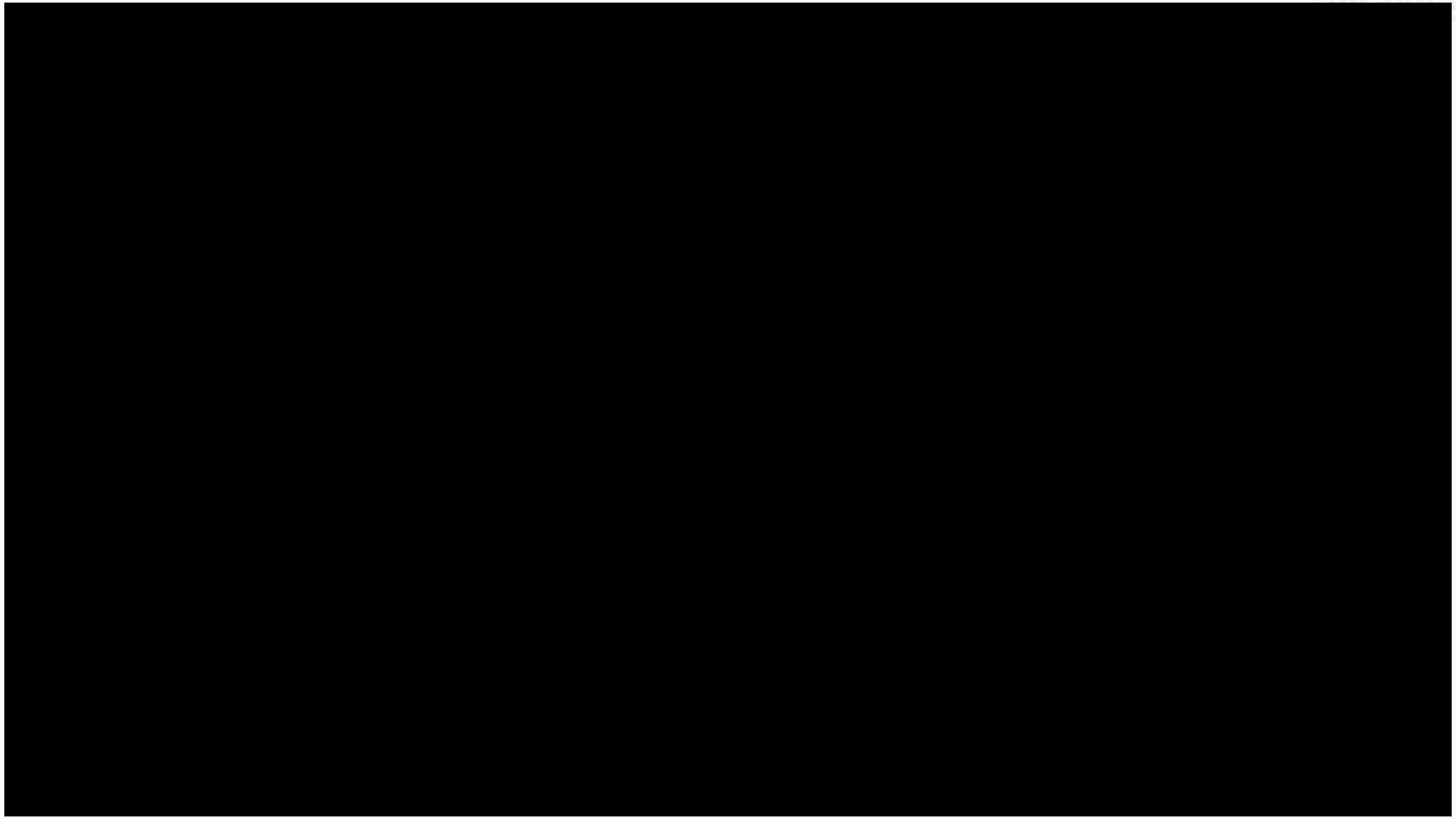
```python
%python

# push data
try:
    oml.drop(table='W_PROCUREMENT_CL')
except:
    pass
```

Supplier Segmentation - Modeling



Supplier Segmentation - Business Insights



Forecasting Procurement Spendings

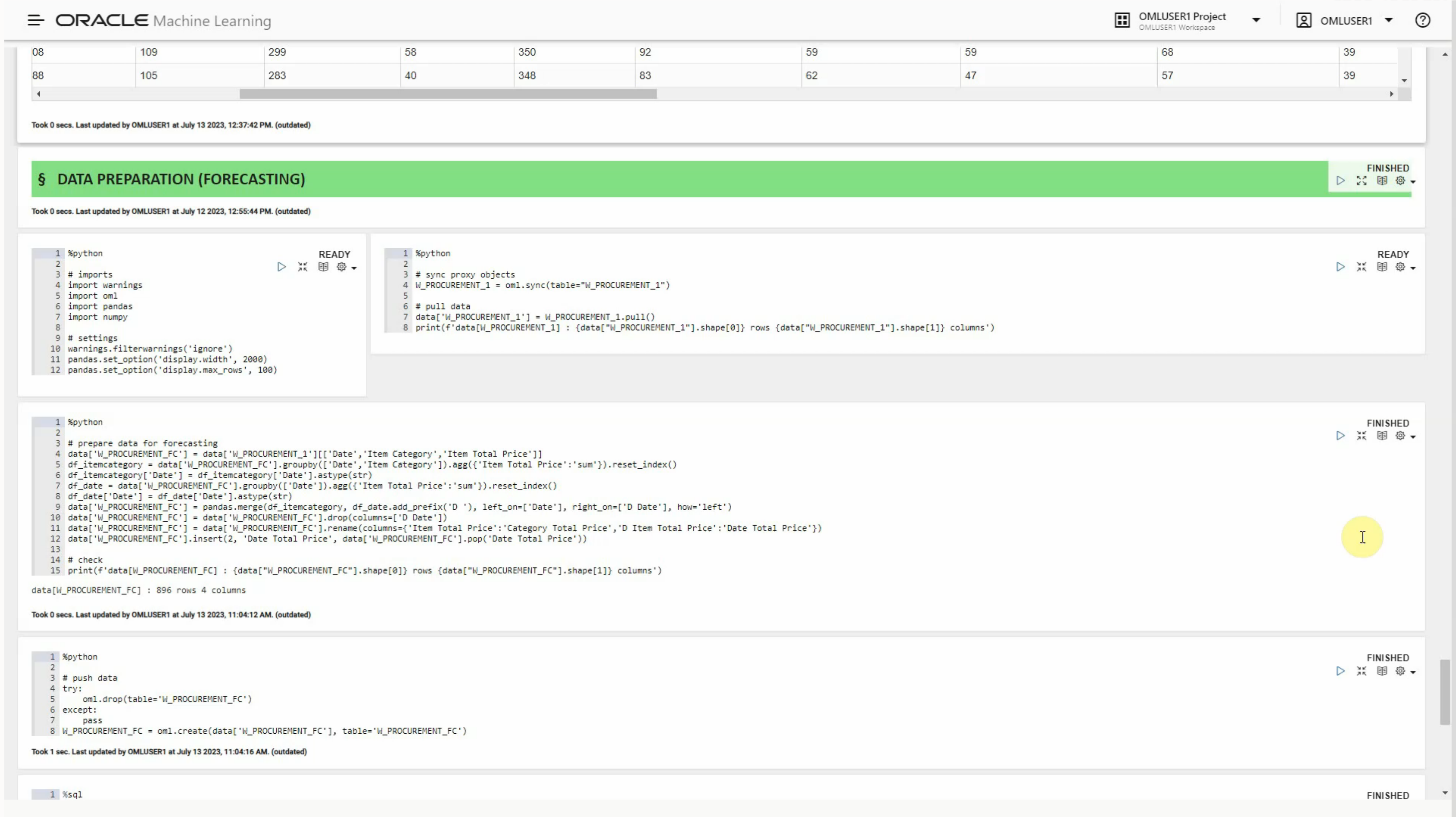
Forecasting Procurement Spendings

Procurement manager wants to predict procurement spendings for each category and day to take proactive actions about spendings. She asks data scientist to prepare a final data to be used in her citizen data scientist environment

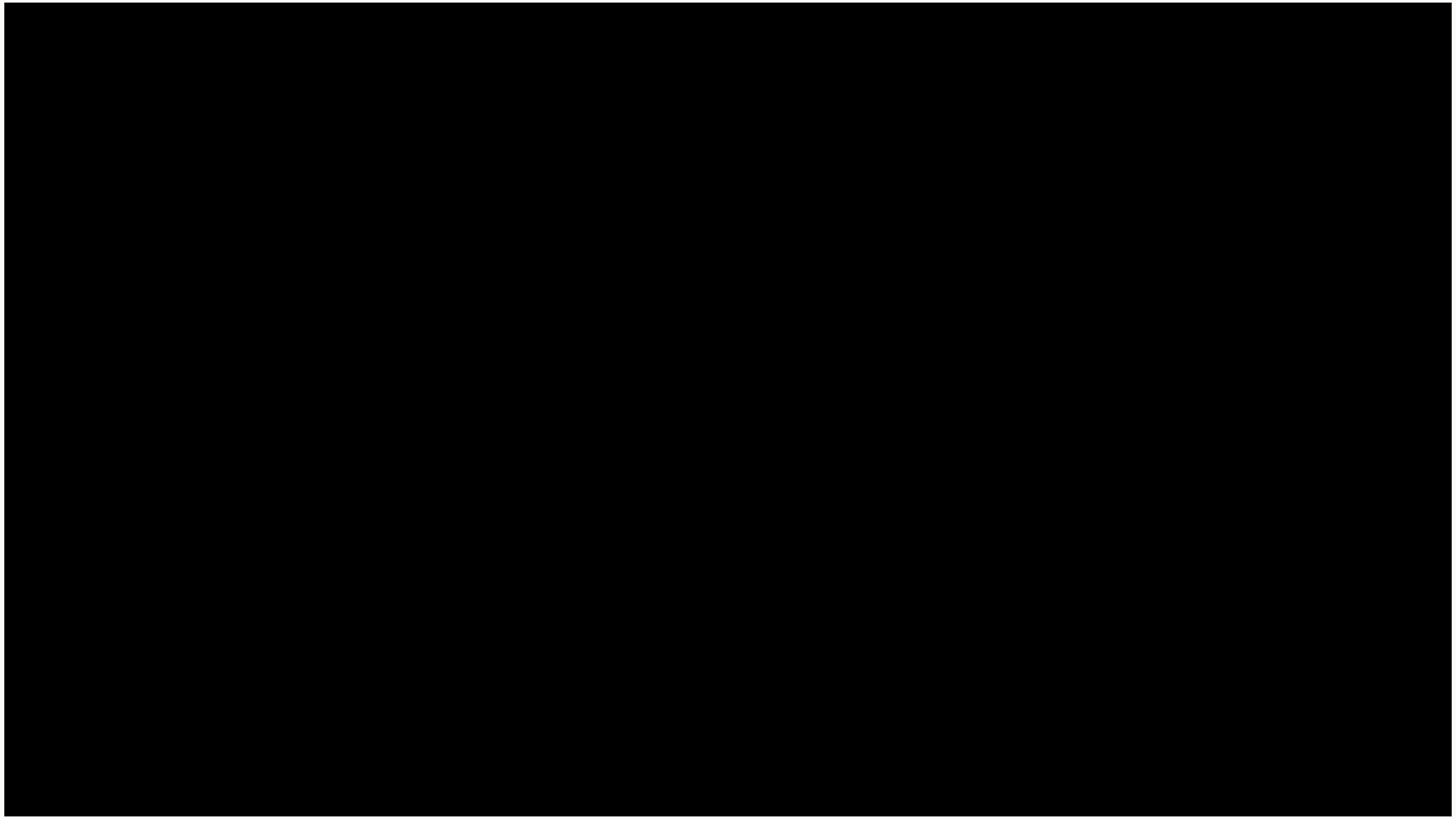
Data scientist prepares final data for category-based procurement spending forecasting and shares with procurement manager.

Procurement manager builds spending forecasting models and discover expected spending patterns for the future

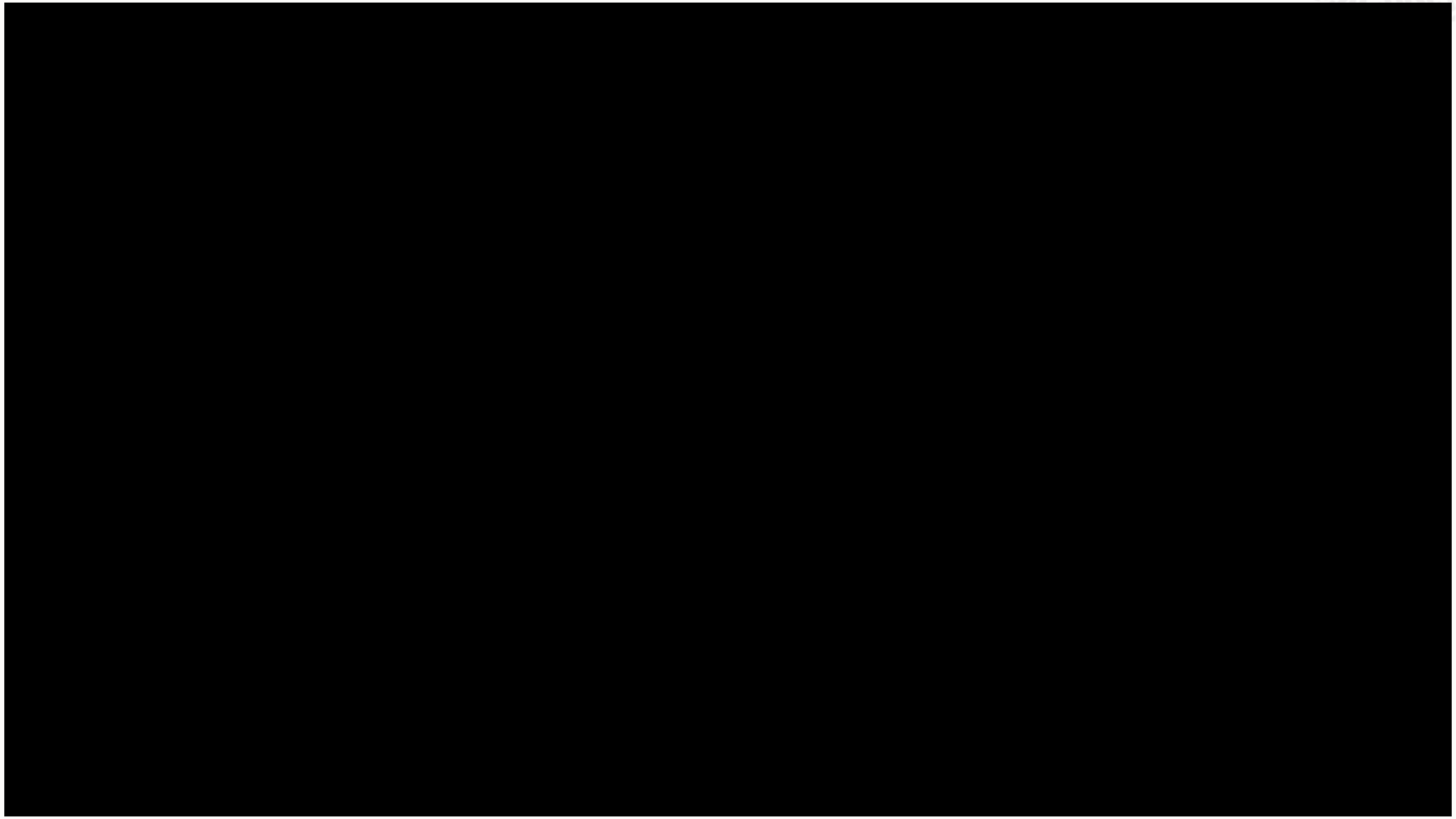
Forecasting Procurement Spendings - Data Preparation



Forecasting Procurement Spendings - Modeling

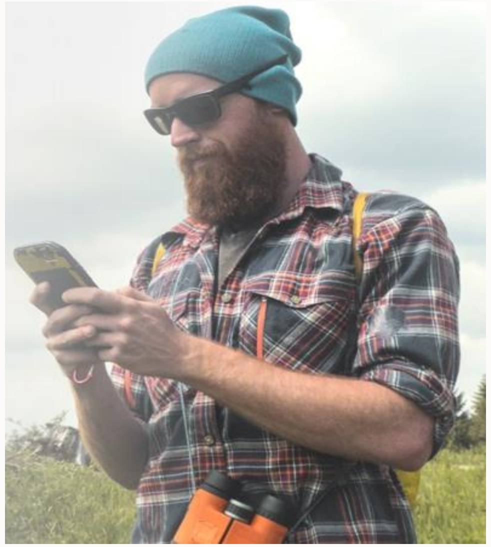


Forecasting Procurement Spendings - Business Insights



Summary

Procurement manager is happy to understand supplier behavior, spending anomalies and forecasting future procurement spendings



Data scientists is happy to have an end-to-end platform for advanced data science requirements

Behind the Scenes: Oracle Data Science Platform