

ORACLE
Data Deep Dive
at AI World

Knowledge Graphs and AI Vector Search

to Trace Linkages in Data in Oracle AI
Database

Phani Chilakapati

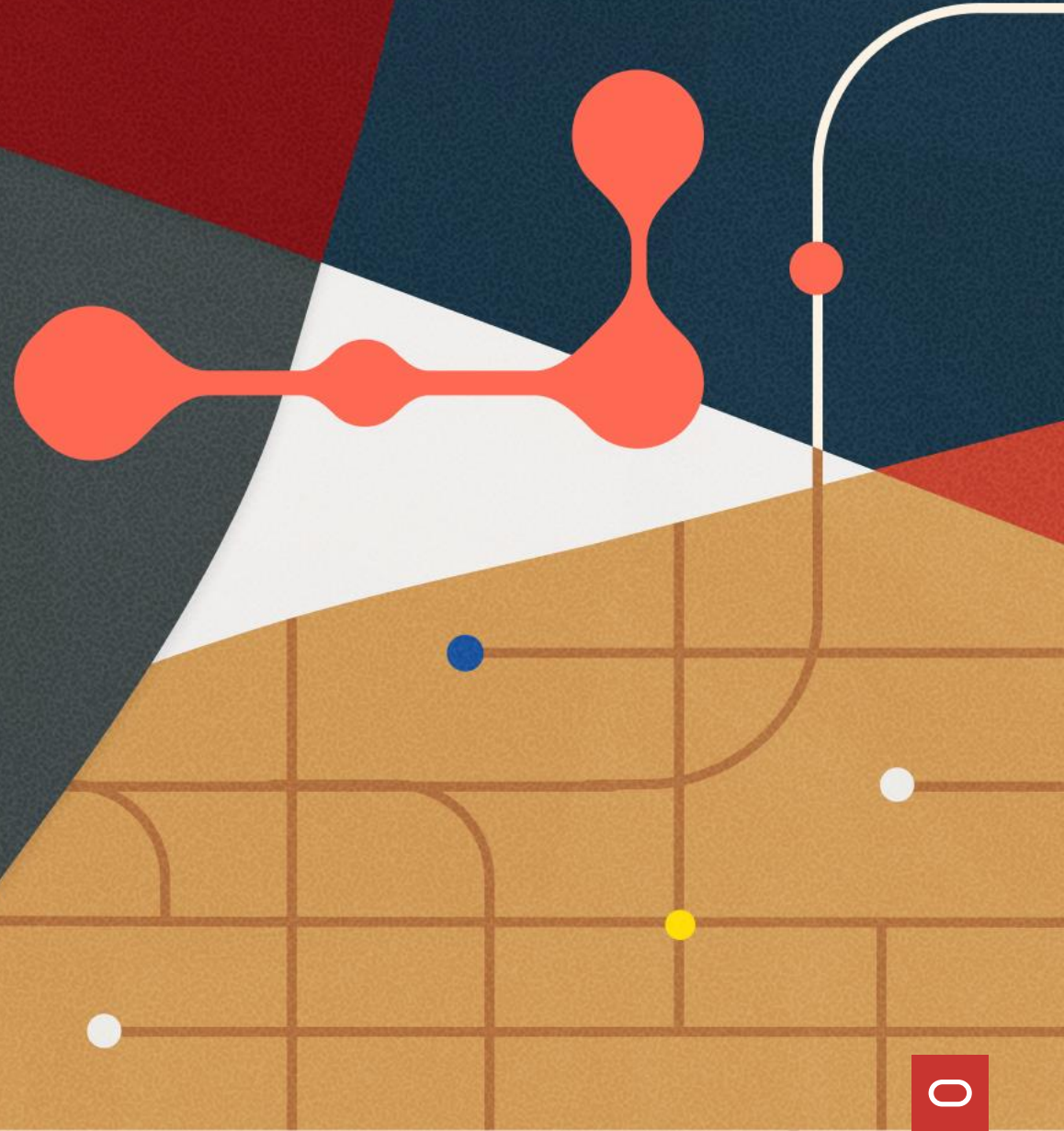
Senior Director, Data Architecture

Industrial Scientific

Ramu Murakami, Denise Myrick, and Rahul Tasker

Product Management

Oracle Graph



Agenda

1 Welcome and introduction

2 **Part 1: Why Graphs?**

Phani Chilakapati

Senior Director, Data Architecture
Industrial Scientific

3 **Part 2: Hands on Lab**

Ramu Murakami, Denise Myrick, Rahul Tasker

Oracle Graph Product Management

4 Wrap up and next steps

Oracle Database 26ai Graph + APEX

At Industrial Scientific

Phani Chilakapati

Senior Director, Data Architecture
Industrial Scientific

Agenda – Part 2

- 1 Overview of knowledge graphs and AI vector search
- 2 Introduction to workshop environment
- 3 Wrap up and next steps

Speakers

Ramu Murakami Gutierrez

Senior Product Manager

Denise Myrick

Senior Product Manager

Rahul Tasker

Principal Product Manager

Provision your environment

—
Knowledge Graphs and AI Vector Search

Oracle LiveLabs

Showcasing how Oracle's solutions solve your business problems — available 24/7 for free!



1000+

events run using
LiveLabs
workshops



700+

free workshops,
available or in
development



10 million

people have already visited
LiveLabs



Requirements for running a Hands-on Lab



Laptop



Oracle Account

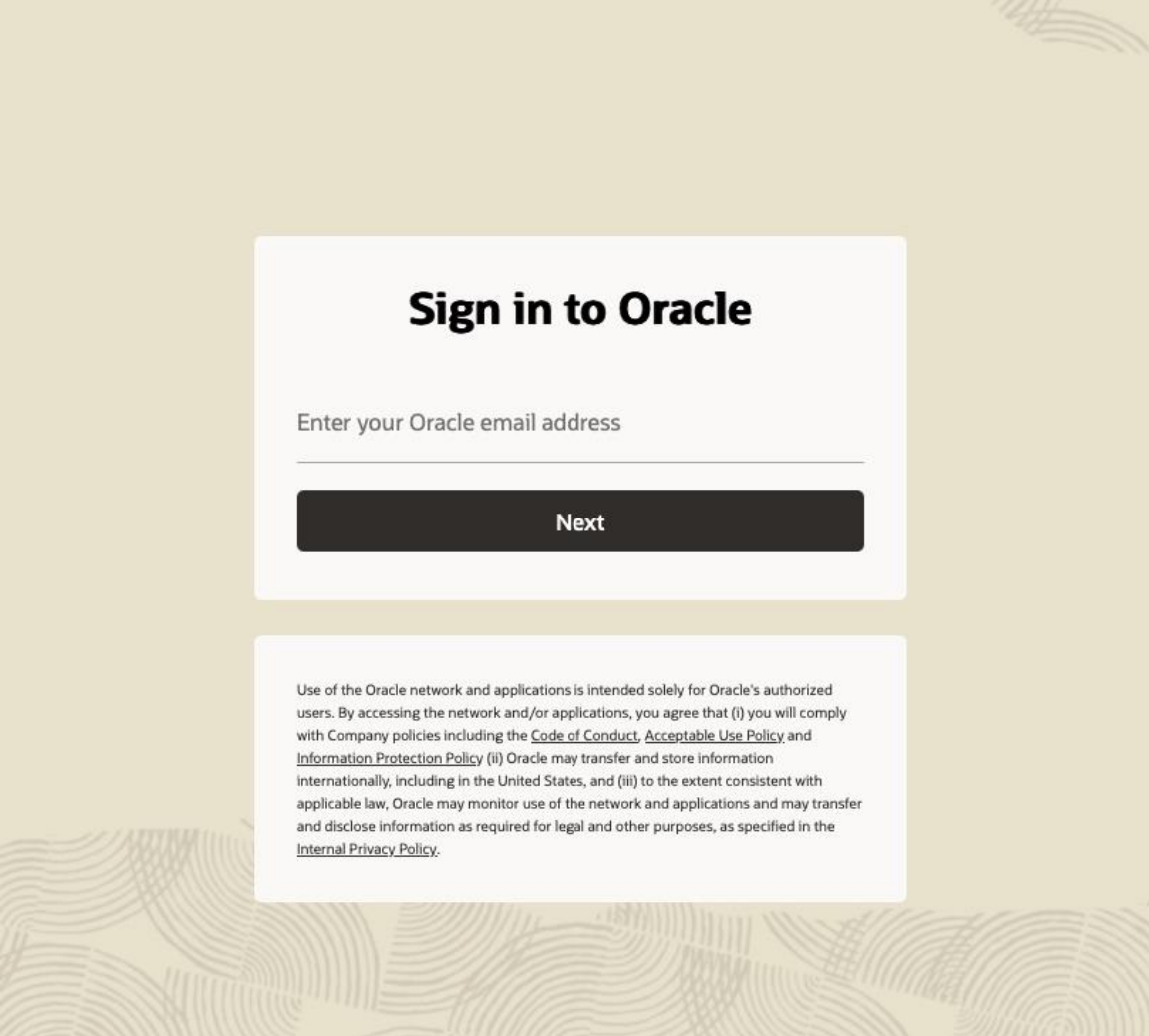
Let's get started

<http://livelabs.oracle.com/ai-world25/HOL2813>

1. Open a web browser
2. Navigate to the provided URL
3. Use your Oracle SSO account to log in

Note:

This is NOT your Oracle Cloud Infrastructure account

A screenshot of the Oracle sign-in page. The page has a light beige background with a subtle pattern of concentric circles. In the center, there is a white rectangular box containing the sign-in form. The form has a title 'Sign in to Oracle' in bold black text. Below the title, there is a text input field with the placeholder text 'Enter your Oracle email address'. Below the input field is a dark grey button with the text 'Next' in white. Below the button, there is a smaller white box containing a disclaimer in small black text. The disclaimer states that the use of the Oracle network and applications is intended solely for Oracle's authorized users and that by accessing the network and/or applications, the user agrees to comply with Oracle's policies, including the Code of Conduct, Acceptable Use Policy, and Information Protection Policy. It also mentions that Oracle may transfer and store information internationally, including in the United States, and may monitor use of the network and applications and may transfer and disclose information as required for legal and other purposes, as specified in the Internal Privacy Policy.

Sign in to Oracle

Enter your Oracle email address

Next

Use of the Oracle network and applications is intended solely for Oracle's authorized users. By accessing the network and/or applications, you agree that (i) you will comply with Company policies including the [Code of Conduct](#), [Acceptable Use Policy](#) and [Information Protection Policy](#) (ii) Oracle may transfer and store information internationally, including in the United States, and (iii) to the extent consistent with applicable law, Oracle may monitor use of the network and applications and may transfer and disclose information as required for legal and other purposes, as specified in the [Internal Privacy Policy](#).

Let's get started

<http://livelabs.oracle.com/ai-world25/HOL2813>

1. Click the **Start** button to access the HOL
2. Click **Run on LiveLabs Sandbox**
3. Toggle the **Start Workshop Now** radio button
4. Check the consent box
5. Click **Submit Reservation**

The screenshot shows the Oracle LiveLabs interface for a workshop titled "Knowledge Graphs and AI Vector Search to Trace Linkages in Data in Oracle 23ai". The interface includes a search bar, a "Start" button, and a "Share" button. A red box highlights the "Run on LiveLabs Sandbox" button, with a tooltip explaining that it will dynamically create resources in an Oracle-owned tenancy for free. Another red box highlights the "Preview Sandbox Instructions" button, with a tooltip explaining that it will open a link with the Sandbox instructions for preview before creating a reservation. A third red box highlights the "Reserve Workshop" form, which includes fields for "Attendee Email Address" (ramu.murakami.gutierrez@oracle.com) and "Attendee Timezone" (Canada/Atlantic (-03:00)). The form also has a "Start Workshop Now?" toggle (set to "On") and a consent checkbox (checked) stating "I consent to receive emails from LiveLabs for my reservation and I agree that I will not upload sensitive personal or company information to Oracle Cloud Infrastructure". The form includes "Preview Sandbox Instructions" and "Submit Reservation" buttons.

LiveLabs Search for workshops and sprints... Event Code Sign In

Knowledge Graphs and AI Vector Search to Trace Linkages in Data in Oracle 23ai

Share Start

Try Oracle technology for free with Oracle LiveLabs

Want to try Oracle technology for free?

The **Run on LiveLabs** button will dynamically create resources in an Oracle-owned tenancy for you to use for free!
[Oracle account help](#) | [Oracle account signup](#)

Run on LiveLabs Sandbox

The **Preview Sandbox Instructions** button will open a link with the Sandbox instructions for you to preview before creating a reservation.

Preview Sandbox Instructions

Prerequisites

- Familiarity with databases is desirable, but not required
- Familiarity with SQL is helpful
- Some understanding of cloud and database terms is helpful
- Familiarity with Oracle Cloud Infrastructure (OCI) is helpful

graph queries with enterprises to use their popular across make it easy to navigate

Reserve Workshop

Attendee Email Address
ramu.murakami.gutierrez@oracle.com

Attendee Timezone
Canada/Atlantic (-03:00)

* Start Workshop Now?
☒

☒ I consent to receive emails from LiveLabs for my reservation and I agree that I will not upload sensitive personal or company information to Oracle Cloud Infrastructure

Preview Sandbox Instructions Submit Reservation

LiveLab Link

<http://livelabs.oracle.com/ai-world25/HOL2813>

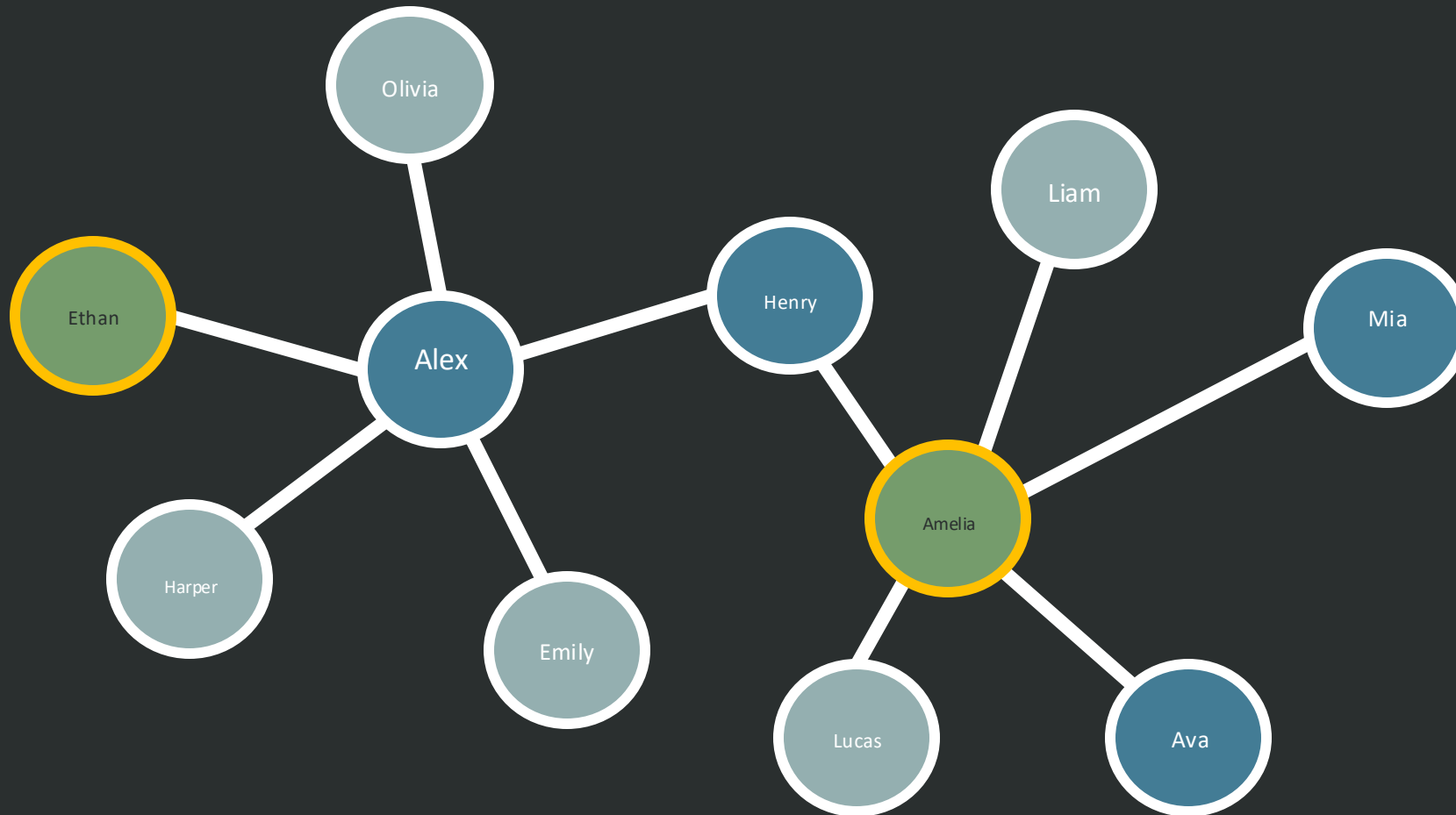
Your Hands-on-lab

Knowledge Graph Feature Overview

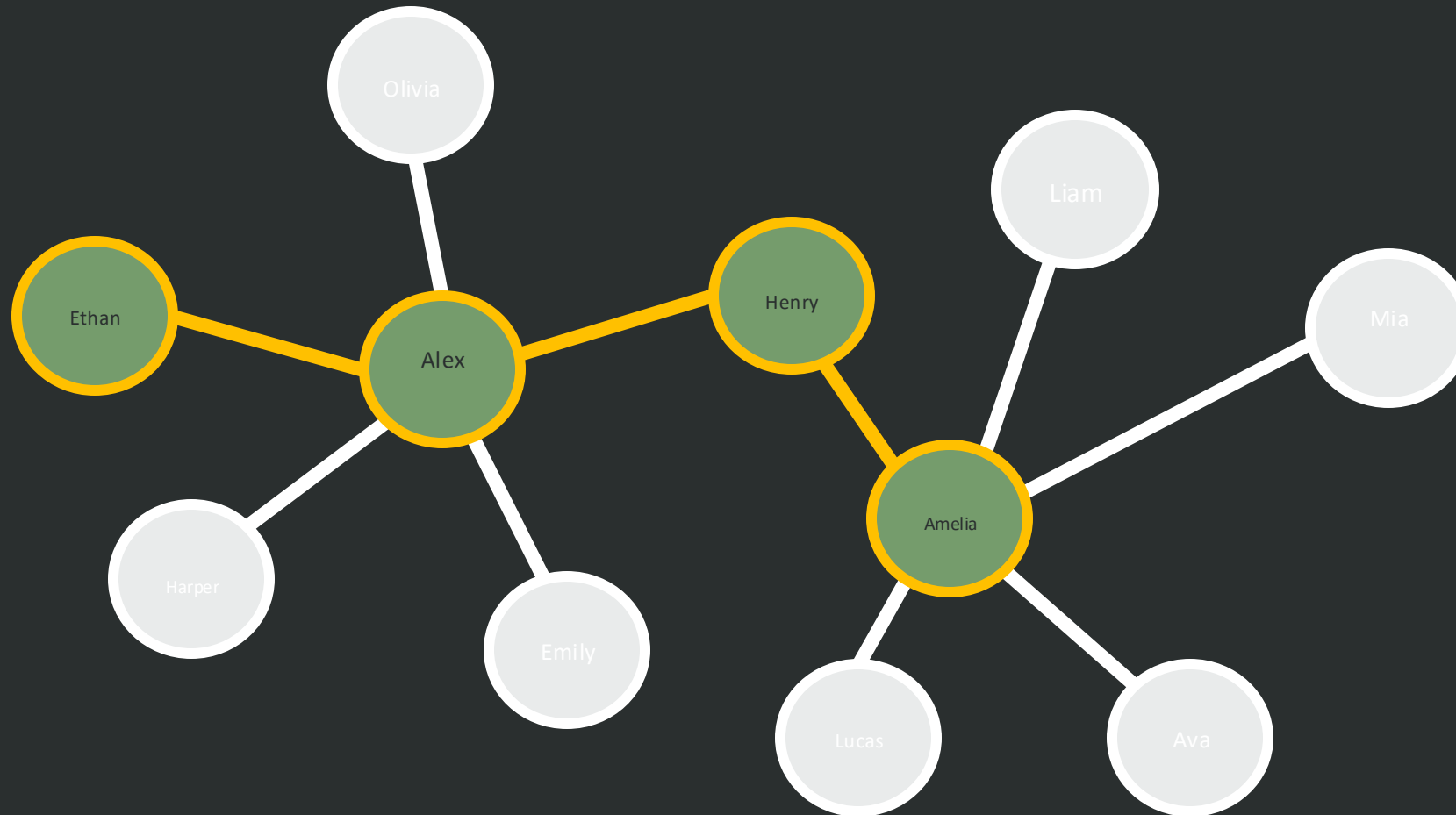
Knowledge Graphs and AI Vector Search



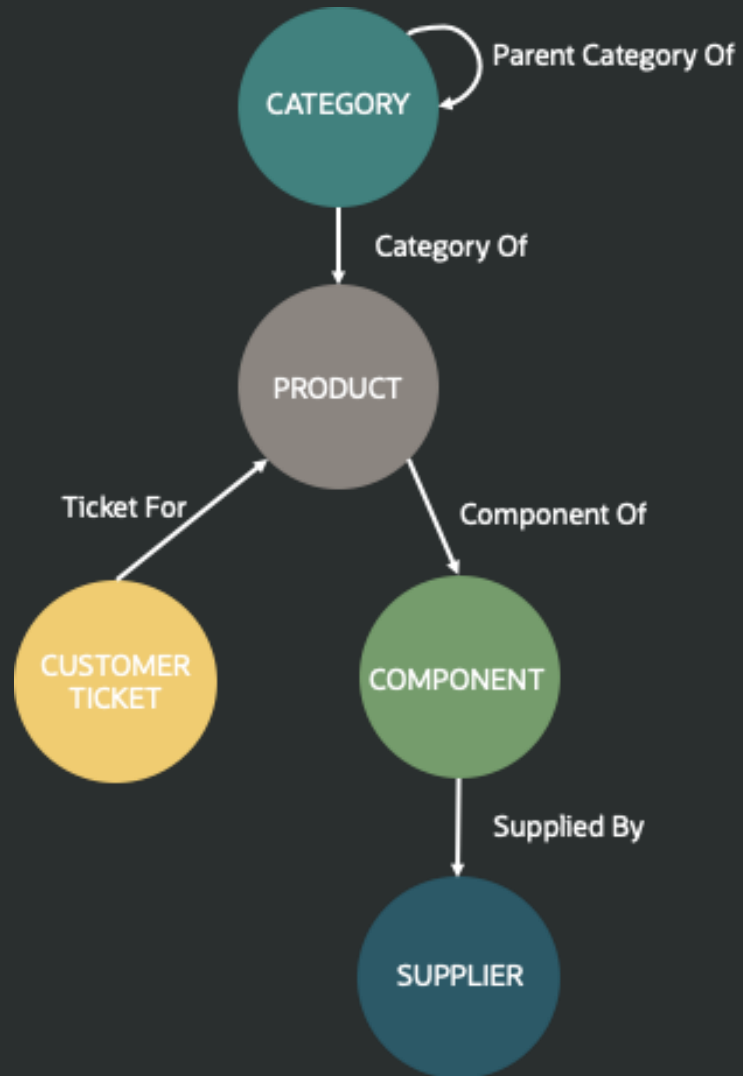
Are you connected to someone you met here?



Are you connected to someone you met here?



Relationships (edges) in our graph

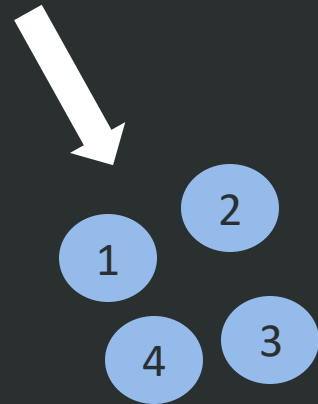


- Categories can have subcategories
- Products belong to one or multiple categories
- Customer tickets are associated with specific products
- Products are built from one or multiple components
- Suppliers supply components

Create a **Graph View** of Data

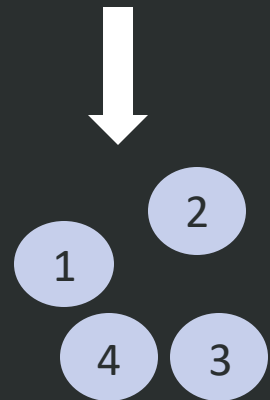
CATEGORY

CAT_ID	CAT_NAME	...
1	Light	...
2	Door	...
3	Mirror	...
4	AC	...
...



PRODUCT

PROD_ID	CAT_ID	...
1	1	...
2	2	...
3	2	...
4	3	...
...



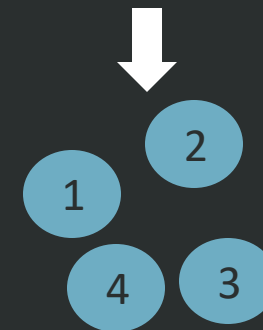
CUSTOMER TICKET

TICKET_ID	CUST_ID	PROD_ID	...
3	4	1	...
4	1	1	...
2	1	3	...
4	2	4	...
...



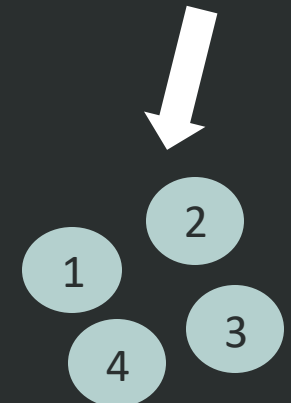
COMPONENT

COMP_ID	PROD_ID	SUP_ID	...
1	1	4	...
2	1	3	...
3	2	3	...
4	3	2	...
...

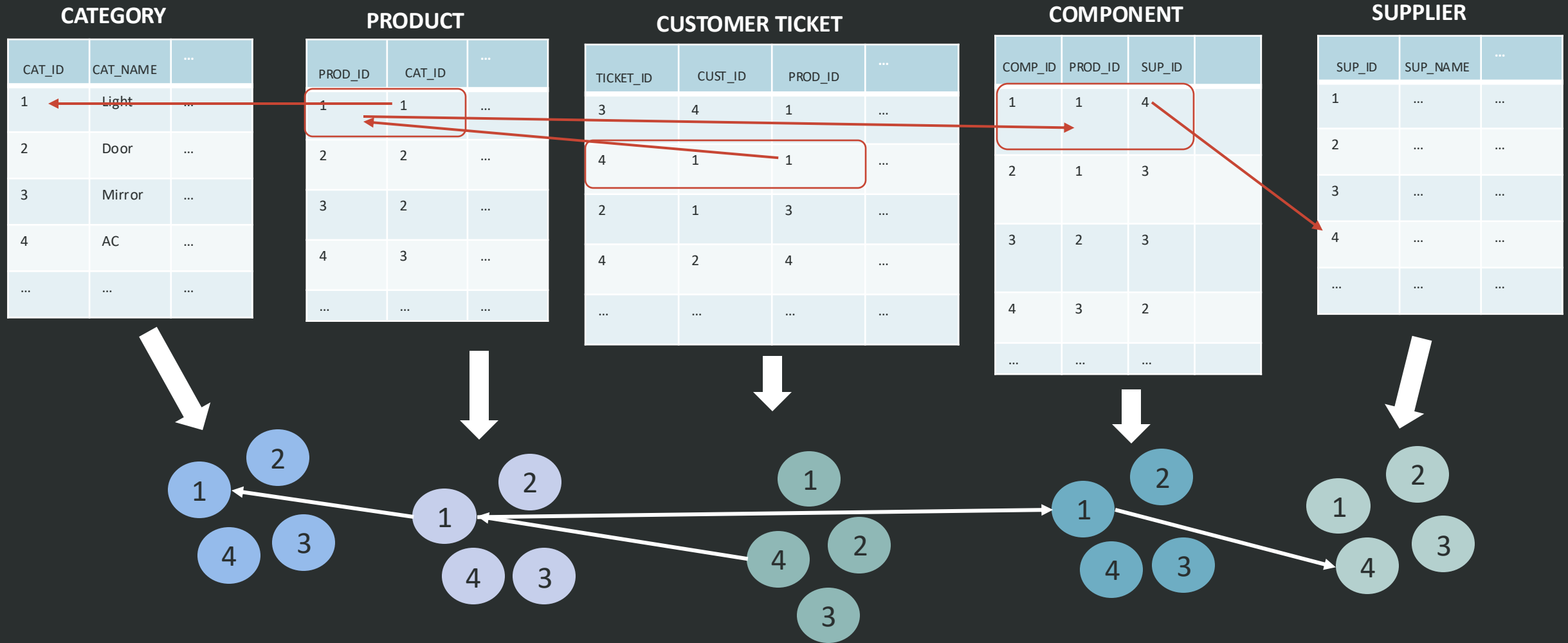


SUPPLIER

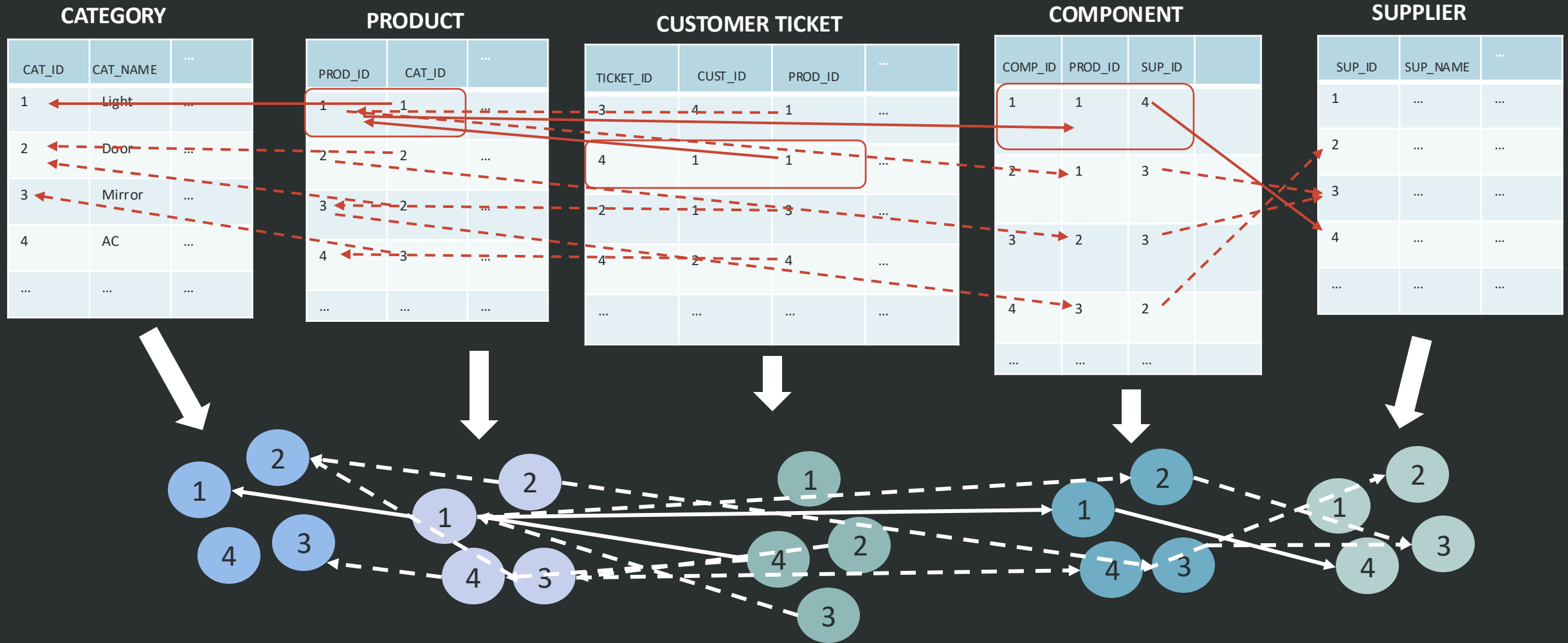
SUP_ID	SUP_NAME	...
1
2
3
4
...



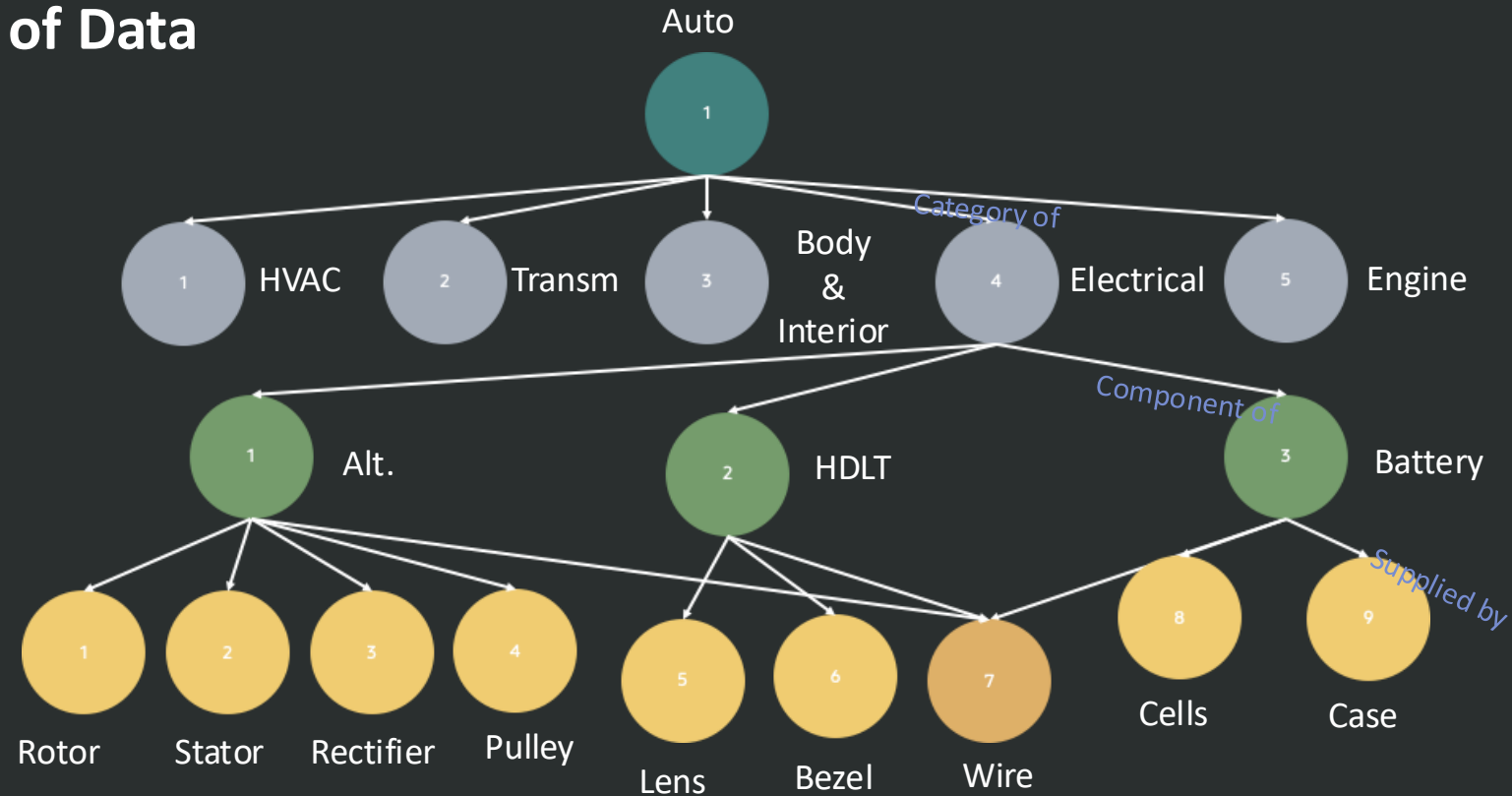
Create a Graph View of Data



Create a Graph View of Data



Graph View of Data



Vertices can have properties (columns from the table)

Edges can have properties (columns from the table)

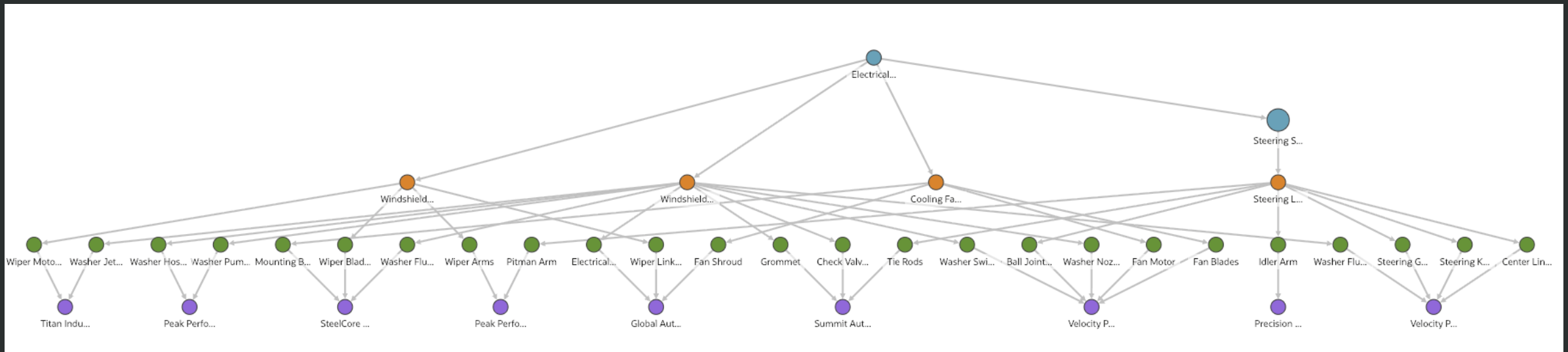
Graph View on Relational Tables

- No data copy – graph is a view on relational tables
- Insert/update/delete in underlying tables instantly available in graph
- Fast, concurrent updates
- Well-suited for operational workloads

Graph Query Example

```
SELECT *  
FROM GRAPH_TABLE (auto_graph  
  MATCH (a IS CATEGORY) - [] ->{1,4} (c)  
  WHERE a.category = 'Electrical System'  
  ONE ROW PER STEP (src, e, dst)  
  COLUMNS (vertex_id(src) as src, edge_id(e) as e, vertex_id(dst) as dst)  
);
```

New syntax in the SQL:2023
standard



Use Output of Graph Queries as Table

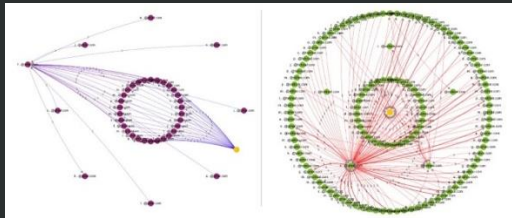
Output of a graph query can be a table

Combine with other relational tables in the database

Combine with other features in the database

- Vector, Geospatial, JSON, etc.

Other Graph Use Cases



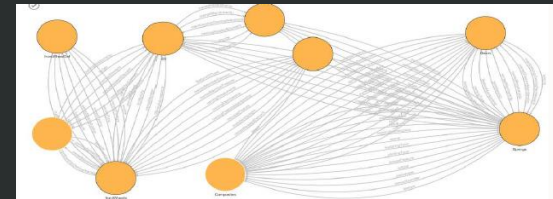
Fraud detection in financial transfers – detect anomalous patterns with graph queries

Image courtesy: Paysafe

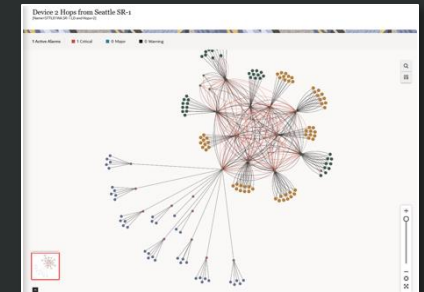


Identify communities using graph clustering algorithms

Image courtesy: Caixabank



Create a digital thread across linked components in manufacturing



Root cause analysis, assess impact of a node failure

Image courtesy:
Oracle Communications

AI Vector Search Overview

Knowledge Graphs and AI Vector Search

AI Vector Search

Vectors represent the semantic content of images, documents, videos, etc.



A vector is a sequence of numbers, called dimensions, used to capture the important “features” of the data

Vector Query Example

```
SELECT DISTINCT ticket_id, component_id, component_name, ticket_description, vector_distance(ticket_vector,
component_vector, COSINE) as vec_distance
FROM GRAPH_TABLE (auto_graph
    MATCH (t IS CUSTOMER_TICKET) - [e] -> (p is PRODUCT) - [f] -> (c is COMPONENT)
    WHERE p.product_id = 11 AND t.product_id=11
    COLUMNS (t.ticket_id as ticket_id, t.ticket_vec as ticket_vector, t.description as ticket_decription,
c.component_name_vec as component_vector, c.component_id as component_id, c.component_name as component_name)
)
WHERE vector_distance(ticket_vector, component_vector, COSINE) <.45
ORDER BY vec_dist;
```

Match the component names with the customer tickets to identify the faulty component

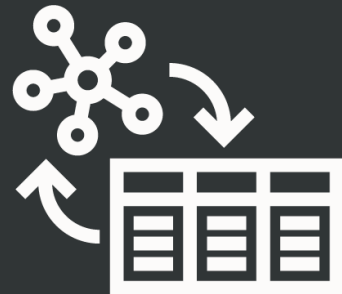
TICKET_ID ↕	COMPONENT_ID ↕	COMPONENT_NAME ↕	TICKET_DESCRIPTION ↕	VEC_DIST ↕
73	1220	Oil Pump	Oil pump issue - please fix	0.17679381551631823
57	1220	Oil Pump	Oil Pump is defective, please send a new one	0.23156266244122026
14	1220	Oil Pump	Hello, I noticed an issue with the Oil Pump in my vehicle. Could you please assist?	0.2522085201548133
19	1220	Oil Pump	Hello, I noticed an issue with the Oil Pump in my vehicle. Could you please assist?	0.2522085201548133
58	1220	Oil Pump	My car won't work with this defective oil pump - I can't get to work without my car, this is unacceptable!!	0.2541787631831328



Oracle AI Database 26ai

One part of an app can treat the data as **relational**, while other parts treat the **same data** as a **graph** and unify with **AI**.

Unification of Graph and Relational

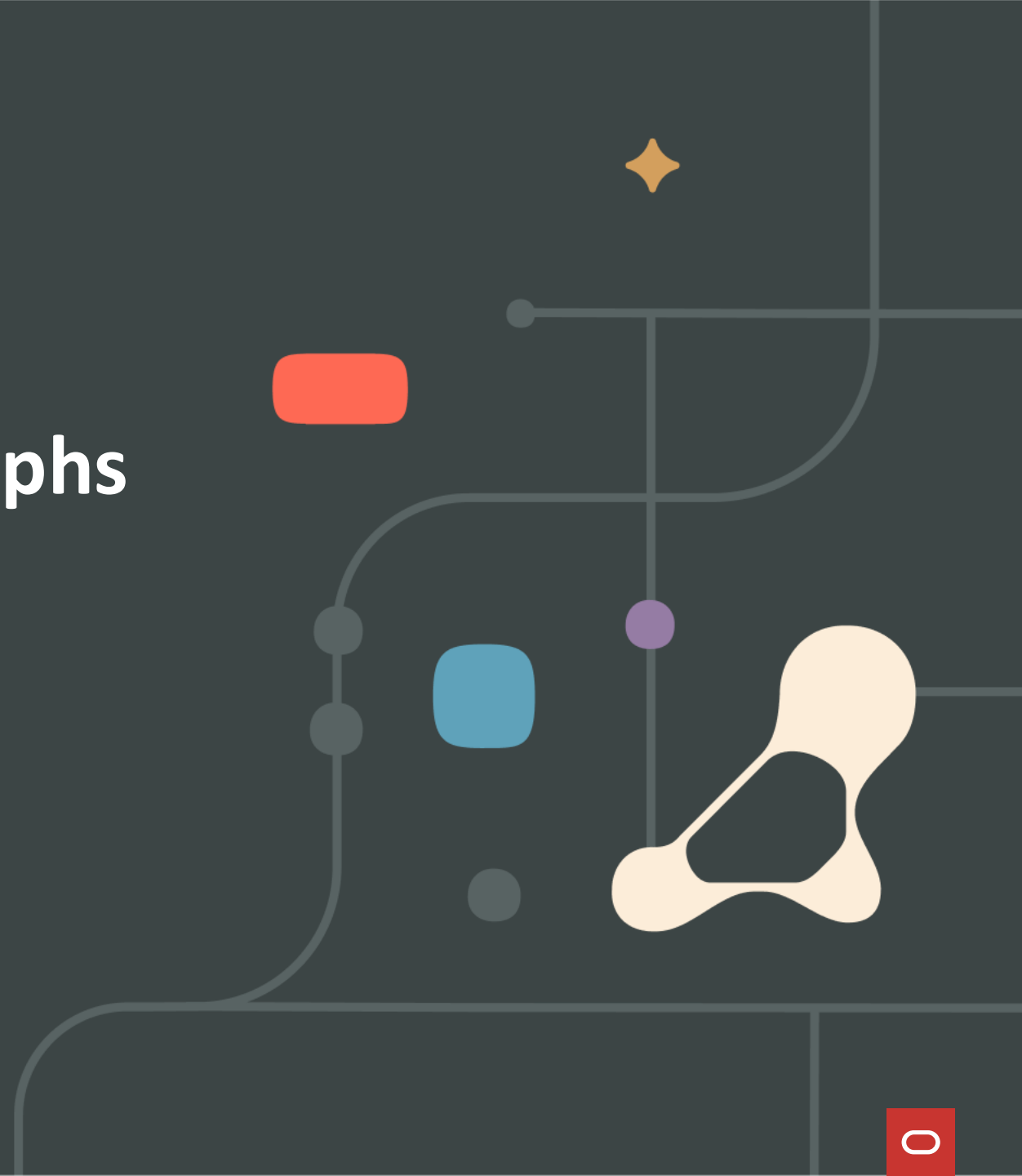


Unification of AI and Databases



Overview: Knowledge Graphs and AI Vector Search

Knowledge Graphs and AI Vector Search



Technologies

Graph search and
vector search



Database with data
on products and
customer reviews

Prompt enhanced with database
query results



LLMs

Use OCI Generative
AI service to answer
questions about our
graph results

We will use two database features

Vector Search

- To match customer sentiments to products

Graph Queries

- To discover how customers are related to products, and how products are related to suppliers
- (CUSTOMER) -> (PRODUCT)
- (PRODUCT) -> (SUPPLIER)

Let's get started!

Knowledge Graphs and AI Vector Search

Trace the linkage between products, components, and suppliers

Monday Morning

Imagine logging into your computer one Monday morning and finding a notification from your manager asking you to let her know when you have some time.

You get yourself a cup of coffee and message her back.

Your manager lets you know she noticed an uptick in negative customer sentiments that popped up on her dashboard. She wants you to investigate it.

Trace the linkage between products, components, and suppliers

Monday Morning

You decide to start by looking at all the sentiments using vector search and find that there are a surprisingly high number are negative.

Strangely, the customers are complaining about different products, so it doesn't make sense.

You decide to create a graph to track the components and sub-components of each product to identify whether a particular sub-component is the problem.

You then connect the graph to the suppliers to uncover any interesting insights.

You discover that components with issues can all be traced back to one supplier.

Bingo.

Trace the linkage between products, components, and suppliers

Monday Afternoon

You put together a dashboard for your manager so that she can ask questions in natural language.

Armed with data to back it up, your manager gets on the phone with the vendor to start getting these components replaced in the supply chain.

Workshop Steps

OCI Gen AI Services

- Use Gen AI to analyze the description of the customer tickets and categorize the sentiment as positive, negative, slightly positive, slightly negative, or neutral

Graph Query

- Use graphs to identify products with the highest number of negative sentiment tickets and their associated components

Vector Search

- Use vectors to match the component names to the language used by customers to file their customer support tickets

LiveLab Walkthrough

Knowledge Graphs and AI Vector Search



Let's get started

<http://livelabs.oracle.com/ai-world25/HOL2813>

Click **Launch Workshop** once
available

Note:

The environments are available in a couple of
minutes.

Refresh the page

My Reservations

All your current workshop reservations are shown below. You can edit active or pending reservations, view workshop details, attend an available workshop, or delete a reservation.

To access this page again click the user dropdown in the top right corner and select **My Reservations**

Note: The status of your reservations will be emailed to you. Check your mail for any status updates.

Knowledge Graphs and AI Vector Search to Trace Linkages in Data in Oracle 23ai



Friday October 3rd, 5:17pm (17:17) Canada/Atlantic

 Launch Workshop

 Details

 Delete



Let's get started

<http://livelabs.oracle.com/ai-world25/HOL2813>

- 1. Click **View Login Info**
- 2. Click **Launch OCI** to proceed to your workshop environment

LiveLabs

Search for workshops and

View Login Info

Knowledge Graphs and AI Vector Search to Trace Link

Introduction

About This Workshop

Acknowledgements

+ Get Started

+ Lab 1: Import Notebook

+ Lab 2: Query and visualize the property graph

+ Need Help?

Intro

About

Graph d

relations

the pow

how all

property

Estimate

About

Oracle A

the crea

includes

using SO

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over 80

Watch t

property

Simplify

Reservation Information

Tenancy Name

devrellivelabs

Region

Germany Central (Frankfurt) (eu-frankfurt-1)

Username

LL163622-USER

Password

soTu9t2n,

Reset Password

Copy Password

Compartment

LL163622-COMPARTMENT

Compartment OCID

ocid1.compartment.oc1..aaaaaaaayrkbx5weszpksyoc25rhv3oolkbtuqimuticxqcuuvtleocwbo6q

Copy Compartment OCID

Generative AI Endpoint Region

Germany Central (Frankfurt) (eu-frankfurt-1)

Terraform Values

Autonomous Database Password

861fE5i7TyWEWHeu

Copy value

Graph Password

69q0fgEYHKD4

Copy value

Graph Username

GRAPHUSER

Copy value

Region Identifier

eu-frankfurt-1

Copy value

Tenancy OCID

ocid1.tenancy.oc1..aaaaaaaaz6bptazeg7qiqy4rt4k3otxi5umailp3rzeio6cc3ubub2

Copy value

User OCID

ocid1.user.oc1..aaaaaaaafzh67jprbkwmus5kngktgmfrznc4yve3jvws2umljrfrfv2wconq

Copy value



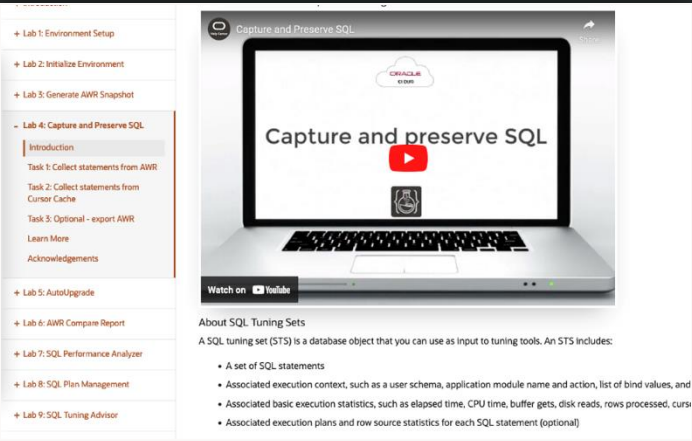
It's Your Turn!

Knowledge Graphs and AI Vector Search

Need Help?

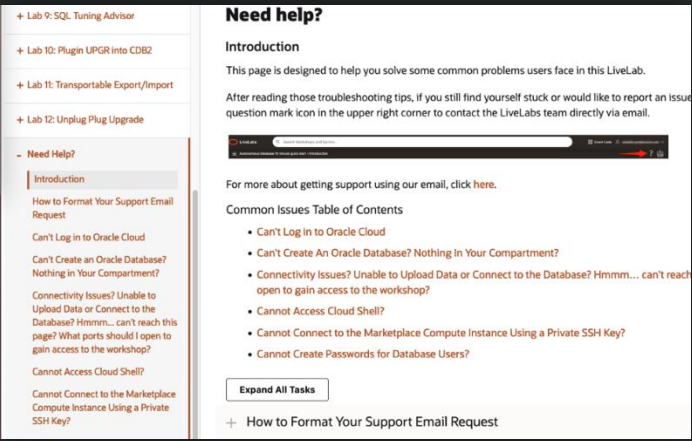
Knowledge Graphs and AI Vector Search

I Need Help!



Self-Service

Watch the videos in beginning of each lab



Get help — Self-Service

Find the 'Need help?' section in the sidebar of the workshop



Ask us!



Import Notebook

Knowledge Graphs and AI Vector Search

15:00

Query and visualize the graph

Knowledge Graphs and AI Vector Search

30:00

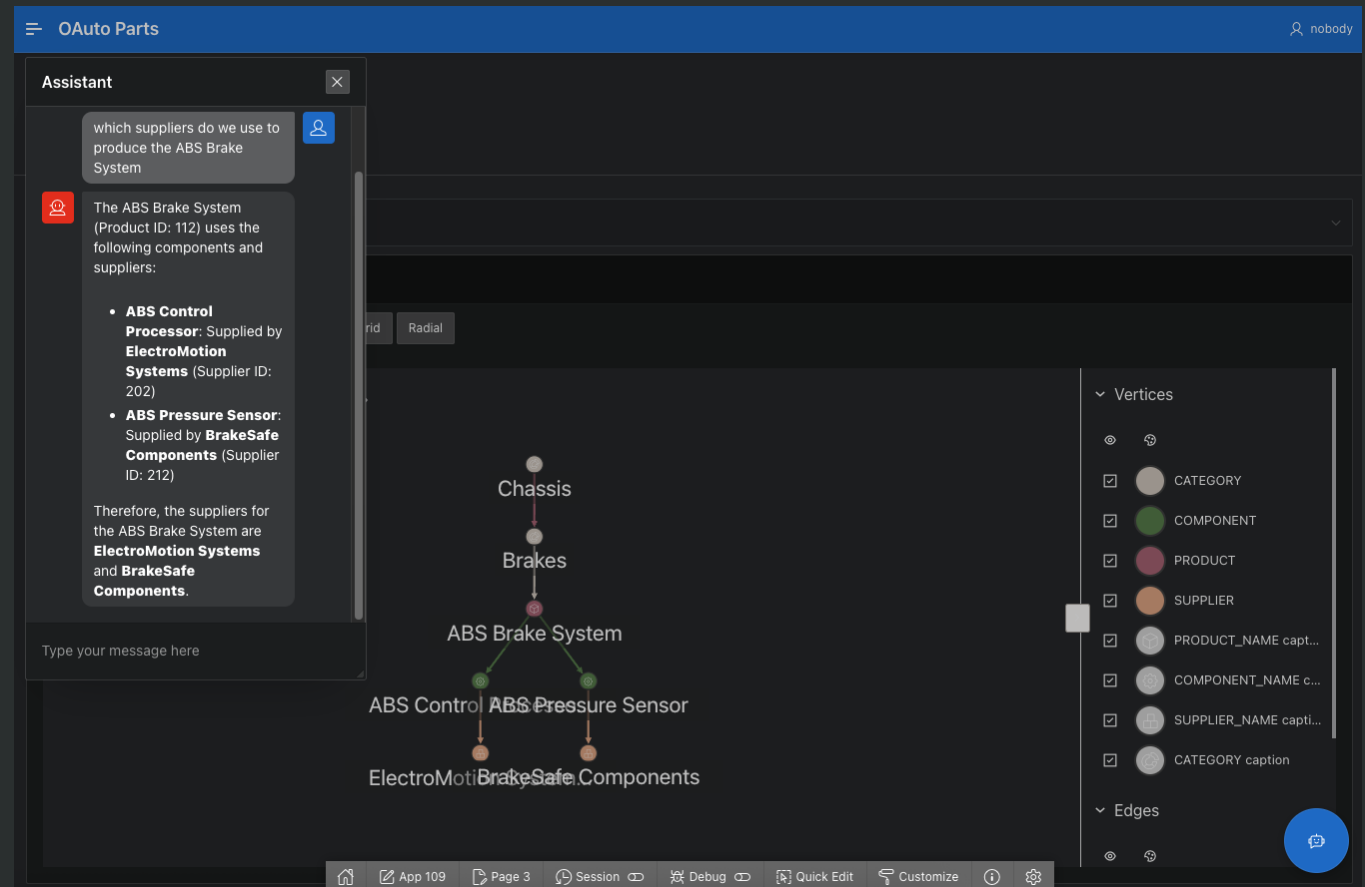
Create an APEX App

—
Knowledge Graphs and AI Vector Search

Graph RAG in APEX

<http://livelabs.oracle.com/ai-world25/HOL2813>

1. You can visualize graphs in APEX using the Graph Visualization Plug-in
2. Use SQL PG as the RAG source and ask questions about your graph in natural language



Wrap Up and Next Steps

Knowledge Graphs and AI Vector Search

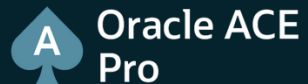


400+ technical experts helping peers globally

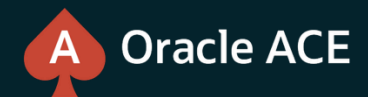
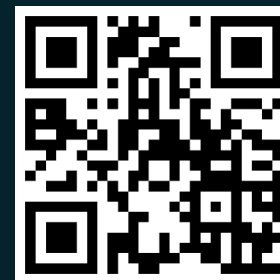
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Connect: ✉ aceprogram_ww@oracle.com

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Thank you

Ramu, Denise, and Rahul

Your feedback is important.

**Scan this QR Code or use the
Mobile App to share your
thoughts on this session.**



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