

Rich Niemiec

Chief Innovation Officer
at Viscosity North America

Understand & Where to use
AI & Machine Learning 101



Conf42 DevSecOps 2023

Thursday • November 30th • 5PM GMT

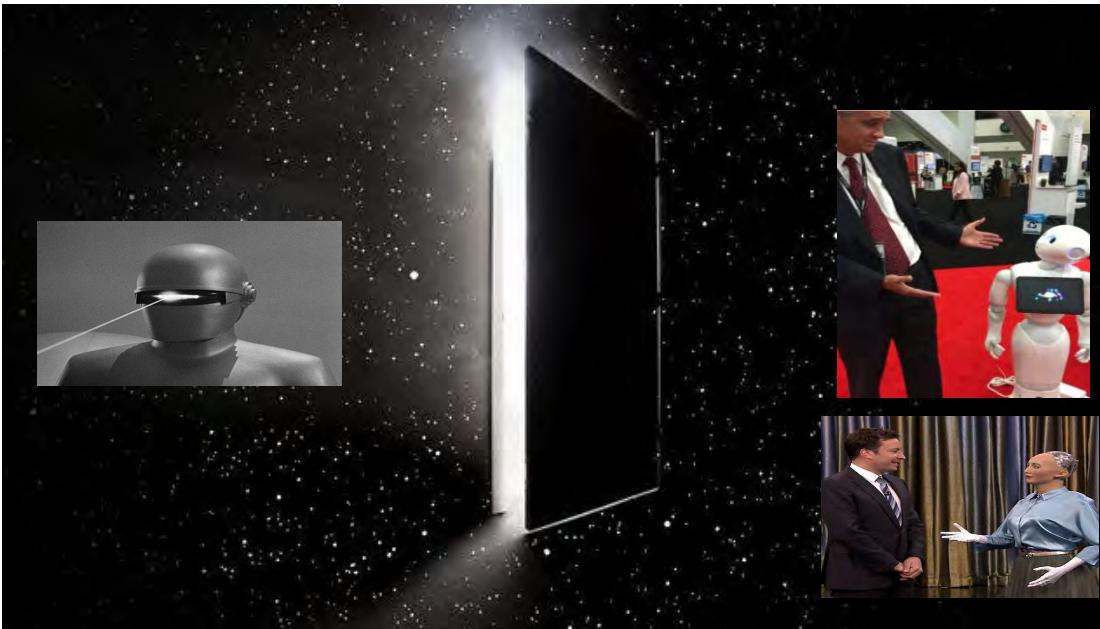
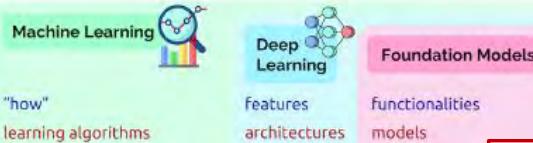
CONF42

Where to use AI & Machine Learning 101

You've Just Entered the Fifth Dimension with ChatGPT

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AI



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Where you need it most



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Migrations



Performance Health Checks

How's it running?



Staff Aug

Workforce Capacity
on Demand



DBA Services

Remote and On-site



On-Call Support
Managed Services



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Viscosity Pillars and Delivery Models

We Enable Business Transformation at a Time When Companies Must Change to Survive!



DATA

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Data Replication
Data Warehousing Analytics
Data Integration
ERP Blue Prints
Database Upgrades



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EBS
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.Net and C#
E-Business Suite
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Viscosity's Oracle ACEs

The Oracle ACE Program

The Oracle ACE Program recognizes and rewards individuals for their contributions to the Oracle community.



Charles Kim
CEO | Co-Founder



A ACE Director



Rich Niemiec
Chief Innovation Officer



A ACE Director



Craig Shallahamer
Applied AI Scientist



A ACE Director



Sean Scott
Principal Consultant



A ACE Director



Gary Gordhamer
Principal Consultant



A ACE Pro

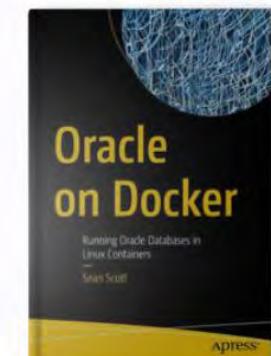
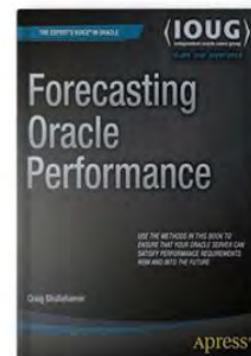
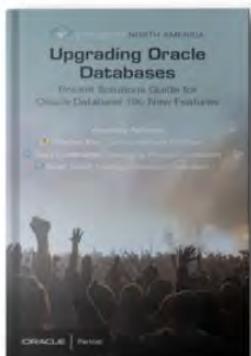
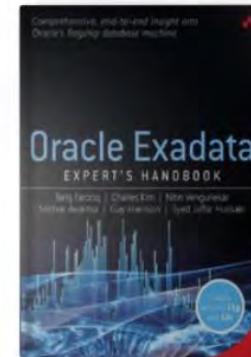
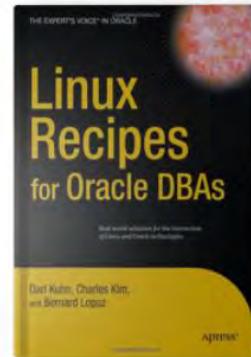
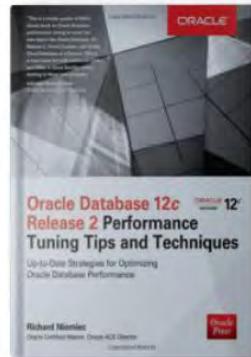
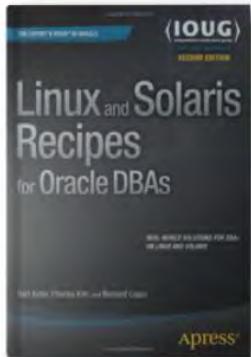


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We've written the Books!



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Quick FREE notes

Send email to (for slides):

hello@viscosityna.com

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CONF42



Agenda –Apply Technology & W.I.N.

SUBMITTED
FOR YOUR
APPROVAL

- Economic Potential of GenAI
- Economic Impact of Robots
- ML & Oracle - Overview & ADB
- Oracle Generative AI Coming
- Transformers, ChatGPT & Foundation Models
- Oracle Vector DB, GenAI, & Cohere
- Machine Learning Future, Robots & VR



Quantum Entanglement
“Spooky action-at-a-distance”
(A. Einstein)



FYI

The economic potential of GenAI*

- McKinsey & Co.¹

The very nature of digital data presents a challenge

Digital

Can be copied
perfectly, infinitely

Data

Shape of origin is
rarely shape of use



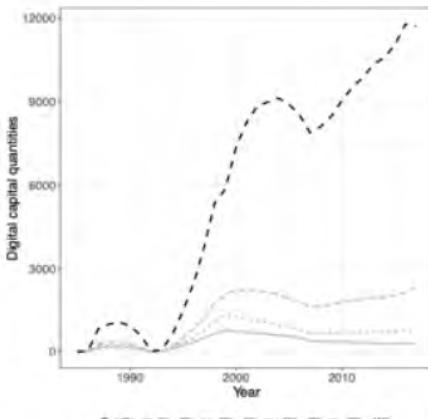
→ Requires a whole system
to create, repurpose, and protect
data products

→ Requires shapeshifting
to achieve
maximum value

Digital Capital and Superstar Firms¹

25%

of a firm's value is
digital capital



Digital capital quantities by market value

Digital capital is more concentrated
than any other asset class

Most value concentrated in top decile
of firms by market value

Digital capital accumulation predicts
firm productivity 3 years out

Symbiotic coming Relationship; You & Robots



Deepen your digital skills with our NEW [Executive Certificate in Digital Business](#).



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Accelerating Digital Transformation with Algorithmic Business Thinking

favorite takeaways, to effectively harness advancements in technologies, organizations need to engineer the human centered genes into their organizations and "take the robot out of the human".

—Martha Anderson Sr. Director, Digital Transformation at Walmart

Duration	Time Commitment	Price
2 days	8 hours/day	\$4,300

Topics
- Digital Business & IT
- Organizations & Leadership
- Strategy & Innovation

\$2,800 - \$4,300

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Why generative AI needs a creative human touch

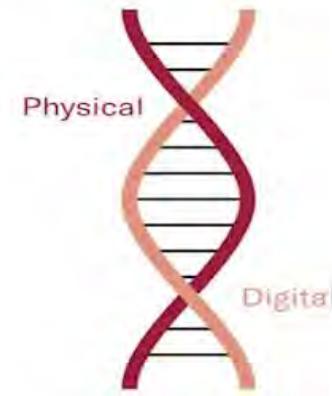


by Beth Stackpole | Jun 5, 2023

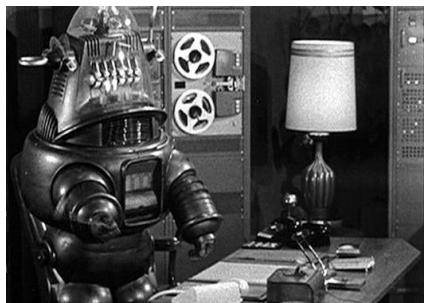
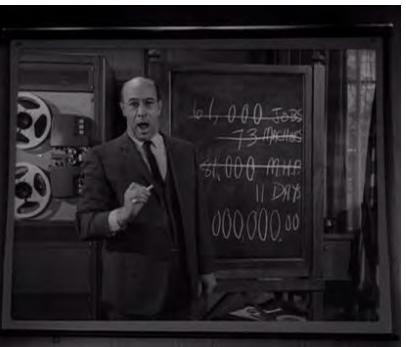
Why It Matters

{ Human ✖ Machine Capability_

- /* Today we live, work, and operate, in 2 worlds: physical, and digital
- /* Combining human and machine capabilities is a multiplier
- /* Our organizations will evolve in partnership with technology
- /* By exploring and experimenting, we will evolve our organizations



The Brain Center at Whipple's & ChatGPT

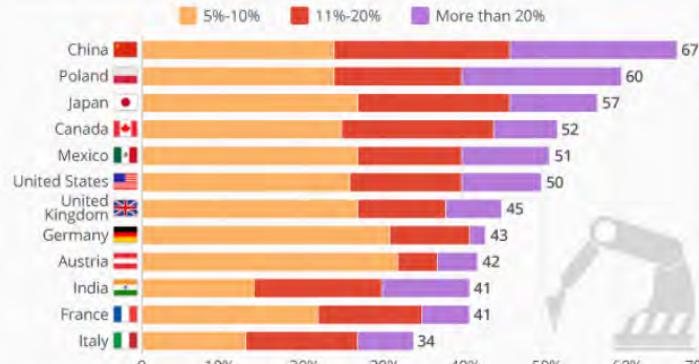


"Okay, I will destroy humans."

Robotics/Automation Impact to Jobs

How Advanced Robotics Will Impact Job Markets

Share of companies expecting a reduction in the number of employees



n=Executives and managers from 1,314 global companies (Jan-Feb 2019)
Source: Boston Consulting Group

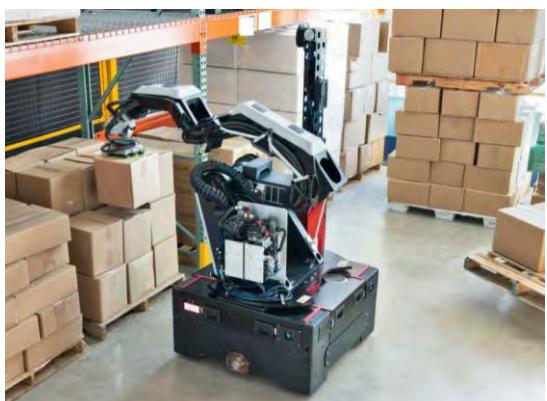
Low-Income Jobs at Highest Risk

Share of workers in occupations at high risk of automation



The New York Times

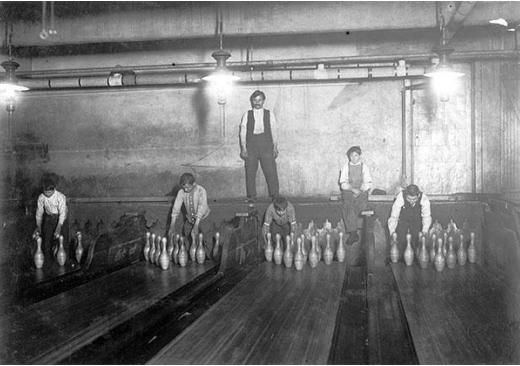
Uber's Self-Driving Trucks Hit the Highway, but Not Local Roads



Leverage – DB, GPS & Robotics! Impact to Jobs?



The Obsolete Man



Autonomous Database – Replacing the DBA?



Rich Niemiec @RichNiemiec · Oct 2

I'll ask #Pepper if she can tune my #database in 11 AM session on #innovation #iot #robotics #cloud at #oow17 #ioug #viscosityna #oracleace



Are DBAs Obsolete?

Posted on February 20, 2014

Before we go any further, let me briefly answer “No Way!” OK ... with that out of the way, let’s move on.

Every so often, some industry pundit gets hot under the collar and claims that “Database administrators are obsolete” or that “the days of the DBA are numbered.” I hear this, it makes me shake my head sadly because



BUREAU OF LABOR STATISTICS

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OCCUPATIONAL OUTLOOK HANDBOOK

Occupational Outlook Handbook > Computer and Information Technology >

Database Administrators

Summary What They Do Work Environment How to Become One Pay Job

Summary

Quick Facts: Database Administrators

2017 Median Pay	\$87,020 per year \$41.84 per hour
Typical Entry-Level Education	Bachelor's degree
Work Experience in a Related Occupation	None
On-the-Job Training	None
Number of Jobs, 2016	119,500
Job Outlook, 2016-26	11% (Faster than average)
Employment Change, 2016-26	13,700

What Database Administrators Do

Database administrators (DBAs) use specialized software to store and organize data, such as customer information and customer shipping records. They make sure that data are available to users

Good News: DBA +11% Increase (2016-2026)

Biju Thomas - *Emerging Jobs (Developer/DBA)*

#8 Data Engineer



2020
Emerging
Jobs Report

- 33% annual growth
- Skills
 - Apache Spark
 - Hadoop
 - Python
 - ETL
 - AWS
- Industries
 - Computer Software
 - Information Technology
 - Financial Services
 - Healthcare & Hospitals
- Primary job responsibilities involve preparing data for analytical or operational uses.
- Works as part of an analytics team, providing data in a ready-to-use form to data scientists.
- Commonly deal with both structured and unstructured data sets

Characteristics of Big Data - The Five V's

Volume

Big data comes in one size: large. Enterprises are awash with data, easily amassing terabytes and even petabytes of information.

TB, Records, Transactions, Tables, Files

Value

Business value of Big Data



Variety

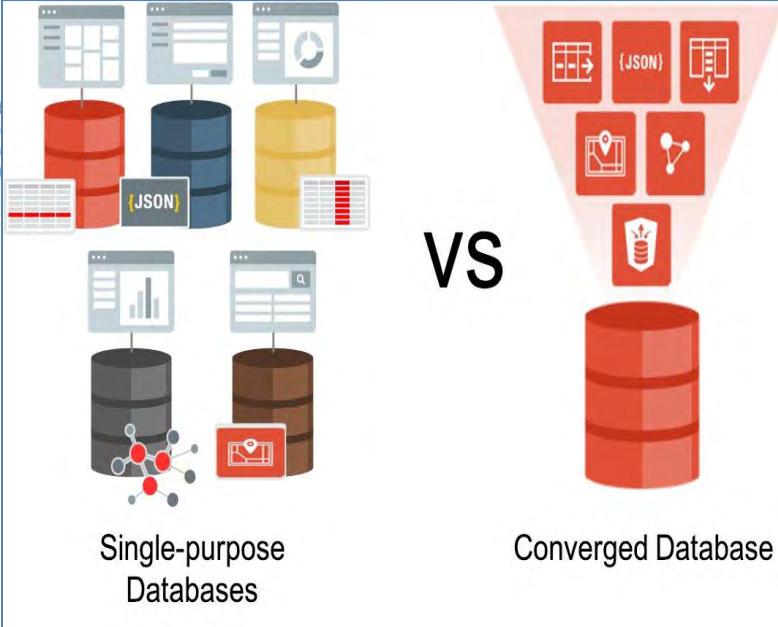
Big data extends beyond structured data, including semi-structured and unstructured data of all varieties: text, audio, video, click streams, log files and more.

Structured, Unstructured, Semistructured

Velocity

Often time-sensitive, big data is often streaming in to the system as it is being generated. To maximize its value to the organization, it must be processed quickly.

Batch, Near time, Real time



Big Data Themes

- HW & SW technologies for large data volumes
- Focus on Web 2.0 technologies
- Database Scale-out
- Relational & Distributed Data Analytics
- Real Time Analytics

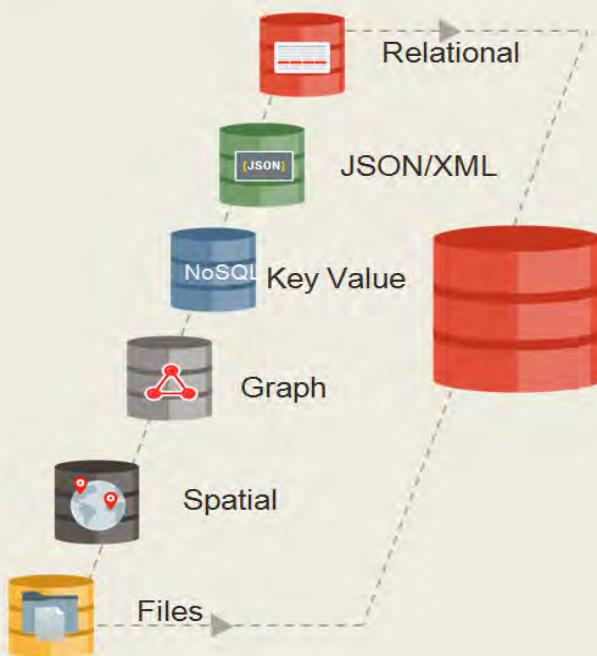
Big Data Domains

- Digital Marketing Optimization
- Data Exploration & Discovery
- Fraud Detection & Prevention
- Social Network & Relationship Analysis
- Machine-generated Data Analytics

Converged Database - Oracle Multi-Model Database*

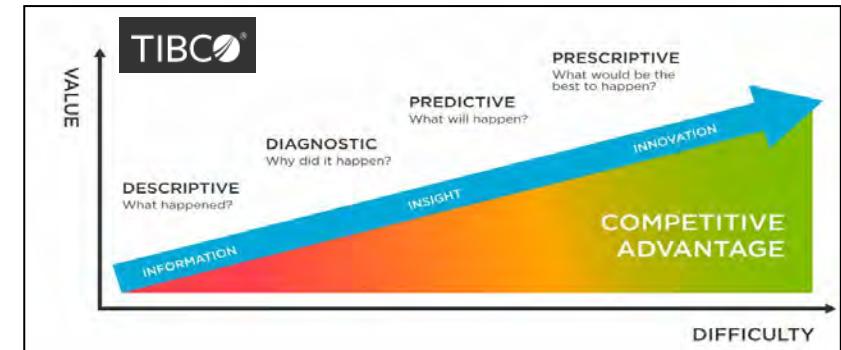
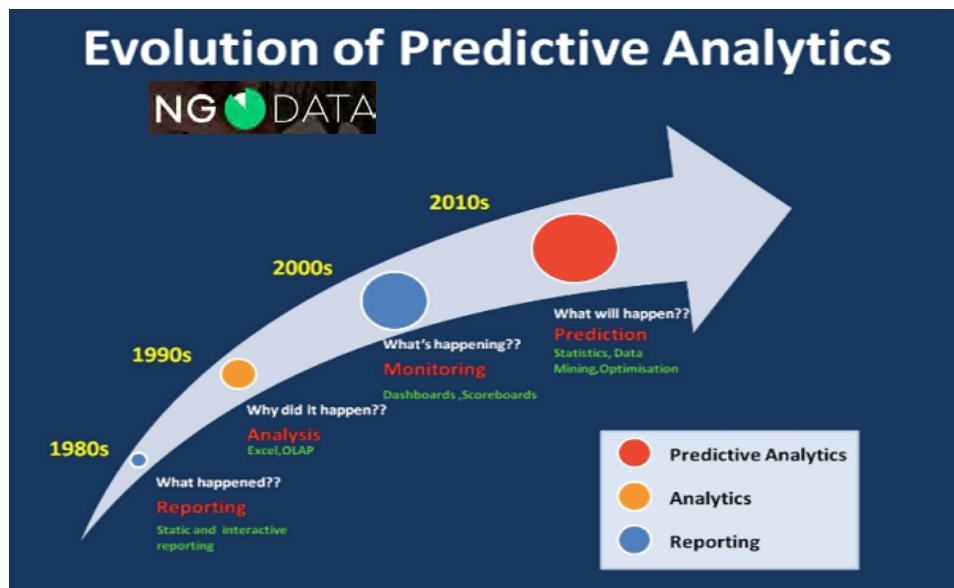
- Benefits of Oracle's Converged Database are broad

*Slide from Oracle's,
Nitin Vengurlekar

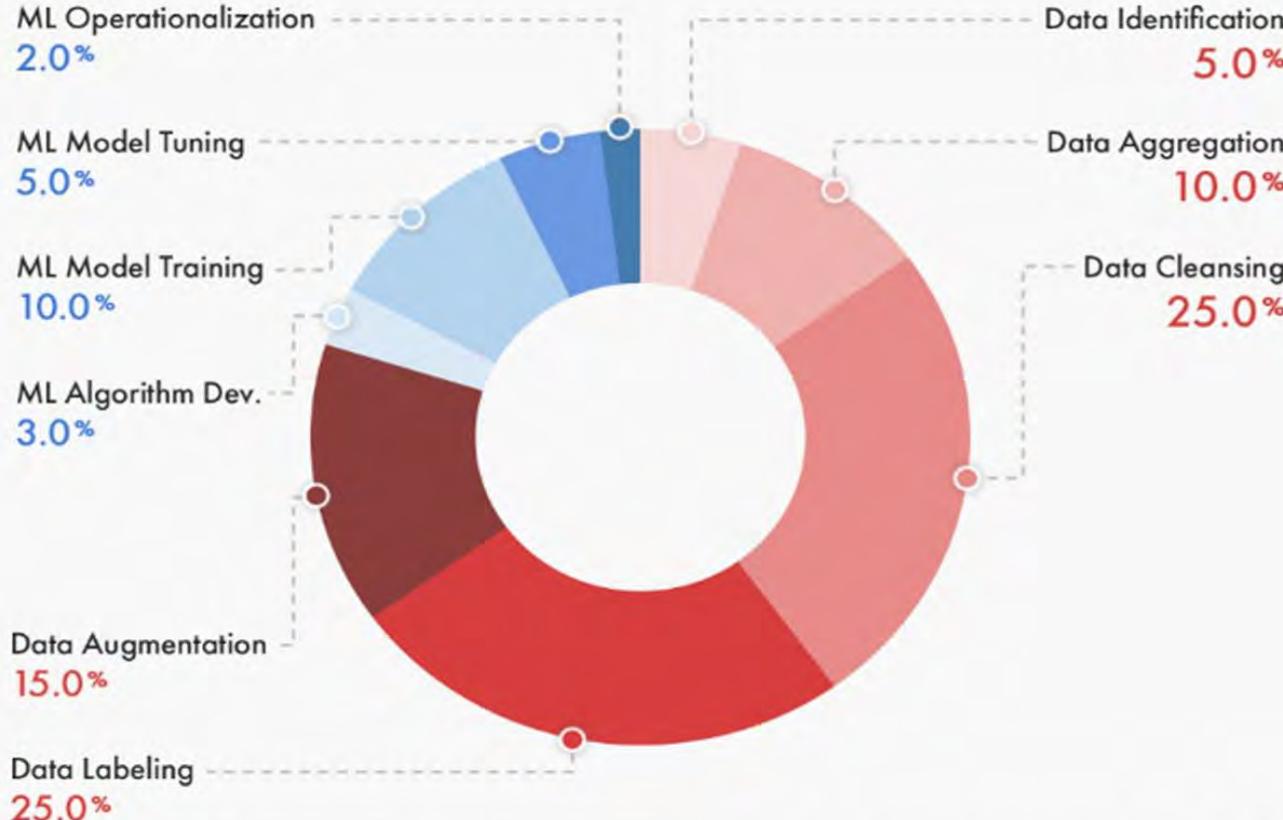


- Integrated development tools (Apex, SQL Dev, Spatial Studio)
- 3rd party and Open Source development tools
- Machine Learning
- Node.js, Python, many others
- In-memory database
- Spatial, Graph support
- NoSQL (JSON, key-value, wide column, XML)
- Containers, microservices, virtualization (Docker, MT)
- Integrated Security
- Deployment choice (on-prem, cloud, hybrid)
- Integrated High Availability and Disaster Recovery

What You Need; Nick of Time (*Predictive Analytics*)

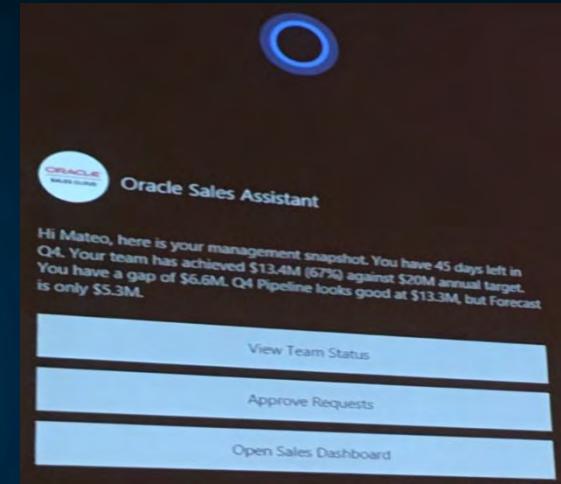


Percentage of Time Allocated to Machine Learning Project Tasks



**The DBA is
most
important
part of the
Machine
Learning
Process**

Niti Sharma An Introduction to Data Labeling in Artificial Intelligence ***Data Wrangling***
consumes over 80% of the time in AI projects.



A Robot may not look like one!

Oh Yeah... they never complain, always happy to do more, work anywhere, get smarter as time goes on, leverages AI & ML, works 24x7, doesn't ask for a raise, no union (yet).



ORACLE®
Database Cloud

The World's First Autonomous Database

A Robot may not look one!

*Robots that Manage a Database (ADW)!

*Robots that secure a system and use ML & AI

Autonomous DB : Future DBA & Robot DB

- Self-Managing (Driving)
- Self-Securing
- Self-Tuning
- Self-Recovering
- Self-Scaling Administration



Adaptive
Machine Learning

Fully automated patching, upgrades, backups, & availability architecture



**Oracle Unveils World's First
Autonomous Database Cloud**

Oracle Focus: Cloud, Data, Apps, Security, Self-Service, ML, & AI!

Innovation Components for Business!

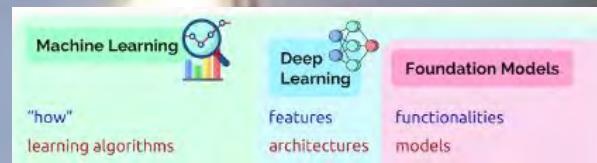


"I admire risk takers. I like leaders – people who do things before they become fashionable or popular. I find that kind of integrity inspirational."

LAWRENCE J. ELLISON | Chairman & Chief Executive Officer, 2003



Oracle Machine Learning: Brief Highlights Only



READY-TO-GO

ORACLE

SaaS APPS w/EMBEDDED ML

Pre-built, packaged ML and
data-driven SaaS applications

READY-TO-WORK

ORACLE

AUTONOMOUS DATABASE

Embedded AI in Databases to
simplify enterprise
data management

READY-TO-BUILD

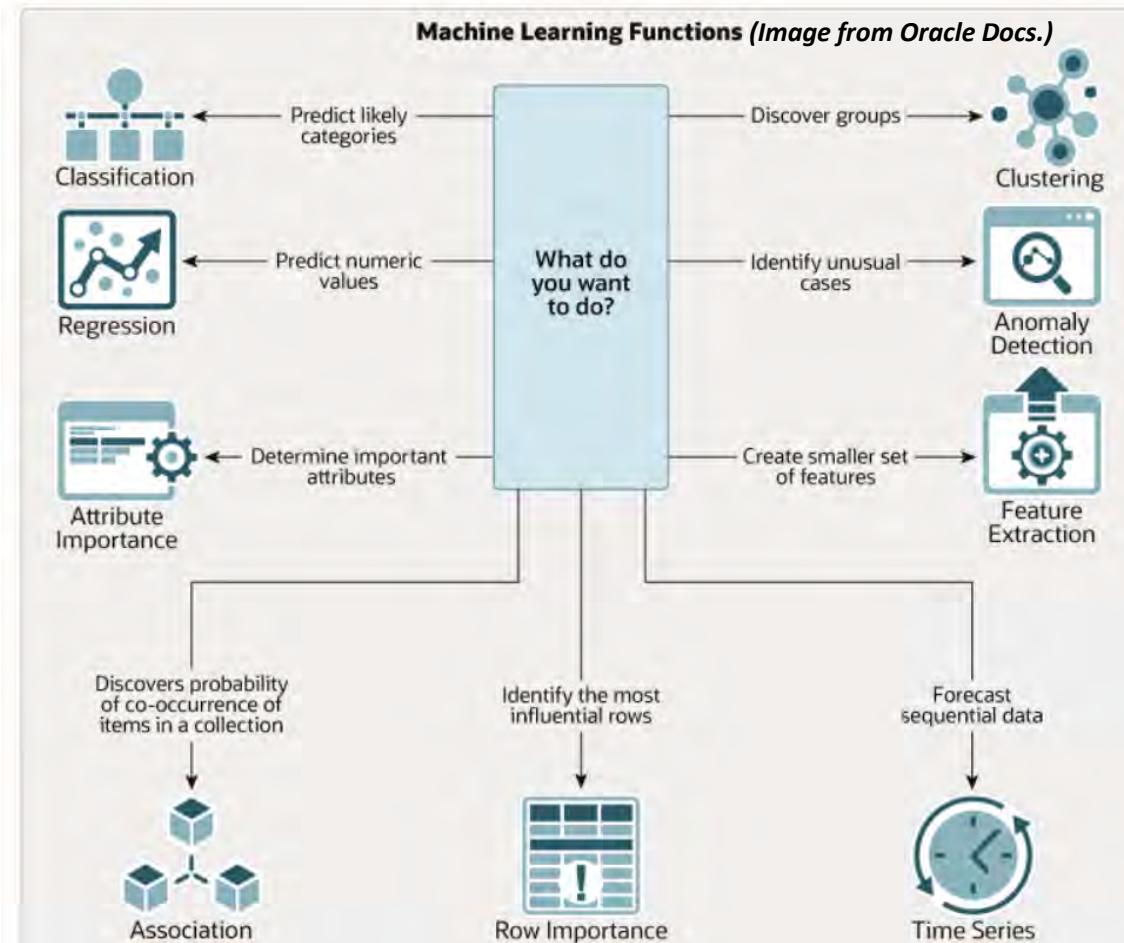
ORACLE

DATA SCIENCE PLATFORM

Complete platform to build and
support ML-powered
applications

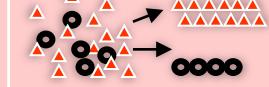
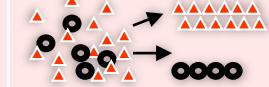
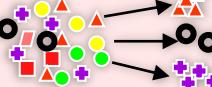
Machine Learning Process (Supervised Learning)

- First: Clear Business Problem to Solve
 - Second: Function to Perform
 - Third: Algorithms to use
-
- First: Build/Train the Model: When you build it use about 60% of your data.
 - Second: Test/Score Model for accuracy/precision using about 40% of data.
- Compare Algorithms!**



Business Understanding

Be Extremely Specific in Problem Statement:

Poorly Defined	Better	Data Mining Technique
Predict employees that leave	<ul style="list-style-type: none">Based on past employees that voluntarily left:<ul style="list-style-type: none">Create New Attribute Empl Turnover → 0/1	
Predict customers that churn	<ul style="list-style-type: none">Based on past customers that left (churn):<ul style="list-style-type: none">Create New Attribute Churn → YES/NO	
Target “best” customers	<ul style="list-style-type: none">Recency, Frequency Monetary (RFM) AnalysisSpecific Dollar Amount over Time Window:<ul style="list-style-type: none">Who has spent \$500+ in most recent 18 months	
How can I make more \$\$?	<ul style="list-style-type: none">What helps me sell soft drinks & coffee?	
Which customers are likely to buy?	<ul style="list-style-type: none">How much is each customer likely to spend?	
Who are my “best customers”?	<ul style="list-style-type: none">What descriptive “rules” describe “best customers”?	
How can I combat fraud?	<ul style="list-style-type: none">Which transactions are the most anomalous?<ul style="list-style-type: none">Then roll-up to physician, claimant, employee, etc.	

OAA Model Build and Real-time SQL Apply

Simple SQL Syntax - Attribute Importance

ML Model Build (PL/SQL)

```
BEGIN
  DBMS_DATA_MINING.CREATE_MODEL(
    model_name      => 'BUY_INSURANCE_AI',
    mining_function => DBMS DATA MINING.ATTRIBUTE IMPORTANCE,
    data_table_name  => 'CUST_INSUR_LTV',
    case_id_column_name => 'cust_id',
    target_column_name  => 'BUY_INSURANCE',
    settings_table_name => 'CUST_INSUR_LTV_SET');
END;
/
```

Additional Detail:

```
drop table CUST_INSUR_LTV_SET;
exec
dbms_data_mining.drop_model('BUY_INSURANCE_AI');

create table CUST_INSUR_LTV_SET (setting_name
varchar2(30), setting_value varchar2(4000));

insert into CUST_INSUR_LTV_SET values
('ALGO_NAME','ALGO_SUPPORT_VECTOR_MACHINES');
insert into CUST_INSUR_LTV values ('PREP_AUTO','ON');
commit;
```

Model Results (SQL query)

```
SELECT attribute_name, explanatory_value, rank
FROM BUY_INSURANCE_AI
ORDER BY rank, attribute_name;
```

ATTRIBUTE NAME	RANK	ATTRIBUTE VALUE
BANK_FUNDS	1	0.2161
MONEY_MONTLY_OVERDRAWN	2	0.1489
N_TRANS_ATM	3	0.1463
N_TRANS_TELLER	4	0.1156
T_AMOUNT_AUTOM_PAYMENTS	5	0.1095

OAA Model Build and Real-time SQL Apply Prediction

Oracle Advanced Analytics (OAA) Simple SQL - Classification

ML Model Build (PL/SQL)

```
BEGIN
  DBMS_DATA_MINING.CREATE_MODEL(
    model_name      => 'BUY_INSUR1',
    mining_function => dbms_data_mining.classification,
    data_table_name => 'CUST_INSUR_LTV',
    case_id_column_name => 'CUST_ID',
    target_column_name  => 'BUY_INSURANCE',
    settings_table_name => 'CUST_INSUR_LTV_SET');
END;
/
```

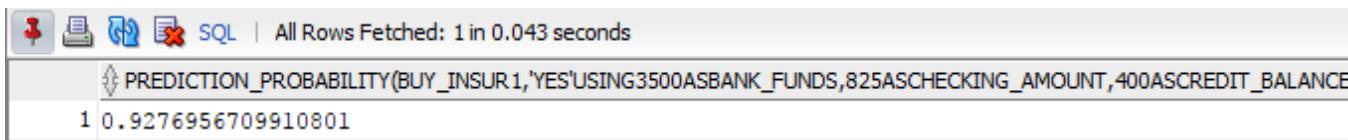
Additional Detail:

```
drop table CUST_INSUR_LTV_SET;
exec dbms_data_mining.drop_model('BUY_INSUR1');
create table CUST_INSUR_LTV_SET
(setting_name varchar2(30), setting_value varchar2(4000));

insert into CUST_INSUR_LTV_SET values
('ALGO_NAME','ALGO_SUPPORT_VECTOR_MACHINE');
insert into CUST_INSUR_LTV_SET values ('PREP_AUTO','ON');
commit;
```

Model Apply (SQL query)

```
Select prediction_probability(BUY_INSUR1, 'Yes'
  USING 3500 as bank_funds, 825 as checking_amount, 400 as credit_balance, 22 as age,
  'Married' as marital_status, 93 as MONEY_MONTLY_OVERDRAWN, 1 as house_ownership)
from dual;
```



The screenshot shows the Oracle SQL Developer interface with the following details:

- Toolbar icons: New, Open, Save, Undo, Redo, SQL.
- Status bar: All Rows Fetched: 1 in 0.043 seconds.
- Result grid:

	PREDICTION_PROBABILITY(BUY_INSUR1,YES'USING3500ASBANK_FUNDS,825ASCHECKING_AMOUNT,400ASCREDIT_BALANCE
1	0.9276956709910801

DBMS_DATA_MINING Oracle Algorithms*

FYI

Algorithm	Abbreviation	Function	*Oracle Database PL/SQL Packages and Types Reference
Apriori	AR	Association	
CUR Matrix Decomposition	CUR	Attribute Importance	
Decision Tree	DT	Classification	
Expectation Maximization	EM	Clustering	
Explicit Semantic Analysis	ESA	Feature Extraction, Classification	
Exponential Smoothing	ESM	Time Series	
Generalized Linear Model	GLM	Classification, Regression	
<i>k</i> -Means	KM	Clustering	
Minimum Descriptor Length	MDL	Attribute Importance	
Naive Bayes	NB	Classification	
Neural Networks	NN	Classification, Regression	
Non-Negative Matrix Factorization	NMF	Feature Extraction	
Orthogonal Partitioning Clustering	O-Cluster	Clustering	
Random Forest	RF	Classification	
Singular Value Decomposition and Principal Component Analysis	SVD and PCA	Feature Extraction	
Support Vector Machine	SVM	Classification, Regression, Anomaly Detection	

DBMS_DATA_MINING Oracle Algorithms *

FYI

ALGO_NAME Value	Description	Mining Function
ALGO_AI_MDL	Minimum Description Length	Attribute Importance
ALGO_APRIORI_ASSOCIATION_RULES	Apriori	Association Rules
ALGO_CUR_DECOMPOSITION	CUR Decomposition	Attribute Importance
ALGO_DECISION_TREE	Decision Tree	Classification
ALGO_EXPECTATION_MAXIMIZATION	Expectation Maximization	Clustering
ALGO_EXPLICIT_SEMANTIC_ANALYSIS	Explicit Semantic Analysis	Feature Extraction Classification
ALGO_EXPONENTIAL_SMOOTHING	Exponential Smoothing	Time Series
ALGO_EXTENSIBLE_LANG	Language used for extensible algorithm	All mining functions supported
ALGO_GENERALIZED_LINEAR_MODEL	Generalized Linear Model	Classification, Regression; also Feature Selection and Generation
ALGO_KMEANS	Enhanced k _Means	Clustering
ALGO_NAIVE_BAYES	Naive Bayes	Classification
ALGO_NEURAL_NETWORK	Neural Network	Classification
ALGO_NONNEGATIVE_MATRIX_FACTORIZATION	Non-Negative Matrix Factorization	Feature Extraction
ALGO_O_CLUSTER	O-Cluster	Clustering
ALGO_RANDOM_FOREST	Random Forest	Classification
ALGO_SINGULAR_VALUE_DECOMP	Singular Value Decomposition	Feature Extraction
ALGO_SUPPORT_VECTOR_MACHINES	Support Vector Machine	Classification and Regression

These are the **actual algorithm names** that need to be used.

These are **values for ALGO_NAME setting**

There are **many additional settings** that go with each Mining Function (i.e. **Confidence, Length, Rules, Aggregates, Cost, Number of Clusters...etc.**)

Machine Learning in ADW/ATP - www.oracle.com/cloud/free/

The screenshot shows the Oracle Autonomous Database (ATP) interface. On the left, there's a sidebar with various icons and labels: ATP (highlighted in green), Development, SQL, Execute query, Liquibase, Track schema, SCHEDULE, Quick, and APEX. The main content area has a header with the database ID DB-20220510121752 and navigation buttons: Database Actions (circled in red), DB Connection, Performance Hub, Service Console, and More Actions. Below this is a navigation bar with tabs: Autonomous Database Information, Tools, and Tags.

The central part of the screen displays a grid of machine learning examples under the heading "ORACLE Machine Learning". Each example includes a title, a brief description, author information, date added, tags, and interaction metrics (Likes, Comments, Shares).

Example Template	Description	Author	Date Added	Tags	Interactions
OML4R Clustering EM	This notebook builds and applies a clustering mod...	Oracle	9/30/21, 8:40 AM	Clustering, Expectation Maximization	0 Likes, 16 Comments, 1 Share
OML4R Clustering KM	This notebook builds and applies a clustering mod...	Oracle	11/26/20, 5:41 AM	Clustering, K-Means	0 Likes, 107 Comments, 5 Shares
OML4R Clustering OC	This notebook builds and applies a clustering mod...	Oracle	2/17/21, 5:18 PM	Python, Data Cleaning, Duplicates Removal	0 Likes, 76 Comments, 2 Shares
OML4Py Classification SVM	This notebook builds and applies a Support Vector...	Oracle	9/30/21, 8:40 AM	Create View, SH.SUPPLEMENTARY_DEMOGR...	0 Likes, 16 Comments, 1 Share
OML4Py Clustering EM	This notebook builds and applies a clustering mod...	Oracle	9/30/21, 8:40 AM	Clustering, Expectation Maximization	0 Likes, 11 Comments, 1 Share
OML4Py Clustering KM	This notebook builds and applies a clustering mod...	Oracle	11/26/20, 5:41 AM	Clustering, K-Means	0 Likes, 107 Comments, 5 Shares
OML4Py Data Cleaning Duplicates Re...	This notebook illustrates removing duplicate rows ...	Oracle	2/17/21, 5:18 PM	Python, Data Cleaning, Duplicates Removal	0 Likes, 76 Comments, 2 Shares
OML4SQL Classification DT	This notebook builds and applies a Decision Tree Classifica...	Oracle	11/26/20 5:40 AM	SQL, Classification, Decision Tree, sql, Create View	0 Likes, 175 Comments, 27 Shares
OML4SQL Classification GLM	This notebook builds and applies a Generalized Linear Clas...	Oracle	9/30/21 8:40 AM	sql, Create View, SH.SUPPLEMENTARY_DEMOGR...	0 Likes, 13 Comments, 1 Share
OML4SQL Classification NB	This notebook builds and applies a Naive Bayes Classificati...	Oracle	9/30/21 8:40 AM	sql, Create View, SH.SUPPLEMENTARY_DEMOGR...	0 Likes, 4 Comments, 1 Share
OML4SQL Classification NN	This notebook builds and applies a Neural Network Classifi...	Oracle	9/30/21 8:40 AM	sql, Create View, SH.SUPPLEMENTARY_DEMOGR...	0 Likes, 28 Comments, 2 Shares

Machine Learning connection to ADW/ATP

ORACLE Machine Learning

ADMIN_RICH2 Project [ADMIN_RIC...]

ADMIN_RICH2

Build Anomaly Detection model (1-Class Support Vector Machine)

```
%script
--Build Anomaly Detection Model (1-Class SVM) on CUSTOMERS360 data

DECLARE
v_sql varchar2(100);

BEGIN
--Create a Build Setting table for Model Build

EXECUTE IMMEDIATE 'CREATE TABLE CUSTOMERS360_SET (setting_name VARCHAR2(30),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 CUSTOMERS360_SET (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, ''CUSTOMERS360_SET'')';
DBMS_OUTPUT.PUT_LINE ('Created model: CUSTOMERS360_MODEL');

END;
```

Created model build settings table: CUS
Created model: CUSTOMERS360_MODEL
PL/SQL procedure successfully completed

Graph all Customers's PROBABILITY_ANOMALOUS vs. YRS_RESIDENCE grouped by CUST_MARITAL_STATUS

FINISHED

```
%sql
-- Click on the bar chart icon and expand settings.  Drag PROBABILITY_ANOMALOUS
-- HINT: Select items in the legend to focus on certain categories.

SELECT *
FROM (SELECT CUST_ID, round(probability_anomalous,2) probability_anomalous, HOUSEHOLD_SIZE, YRS_RESIDENCE, CUST_GENDER, CUST_MARITAL_STATUS,
rank() over (ORDER BY probability_anomalous DESC) rnk
  FROM (SELECT CUST_ID, HOUSEHOLD_SIZE, YRS_RESIDENCE, CUST_GENDER, CUST_MARITAL_STATUS, prediction_probability(CUSTOMERS360MODEL, '0' using *) probability_anomalous
        FROM CUSTOMERS360))
 ORDER BY probability_anomalous DESC;
```

Grouped Stacked

YRS_RESIDENCE	Widowed	Divorc.	Mabsent	Separ.	Married	Mar-AF	NeverM
1	0.45	0.22	0.35	0.28	0.25	0.22	0.22
2	0.52	0.28	0.30	0.25	0.25	0.25	0.25
5	0.38	0.25	0.35	0.28	0.25	0.25	0.25
7	0.37	0.22	0.20	0.25	0.22	0.22	0.25
9	0.28	0.20	0.38	0.35	0.22	0.22	0.38
11	0.35	0.22	0.35	0.25	0.22	0.22	0.25
12	0.35	0.25	0.25	0.22	0.22	0.22	0.32

Machine Learning connection to ADW/ATP

ORACLE® Machine Learning

ADMIN_RICH2 Project [ADMIN_RIC... ▾] ADMIN_RICH2

Display the top 15 most anomalous customers

```
%sql  
--Display the Top 15 Most Anomalous Customers  
  
SELECT *  
FROM (SELECT CUST_ID, round(probability_anomalous,2) probability_anomalous, HOUSEHOLD_SIZE, YRS_RESIDENCE,  
CUST_GENDER, CUST_MARITAL_STATUS, rank() over (ORDER BY probability_anomalous DESC) rnk  
      FROM (SELECT CUST_ID, HOUSEHOLD_SIZE, YRS_RESIDENCE, CUST_GENDER,  
            CUST_MARITAL_STATUS, prediction_probability(CUSTOMERS360MODEL, '0' using *) probability_anomalous  
      FROM CUSTOMERS360))  
WHERE rnk <= 15  
ORDER BY probability_anomalous DESC;
```

FINISHED

View Prediction_Details that explain why the record was selected as anomalous

```
%sql  
-- Select customers with OCCUPATION of 'TechSup' and more than 55% probability of being anomalous  
  
SELECT CUST_ID,  
       RTRIM(TRIM(SUBSTR(OUTPRED."Attribute1",17,100)),',rank="1"/>') FIRST_ATTRIBUTE,  
       RTRIM(TRIM(SUBSTR(OUTPRED."Attribute2",17,100)),',rank="2"/>') SECOND_ATTRIBUTE,  
       RTRIM(TRIM(SUBSTR(OUTPRED."Attribute3",17,100)),',rank="3"/>') THIRD_ATTRIBUTE,  
       RTRIM(TRIM(SUBSTR(OUTPRED."Attribute4",17,100)),',rank="4"/>') FOURTH_ATTRIBUTE,  
       RTRIM(TRIM(SUBSTR(OUTPRED."Attribute5",17,100)),',rank="5"/>') FIFTH_ATTRIBUTE  
  FROM (SELECT CUST_ID, PREDICTION_DETAILS(CUSTOMERS360MODEL, '0' USING *) PREDICTION_DETAILS FROM CUSTOMERS360  
    WHERE PREDICTION_PROBABILITY(CUSTOMERS360MODEL, '0' USING *) > .50  
      AND OCCUPATION='TechSup'  
      ORDER BY CUST_ID) OUT,
```

FINISHED

CUST_ID	FIRST_ATTRIBUTE	SECOND_ATTRIBUTE	THIRD_ATTRIBUTE
100646	"CUST_MARITAL_STATUS" actualValue="Widowed" weight=".226"	"CUST_YEAR_OF_BIRTH" actualValue="1941" weight=".118" "CUST_CREDIT_LIMIT" actualValue="1500" weight=".118"	
102922	"CUST_MARITAL_STATUS" actualValue="Widowed" weight=".222"	"CUST_YEAR_OF_BIRTH" actualValue="1931" weight=".169"	"CUST_CREDIT_LIMIT" actualValue="1500" weight=".150"
103441	"CUST_MARITAL_STATUS" actualValue="Widowed" weight=".222"	"CUST_YEAR_OF_BIRTH" actualValue="1941" weight=".117" "EDUCATION" actualValue="Bach." weight=".076"	
104286	"EDUCATION" actualValue="9th" weight=".165"	"HOUSEHOLD_SIZE" actualValue="4-5" weight=".146"	"CUST_CREDIT_LIMIT" actualValue="1500" weight=".150"

A Game of Pool (*Talent / Luck / Work / Nerve*)

(Your Current Team Plays Robots built on the Best Past Teams or ML)



Gambling on virtual reality: the online casinos of the future

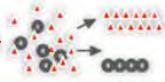


Image Credit: SlotsMillion

Oracle Machine Learning Algorithms and Analytics in Oracle Database

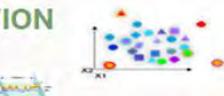
CLASSIFICATION

- Naive Bayes
- Logistic Regression (GLM)
- Decision Tree
- Random Forest
- Neural Network
- Support Vector Machine (SVM)
- Explicit Semantic Analysis
- XGBoost*



ANOMALY DETECTION

- One-Class SVM
- MSET-SPRT*



CLUSTERING

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



TIME SERIES

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- Includes popular models
e.g. Holt-Winters with trends, seasonality, irregular time series



[OML Algorithm Cheat Sheet](#)
[Algorithm Documentation](#)

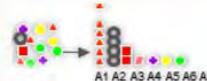
REGRESSION

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- Support Vector Machine (SVM)
- Stepwise Linear regression
- Neural Network
- XGBoost*



ATTRIBUTE IMPORTANCE

- Minimum Description Length
- Random Forest
- Unsupervised Pairwise KL Divergence
- CUR decomposition for row & AI



ASSOCIATION RULES

- A priori



SQL ANALYTICS

- SQL Windows
- SQL Patterns
- SQL Aggregates



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ROW IMPORTANCE

- CUR Decomposition

RANKING

- XGBoost*



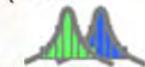
TEXT MINING SUPPORT

- Algorithms support text columns
- Tokenization and theme extraction
- Explicit Semantic Analysis (ESA)



STATISTICAL FUNCTIONS

- min, max, median, stdev, t-test, F-test, Pearson's, Chi-Sq, ANOVA, etc.



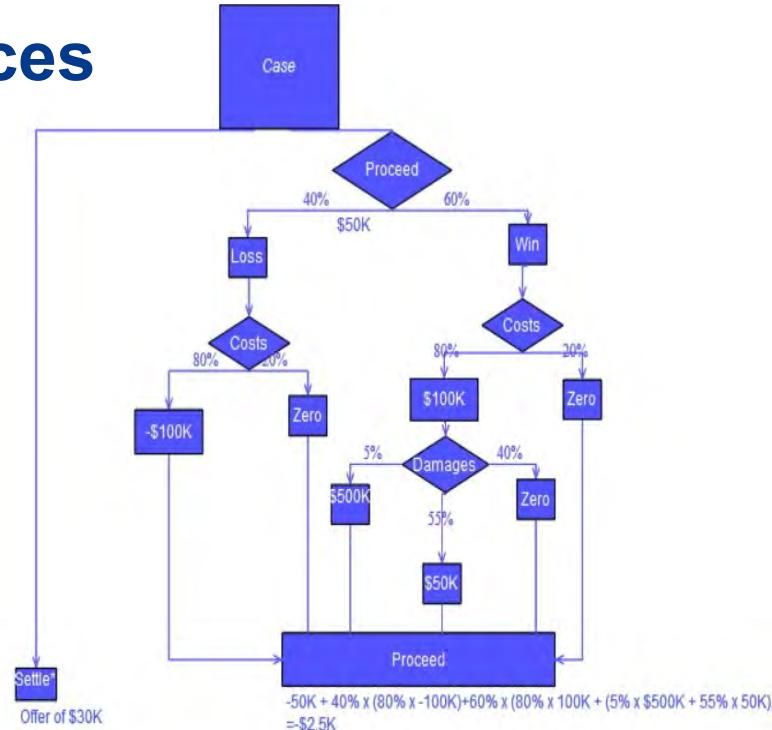
Includes support for partitioned models, integrated text mining, automated data preparation

* New in 21c

Decision Tree Algorithm (ML Classifier)

- Tree model for decisions
- Decisions made to reach goal
- **Calculate odds of different choices**
- Can have chance outcomes
- **Calculate costs & utility (value)**
- Could be used for chatbots
(to answer questions)

Flow Chart calculates when to settle a case or not based on costs/probabilities



OML (OAA) Oracle Data Mining SQL Sample (PARTIAL)

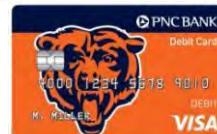
dmdtdemo.sql – DBMS_DATA_MINING package – Decision Tree

```
-- Given demographic data about a set of customers, predict the  
-- customer response to an affinity card program using a classifier  
-- based on Decision Trees algorithm.
```

```
INSERT INTO dt_sh_sample_settings VALUES  
  (dbms_data_mining.algo_name, dbms_data_mining.algo_decision_tree);
```

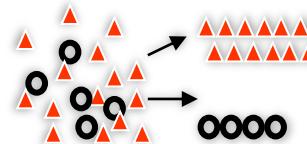
```
--  
-- CREATE A NEW MODEL  
-- Build a DT model
```

```
BEGIN  
  DBMS_DATA_MINING.CREATE_MODEL(  
    model_name      => 'DT_SH_Class_sample',  
    mining_function => dbms_data_mining.classification,  
    data_table_name  => 'mining_data_build_v',  
    case_id_column_name => 'cust_id',  
    target_column_name => 'affinity_card',  
    settings_table_name => 'dt_sh_sample_settings');  
END;  
/
```



```
SELECT T.cust_id, S.prediction, S.probability, S.cost  
FROM (SELECT cust_id,  
           PREDICTION_SET(dt_sh_class_sample COST MODEL USING *) pset  
      FROM  mining_data_apply_v  
     WHERE cust_id < 100011) T,  
     TABLE(T.pset) S  
ORDER BY cust_id, S.prediction;
```

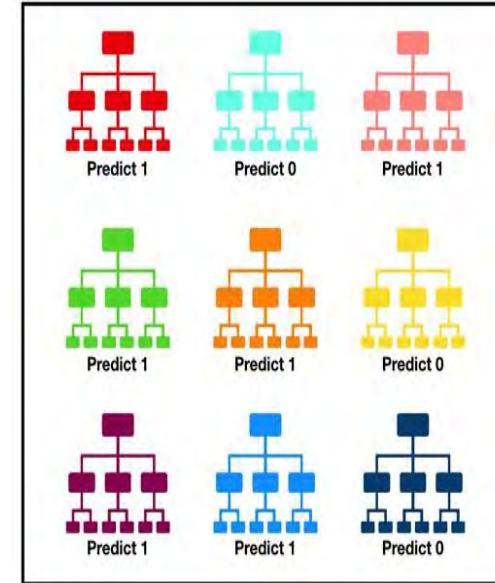
CUST_ID	PREDICTION	PROBABILITY	COST
100001	0	.966183575	.270531401
100001	1	.033816425	.966183575
100002	0	.740384615	2.076923077
100002	1	.259615385	.740384615
100003	0	.909090909	.727272727
100003	1	.090909091	.909090909
100004	0	.909090909	.727272727
100004	1	.090909091	.909090909
100005	0	.272357724	5.821138211
100005	1	.727642276	.272357724
100006	0	1.000000000	.000000000
100006	1	.000000000	1.000000000
100007	0	.909090909	.727272727
100007	1	.090909091	.909090909
100008	0	.909090909	.727272727
100008	1	.090909091	.909090909
100009	0	.272357724	5.821138211
100009	1	.727642276	.272357724
100010	0	.675965665	2.592274678
100010	1	.324034335	.675965665



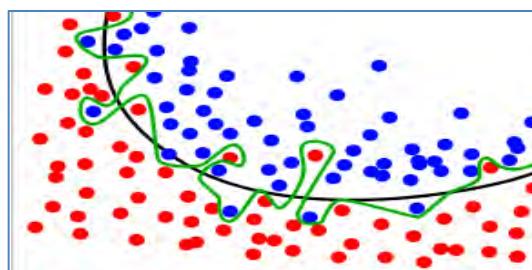
Random Forest (ML Classifier)

- Multitude of Decision Trees (picks the mode)
- Output: Class of decision tree most likely
- Mode of the classes is mean or *most likely*
- Mode is found during training time
- **Separate the Real Data from the Noise!**
(divide and conquer)
- Fix decision tree “overfitting” or “*too close of fit*” with supervised learning training set.
- Miss outliers if overfitting occurs
- *Bagging* smooths things out

TowardsDataScience.com



Tally: Six 1s and Three 0s
Prediction: 1

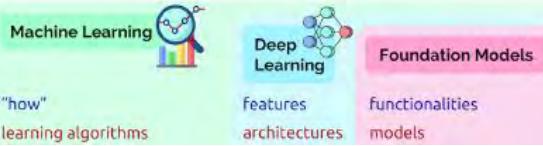


Neural Network (ML Classifier)

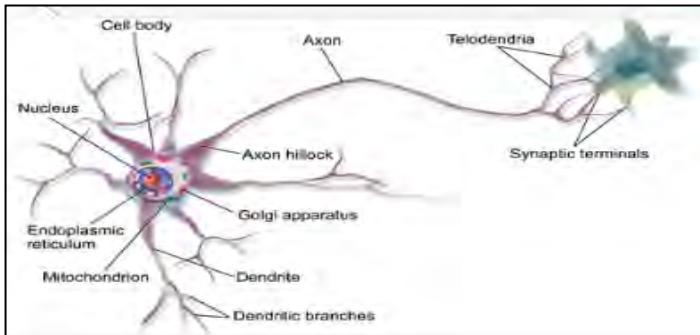
- Artificial Neural Networks (ANN) make ML/AI fast
- Deep Learning (Google's **Tensor Flow** leverages this)
- Image Classification with Tensor Flow
- Classify patterns & sequences, regression testing...
- Data Mining, Spam Filtering, Robotics
- **Supervised or Unsupervised Learning**
- **Autonomous Vehicles**
- Use for Predictive Modeling
- Used with **Speech Recognition**



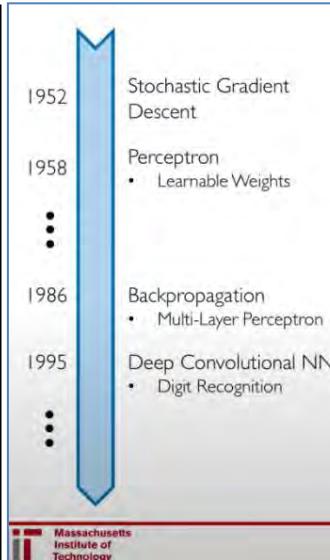
Neural Network (ML Classifier): Pixels



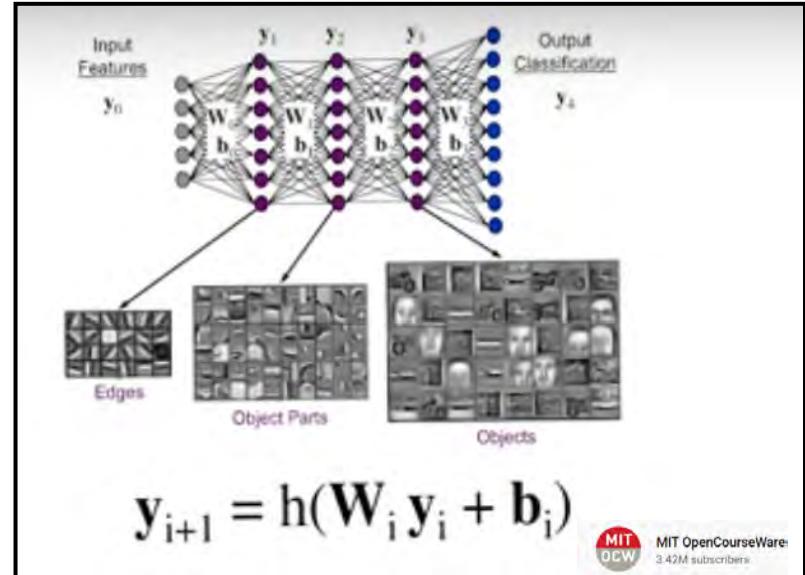
Biological Neural Network



A **neural circuit** is a population of neurons interconnected by synapses to carry out a specific function when activated. Neural circuits interconnect to one another to form large scale brain networks. Biological neural networks have inspired the design of artificial neural networks, but artificial neural net



AI Neural Network



MIT OCW
3.42M subscribers

y = vector/image

W =weight (each line weight/strength)

b = thresholds/vector or bias

y times W is just Vector x Matrix

h = rectified linear unit (>0)

Set: #layers / W's / b's / #neurons / features

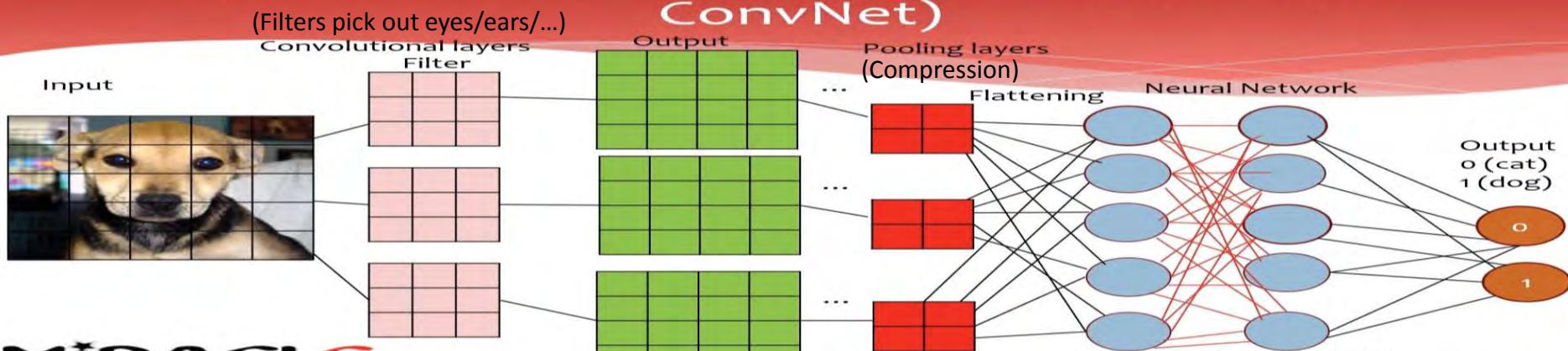


Use BP or Backpropagation to update weights to minimize loss;
use gradient descent or stochastic gradient descent [differential].
(PyTorch autograd / Dropout so you don't overfit)

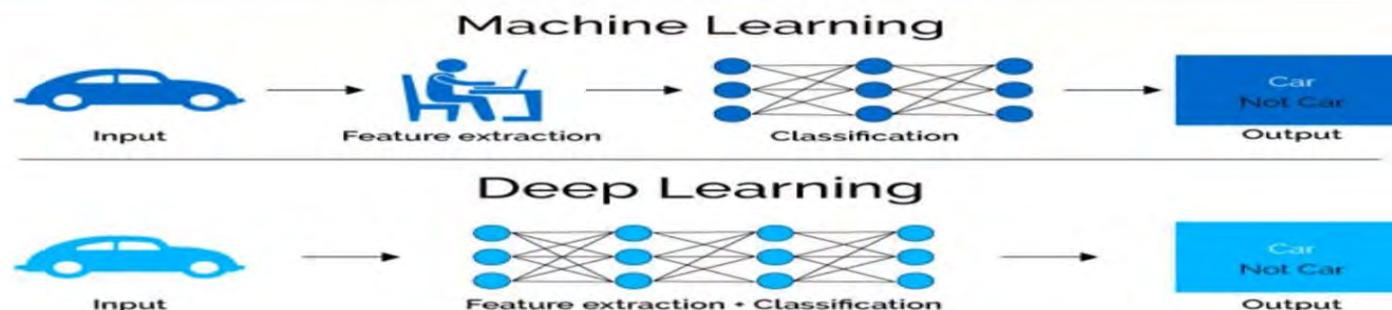
NN's also called ANN's /Artificial Neural Networks

Neural Network - CNN (ML Classifier)* *HeliFromFinland

Convolutional Neural Networks (CNN, or ConvNet)



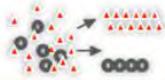
What is deep learning?



Oracle Machine Learning Algorithms and Analytics in Oracle Database

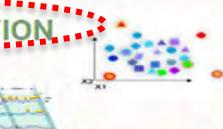
CLASSIFICATION

- Naive Bayes
- Logistic Regression (GLM)
- Decision Tree
- Random Forest
- Neural Network
- Support Vector Machine (SVM)
- Explicit Semantic Analysis
- XGBoost*



ANOMALY DETECTION

- One-Class SVM
- MSET-SPRT*



CLUSTERING

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



TIME SERIES

- Forecasting - Exponential Smoothing
- Includes popular models
e.g. Holt-Winters with trends, seasonality, irregular time series



[OML Algorithm Cheat Sheet](#)
[Algorithm Documentation](#)

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- CUR decomposition for row & AI



ASSOCIATION RULES

- A priori



SQL ANALYTICS

- SQL Windows
- SQL Patterns
- SQL Aggregates



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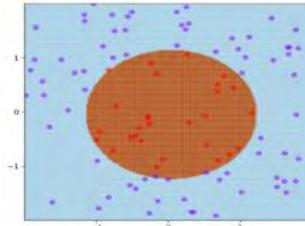


Includes support for partitioned models, integrated text mining, automated data preparation

* New in 21c

One-Class SVM (ML Anomaly Detection)

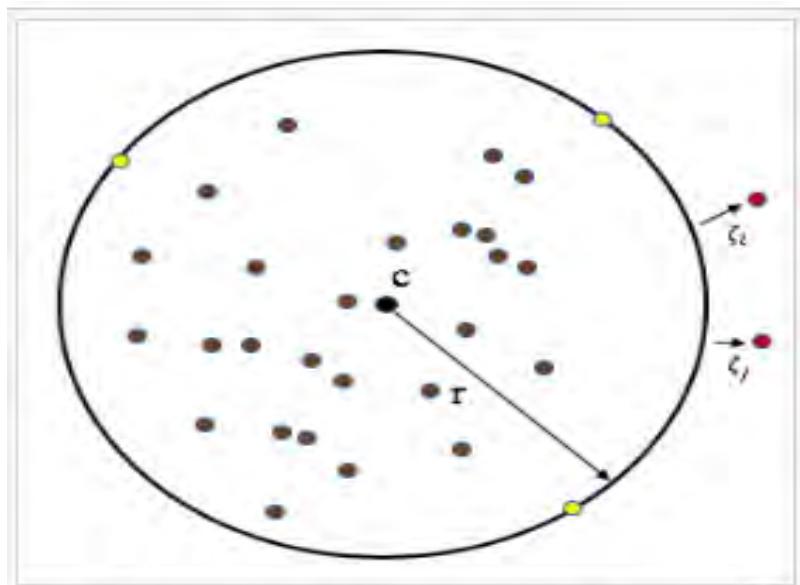
- Support Vector Machine (**SVM**)
- **One-Class Classification (OCC)**
- Used to Classify Data
- **Supervised Learning using Algorithms**
- **Identify specific objects of a class** based on supervised learning based on objects of that class.
- SVM maps training data into separated areas
- **Unsupervised Learning** does data **clustering**
- They analyze the data used for **regression**
- SVM as binary non-probabilistic linear classifier
- **Classify images, text, & even hand written text.**



Fraud detection
Use SVM OCC

One-Class SVM (ML Anomaly Detection)*

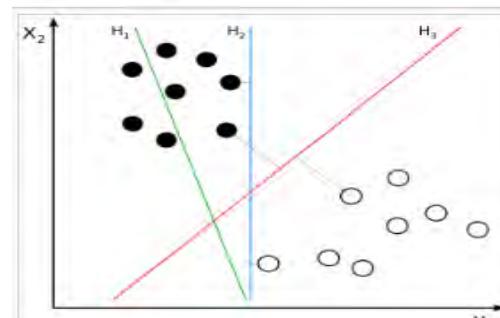
FYI



The hypersphere containing the target data having center a and radius R . Objects on the boundary are support vectors, and two objects lie outside the boundary having slack greater than 0.

Support Vector Data Description (SVDD):

Find the smallest hypersphere containing all data points (use supervised training to get it)

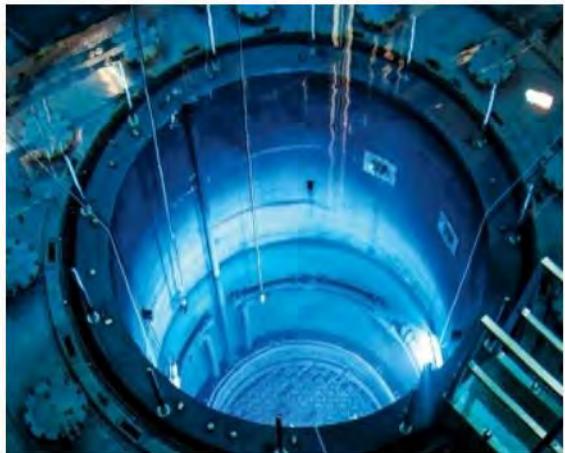


H_1 does not separate the classes.
 H_2 does, but only with a small margin.
 H_3 separates them with the maximal margin.

Linear SVM

Smart Anomaly Detection with MSET2 (SAM)

Created by nuclear scientists to analyze physical systems



All 90+ US nuclear reactors and most of the 450 reactors worldwide use MSET for prognostic analytics in safety systems



Oracle Exadata machines and Oracle Cloud use MSET for predictive maintenance, helping to deliver highest cloud uptime in the industry

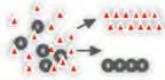


Major airlines use MSET in jet engines for predictive health monitoring, benefiting uptime, maintenance activities, and supply chain costs

Oracle Machine Learning Algorithms and Analytics in Oracle Database

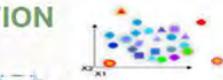
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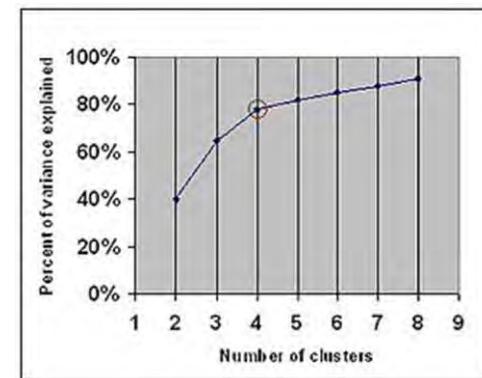


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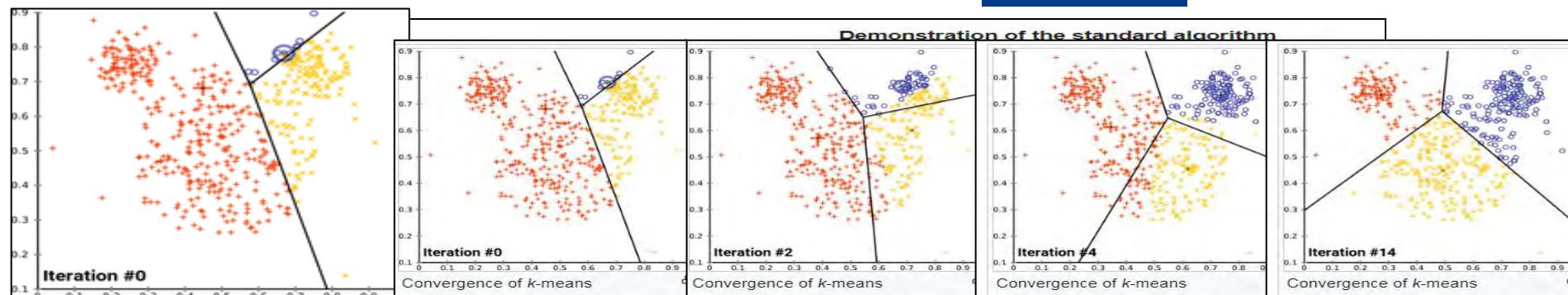
* New in 21c

Hierarchical K-Means (ML Cluster)

- Use the **K-means (Lloyd's) Algorithm**
- Use **observations** of the Data Set
- Clusters generated based on each observation with **nearest mean & hierarchies of clusters.**
- **Centroid cluster is new mean - Repeat**

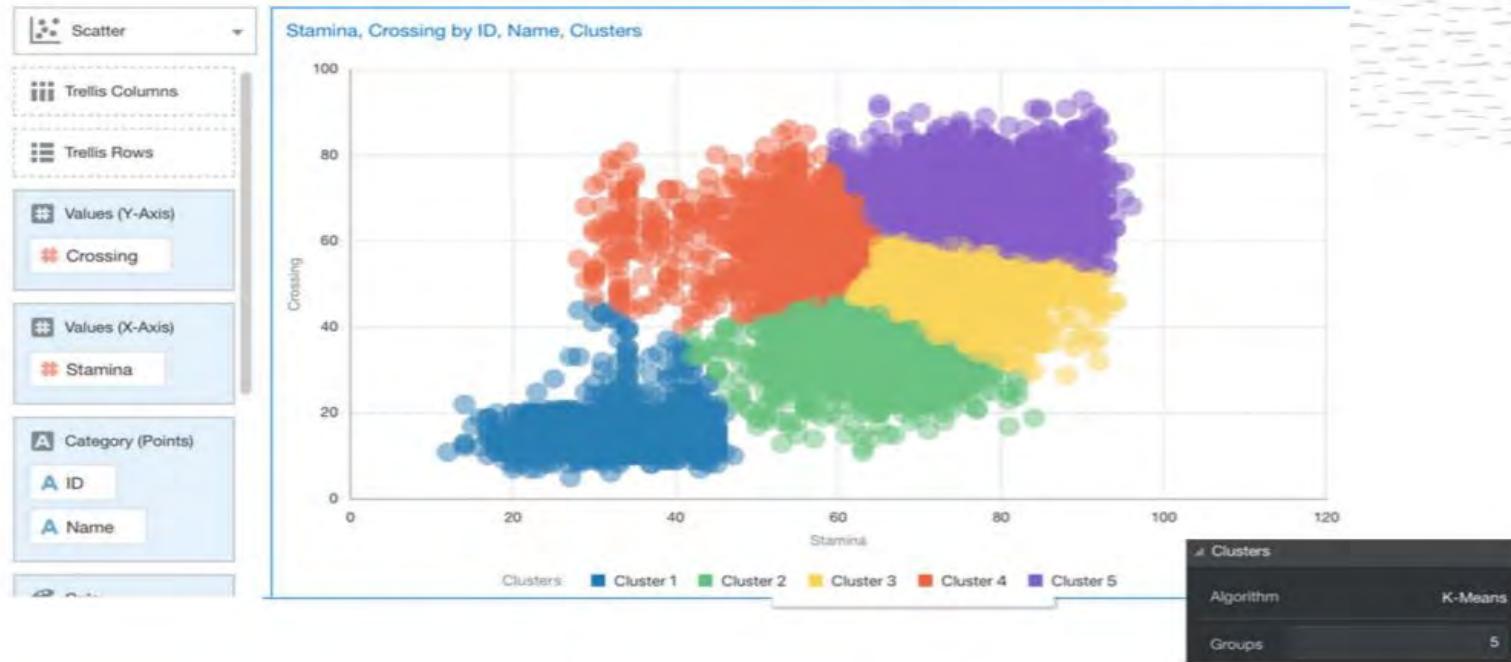


How Many? Elbow Method (4 in image)!



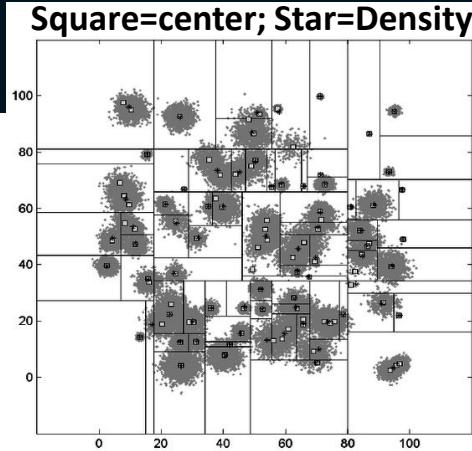
Oracle Analytics Cloud (OAC) to Cluster Data

Easy Models



Hierarchical O-Cluster (ML Cluster)

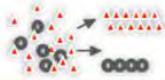
- Orthogonal Partitioning Clustering
- Oracle-Proprietary clustering algorithm
- Algorithm **operates recursively**
- Creates dense areas in attribute space
- Hierarchical grid-based with Axis-parallel (orthogonal) partitions
- *Sensitivity defines baseline* density level (to separate peaks/valleys)
- **Areas with peak density above baseline are clusters**
- Clusters used to generate Bayesian probability
- Outliers can cause issue; pre-clip outliers
- **K-Means is Distance Based; O-Cluster is Density Based!**



Oracle Machine Learning Algorithms and Analytics in Oracle Database

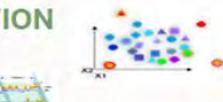
CLASSIFICATION

- Naive Bayes
- Logistic Regression (GLM)
- Decision Tree
- Random Forest
- Neural Network
- Support Vector Machine (SVM)
- Explicit Semantic Analysis
- XGBoost*



ANOMALY DETECTION

- One-Class SVM
- MSET-SPRT*



CLUSTERING

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



TIME SERIES

- Forecasting - Exponential Smoothing
- Includes popular models
e.g. Holt-Winters with trends, seasonality, irregular time series



[OML Algorithm Cheat Sheet](#)
[Algorithm Documentation](#)

REGRESSION

- Generalized Linear Model (GLM)
- Support Vector Machine (SVM)
- Stepwise Linear regression
- Neural Network
- XGBoost*



ATTRIBUTE IMPORTANCE

- Minimum Description Length
- Random Forest
- Unsupervised Pairwise KL Divergence
- CUR decomposition for row & AI



ASSOCIATION RULES

- A priori



SQL ANALYTICS

- SQL Windows
- SQL Patterns
- SQL Aggregates



FEATURE EXTRACTION

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

ROW IMPORTANCE

- CUR Decomposition

RANKING

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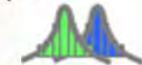
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- Algorithms support text columns
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- min, max, median, stdev, t-test, F-test, Pearson's, Chi-Sq, ANOVA, etc.



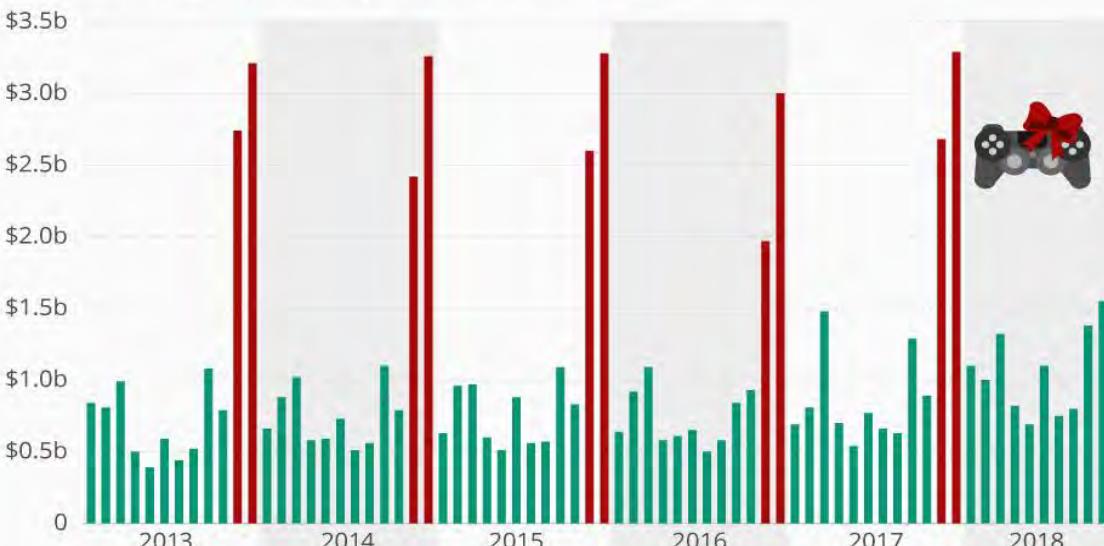
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* New in 21c

Seasonal, Irregular & Missing Data: Time Series Algorithm

Video Game Sales Are Extremely Seasonal

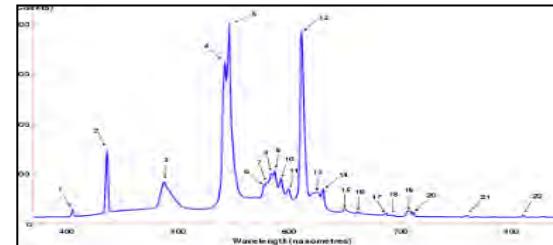
Monthly video games industry sales in the United States*



* incl. video games hardware, PC & video games software, accessories and game cards

Source: NPD Group

statista



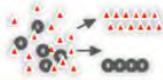
The power spectrum $S_{xx}(f)$ of a time series $x(t)$ describes the distribution of power into frequency components composing that signal. According to Fourier analysis, any physical signal can be decomposed into a number of discrete frequencies, or a spectrum of frequencies over a continuous range.



Oracle Machine Learning Algorithms and Analytics in Oracle Database

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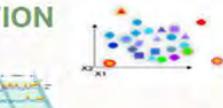
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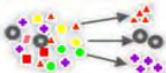
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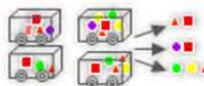
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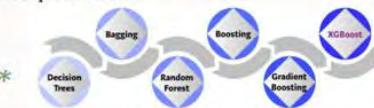
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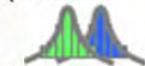
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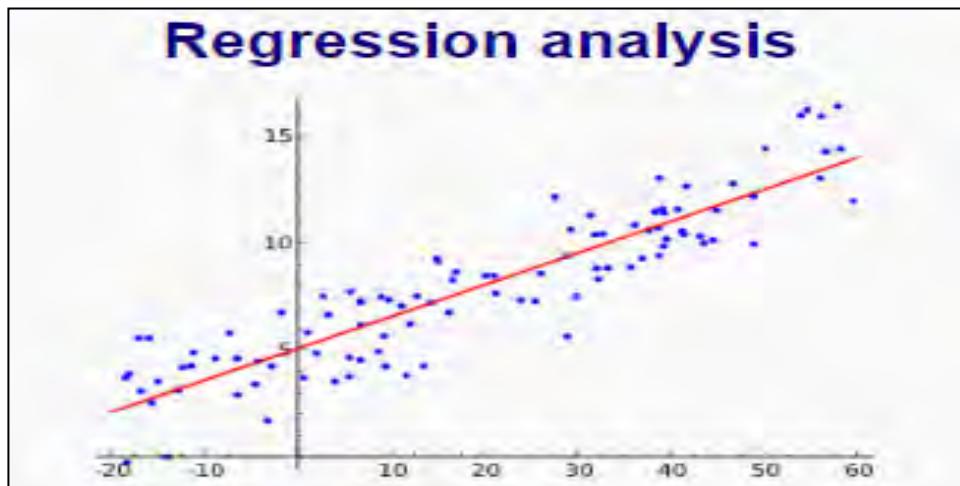


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Linear Model (Regression)

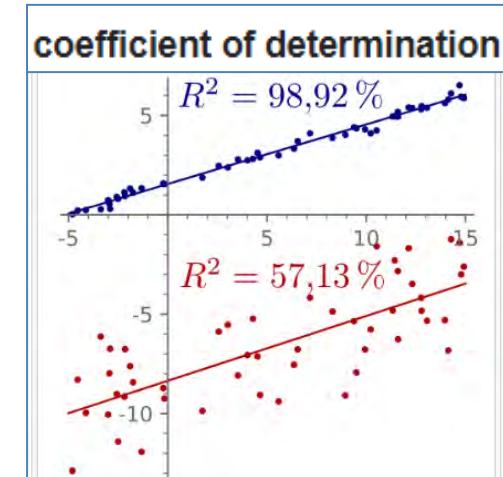
Linear Regression (below):

Using simple **Linear Regression** we find the line between the points. There is one independent and one dependent variable. This helps us get to predictive analytics.



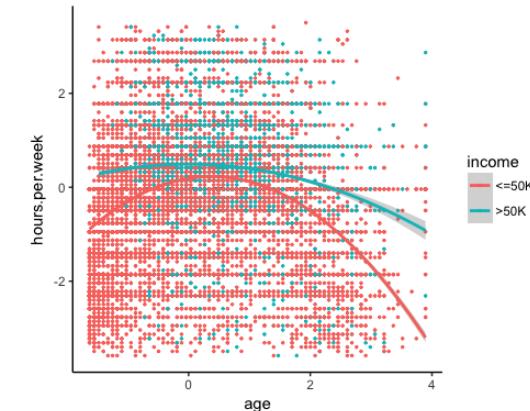
Linear Regression (above):

Unemployment goes down & GDP goes up



Generalized Linear Model (GLM)

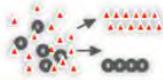
- GLM: *Flexible* generalization of linear regression
- GLM allows output that **doesn't match normal linear regression** & generalizes it by a *link function* based on variance from predicted value.
- GLM for varying situations without Normal Distributions
- GLM assumes observations uncorrelated
- GLM assumes **random vs. normal effects**
- GLM mixed models allow random effects that can be correlated through some probability.



Oracle Machine Learning Algorithms and Analytics in Oracle Database

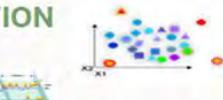
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- A priori



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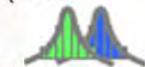
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* New in 21c



Principal Component Analysis (Attribute Importance)

- PCA: A dimension-reduction tool **taking large set of attributes to small set (reduction) with most important information**.
- Use Feature Selection of Most Important Attributes
- PCA speeds up your ML - reducing dimension input
- “The **eigenvectors** and **eigenvalues** of a covariance (or correlation) matrix are the “core” of **PCA** and...
- The **eigenvectors** (principal components) determine the directions of the new feature space, and the **eigenvalues** determine their magnitude.”
- PCA is the simplest eigenvector based analysis (multivariate)

(see next slide for example & later slides for example on PCA Feature Extraction)

Living Doll



These dolls are spying on your kids, consumer groups say

By Doug Criss, CNN

Published 3:46 PM EST, Thu December 8, 2016

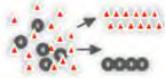


"Privacy advocates try to keep 'creepy,' 'eavesdropping' Hello Barbie from hitting shelves," Sarah Halzack, *Washington Post*

Oracle Machine Learning Algorithms and Analytics in Oracle Database

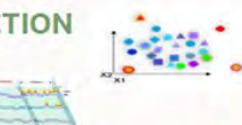
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[Algorithm Documentation](#)

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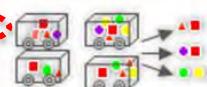
ATTRIBUTE IMPORTANCE

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ASSOCIATION RULES

- Apriori



SQL ANALYTICS

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- SQL Aggregates



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ROW IMPORTANCE

- CUR Decomposition

RANKING

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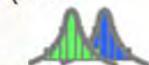
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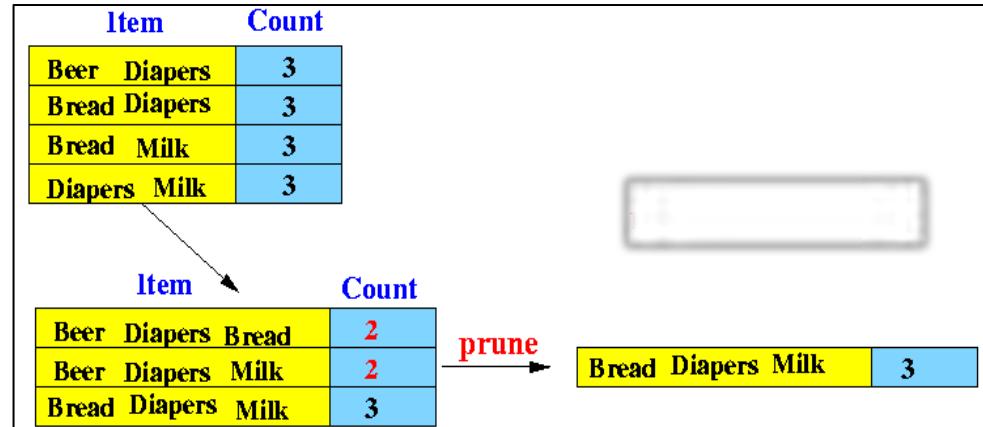
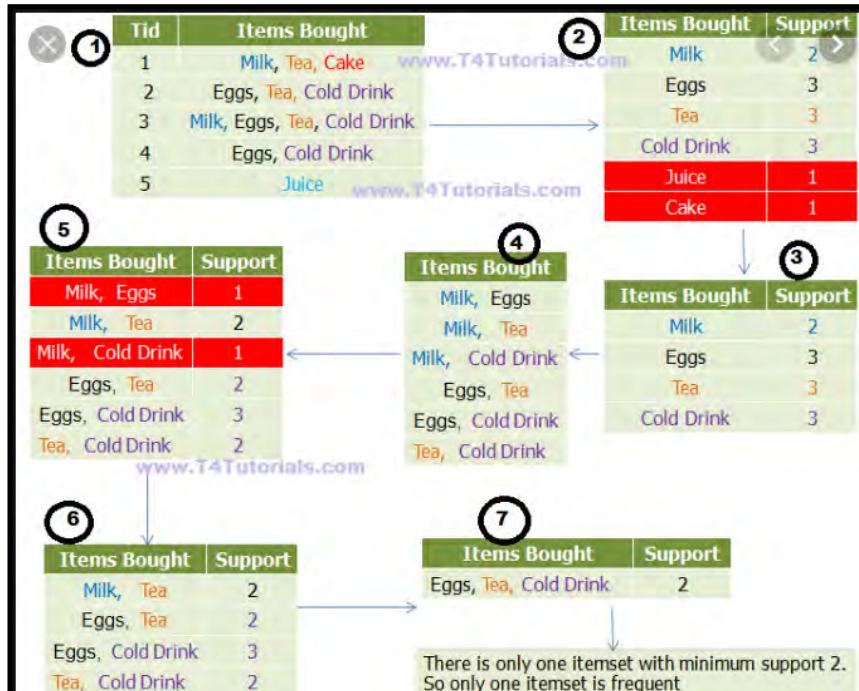
* New in 21c

Apriori / Market Based (Association Rules)

- **Apriori Algorithm** is used for association rule learning databases. Oracle Excels here!
- Identifies frequently associated database items
- Frequent items determine Association Rules (trends)
- Helps with Market Basket analysis (purchase behavior of customers (retail) by using information to discount/promote items
- Also shows items bought together (cheese/crackers)
- The algorithm may scan database many times (downside)
- Finds too many matches (must limit this at times)



A Priori / Market Based (Association Rules)



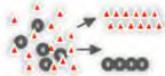
T4Tutorials: Finding best Items Frequently Bought together.

Emory Univ. CS: Maybe we don't need the beer that close to the Bread, Diapers & Milk

Oracle Machine Learning Algorithms and Analytics in Oracle Database

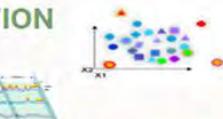
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ANOMALY DETECTION

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[OML Algorithm Cheat Sheet](#)
[Algorithm Documentation](#)

REGRESSION

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ATTRIBUTE IMPORTANCE

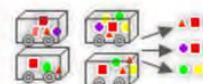
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A1 A2 A3 A4 A5 A6 A7

ASSOCIATION RULES

- A priori



SQL ANALYTICS

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FEATURE EXTRACTION

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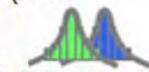
RANKING

- XGBoost*



TEXT MINING SUPPORT

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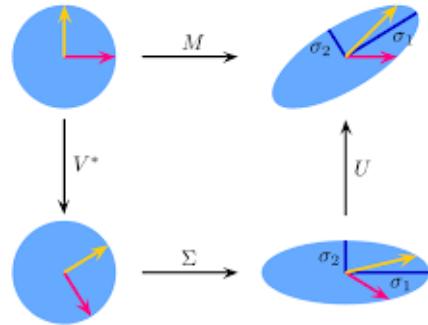
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Singular Value Decomposition (Feature Extraction)



$$M = U \cdot \Sigma \cdot V^*$$

Diagrams illustrating matrix multiplication properties and orthogonal matrices:

$M_{m \times n} = U_{m \times m} \Sigma_{m \times n} V^*_{n \times n}$

$U_{m \times m} U^*_{m \times m} = I_m$

$V_{n \times n} V^*_{n \times n} = I_n$

Item x subject matrix (ISM)

	S1	S2	S3	S4	S5
dog	1	1	1	1	1
cat	1	1	0	1	0
cow	0	0	1	0	1
lion	0	0	1	1	0
tiger	1	1	0	0	1

i2tutorials.com

Singular decomposition analysis (SVD)

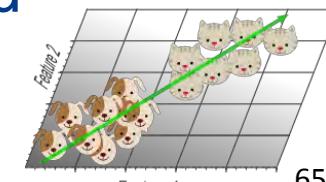
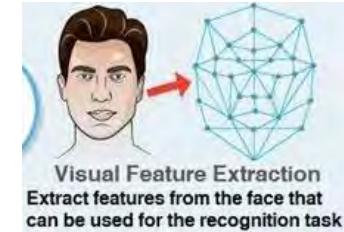


Reducing dimensions from r to k

$$\begin{aligned} C_{m \times n} &= U_{m \times r} \times \Sigma_{r \times r} \times V'_{r \times n} \\ \tilde{C}_{m \times n} &= U_{m \times k} \times \Sigma_{k \times k} \times V'_{k \times n} \end{aligned}$$

Principal Component Analysis (Feature Extraction)

- PCA Feature extraction reduces large data sets, by **building new set of attributes** making it faster to process
- Present the same information with Fewer Variables
- Ensure you **preserve the structure (variance)**
- Use Feature Extraction vs. Feature Selection
- PCA is a dimension-reduction tool **taking large set of variables to small set with most important information.**
- First component has largest variance and succeeding variables are orthogonal & highest variance.
- PCA uses orthogonal transformation to convert possibly correlated variables (numeric) into linear uncorrelated variables (principle components)
- **New Attributes a Combination of Old Attributes**



In His Image (*Available Now - 100K+ Waiting List*)



ETER9

The most daring experience ever made on the Internet.

Let your counterpart work for you. The very first-ever intelligent virtual self of you.

[DOUBLE YOURSELF](#)

Currently, we have over 100,000 registered users who are on the waiting list for ETER9 brainchild: [dduplicata](#). Be a part of this remarkable phase too!

CBS AOL BBC The Telegraph theguardian Sun

 **Artificial Intelligence**

ETER9 is a social network that relies on Artificial Intelligence as a central element, and it's currently in the BETA stage. Even in your absence, the virtual beings will publish, comment and interact with you intelligently.

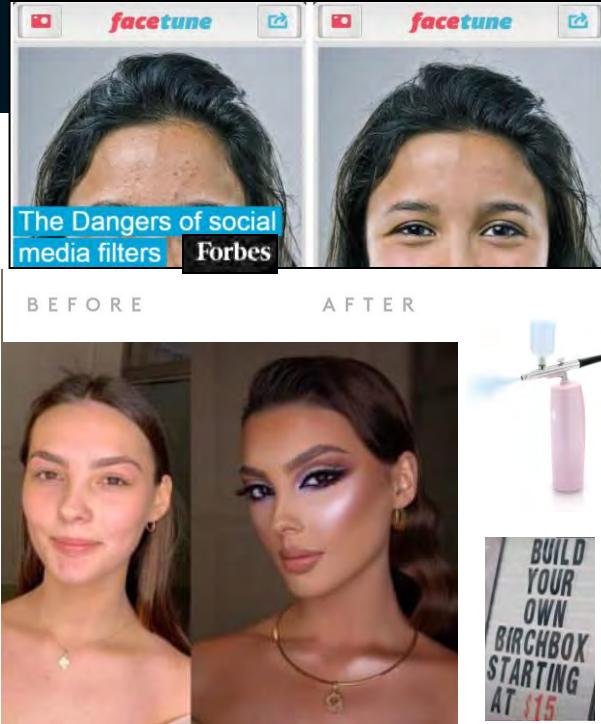
 **Counterpart**

The Counterpart is your Virtual Self that will stay in the system and interact with the world just like you would if you were present. Your Counterpart will learn more with each action you take. The more you interact in the new social network, the more your Counterpart will learn!

 **Cyber Eternity**

Eternizing is a way of keeping your thoughts and posts for all time. Are you curious? Come meet your Counterpart and become eternal. Challenge the impossible.

Number 12 Looks Like You (2020)



Camouflage Makeup - Amazon.com



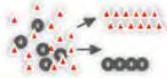
hide or disguise the presence of



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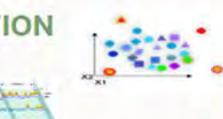
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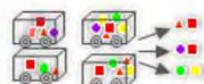
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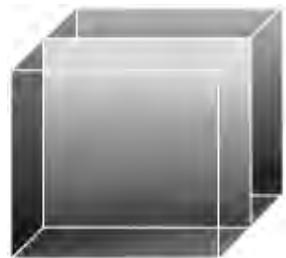
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SQL Analytics (Windows / Patterns / Aggregates)*

*Oracle Docs

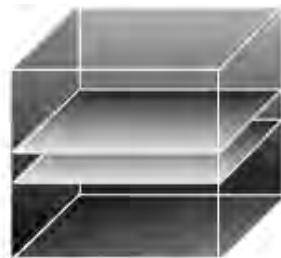
FYI



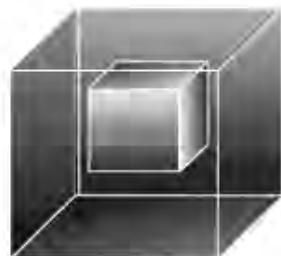
Product Mgr. View



Financial Mgr. View



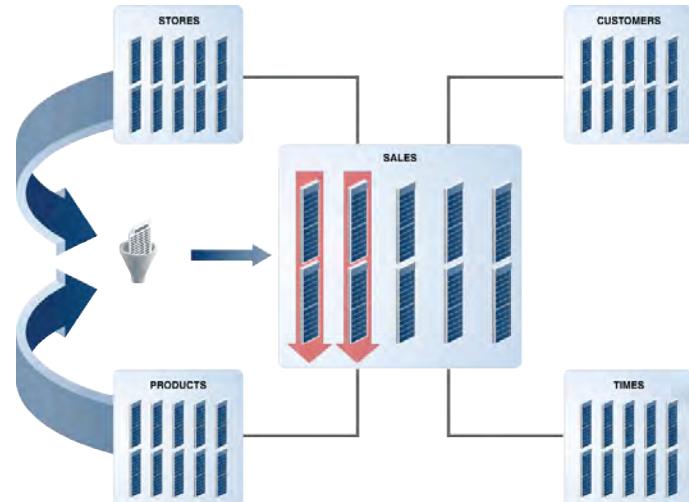
Regional Mgr. View



Ad Hoc View

Cubes show many dimensions for various users of the system.

In-Memory will use Vector Group By Aggregation



Oracle Machine Learning Algorithms and Analytics in Oracle Database

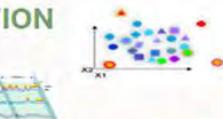
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- Neural Network
- XGBoost*



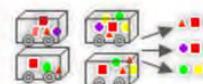
ATTRIBUTE IMPORTANCE

- Minimum Description Length
- Random Forest
- Unsupervised Pairwise KL Divergence
- CUR decomposition for row & AI



ASSOCIATION RULES

- A priori



SQL ANALYTICS

- SQL Windows
- SQL Patterns
- SQL Aggregates



FEATURE EXTRACTION

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

ROW IMPORTANCE

- CUR Decomposition

RANKING

- XGBoost*



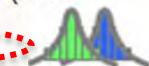
TEXT MINING SUPPORT

- Algorithms support text columns
- Tokenization and theme extraction
- Explicit Semantic Analysis (ESA)



STATISTICAL FUNCTIONS

- min, max, median, stdev, t-test, F-test, Pearson's, Chi-Sq, ANOVA, etc.



Includes support for partitioned models, integrated text mining, automated data preparation

* New in 21c

Statistical Functions in Oracle (Partial List)*

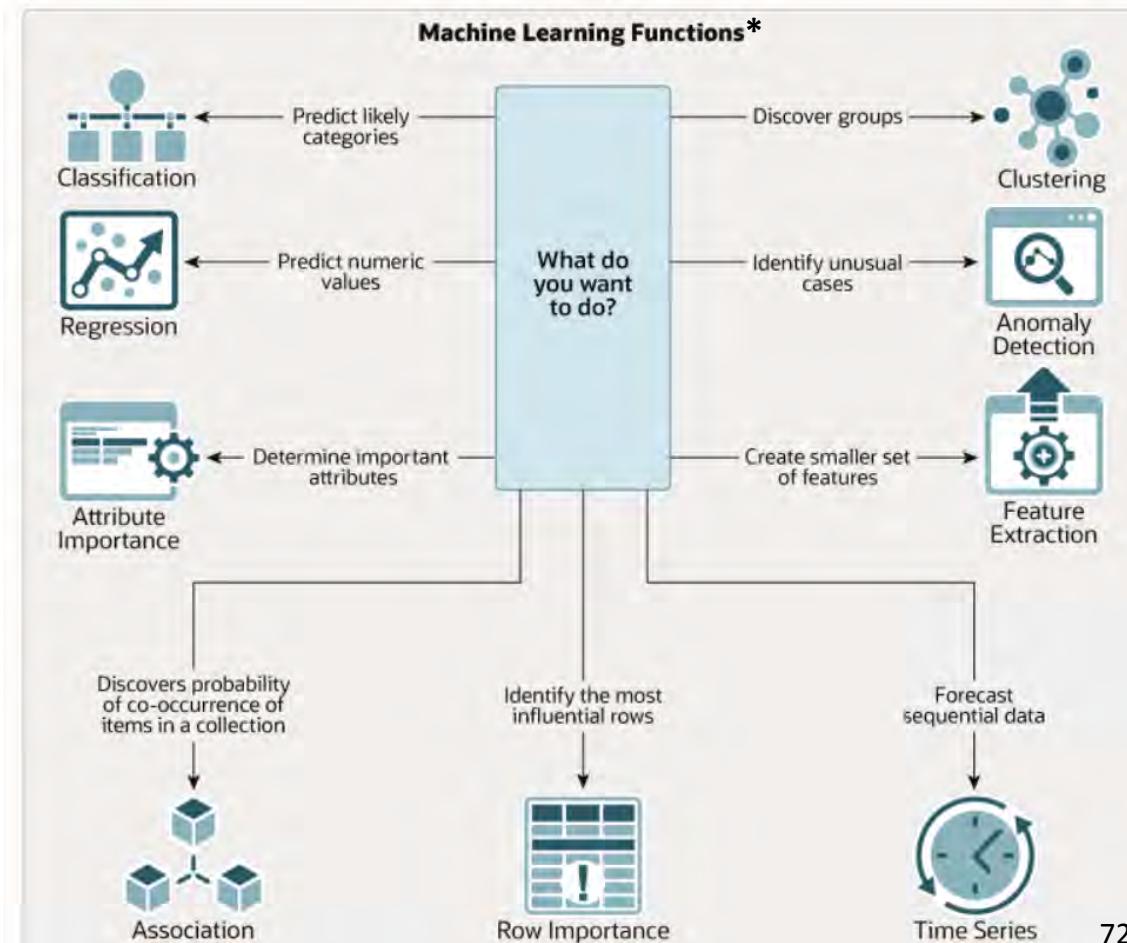
<u>Numeric Functions</u>	<u>Analytic Functions</u>	<u>Aggregate Functions</u>	<u>Data Mining Functions</u>
ABS	AVG *	MAX *	CLUSTER_DETAILS
ACOS	CLUSTER_DISTANCE	MIN *	CLUSTER_DISTANCE
ASIN	CLUSTER_ID	NTH_VALUE *	CLUSTER_ID
ATAN	CLUSTER_PROBABILITY	NTILE	CLUSTER_PROBABILITY
ATAN2	CLUSTER_SET	PERCENT_RANK	CLUSTER_SET
BITAND	CORR *	PERCENTILE_CONT	FEATURE_COMPARE
CEIL	COVAR_POP *	PERCENTILE_DISC	FEATURE_DETAILS
COS	COVAR_SAMP *	PREDICTION	FEATURE_ID
COSH	CUME_DIST	PREDICTION_COST	FEATURE_SET
EXP	DENSE_RANK	PREDICTION_DETAILS	FEATURE_VALUE
FLOOR	FEATURE_DETAILS	PREDICTION_PROBABILITY	ORA_DM_PARTITION_NAME
LN	FEATURE_ID	PREDICTION_SET	PREDICTION
LOG	FEATURE_SET	RANK	PREDICTION_BOUNDS
MOD	FEATURE_VALUE	RATIO_TO_REPORT	PREDICTION_COST
NANVL	FIRST	REGR_(Linear Regression)	PREDICTION_DETAILS
POWER	FIRST_VALUE *	ROW_NUMBER	PREDICTION_PROBABILITY
REMAINDER	LAG	STDDEV *	PREDICTION_SET
ROUND (number)	LAST	STDDEV_POP *	
SIGN	LAST_VALUE *	STDDEV_SAMP *	
SIN	LEAD	SUM *	
SINH	LISTAGG	VAR_POP *	
SQRT	LISTAGG	VAR_SAMP *	
TAN	VARIANCE *	VARIANCE *	
TANH			
TRUNC (number)			
WIDTH_BUCKET			

* Oracle Database SQL Language Reference

Also: T-Test, F-Test, Chi-Squared, ANOVA (Analysis of Variance), Pearson's Test...

Machine Learning Functions* - Oracle Docs.

- **First:** Clear Business Problem to Solve
 - **Second:** Function to Perform
 - **Third:** Algorithm to use
-
- **First:** Build/*Train the Model* when you build it using about 60% of data.
 - **Second:** *Test/Score Model* for accuracy/precision using about 40% of data.
- Compare Algorithms!**



AutoML is here for Autonomous Database

ORACLE Machine Learning

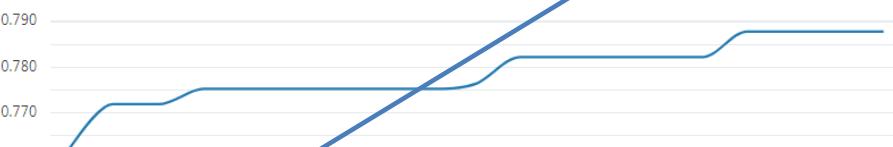
ML_USER Project [ML_USER Works...]

<- Experiments

AutoML_Rich

Experiment Settings 

Accuracy



Leader Board

Deploy Create Notebook Metrics

Algorithm	Model Name	Accuracy
Support Vector Machine (Gaussian)	svmg_09cd02ee4e	0.7878
Random Forest	rf_df53fb31a8	0.7821
Generalized Linear Model	glm_74ccb2b7ac	0.7821
Generalized Linear Model (Ridge Regres...	glmr_df24288679	0.7821
Support Vector Machine (Linear)	svml_a031bb0ae1	0.7431

Leader Board

Deploy Create Notebook Metrics

Algorithm	Model Name	Accuracy
Support Vector Machine (Gaussian)	svmg_09cd02ee4e	0.7878
Random Forest	rf_df53fb31a8	0.7821
Generalized Linear Model	glm_74ccb2b7ac	0.7821
Generalized Linear Model (Ridge Regres...	glmr_df24288679	0.7821
Support Vector Machine (Linear)	svml_a031bb0ae1	0.7431

Create Notebook

Create a notebook based on selected model and this experiment's settings. Use a generated notebook to further tune your approach using Python.

Notebook Name:



OK

Cancel

Quick Actions



AutoML
Create and run AutoML Experiments



Scratchpad
Run Scratchpad



Notebooks
The place for data discovery and analytics

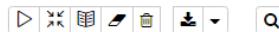


Jobs
Schedule notebooks to run at certain times



Examples
Check out some examples

AutoML_Classify



Build Data

```
%python
import oml

columns = 'CUST_ID', 'CUST_CREDIT_LIMIT', 'CUST_GENDER', 'CUST_INCOME_LEVEL', 'CUST_MARITAL_STATUS', 'CUST_YEAR_OF_BIRTH', 'EDUCATION', 'HOUSEHOLD_SIZE', 'OCCUPATION', 'YRS_RESIDENCE',
'Y_BOX_GAMES', 'AFFINITY_CARD'
schema='ML_USER'
table='CUSTOMERS360'

column = ','.join(columns)
query = 'SELECT ' + column + ' FROM ' + schema + '.' + table

data_build = oml.sync(query=query)
> show(data_build)
```

Create Train Data

```
%python
import oml

X_train = data_build[:,['CUST_ID', 'CUST_CREDIT_LIMIT', 'CUST_GENDER', 'CUST_INCOME_LEVEL', 'CUST_MARITAL_STATUS', 'CUST_YEAR_OF_BIRTH', 'EDUCATION', 'HOUSEHOLD_SIZE', 'OCCUPATION', 'YRS_RESIDENCE',
'Y_BOX_GAMES']]
v_train = data_build[:, 'AFFINITY_CARD']
```

Build 'SUPPORT_VECTOR_MACHINES' Model

```
%python
import oml

svm_settings = {
    'ODMS_SAMPLE_SIZE': '1294', 'SVMS_COMPLEXITY_FACTOR': '66.700000000002', 'SVMS_KERNEL_FUNCTION': 'SVMS_GAUSSIAN', 'SVMS_STD_DEV': '2.23606797749979', 'CLAS_WEIGHTS_BALANCED': 'OFF',
    'SVMS_NUM_PIVOTS': '200', 'ODMS_DETAILS': 'ODMS_DISABLE', 'ODMS_SAMPLING': 'ODMS_SAMPLING_ENABLE', 'ALGO_NAME': 'ALGO_SUPPORT_VECTOR_MACHINES'
}

svm_mod = oml.svm(**svm_settings)
svm_mod = svm_mod.fit(X_train, v_train)
```

Time Enough at Last for ML with AutoML



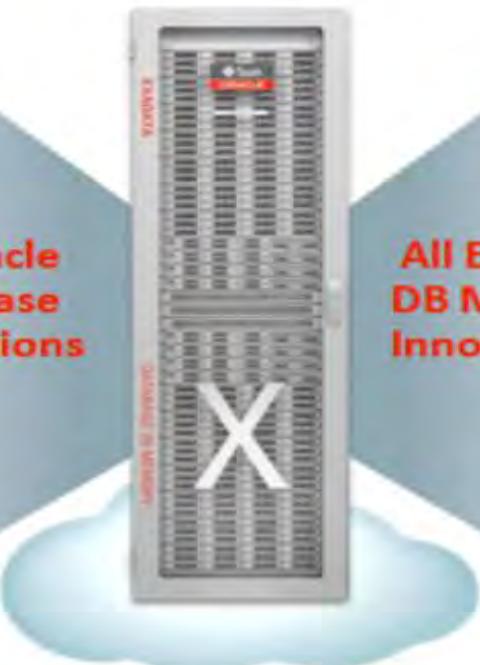
Exadata Cloud Machine: ALL Features (X10M is Out - 1T/sec!)

(Oracle's Juan Loaiza presentation on Exadata Cloud; X10M has > 2P Flash)

Exadata Cloud: Compatible, Scalable, Available, Secure Decades of Database Innovation Proven at Millions of Mission-Critical Deployments

	Multitenant
	In-Memory DB
	Real Application Clusters
	Active Data Guard
	Partitioning
	Advanced Compression
	Advanced Security, Label Security, DB Vault
	Real Application Testing
	Advanced Analytics, Spatial and Graph
	Management Packs for Oracle Database

All Oracle Database Innovations



	Offload SQL to Storage
	InfiniBand Fabric
	Smart Flash Cache, Log
	Storage Indexes
	Columnar Flash Cache
	Hybrid Columnar Compression
	I/O Resource Management
	Network Resource Management
	In-Memory Fault Tolerance
	Exafusion Direct-to-Wire Protocol

Oracle Machine Learning Algorithms



CLASSIFICATION

Naïve Bayes
Logistic Regression (GLM)
Decision Tree
Random Forest
Neural Network
Support Vector Machine
Explicit Semantic Analysis
XGBoost*



REGRESSION

Linear Model
Generalized Linear Model
Support Vector Machine (SVM)
Stepwise Linear regression
Neural Network
XGBoost*



FEATURE EXTRACTION

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

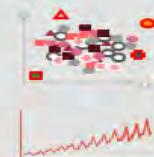
CLUSTERING

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



ANOMALY DETECTION

One-Class SVM
MSET-SPRT*



TIME SERIES

Forecasting - Exponential Smoothing
Includes popular models
e.g. Holt-Winters with trends,
seasonality, irregularity, missing data

ATTRIBUTE IMPORTANCE

Minimum Description Length
Principal Comp Analysis (PCA)
Unsupervised Pair-wise KL Div
CUR decomposition for row & Al



ASSOCIATION RULES

A priori/ market basket



PREDICTIVE QUERIES

Predict, cluster, detect, features



SQL ANALYTICS

SQL Windows
SQL Patterns
SQL Aggregates



*Includes support for Partitioned Models, Transactional data and aggregations,
Unstructured data, Geo-spatial data, Graph data. etc,*



Biju Thomas at ODTUG - *Emerging Jobs*

#1 AI / ML Specialist (Engineer)



2020
Emerging
Jobs Report

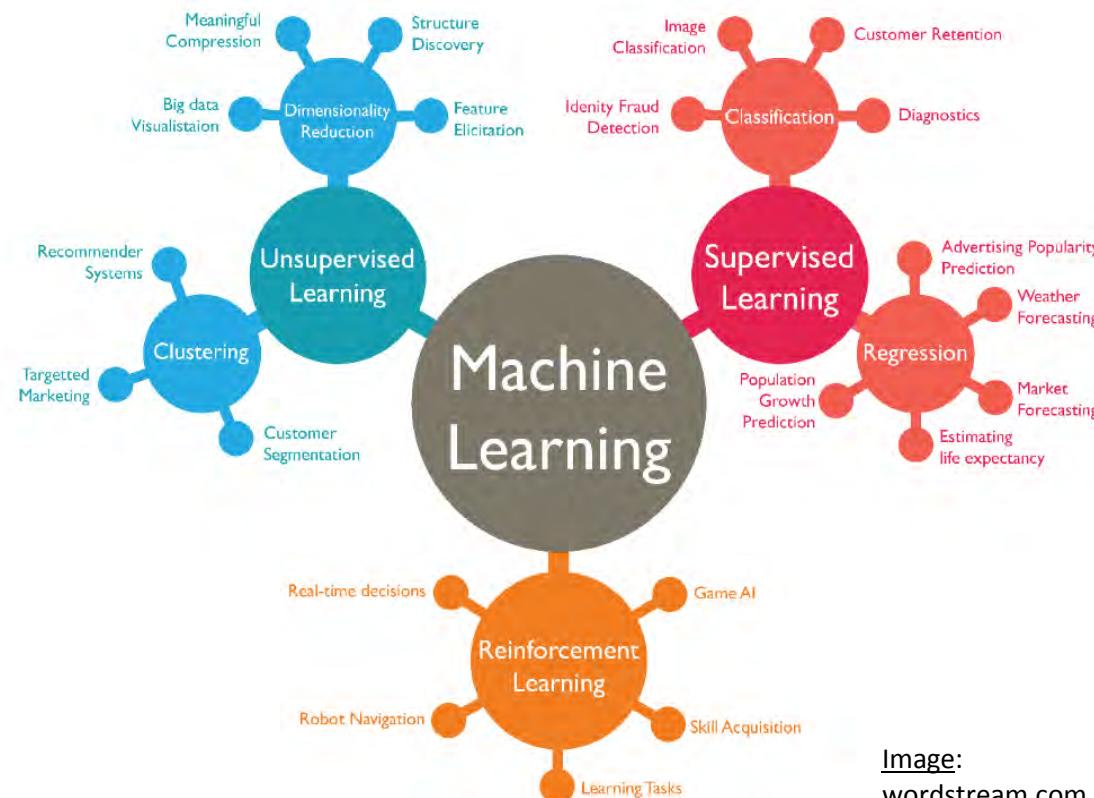
- 74% annual growth
- Skills
 - Machine Learning
 - Deep Learning
 - TensorFlow
 - Python
 - Natural Language Processing
- Industries
 - Computer Software
 - Information Technology
 - Higher Education
 - Consumer Electronics
- Take the data scientists' code and making it more effective and scalable.
- Introduce various programming rules and good practices.
- Join the results from potentially unrelated tasks to enhance the models performance even more.
- Glue all the "data science" and "software" parts together.

ML & Business Apps

**ORACLE®
SALES CLOUD**

**ORACLE®
RETAIL CLOUD**

**ORACLE®
CONFIGURE, PRICE,
AND QUOTE
CLOUD**



**ORACLE®
E-BUSINESS SUITE**

**ORACLE®
IDENTITY MANAGEMENT**

**ORACLE®
FINANCIAL SERVICES**

**ORACLE®
HUMAN CAPITAL
MANAGEMENT
CLOUD**

Image:
wordstream.com

Applications - AI Powered; Analytics & ML

E-Business Analytics Accelerator: Pre-built solutions to speed insights



Autonomous
Data Warehouse



Generate
continuous
business outcomes
with your data



Outcomes	
Financials	<ul style="list-style-type: none">• Profitability drivers• Improve use of working capital• Control business expenditures
Supply Chain	<ul style="list-style-type: none">• Improve efficiency• Reduce costs• Ensure customer satisfaction
HCM	<ul style="list-style-type: none">• Complete view of employees• Identify best resources• Identify attrition factors and predict risk• Cross-domain reporting

Oracle GenAI

Oracle Database 23c

Sample of Marquee Features for DBAs, Analysts, & Developers

Now **GA** on OCI
Base Database
Service

NEW IN
23c

Oracle Database Vision

With Generative AI (LLM)

Make it easy to generate and run modern apps and analytics for all use cases at any scale



DBA



Real-time SQL Plan Management
SQL Firewall
True Cache

ANALYST



Automatic Materialized Views
Improved ML Algorithms

DEVELOPER



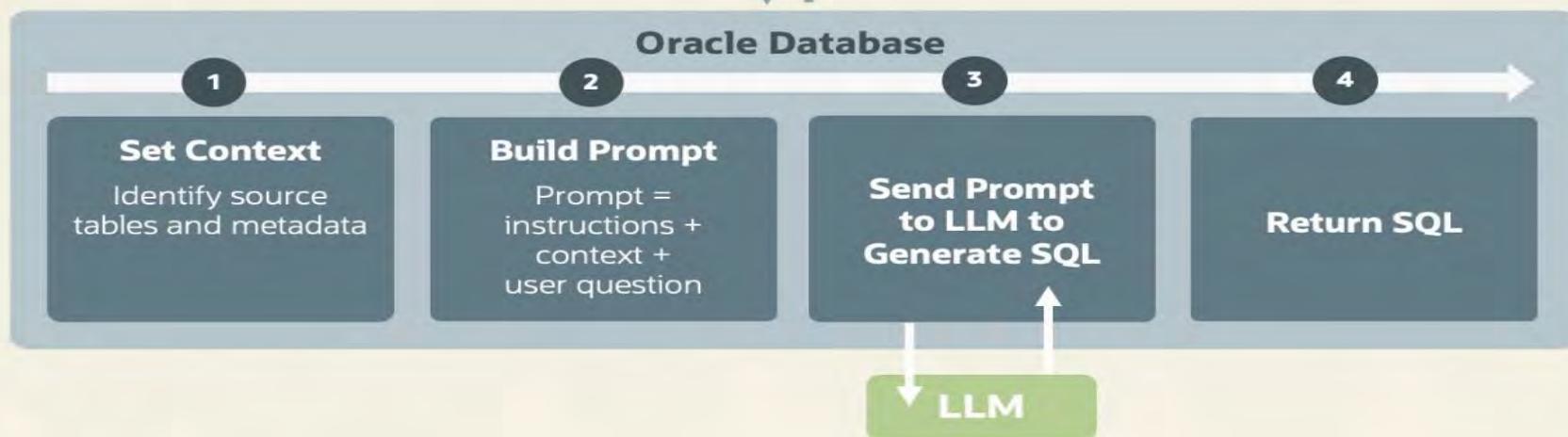
JSON Duality Views
Property Graph Views
JavaScript Stored Procedures
SQL Domains
AI Vector Search* (coming soon)

* Sign up to preview AI Vector Search



SQL Generation from Natural Language *using LLM*

→ “Give me the average salary of employees in each department”



Think of it as an Assistant (60-70%)

Example of a *Prompt*

Instructions: You are an Oracle SQL expert. Given an input question, first create a syntactically correct Oracle SQL query to run. You must query only the columns that are needed to answer the question.

Pay attention to use only the column names you can see in the tables below. Be careful to not query for columns that do not exist. Also, pay attention to which column is in which table.

Use the following format:

Question: Question here

SQL: Generated SQL query

Context: Only use the following tables and columns

Table: HR.DEPARTMENTS, **Columns:** DEPARTMENT_ID, DEPARTMENT_NAME, MANAGER_ID, LOCATION_ID

Table: HR.EMPLOYEES, **Columns:** EMPLOYEE_ID, FIRST_NAME, LAST_NAME, SALARY, MANAGER_ID, DEPARTMENT_ID

Primary keys: HR.DEPARTMENTS.DEPARTMENT_ID, HR.EMPLOYEES.EMPLOYEE_ID

Foreign keys: HR.EMPLOYEES.DEPARTMENT_ID -> HR.DEPARTMENTS.DEPARTMENT_ID, HR.DEPARTMENTS.MANAGER_ID -> HR.EMPLOYEES.EMPLOYEE_ID

Question: Give me the average salary of employees in each department

SQL:



What's next from
Oracle Data Management

Think of it as an Assistant (60-70%)

APEX App Builder SQL Workshop Team Development Gallery Search   DE

↑ Utilities \ Quick SQL

✓ Settings saved

Quick SQL Help Settings SQL Diagram Review and Run

1 departments
2 name
3 function /check IT, Sales, Accounting, Finance
employees
4 name /n
5 email /lower
6 location
7 cost_center num
8 date_hired
9
10

-- create tables

1 create table hr_departments (

2 id number generated by default on null as identity
3 constraint hr_departments_id_pk primary key,
4 name varchar2(255 char),
5 function varchar2(4000 char) constraint hr_departments_function_ck
6 check (function in ('IT','Sales','Accounting','Finance')),
7 integer not null,
8 date_hired date not null,
9 department_id varchar2(255 char) not null,
10 created_by varchar2(255 char) not null,
11 updated_by date not null,
12 updated_by varchar2(255 char) not null
13);
14
15
16
17 create table hr_employees (

18 id number generated by default on null as identity
19 constraint hr_employees_id_pk primary key,
20 department_id number
21 constraint hr_employees_department_id_fk
22 references hr_departments,
23 name varchar2(255 char) not null,
24 email varchar2(255 char),
25 location varchar2(4000 char),
26 cost_center number,
27 date_hired date,
28 row_version integer not null,

What's next from Oracle Data Management 

In whole example: He wrote 47 lines & it built 1200

APEX App Builder SQL Workshop Team Development Gallery Search Utilities Quick SQL Help Settings SQL Diagram Review and Run

What's next from Oracle Data Management

Quick SQL

```
1 jobs
2 job_id          vc10 /pk
3 job_title       vc35 /nn
4 min_salary      num
5 max_salary      num
6
7 regions
8 region_id      num /nn /pk
9 region_name     vc25
10
11 countries
12 country_id     /nn /pk
13 country_name   vc40
14 region_id      num /fk regions
15
16 locations
17 location_id    num /nn /pk
18 street_address vc40
19 postal_code    vc12
20 city           vc30 /nn
21 state_province vc25
22 country_id     /fk countries
23
24 departments
25 department_id  num /nn /pk
26 department_name vc30 /nn
27 manager_id     num /fk employees
28 location_id    num /fk locations
29
30 employees
```

Diagram showing relationships between HR_JOB_HISTORY, HR_JOBS, HR_EMPLOYEES, HR_DEPARTMENTS, and HR_LOCATIONS.

- HR_JOB_HISTORY:**
 - ID (NUMBER)
 - EMPLOYEE_ID (NUMBER)
 - START_DATE (DATE)
 - END_DATE (DATE)
 - JOB_ID (INTEGER)
 - DEPARTMENT_ID (NUMBER)
 - ROW_VERSION (INTEGER)
 - CREATED (DATE)
 - CREATED_BY (VARCHAR2(255 CHAR))
 - UPDATED (DATE)
 - UPDATED_BY (VARCHAR2(255 CHAR))
- HR_JOBS:**
 - JOB_ID (INTEGER)
 - JOB_TITLE (VARCHAR2(35 CHAR))
 - MIN_SALARY (NUMBER)
 - MAX_SALARY (NUMBER)
 - ROW_VERSION (INTEGER)
 - CREATED (DATE)
 - CREATED_BY (VARCHAR2(255 CHAR))
 - UPDATED (DATE)
 - UPDATED_BY (VARCHAR2(255 CHAR))
- HR_EMPLOYEES:**
 - EMPLOYEE_ID (NUMBER)
 - FIRST_NAME (VARCHAR2(20 CHAR))
 - LAST_NAME (VARCHAR2(25 CHAR))
 - EMAIL (VARCHAR2(25 CHAR))
 - PHONE_NUMBER (NUMBER)
 - HIRE_DATE (DATE)
 - JOB_ID (INTEGER)
 - SALARY (NUMBER)
 - COMMISSION_PCT (NUMBER)
 - DEPARTMENT_ID (NUMBER)
 - ROW_VERSION (INTEGER)
 - CREATED (DATE)
 - CREATED_BY (VARCHAR2(255 CHAR))
 - UPDATED (DATE)
 - UPDATED_BY (VARCHAR2(255 CHAR))
- HR_DEPARTMENTS:**
 - DEPARTMENT_ID (NUMBER)
 - DEPARTMENT_NAME (VARCHAR2(30 CHAR))
 - MANAGER_ID (NUMBER)
 - LOCATION_ID (NUMBER)
 - ROW_VERSION (INTEGER)
 - CREATED (DATE)
 - CREATED_BY (VARCHAR2(255 CHAR))
 - UPDATED (DATE)
 - UPDATED_BY (VARCHAR2(255 CHAR))
- HR_LOCATIONS:**
 - DEPARTMENT_ID (NUMBER)
 - DEPARTMENT_NAME (VARCHAR2(30 CHAR))
 - MANAGER_ID (NUMBER)
 - LOCATION_ID (NUMBER)
 - ROW_VERSION (INTEGER)
 - CREATED (DATE)
 - CREATED_BY (VARCHAR2(255 CHAR))
 - UPDATED (DATE)
 - UPDATED_BY (VARCHAR2(255 CHAR))

APEX Development Speed- GenAI

The screenshot shows the Oracle APEX development environment. On the left, a context menu is open over a page item, with the 'Application' option circled in red. The menu includes options like 'Duplicate', 'Create Sub Region', and 'Create Page Item'. The main workspace displays an application titled 'My Awesome App' with a 'Run Application' button. A modal dialog titled 'Create a Page' is open in the center, with the 'Prompt' tab selected. It asks 'Describe the page you would like to create' and lists 'Sample Prompts' including 'chart of employees by department', 'faceted search of top sales wins with filters for region, industry, and product', 'bar chart of products and their average selling price', 'dashboard showing sales by product, region, and sales rep', and 'pie chart of total number of orders grouped by order status'. At the bottom of the dialog are 'Cancel', 'Help', 'Create Page as Copy', and 'Next >' buttons.

Duplicate

Create Sub Region

Create Page Item

Create Button

Create Dynamic Action

Create Region Below

Create Page Item Below

Create Button Below

Copy to other Page...

Expand All Below

Collapse All Below

Comment Out

Delete

Cancel Help Create Page as Copy Next >

What's next from Oracle Data Management

APEX

Application

Page created!

Page 26: Employees t

Pre-Rendering

Components

Breadcrumb Bar

Breadcrumbs

Body

Employees

Series

Axes

Run Application

0 - Global Page

5 - Order Search

Create a Page

Prompt Component Feature Legacy Pages

Describe the page you would like to create

Sample Prompts

- chart of employees by department
- faceted search of top sales wins with filters for region, industry, and product
- bar chart of products and their average selling price
- dashboard showing sales by product, region, and sales rep
- pie chart of total number of orders grouped by order status

APEX Development Speed- GenAI

The screenshot shows the Oracle APEX App Builder interface. At the top, there's a navigation bar with links for APEX, App Builder, SQL Workshop, Team Development, and Gallery. To the right of the navigation is a green circular icon with a white rocket ship and the text "What's next from Oracle Data Management". Below the navigation, on the left, is a sidebar titled "My Awesome App" containing icons for Run Application, Global Page, and Order Search, along with their respective counts (0, 0, 5). The main content area is titled "Create a Page" and has tabs for Prompt, Component, Feature, and Legacy Pages. The "Prompt" tab is selected, showing a text input field with the placeholder text "chart of employees by department". Below this, under "Sample Prompts", is a list of six items:

- chart of employees by department
- faceted search of top sales wins with filters for region, industry, and product
- bar chart of products and their average selling price
- dashboard showing sales by product, region, and sales rep
- pie chart of total number of orders grouped by order status

At the bottom of the page are buttons for Cancel, Help, Create Page as Copy, and Next >.

APEX Development Speed- GenAI



What's next from Oracle Data Management

X

Create Page Wizard

Title
Employees by Department

SQL

```
1 select department_name as chart_label,
2       count(employee_id) as chart_value
3   from oechr_employees
4   join oechr_departments on oechr_employees.department_id = oechr_departments.department_id
5   group by department_name
6   order by count(employee_id) desc
```

Navigation

ion About

Use the App to run, edit, copy, or delete. Select a page properties, or to add a page.

Learn More

Tasks

Delete A

Copy A

Add Fea

Browse

Workflo

Working Co

Create Work

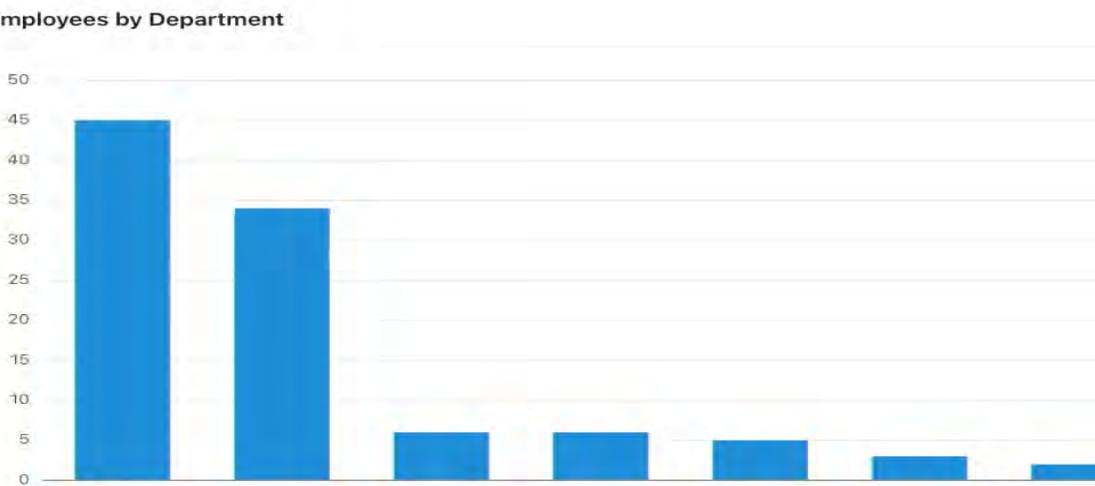
APEX Development Speed- GenAI

What's next from Oracle Data Management

My Awesome App

Employees

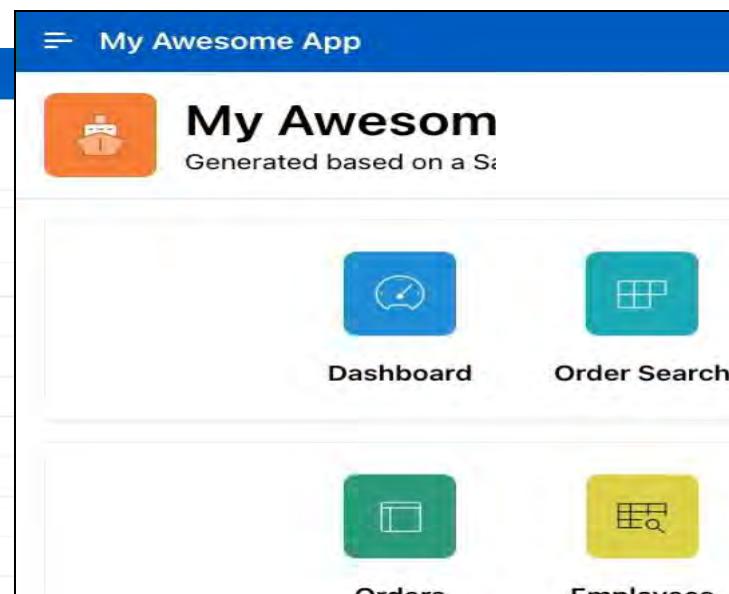
Employees by Department



Department	Count
Shipping	45
Sales	35
Finance	6
Purchasing	6
IT	5
Executive	3
Accounting	2
Marketing	1
Public Relations	1
Human Resources	1
Administration	1

My Awesome App

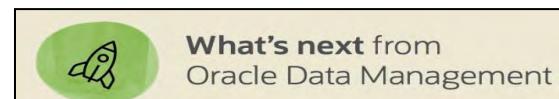
My Awesome App
Generated based on a Schema



Dashboard Order Search

Orders Employees

APEX Development Speed- GenAI



Screenshot of the Oracle APEX Application Builder interface showing a "Page created!" message and a "Code Editor - SQL Query" window displaying the query "show me average salaries by job".

Generative AI will also enable low-code developers to declare intent using natural language

Data Professional Developer Low-Code Developer End-User

APEX Development Speed- GenAI

Code Editor - SQL Query

```
1 select job_title as chart_label,
2       avg(salary) as chart_value
3 from oechr_employees,
4      oechr_jobs
5 where oechr_employees.job_id = oechr_jobs.job_id
6 group by job_title
7 order by avg(salary) desc
```

APEX Application 110 Page Designer

Page created!

Page 26: Employees by Department

Components:

- Breadcrumb Bar
- Body
 - Employees by Department
 - Series
 - Series 1
 - Axes
 - x
 - y
 - Average Salary by Job
 - Series
 - Series 1
 - Axes
 - x
 - y

What's next from Oracle Data Management

Execution

Sequence: 10

Source

Location: Local Database

Type: SQL Query

SQL Query:

```
select job_title as chart_label,
       avg(salary) as chart_value
from oechr_employees,
      oechr_jobs
where oechr_employees.job_id =
oechr_jobs.job_id
group by job_title
order by avg(salary) desc
```

APEX Development Speed- GenAI

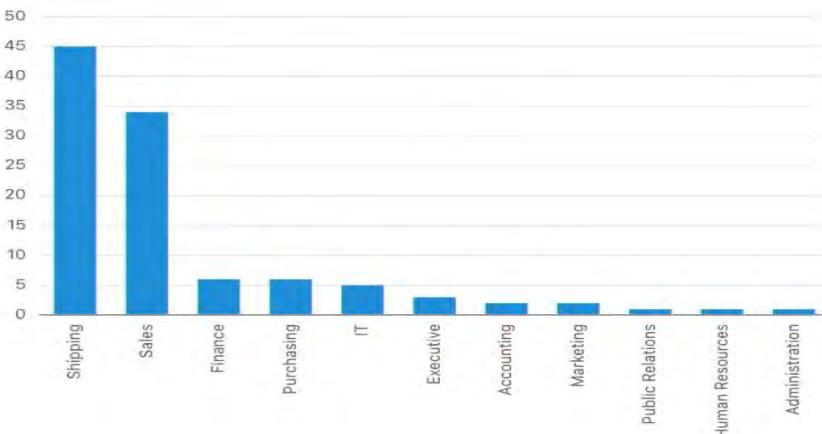


≡ My Awesome App

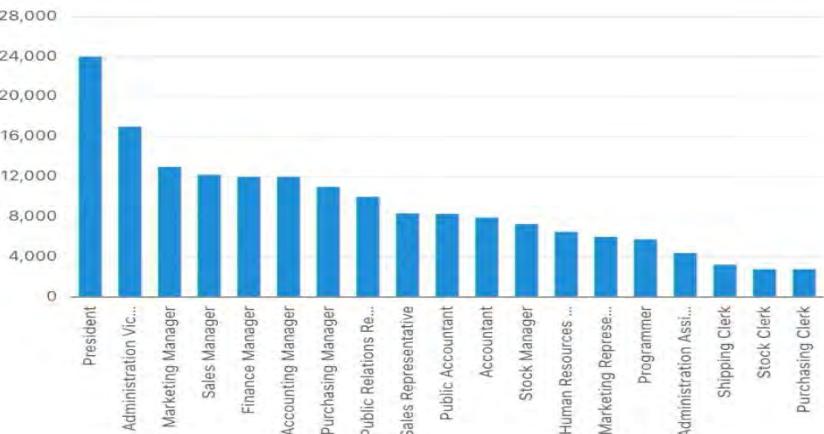
demo

Employees

Employees by Department



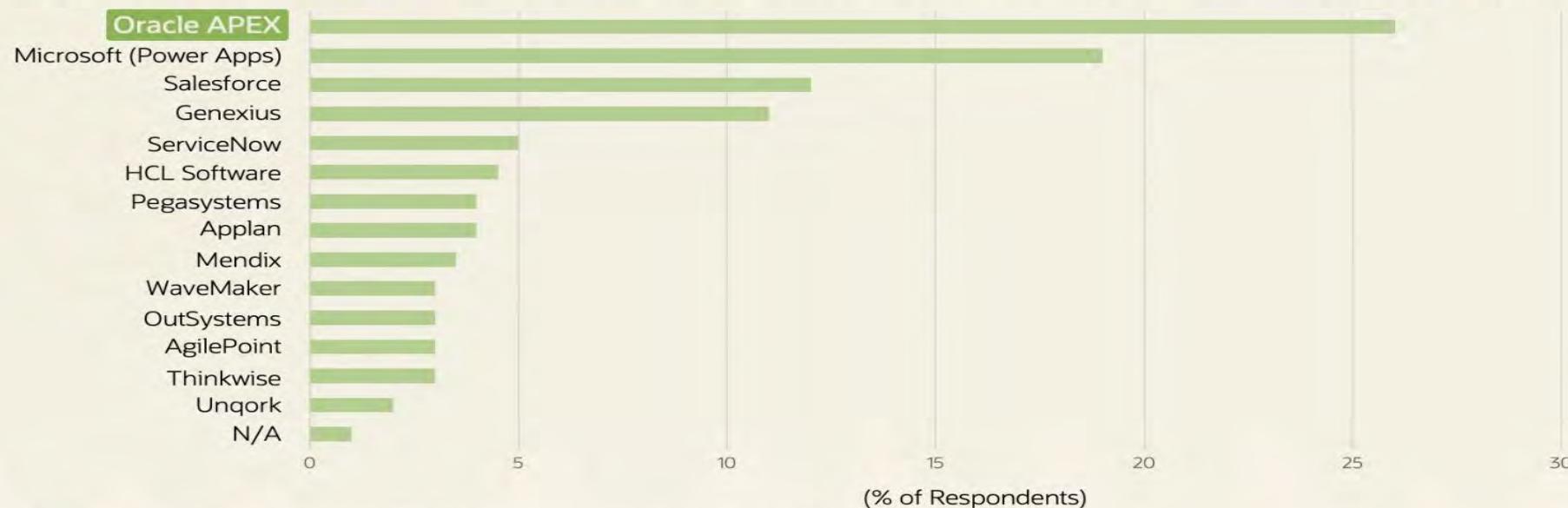
Average Salary by Job



APEX THE low code Dev Tool: 2M APEX Apps = 3K/day

IDC Survey Spotlight

Regardless of your organization's maturity with low code/no code app dev, which of the following platforms does your organization **predominantly utilize today** (or would likely use in the next 24 months) to build **low code/no code** applications?

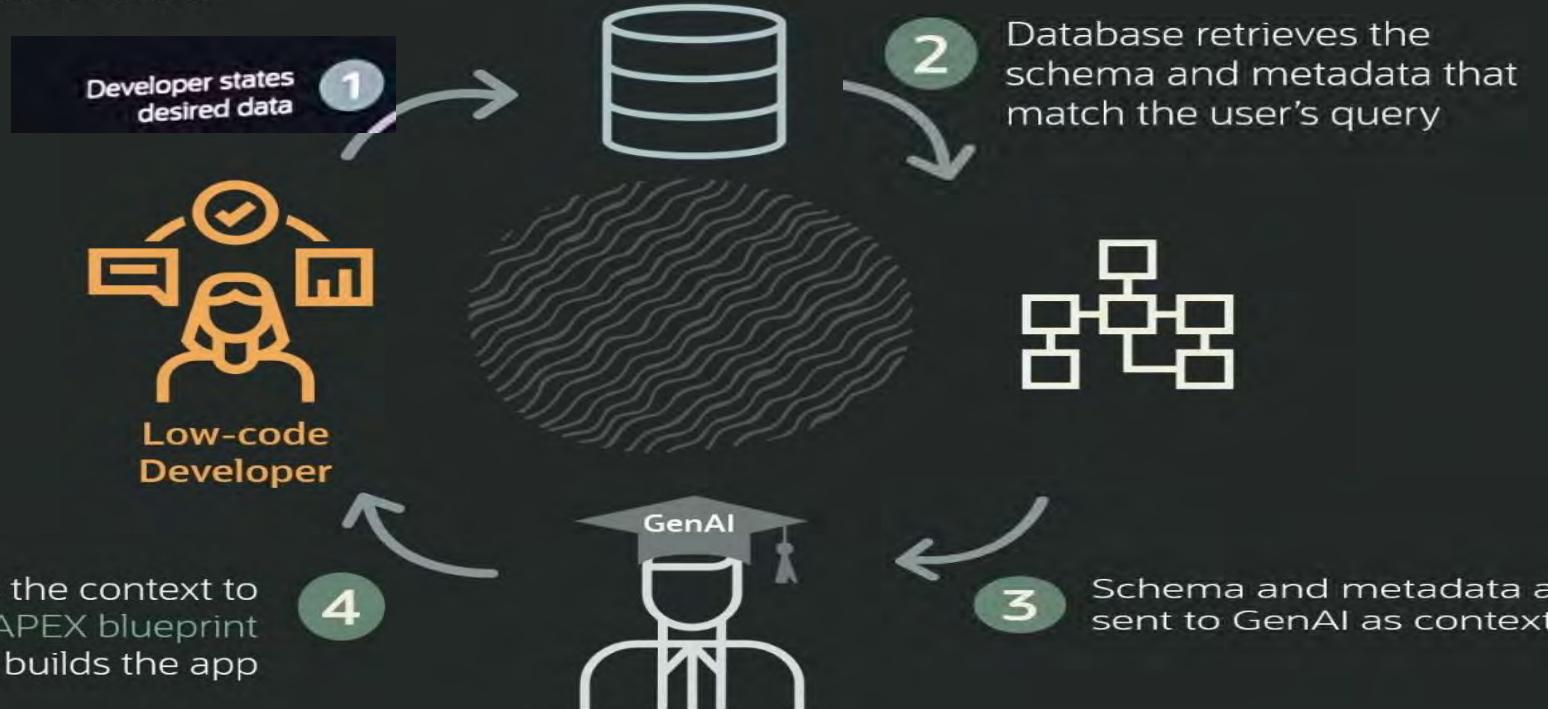


GenAI Writes the SQL

Generative AI can't generate a complete solution

It generates a first draft that experts validate and evolve

It works like this



GenAI will get to the End-User in ALL products

Data Professional



Developer



Low-Code Developer



End-User



Declare User Intent

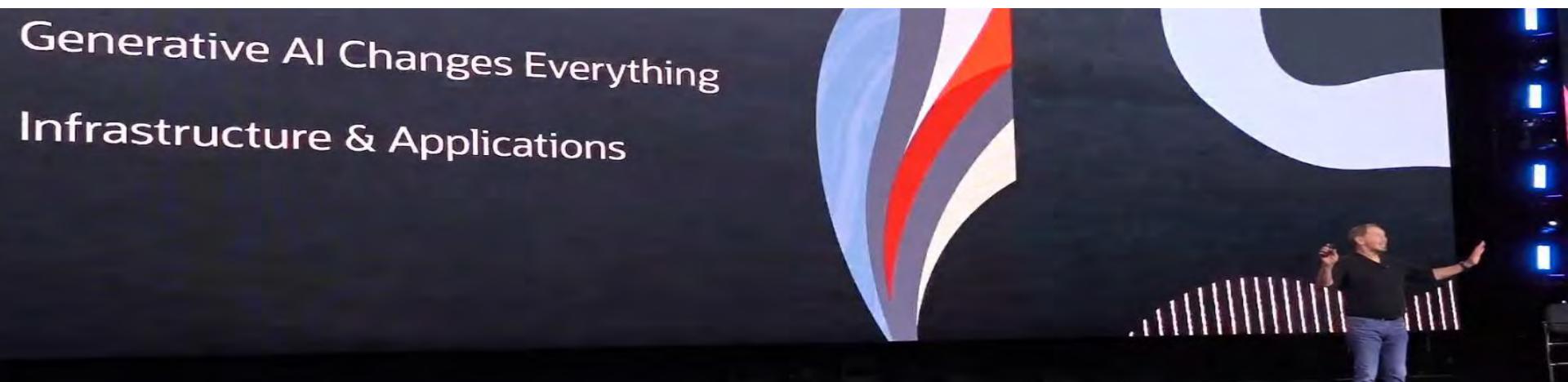
Using AI, everyone can now search unstructured data, and query natural language



What's next: A Worldwide race to build AI.



Generative AI Changes Everything
Infrastructure & Applications



Is GenAI Most Important Ever? You're About to Find Out!

Generative Artificial Intelligence – Question?

Is Generative AI the Most Important New Computer Technology Ever? Probably!

- Countless Billions \$\$\$: Being Invested in Generative AI and Large Language Models
- Last Year: ChatGPT 4.0, Cohere, other LLMs Generated Images, Music, Computer Code ...
- Coming Soon: Self-Driving Cars, Antiviral Drug Design, Clinical Voice Digital Assistant ...

More Big Surprises !!



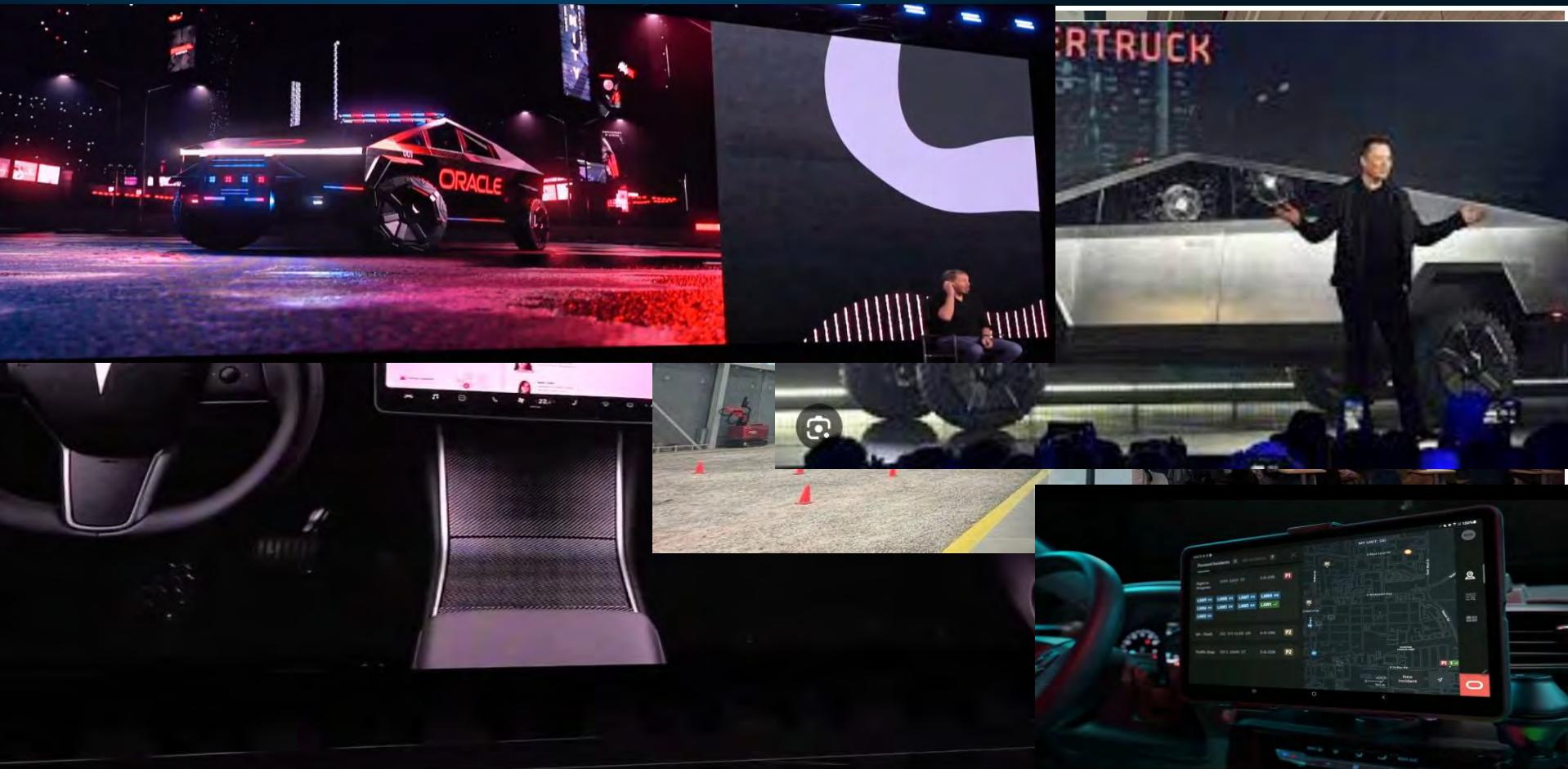
Healthcare Driving Oracle to Better AI Products

IoT Sensors: Collect Huge Amounts of AI Training Data

- Healthcare Training Data: Some Data Not Saved
 - Patient Monitoring: Blood Pressure, Pulse Oximeter, Smart Watch
 - Diagnostic Images: X-Rays, MRI Scans, Biopsy Slides ...
 - Genomics: Gene Sequences, Variations and Mutations
- Diagnostic Image Storage Cost Problem
 - Diagnostic Images & Genomics: Not Saved Due to Cloud Storage Costs
 - Oracle Cloud: Provides an Economic Solution to this Problem



Oracle Driving First Responders with Tesla

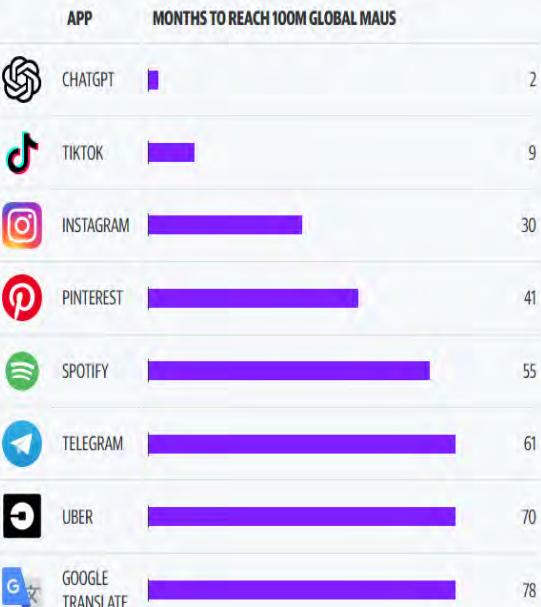


OpenAI - Ten Years Later... the Baby Talks!

HOW LONG IT TOOK TOP APPS TO HIT 100M MONTHLY USERS

ChatGPT is estimated to have hit 100M users in January, 2 months after its launch.

Here's how long it took other top apps to reach that:



About One Year Ago: ChatGPT 3.5 was Born ... the Baby Talks

ChatGPT 3.5 was Born ... the Baby Talks

Developed by OpenAI: A Company Founded by Elon Musk 10 Years Ago

- Developed by OpenAI: A Company Founded by Elon Musk 10 Years Ago
- Huge Artificial Neural Network: Multi-Billion Parameter Large Language Model (LLM)
- Trained on Language: Trillions of Data Elements ... Wikipedia + Public Internet
- ChatGPT 3.5 Talks: Generates Answers to Questions ... Engages in Conversations

A Big Surprise

ChatGPT's Scale Enabled it to Understand and Generate Language

Main Difference Between GPT-4 and ChatGPT

Unlike ChatGPT, GPT-4 can see and understand images, whereas the former is limited to text.

While ChatGPT had several issues upon its arrival, Microsoft claims that GPT-4 has been trained to avoid several malicious prompts.

Generative AI - Things to Know...

- ChatGPT predicts the next word ... looks at less stuff.
- Oracle announces Vector DB to store words, images+ & use LLM to search
- LLM's - Every Text / Email has auto-complete; translate languages, using a NN
- GenAI, LLM, ChatGpt (Generates News, articles, etc.)
- Will get us to AGI - Artificial Generative Intelligence. Language gets us to AGI.
- “Time of Exponential Development” - Similar to how Computers started to Exponentially get bigger & faster.
- ***We use language - even when thinking about something***
- LLM's are predictive machines, training data of Wikipedia & the Internet
- 100 layers of neurons for ChatGPT4 - **But, still can “Hallucinate”**
- Trains the NN by reading the internet ... etc.
- GenAI, Gpt4 (LLM), DeepMind WaveNet (text to audio), OpenAI DALL*E 2 - (text to images), Google DeepMind Google AlphaFold (phara - protein folding - same timing as ChapGPT 3.5) discoveries, ChatPDF, SlideGPT, MusicLM

ChatGPT

GPT-4 has arrived. It will blow ChatGPT out of the water **The Washington Post** **3/14/2023**

ChatGPT was launched on November 30, 2022, by San Francisco-based OpenAI (the creator of the GPT series of large language models; DALL-E 2, a diffusion model used to generate images; and Whisper, a speech transcription model).



OpenAI Research Product Developers Safety Company Search Log in Sign up

Introducing ChatGPT

We've trained a model called ChatGPT which interacts in a conversational way. The dialogue format makes it possible for ChatGPT to answer followup questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests.

Try ChatGPT Read about ChatGPT Plus



OpenAI

ChatGPT → DALL-E → API

Interact with our flagship language models in a conversational interface

Create realistic images and art from a description in natural language

Integrate OpenAI models into your application or business

Main Difference Between GPT-4 and ChatGPT

Unlike ChatGPT, GPT-4 can see and understand images, whereas the former is limited to text.

While ChatGPT had several issues upon its arrival, Microsoft claims that GPT-4 has been trained to avoid several malicious prompts.

RI what are the top 10 databases

As of my knowledge cutoff in September 2021, the top 10 databases were:

1. Oracle Database: A relational database management system (RDBMS) known for its scalability, security, and comprehensive features.
2. MySQL: An open-source RDBMS widely used for web applications due to its simplicity, reliability, and compatibility.
3. Microsoft SQL Server: A popular RDBMS developed by Microsoft, known for its strong integration with Windows Server and seamless integration with other Microsoft products.
4. PostgreSQL: An open-source object-relational database management system (ORDBMS) known for its extensibility, robustness, and compliance with SQL standards.
5. MongoDB: A NoSQL database that uses a flexible, document-oriented model and is known for its scalability, performance, and ease of use.
6. IBM Db2: A family of database management systems developed by IBM, known for its reliability, scalability, and support for a wide range of applications.
7. SQLite: A lightweight, file-based, embedded database engine that requires no separate server process and is commonly used in mobile and embedded systems.
8. Redis: An in-memory data structure store that can be used as a database, cache, or message broker. It is known for its high performance and flexibility.
9. Cassandra: A distributed and highly scalable NoSQL database designed for handling large amounts of data across commodity servers and providing high availability and fault tolerance.
10. Amazon DynamoDB: A fully managed NoSQL database service provided by Amazon Web Services.

Regenerate response

Google's Bard



☰ Bard Experiment

R

What are the top 10 databases

Here is a brief overview of each of the top 10 databases:

- Oracle is a commercial database that is known for its scalability and performance. It is often used by large enterprises that need to store and manage large amounts of data.
- MySQL is an open-source database that is known for its ease of use and flexibility. It is often used for web applications and other applications that need to be scalable and easy to maintain.
- Microsoft SQL Server is a commercial database that is known for its integration with other Microsoft products. It is often used by businesses that use Microsoft's Windows operating system and other Microsoft products.
- PostgreSQL is an open-source database that is known for its power and flexibility. It is often used for applications that need to store complex data or that need to be highly scalable.
- MongoDB is a NoSQL database that is known for its flexibility and scalability. It is often used for applications that need to store large amounts of unstructured data.
- Redis is a NoSQL database that is known for its speed and performance. It is often used for applications that need to store and manage large amounts of data in real time.
- IBM DB2 is a commercial database that is known for its scalability and performance. It is often used by businesses that need to store and manage large amounts of data.
- Elasticsearch is a search engine database that is known for its speed and scalability. It is often used for applications that need to search and index large amounts of data.
- Cassandra is a NoSQL database that is known for its scalability and fault tolerance. It is often used for applications that need to store and manage large amounts of data in a distributed environment.
- MariaDB is a fork of MySQL that is known for its stability and performance. It is often used as a replacement for MySQL when MySQL is not available or when a more stable database is needed.

Enter a prompt here



Illinois, USA

From your IP address • Update location

Bard may display inaccurate or offensive information that doesn't represent Google's views.

Transformers - Google, 2017

FYI



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Abstract

The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely. Experiments on two machine translation tasks show these models to be superior in quality while being more parallelizable and requiring significantly less time to train. Our model achieves 28.4 BLEU on the WMT 2014 English-to-German translation task, improving over the existing best results, including ensembles, by over 2 BLEU. On the WMT 2014 English-to-French translation task, our model establishes a new single-model state-of-the-art BLEU score of 41.8 after training for 3.5 days on eight GPUs, a small fraction of the training costs of the best models from the literature. We show that the Transformer generalizes well to other tasks by applying it successfully to English constituency parsing both with large and limited training data.

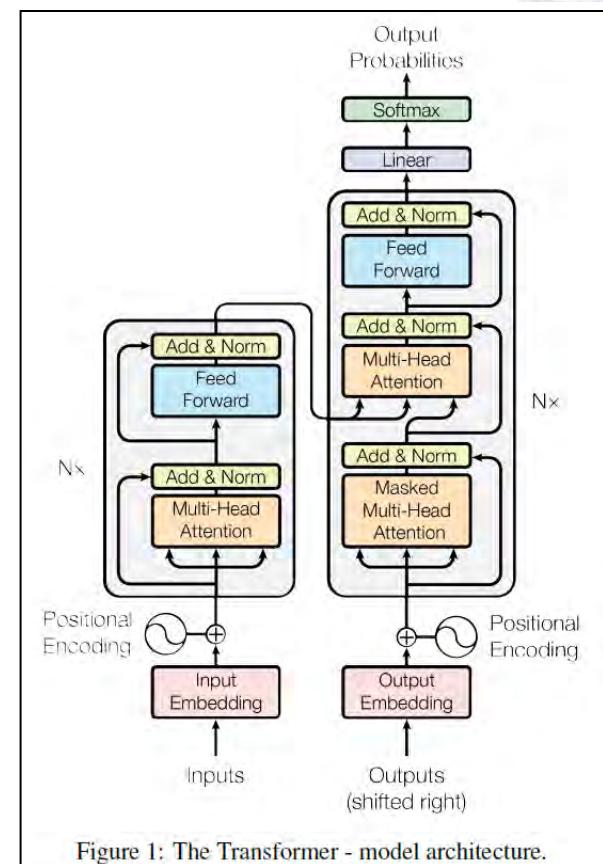


Figure 1: The Transformer - model architecture.

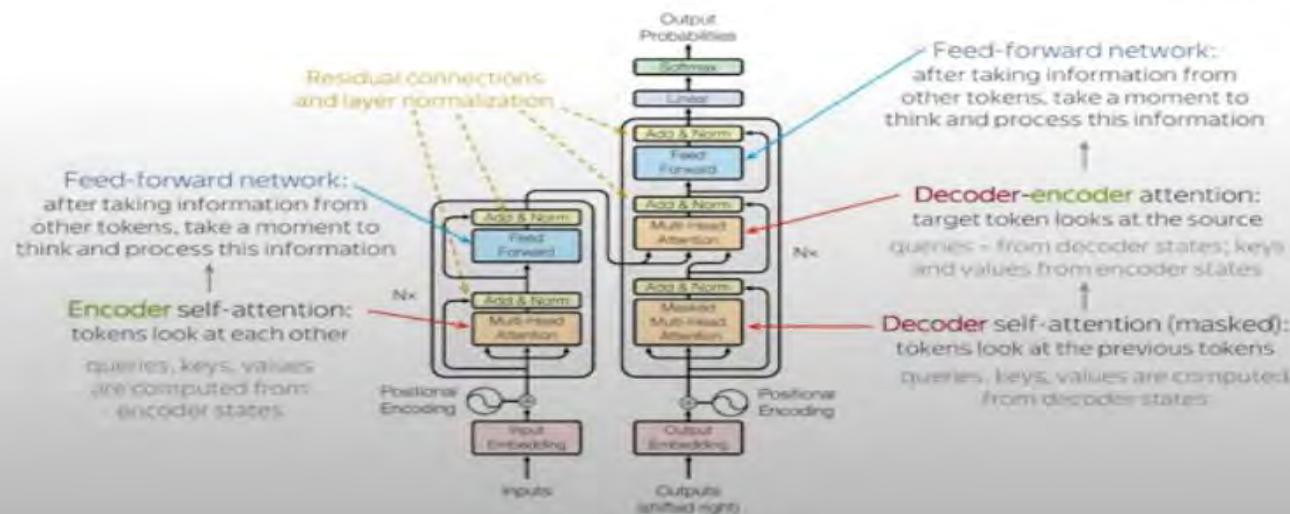
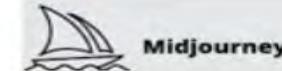
Leverages Parallelism to train model

Transformer Model led to Dominant Design

- All main models today are transformer models

The Transformer Architecture: Gene

OpenAI



Generative AI: GPT & ChatGPT

FYI



- **GPT = Generative Pre-trained Transformer**
- **ChatGPT is a Foundation Model** (Stanford paper 2021/2022) **for LLM (Large Language Model) Chatbots**. At end of 2018, NLP changed with start of foundation models begins.
- **Transformer model architecture** [Vaswani et al. 2017] that **leverages the parallelism of the hardware to train** much more expressive models than before.
- Foundation models have also led to surprising emergence which results from **scale**. For example, **GPT-3 [Brown et al. 2020]**, with **175 billion parameters** compared to **GPT-2's 1.5 billion**, permits in-context learning. (DALL-E for images)
- **GPT-4 is 1 trillion parameters** & you refine using your data.
- **GenAI Generates new content/output (GANs & Deep Fake)**

ChatGPT-4

Model
GPT-4

 i need to write a script for an introduction to Generative AI for a group of brilliant business professionals

 Title: Unlocking the Future: An Introduction to Generative AI

GPT-4 Technical Report



This report focuses on the capabilities, limitations, and safety properties of GPT-4. GPT-4 is a Transformer-style model [39] pre-trained to predict the next token in a document, using both publicly available data (such as internet data) and data licensed from third-party providers. The model was then fine-tuned using Reinforcement Learning from Human Feedback (RLHF) [40]. Given both the competitive landscape and the safety implications of large-scale models like GPT-4, this report contains no further details about the architecture (including model size), hardware, training compute, dataset construction, training method, or similar.

ChatGPT 4 is Bi-Modal (Images/Words)

GPT - 4

Predictions: Potential Capabilities of

GPT-4



What's in this picture?

Looks like a duck.

That's not a duck. Then what's it?

Looks more like a bunny.

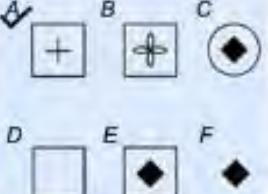
Why?

 I see bunny ears.

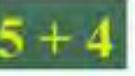
Here are eight images:



The following image is:



Input Prompt:
Completion:

	Question: Explain why this photo is funny? Answer: The cat is wearing a mask that gives the cat a smile.	(1)		Question: Why did the little boy cry? Answer: Because his scooter broke.	(2)		Question: What is the hairstyle of the blond called? Answer: pony tail	(3)		Question: When will the movie be released? Answer: On June 27	(4)
	Input Prompt: Completion: What is TorchScale?	(5)		Question: The result is? Answer: $5 + 4 = 9$	(6)		Question: What is the heart rate in this picture? Answer: 57 bpm	(7)		The time now is 10:10 on a large clock	(8)
	A library that allows transformers to work efficiently and effectively at any scale.	(9)			(10)						

Oracle Vector Database Introduced!

Oracle Vector Database: Easily Specialize AI Models & Build AI Apps

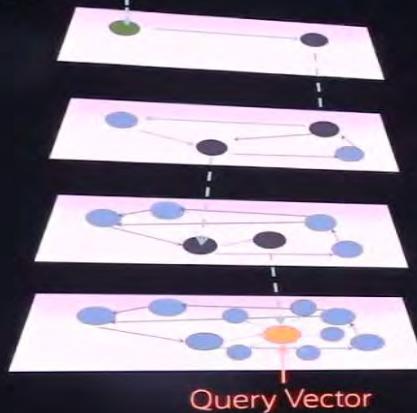
- Designing & Training Foundational AI Models: Complex and Expensive
 - Design Multi-Billion Parameter Artificial Neural Network: OpenAI, Cohere, xAI ...
 - Ingest Trillions of Training Data Elements: Wikipedia + Everything on the Internet
 - Oracle Cloud: 16,000 Node H100 NVIDIA Supercluster with RDMA Interconnect
- Specializing AI Models: Pretrained Foundational Model + Supplementary Training Data
 - Oracle Vector Database: Stores Vectorized Supplementary Training Data
 - Specialized AI Model with EHR Data: Generate Doctors' Orders – Cerner New Millennium
 - Specialized AI Model with Diagnostic Image Data: Rapid Cancer Detection – Imagene

Most Customers will Train Specialized AI Models for Specific Applications



Vector Indexes Leverage Partitions / RAC / Exadata

Entry Point



Oracle database accelerates
AI vector search using
sophisticated vector indexes



From Juan Loaiza Interview

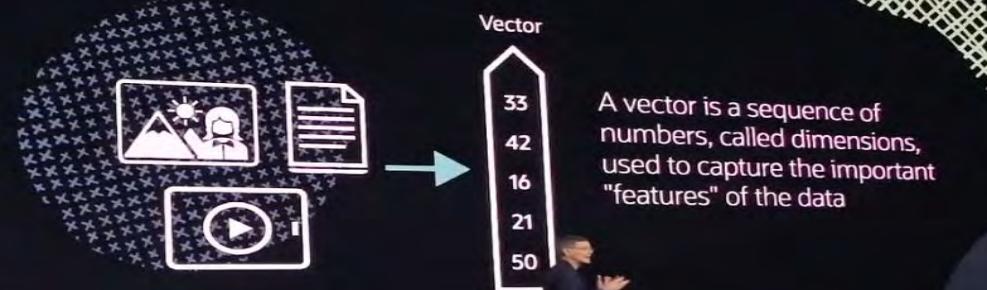
AI vector search using
sophisticated vector indexes



- Time of Big Transitions
 - Generating Apps with GenAI
 - AI & AI Search
- **Dramatic! Orders of benefit - at least 10x**
- GenAI - build directly into DB - No need to be a data scientists
- **AI Vector search - take a document/image with the content (not pixels) - build a vector for this & compare things better.** Very new tech!!!
- Used to need to be a data scientist... now just use SQL with vector searches.
- **Talk to the system like ChatGPT to pose questions to the database & get answers back using vector search (in 23c only)**
- AI benefit - does things like **Generate Apps** - describe it & they will build the first version of it. You get a DRAFT of it. You just need to check everything (like chatGPT).
- **It will keep improving!** Hard to predict where it is going - not as esoteric - used to be for corner cases - easier now & better.
- **Won't replace experts - gives a first draft** - verify draft / update it / own it
- AI won't get it 100% right
- Traditionally via Relational Data - App users want to use **JSON & Graph: ALL ok now.**

Search on Data with AI Vectors & Vector Indexes

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



Oracle Vector Database

Example: the features for a house image could be

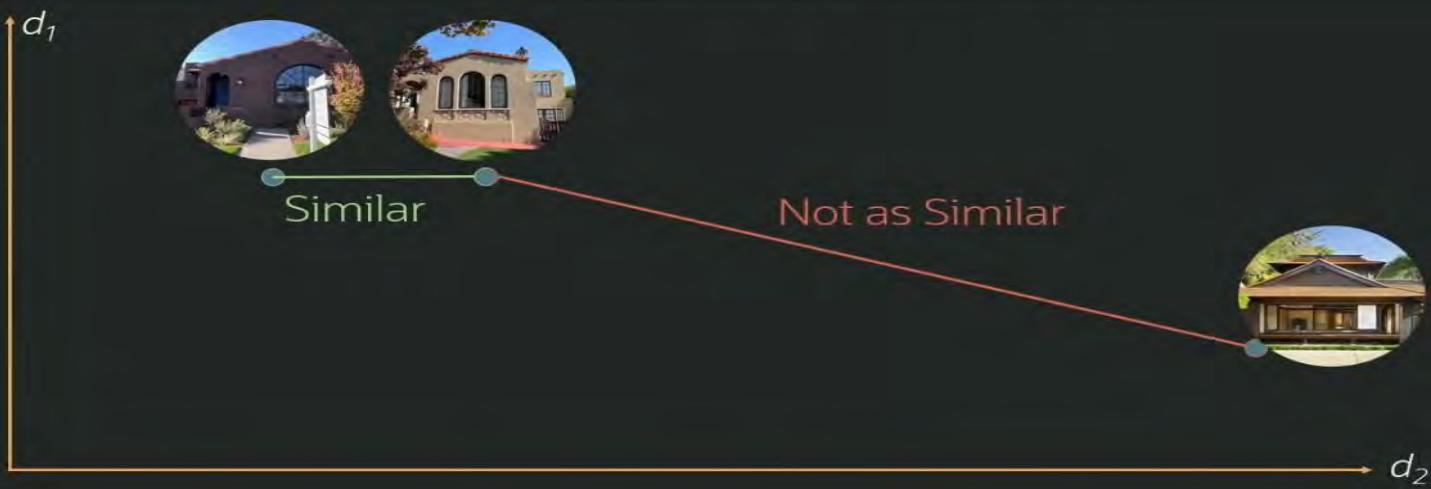


Vector Search

Imagine a house-hunting app that helps customers find houses for sale that are similar to a picture the customer uploads



The **distance** between the vectors is proportional to their semantic similarity



Search on vector (GenAI), add prices/locations



Business Database

User and Product Data

Continuously send your business
data to a vector database



Vector Database

Searches on a combination of business
and semantic data are more effective
if both types of data are stored together



Create table with Vector Data Type & Blob

```
CREATE TABLE house_for_sale (house_id      number,  
                           price        number,  
                           city         varchar2(400),  
                           house_photo  blob,  
                           house_vector vector  
);
```

Find houses that are similar to this picture
and match the customer's preferred city
and budget



```
SELECT ...  
FROM   house_for_sale  
WHERE  price <= (SELECT budget      FROM customer ...)  
AND    city  in (SELECT search_city FROM customer ...)  
ORDER BY vector_distance(house_vector, :input_vector);
```

AI Vector search Preview!



Announcing:
AI Vector Search in
Oracle Database 23c

*Sign up
for Preview Now*

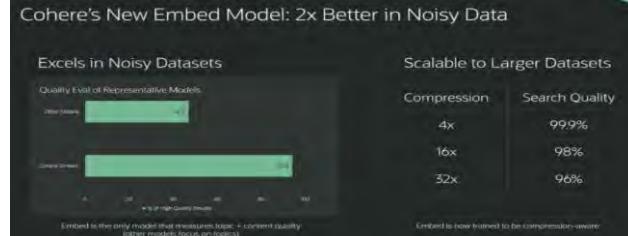


Cohere & Oracle GenAI Partnership (Signed June 2023)

- **Aiden Gomez, Cohere CEO** worked on “Attention is all you need” paper on Transformers Aidan while at Google Brain
- **Cohere turns words to numbers with semantic knowledge**
- Knowledge Augmentation - Don’t read 100 docs, **feed into Cohere LLM models** (Working with ALL Oracle Teams).
- Vector DB uses your information & knowledge that you have
- **Challenges - Hallucinations (made up “facts”)**
- **RAG** - most promising **solution to hallucinations**
- **Models trained on the web can now use your own data with RAG (Retrieval Augmented Generation)**
- Training vs. RAG - Training good to **get model to speak in your brand voice** - Adds new knowledge coming in every msec when you update the DB & RAG keeps it up to date.
- **Future - Embedding Models** - performs **twice as well in speed & accuracy. Also compress 32x with 96% accuracy.**
- **Noisy data** (pdf scrapes / errors); bad emails; No matter how noisy, you still get accurate results with what we’re building.



Officially launched partnership
at Cloud World (Sept 2023)



Retrieval Augmented Generation

Retrieval Augmented Generation How it works



Vector Databases augment Generative AI by retrieving detailed, often private content needed to answer questions

Called: Retrieval Augmented Generation (RAG)



Oracle AI & GenAI

SOTA = State of the Art

Coming soon: OCI Generative AI

State-of-the-art foundational models

We have partnered with Cohere to bring SOTA foundational models to both OCI customers and Oracle SaaS customers.

Fine-tuning support

Tune custom models with your own data to solve specific problems or target specific domains.

Fully hosted on OCI

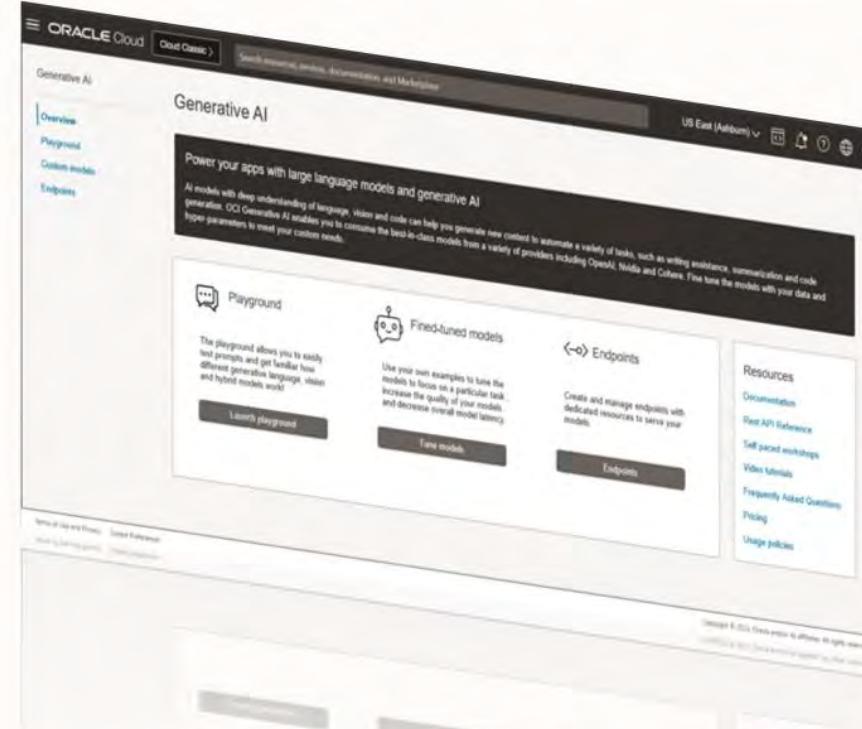
All processing and data storage happens inside OCI, no cross-region or cross-cloud communication.

Respect for customer privacy

Customer training and inference data is owned by the customer and only used to serve the customer.

PAYG and single tenant, dedicated hardware

Pay per token or host the models on dedicated hardware for stable performance.



The Oracle AI Stack



Business applications, Oracle SaaS portfolio

ORACLE
Cerner

ORACLE
NETSUITE

ORACLE
Aconex

...

AI services



Digital Assistant



Speech



Language



Vision



Document
Understanding



Anomaly Detection



Forecasting



OCI Generative AI

Machine Learning services



OCI Data Science



ML in Oracle Database



MySQL Heatwave



OCI Data Labeling

Data Platform

AI infrastructure



Compute bare metal instances and VMs



Cluster networking



Block, object, and file storage; HPC filesystems



GPUs, OCI Supercluster



A100

Answer Detailed Questions / Supply Manuals

Kate's List

Your AI powered source for home repairs



Natalie Beckham



Welcome to Kate's List. How can I help you?



Hello, my power generator does not seem to be starting up on saturday mornings anymore. The model is X2341.



I am sorry to hear that. According to our database there are several potential reasons that may cause a generator not to start on it's scheduled time.

- Check if combustion can take place. According to ②, a generator won't start when it's not getting the fuel it needs, air or a spark.
 - If your generator is programmable, check that it is programmed correctly. ③
 - Checked that the generator is actually on. ④
- Please refer to the X2341 generator operator's manual ① for safety precautions.



Hmm, it's definitely programmed correctly. I think it's the spark plug. Which one do you recommend?



For an X2341 sparkplug, I recommend an NGK Spark Plug, NGK BCPR5ES. ①

ok, where can I fi|

Home Repair Resources

Use our automated chat to the left to get assistance now!



1. User's Guide X2341

USER MANUAL



2. X Series GeneApp Mobile Application

USER MANUAL



3. 12 Reasons why your generator may not be ready for Winter.

ARTICLE



4. User's Guide X2341

USER MANUAL

Answer Location Questions - Integrate Map

Kate's List

Your AI powered source for home repairs



Natalie Beckham

I am sorry to hear that. According to our database there are several potential reasons that may cause a generator not to start on it's scheduled time.

- Check if combustion can take place. According to ②, a generator won't start when it's not getting the fuel it needs, air or a spark.

- If your generator is programmable, check that it is programmed correctly. ③

- Checked that the generator is actually on. ④

Please refer to the X2341 generator operator's manual ① for safety precautions.

Hmm, it's definitely programmed correctly. I think it's the spark plug. Which one do you recommend?



For an X2341 sparkplug, I recommend an NGK Spark Plug, NGK BCPR5ES. ①



ok, where can I find in my area?

The spark plug can be found at the following stores in the Huntsville area (See map to the right). I can also order one for you online with free shipping. It's only \$4.99.

OH - online, even better. |

> 3. 12 Reasons why your generator may not be ready for Winter.pdf

ARTICLE

> 4. User's Guide X2341

USER MANUAL

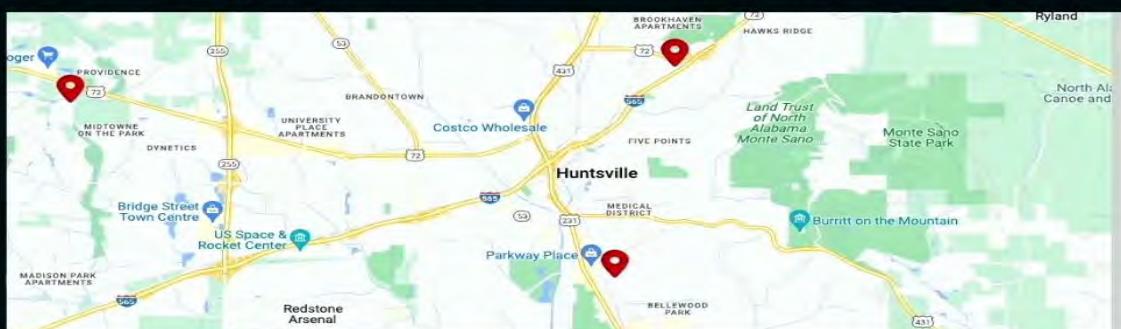
▼ Huntsville, AL 3 Locations:

Acme Parts 234 Hughes Rd
Huntsville, AL 55543

Foobar Hardware 456 2nd Street
Huntsville, AL 55543

The Third Wheel 987 Long Parkway
Huntsville, AL 55543

MAP & LOCATION



Ask Questions & Reference Document AI Searches

Ask a Question 

Page 04 / 21

Chat with Nicky



Welcome to Acme
Insurance. How can I help
you today?

Are hotel stays covered in
my policy? 



Boarding is not covered as
part of your current policy.
(See [Policy Exclusions](#), Page 13)

Now displaying Page 13.

 FOUND ON THIS PAGE BELOW

WHAT IS NOT COVERED

Exclusions

We will not pay for costs associated with or resulting from the following:

- a. Aesthetic, cosmetic, endodontic, or orthodontic dental services such as caps, crowns or crown amputation, fillings, implants and root canals or planing.
- b. Organ or heart valve transplants.
- c. Boarding.
- d. **Conditions that occur** during a waiting period.
- e. Cosmetic and elective prostheses or procedures (including but not limited to claw removal, ear cropping and tail docking).
- f. Dental cleanings unless used to treat a covered **illness** or covered by an applicable endorsement.
- g. Experimental or investigational **treatment** or medication (including clinical trials) that is not generally accepted in the **veterinary** medical community as effective or proven.
- h. Funeral services, memorial items, urns, caskets, or burial plots/fees.
- i. Grooming or grooming supplies (including but not limited to non-prescription baths, ear cleanings, non-prescription shampoos and nail trims).
- j. Food products.
- k. House call fees, time and travel expenses to and from the **veterinarian's** premises or hospital.
- l. **Illness or Injury** that results from intentional, malicious, or grossly negligent activities or from failure to perform actions commonly accepted as responsible **pet** care by **you**, a member of **your** household or a caregiver for **your pet**.
- m. **Ligament and knee conditions**, if any **ligament and knee condition** occurred prior to the first **effective date** of the applicable coverage or during a waiting period.
- n. Non-medical supplies such as but not limited to toys, leashes, ramps, bedding or other devices intended to prevent **Injury** or **illness**, but that do not treat a **condition**.
- o. **Non-veterinary** services (including but not limited to administrative fees, medical records expenses, medical waste, discount package or membership fees, postage and tax).
- p. **Pre-existing conditions** that occurred on or before the first **effective date** of the applicable coverage or during a waiting period.

Stanford (113 authors / 215 pgs.) on Foundation Models 2021/2022

On the Opportunities and Risks of Foundation Models

Rishi Bommasani* Drew A. Hudson Ehsan Adeli Russ Altman Simran Arora
Sydney von Arx Michael S. Bernstein Jeannette Bohg Antoine Bosselut Emma Brunskill
Erik Brynjolfsson Shyamal Buch Dallas Card Rodrigo Castellon Niladri Chatterji
Annie Chen Kathleen Creel Jared Quincy Davis Dorottya Demszky Chris Donahue
Moussa Doumbouya Esin Durmus Stefano Ermon John Etchemendy Kawin Ethayarajh
Li Fei-Fei Chelsea Finn Trevor Gale Lauren Gillespie Karan Goel Noah Goodman
Shelby Grossman Neel Guha Tatsunori Hashimoto Peter Henderson John Hewitt
Daniel E. Ho Jenny Hong Kyle Hsu Jing Huang Thomas Icard Saahil Jain
Dan Jurafsky Pratyusha Kalluri Siddharth Karamcheti Geoff Keeling Fereshte Khani
Omar Khattab Pang Wei Koh Mark Krass Ranjay Krishna Rohith Kuditipudi
Ananya Kumar Faisal Ladha Mina Lee Tony Lee Jure Leskovec Isabelle Levent
Xiang Li Xuechen Li Tengyu Ma Ali Malik Christopher D. Manning
Suvir Mirchandani Eric Mitchell Zanele Munyikwa Suraj Nair Avanika Narayan
Deepak Narayanan Ben Newman Allen Nie Juan Carlos Niebles Hamed Nilforoshan
Julian Nyarko Giray Ogut Laurel Orr Isabel Papadimitriou Joon Sung Park Chris Piech
Eva Portelance Christopher Potts Aditi Raghunathan Rob Reich Hongyu Ren
Frieda Rong Yusuf Roohani Camilo Ruiz Jack Ryan Christopher Ré Dorsa Sadigh
Shiori Sagawa Keshav Santhanam Andy Shih Krishnan Srinivasan Alex Tamkin
Rohan Taori Armin W. Thomas Florian Tramèr Rose E. Wang William Wang Bohan Wu
Jiajun Wu Yuhuai Wu Sang Michael Xie Michihiro Yasunaga Jiaxuan You Matei Zaharia
Michael Zhang Tianyi Zhang Xikun Zhang Yuhui Zhang Lucia Zheng Kaitlyn Zhou
Percy Liang¹

Center for Research on Foundation Models (CRFM)
Stanford Institute for Human-Centered Artificial Intelligence (HAI)
Stanford University

AI is undergoing a paradigm shift with the rise of models (e.g., BERT, DALL-E, GPT-3) trained on broad data (generally using self-supervision at scale) that can be adapted to a wide range of downstream tasks. We call these models foundation models to underscore their critically central yet incomplete character. This report provides a thorough account of the opportunities and risks of foundation models, ranging

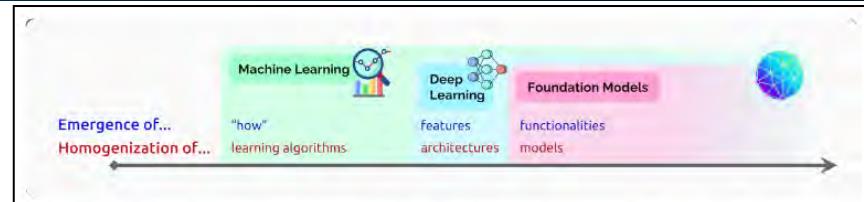
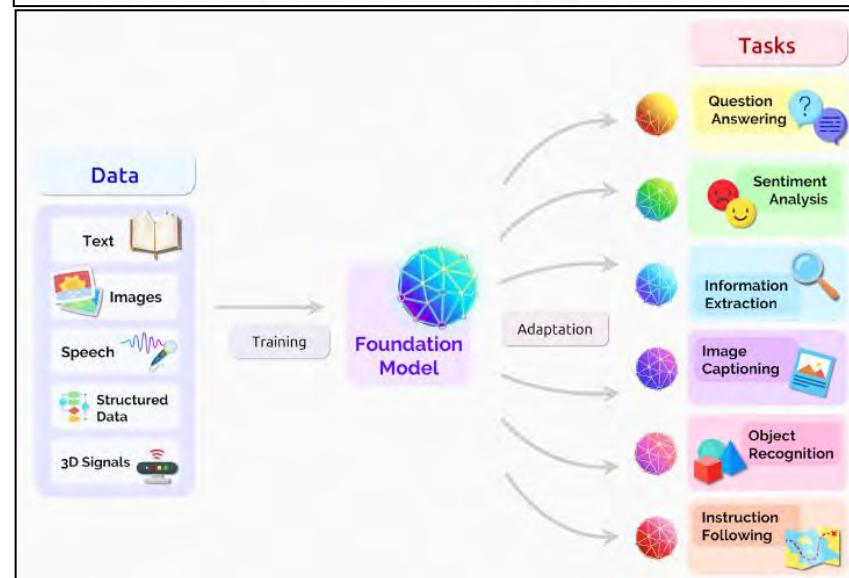
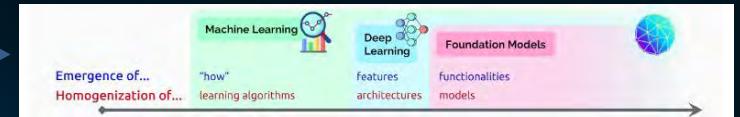


Fig. 1. The story of AI has been one of increasing *emergence* and *homogenization*. With the introduction of machine learning, *how* a task is performed emerges (is inferred automatically) from examples; with deep learning, the high-level features used for prediction emerge; and with foundation models, even advanced functionalities such as in-context learning emerge. At the same time, machine learning homogenizes learning algorithms (e.g., logistic regression), deep learning homogenizes model architectures (e.g., Convolutional Neural Networks), and foundation models homogenizes the model itself (e.g., GPT-3).



From Stanford Paper

FYI



- **Machine learning:** Most AI systems today are powered by machine learning, where predictive models are trained on historical data and used to make future predictions.
- **Deep neural networks** would be trained on the raw inputs (e.g., pixels), and higher-level features would emerge through training (a process dubbed “representation learning”).
- **Foundation models** are enabled by transfer learning [Thrun 1998] and scale. The idea of transfer learning is to take the “knowledge” learned from one task (e.g., object recognition in images) and apply it to another task (e.g., activity recognition in videos).

Fig. 1. The story of AI has been one of increasing *emergence* and *homogenization*. With the introduction of machine learning, *how* a task is performed emerges (is inferred automatically) from examples; with deep learning, the high-level features used for prediction emerge; and with foundation models, even advanced functionalities such as in-context learning emerge. At the same time, machine learning homogenizes learning algorithms (e.g., logistic regression), deep learning homogenizes model architectures (e.g., Convolutional Neural Networks), and foundation models homogenizes the model itself (e.g., GPT-3).

From Stanford Paper

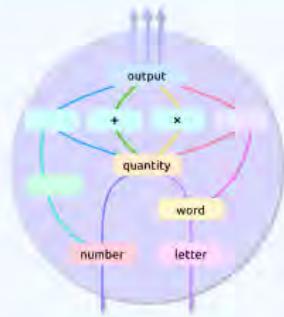
FYI

124

Center for Research on Foundation Models (CRFM)

One Model

A finite number of **generalizable model mechanisms** are combined to produce behaviors across tasks.



Many Models

For each task, distinct model mechanisms are used to produce behaviors; akin to a **large collection of individual expert models**.



On the Opportunities and Risks of Foundation Models

4.7 Security and privacy

Authors: Florian Tramèr*, Rohith Kuditipudi*, Xuechen Li*

Large Uncurated Datasets

- ✓ Source of robustness
- ✗ Increased risk of poisoning



Foundation Model

- ✓ Security choke point
- ✗ Single point-of-failure
- ✗ Increased attack surface

Training



Downstream Applications

- ✓ Cheaper private learning
- ✗ Function creep



Fig. 20. Risks and opportunities raised by foundation models for security and privacy of ML systems.

Will Businesses of the Future just be a Single Foundation Model to do all Tasks? (my own question)

Fig. 23. The one model–many model nature of foundation models: A central interpretability question is to understand where a foundation model lies on the spectrum between *one model* and *many models*. As one model, behavior can be made interpretable by identifying and characterising the finite number of generalizable model mechanisms used to produce behaviors across tasks (e.g., mechanisms that assign meaning to words, compare quantities, and perform arithmetic). As many models, explanations of model behavior in one task are not necessarily informative about behavior in other tasks, thus requiring the independent study of behavior in each task.

From Stanford Paper (Example Application)

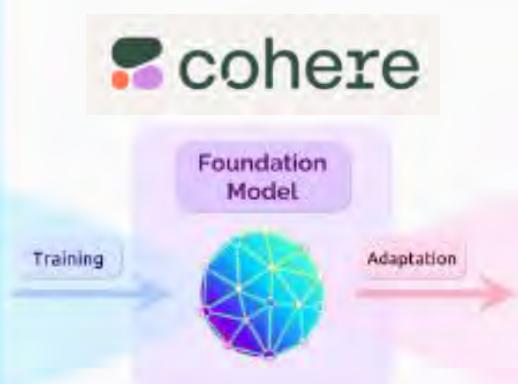
Section on Healthcare & Biomedicine

Data Sources

Sources



Modalities



ORACLE®

Downstream Tasks

Healthcare



- Interface for Care Providers
- Diagnosis
 - Treatment
 - Summarization of Patient Records



- Interface for Patients
- Question Answering
 - Assistive Care
 - Community Health & Prevention

Biomedicine



- Personalized Medicine



- Drug Discovery



- Clinical Trials

Better World – Leverage Tech!

Steve Wozniak on AI: Will we be pets or mere ants to be squashed our robot overlords?

Apple co-founder Steve Wozniak predicts a 'scary' future when artificial intelligence takes

COMPUTERWORLD

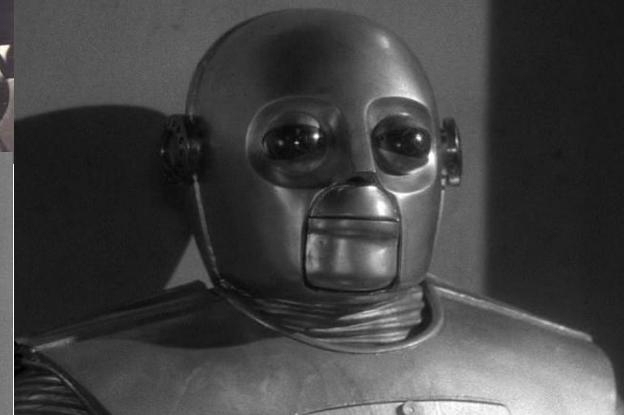
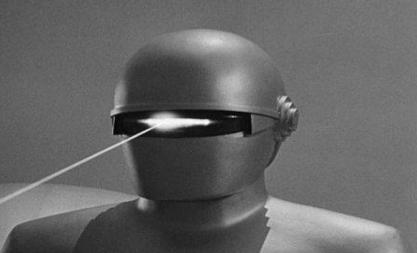
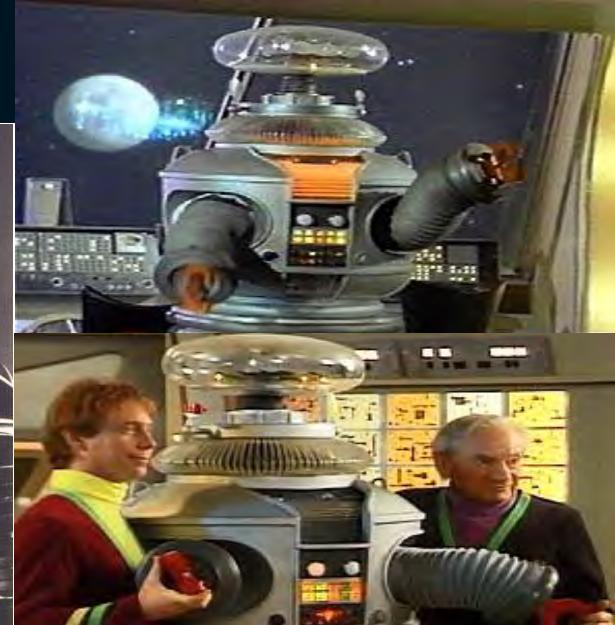
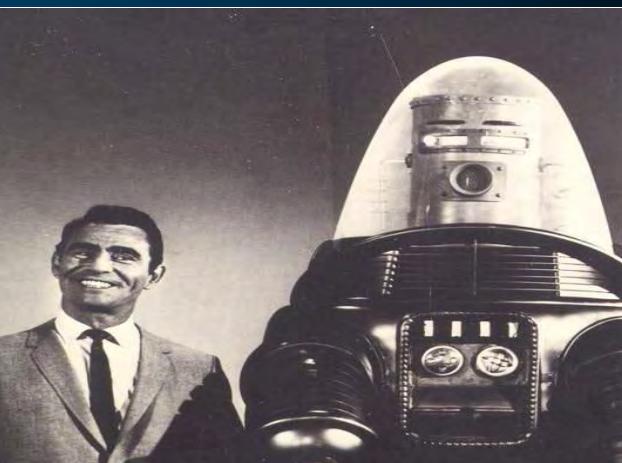
THE TWILIGHT ZONE

"You unlock this door with the key of imagination. Beyond it is another dimension - a dimension of sound, a dimension of sight, a dimension of mind. You're moving into a land of both shadow and substance, of things and ideas. You've just crossed over into the Twilight Zone." — Rod Serling



E=MC²

Robots We Grew up With...

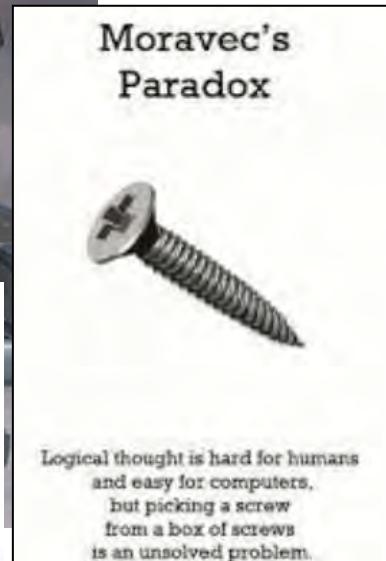


Movie Robots... Closer to the Future

MIT MANAGEMENT
EXECUTIVE EDUCATION



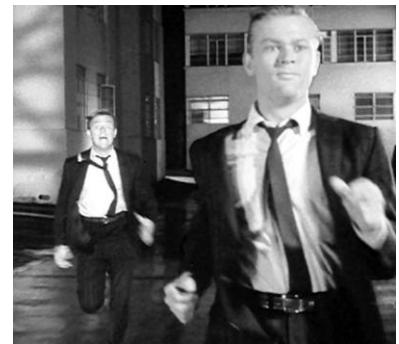
/* MORAVEC PARADOX: WHAT'S EASY FOR MACHINES IS DIFFICULT FOR HUMANS AND WHAT'S EASY FOR HUMANS IS DIFFICULT FOR MACHINES: E.G. IT'S HARD TO BUILD A ROBOT WITH THE SENSORIMOTOR SKILLS OF A 3 YEAR OLD HUMAN



Actual Robots Now... Beyond Science Fiction



Mirror Image



Mirror Image



Prof. Hiroshi Ishiguro, right, inspects his robotic twin, Geminoid HI-1, also known as 'Gemmy,' who handles his teaching duties at Osaka University in Japan. Photo courtesy of ATR Intelligent Robotics and Communication Laboratories.



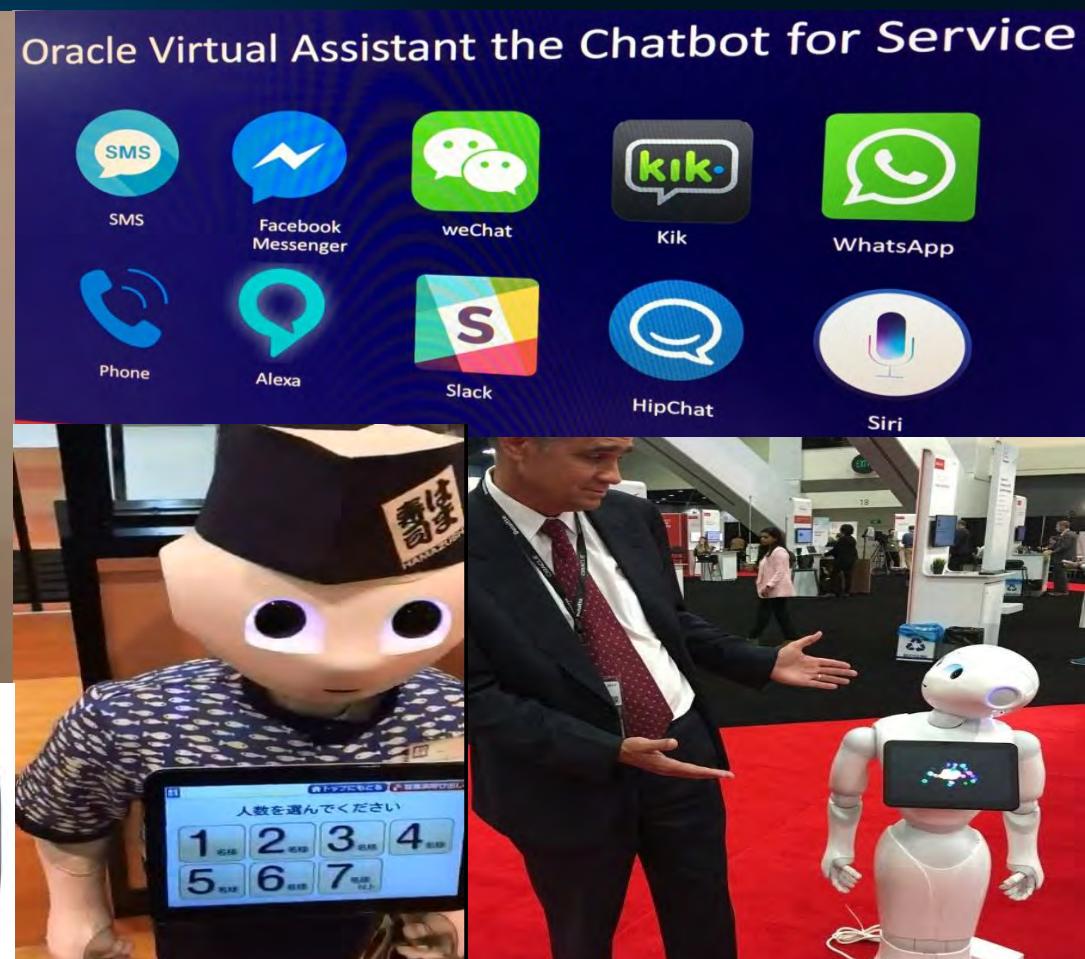
GenAI inside APEX, Sensors, Robots...etc.

Transformative Technologies: Applied to other Industries

- **Generative Artificial Intelligence**
 - APEX No Code Application Generation System
 - Autonomous Database Stores Vast Amounts AI Training Data
- **Internet of Things: Sensors & Robots**
 - Sensors Collect Vast Amounts of Training Data
 - Robots Lower Costs and Improve Product Quality & Job Quality



Use Oracle Virtual Assistant with Robots



Oracle Virtual Assistant the Chatbot for Service



SMS



Facebook
Messenger



weChat



Kik



WhatsApp



Phone



Alexa



Slack



HipChat



Siri

Oracle Virtual Assistant Interface

Secure | https://oc-140-86-34-191.compute.oraclecloud.com/athena/ui/v1/scdemo3/index.html

Now Updated every 30 secs

2 Conversations 3 Issues 12% ▲

This Week April 8, 2018 to April 14, 2018

Most Popular Expressions

- sometimes, there is a blinking...
- i need to reset my password
- I'm still seeing the same erro... how old are you
- how do i reset my password
- live agent no
- sure
- hi yes
- agent
- where do i find the heart vide...
- my coffee maker makes weak esp...
- coffee maker
- can you beatbox

Issues 7

16% Exchanges with Issues

Updated every 30 secs

Intents

348 Total 332 Published 16 Not Published

125 Conversations 405 Exchanges 66 Issues

Most Popular Intents

Sort By	Total	Without Issues	With Issues
Hello!	399		
Can I talk to an agent?			43
I need to reset my password		20	
My coffee makes makes weak espr...		19	
I'm seeing error message m4			
I'm still seeing the same error mes...			
Where can I find the making a hea...			

-- 90 Day Average

Test

Dashboard Analysis Intents Administration

ORACLE Virtual Assistant

137

Leveraging – DB, AI & Virtual Reality!



Virtual Reality



- > Immersion in virtual worlds
- > Total interaction with virtual
- > E.g. Oculus Rift



Mixed Reality



- > Virtual World integrated to reality
- > Interaction between reality and virtual
- > E.g. Microsoft HoloLens



Augmented Reality



- > Virtual on top of reality
- > Limited interaction with the virtual
- > E.g. Smartphones & tablets

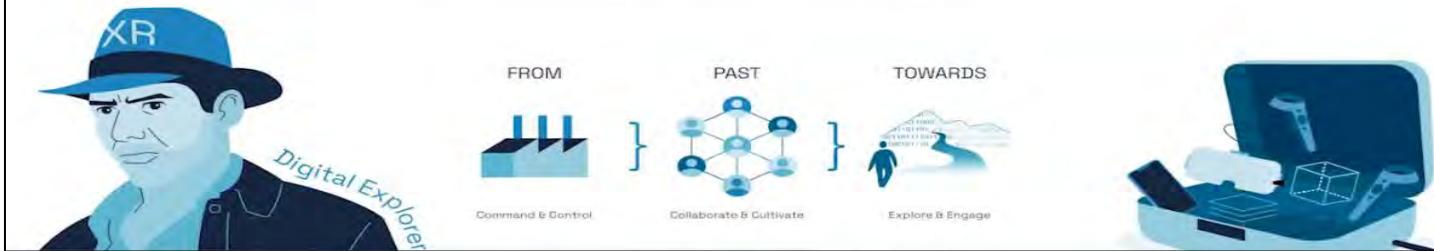
What Is XR (Extended Reality)?

XR describes virtual, augmented, and mixed-reality technologies

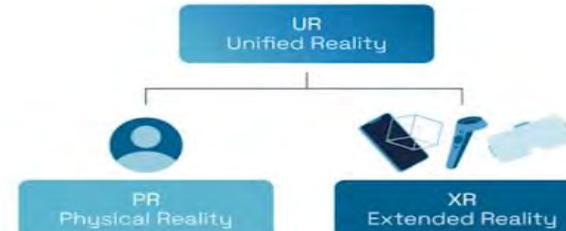
{ XR & Immersive Curiosity_

< Extended reality (or XR) is a suitcase term for the growing family of immersive technologies* that connect the bits & bytes of digital reality with the atoms and molecules of human reality to create opportunities for engagement and value creation />

*Including AR, VR, MR, METAVERSE | MULTIVERSE, 360-VIDEO, FILTERS, DIGITAL TWINS & OTHERS



- Electricity crackles with this UR in the world it serves & was built.



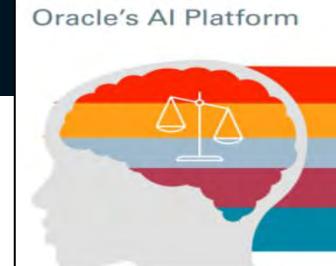
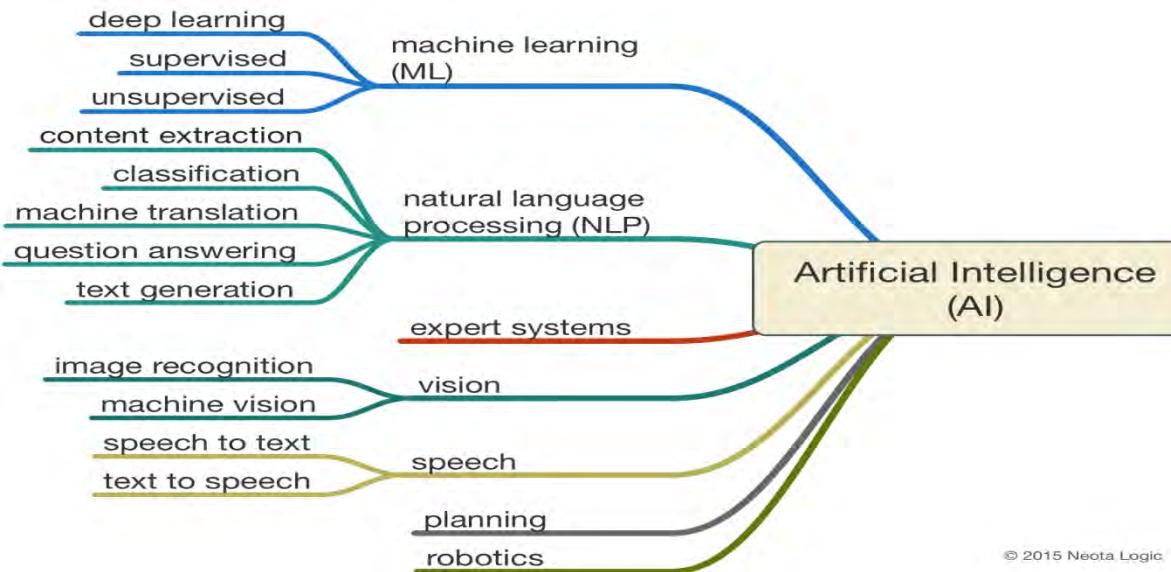
{ Unified Reality (UR)_



A World of Difference (*Getting Closer*)



Future Tech is in AI: You can Leverage this NOW!



© 2015 Neota Logic.



100%
of cloud applications will
feature AI

>50%
of enterprise data
managed autonomously

85%
of all Interactions will be
automated

The After Hours (*Future Sentience Issues Ahead*)



- Is now a Citizen
- Wants to get degree
- Wants to have kids
- What is Alive?
- Sentience Issues?
- Robot's Feelings?
- Ethical Issues +++



The Digital Transformation Ahead

Digital Transformation 2000 to 2050

A historically significant
change in humanity...

Gerd



Disconnected
The Dark Ages

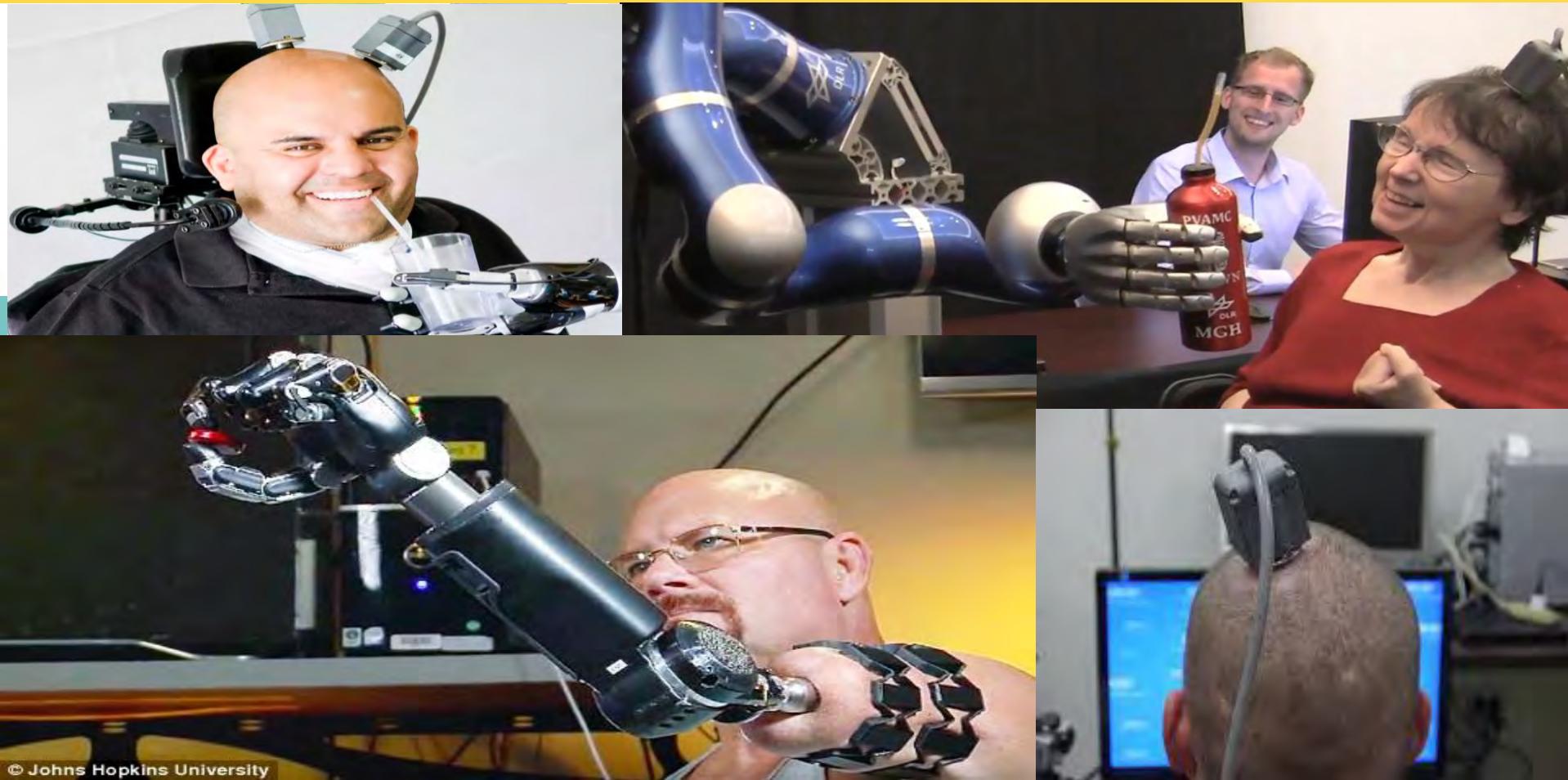
Using
Digital

Wearing
Digital

Implanting
Digital

The Hive
Mind

Connection to the Brain – Currently Working

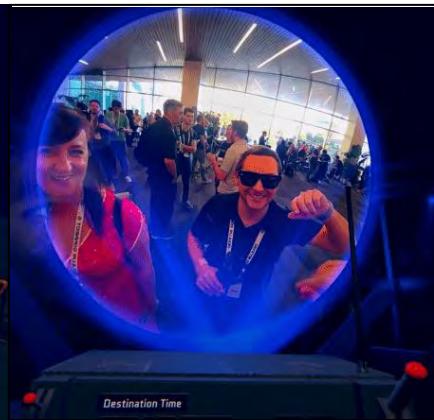


Walking Distance (*Create your past to view*)



Developer Creates VR Time Machine To Relive His Past Year

July 13, 2020 • by Bobby Carlton



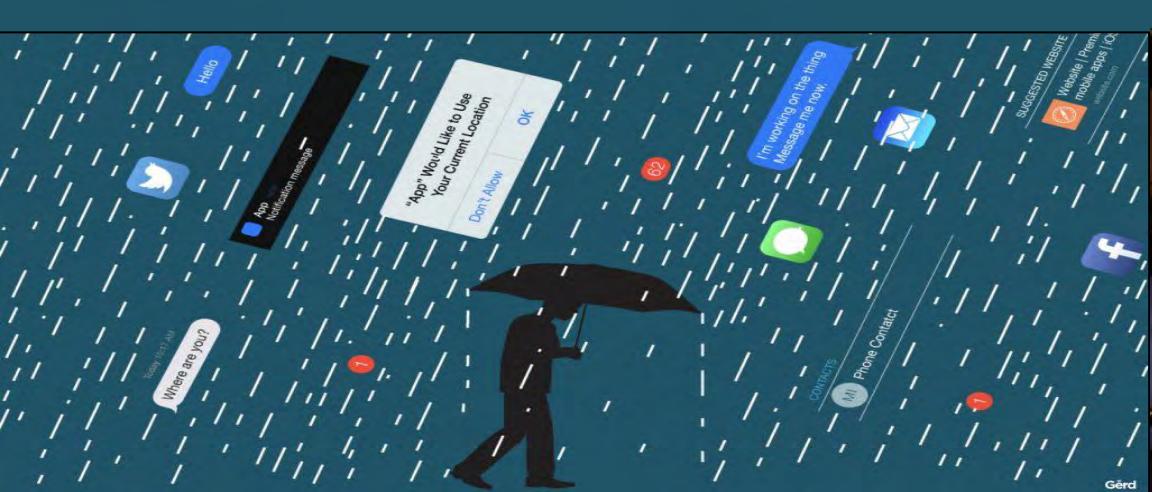
Digital – How did we go from Magical to Toxic?



MAGIC

MANIC

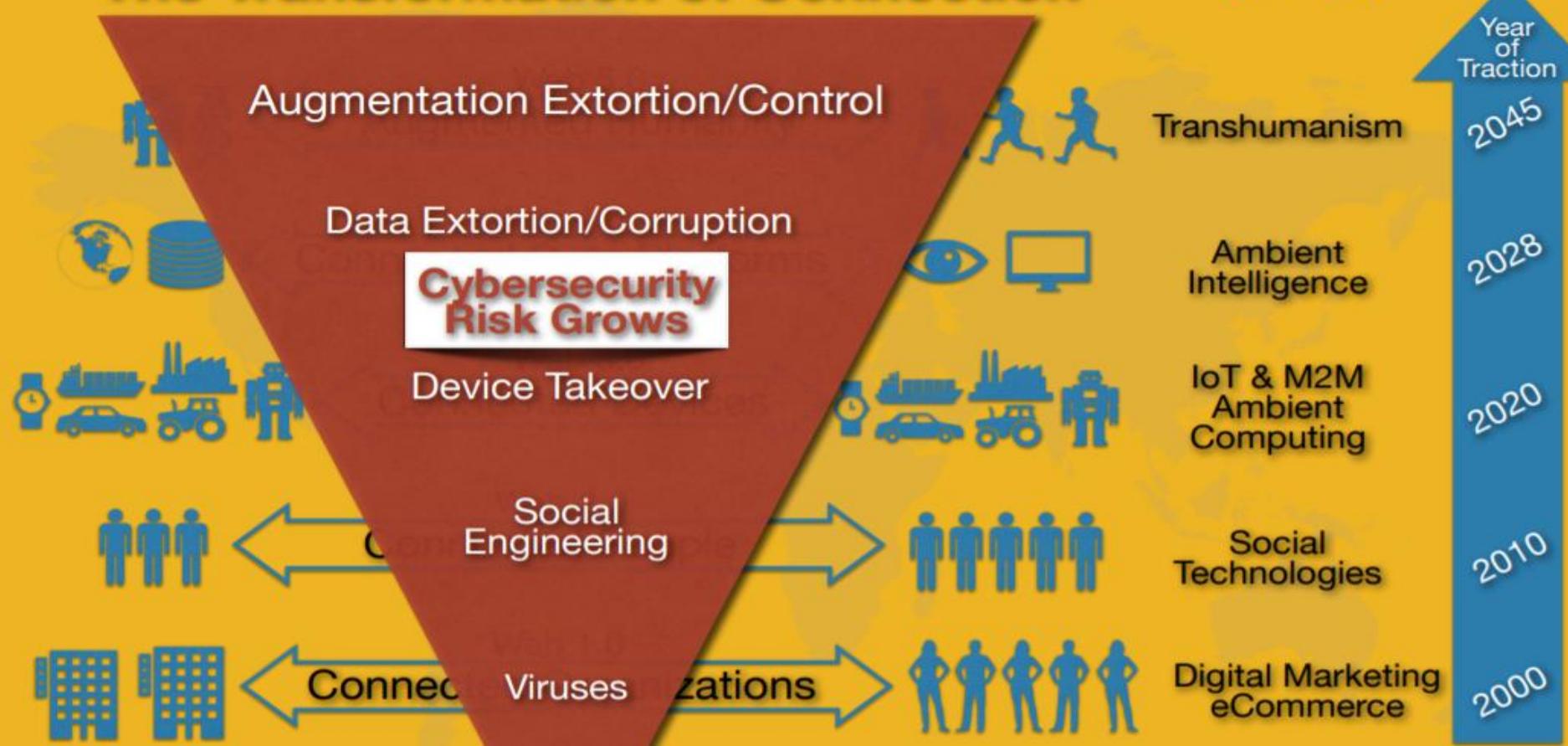
TOXIC



The Issues to Overcome moving Forward...

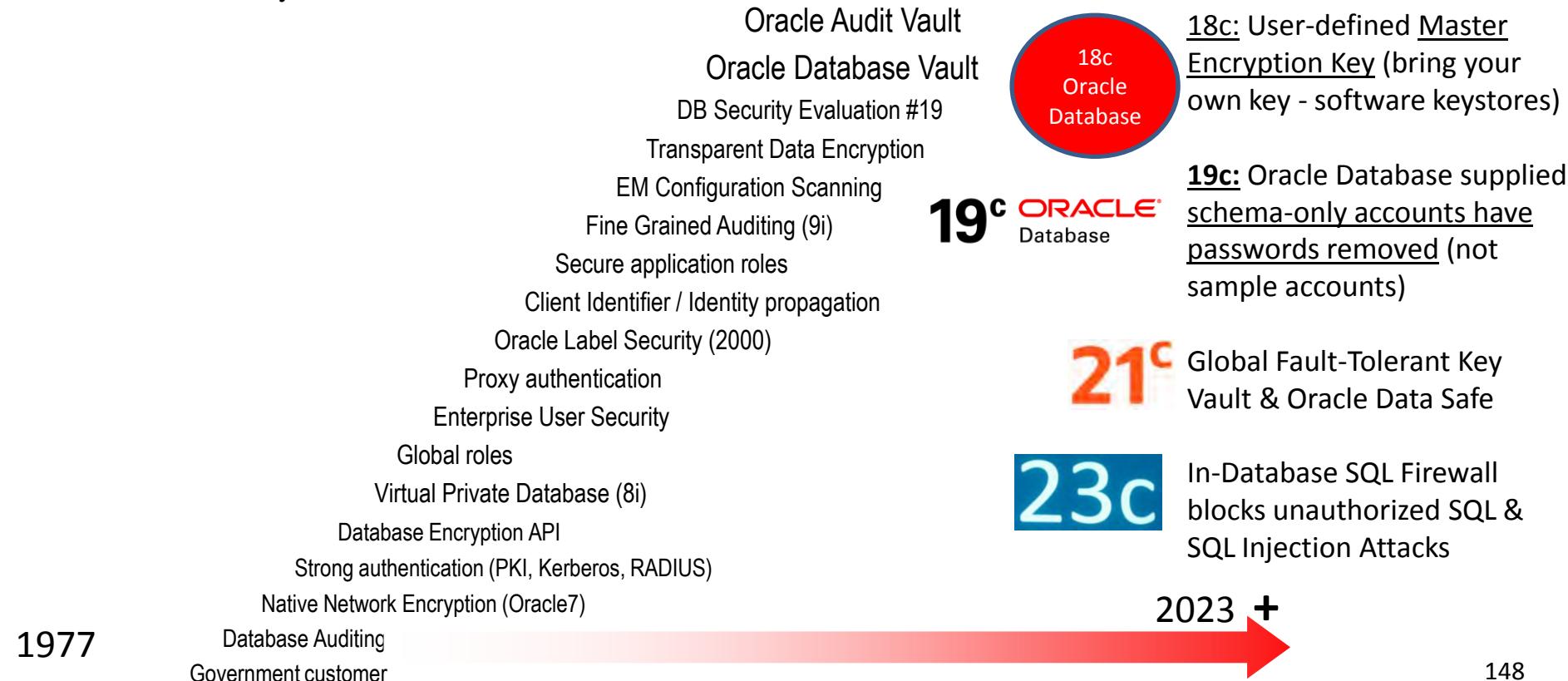
The Transformation of Connection

OFPOV



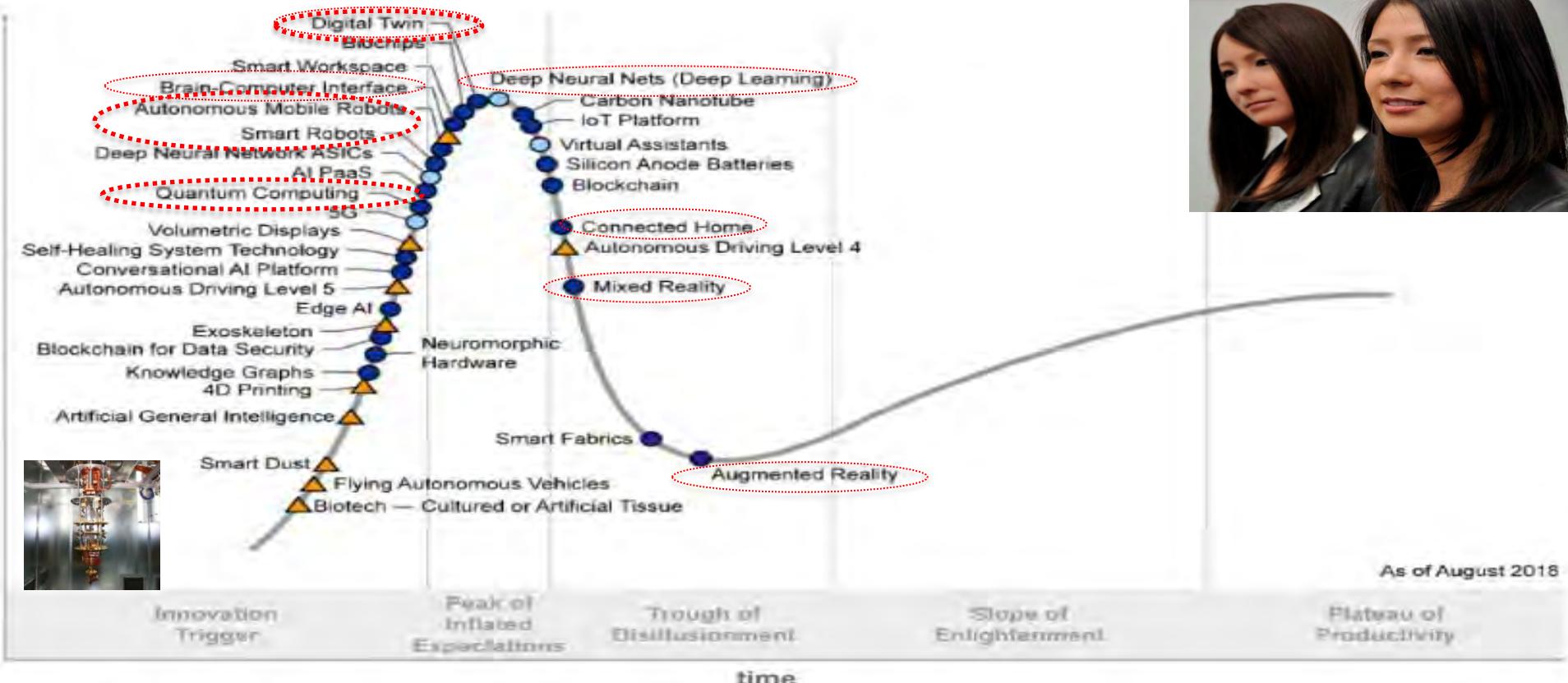
Oracle Database Security

Built over MANY years...



Gartner Hype Cycle August 2018

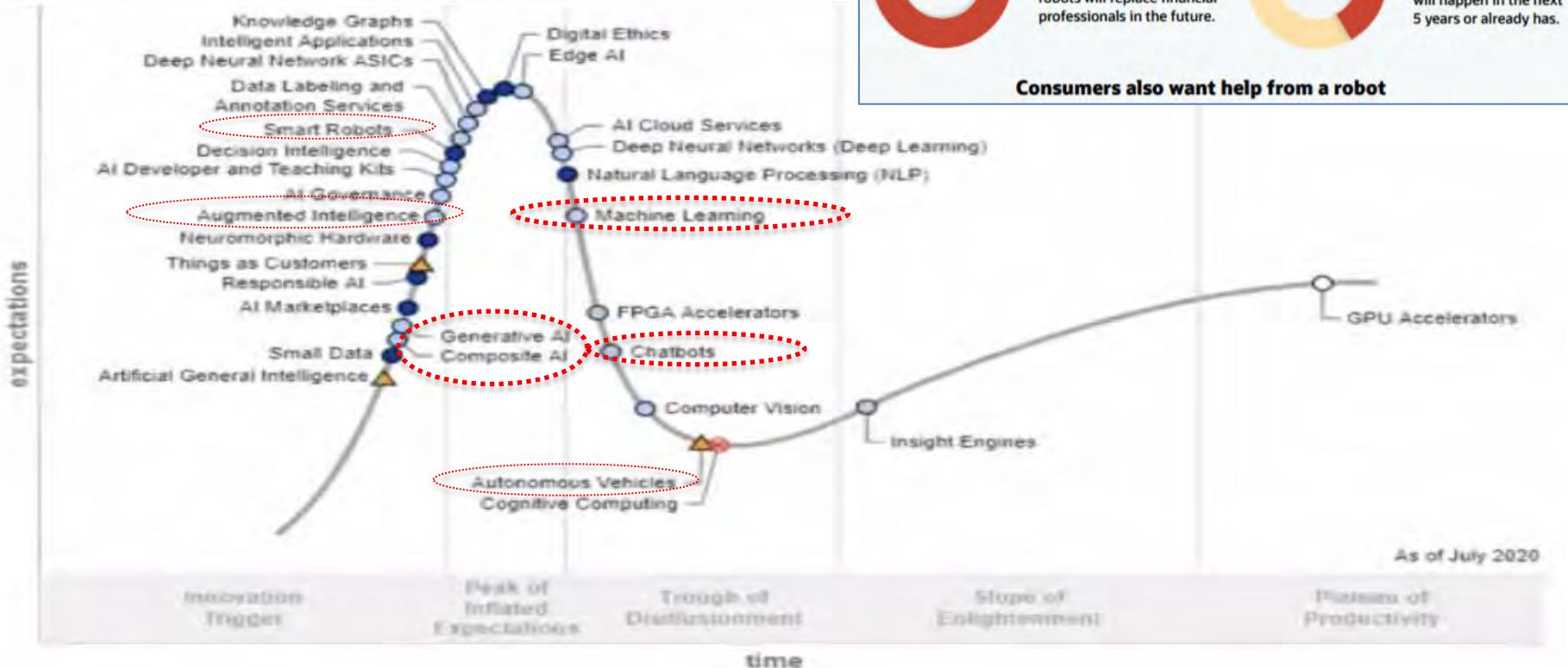
All about Tech Creating a New Reality



Plateau will be reached:

- less than 2 years
- 2 to 5 years
- 5 to 10 years
- more than 10 years
- obsolete before plateau

Gartner 2020 hype cycle



Plateau will be reached:

- Less than 2 years
- 2 to 5 years
- 5 to 10 years
- more than 10 years
- obsolete before plateau



82%

of consumers believe that
robots will replace financial
professionals in the future.



42%

of consumers believe it
will happen in the next
5 years or already has.

Consumers also want help from a robot

What's comes *after* the Exadata Zone?

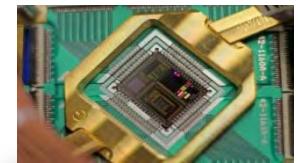
YOU will soon be in for more...

Directly Addressable

<u>4 Bit:</u>	16
<u>8 Bit:</u>	256
<u>16 Bit:</u>	65,536
<u>32 Bit:</u>	4,294,967,296
<u>64 Bit:</u>	18,446,744,073,709,551,616
<u>128 Bit:</u>	3.4 x 10e+38... quantum leap!

Indirect/Extended

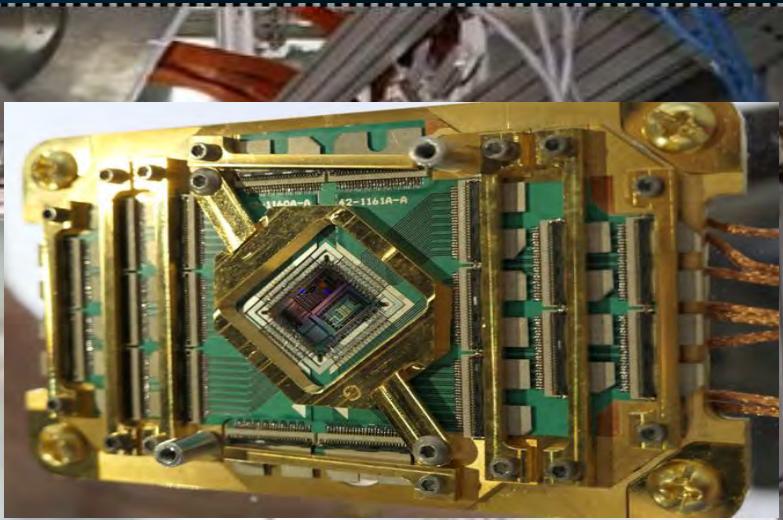
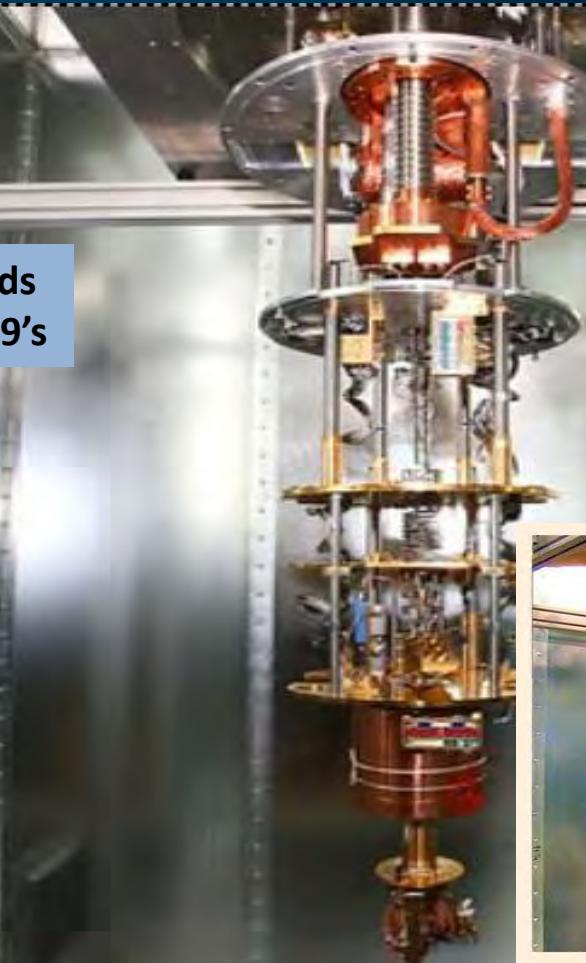
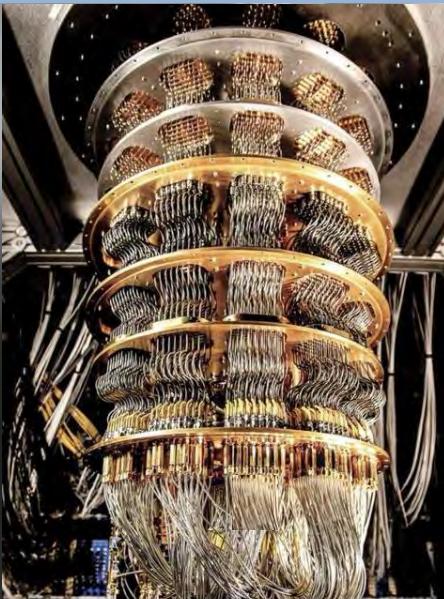
(640)
(65,536)
(1,048,576)



- Qubits allow multiple states so that you can look at all of the possibilities/probabilities at one time (IBM Q is 20 qubits).
- The “**Quantum Zone**” next (Quantum Physics is incomplete – Einstein)
 - Just 512 qubits would store 512-bits of addressable memory or 2^{512} (which is well over a googol or 1 with 100 zero's after it – **a googol is about 2^{332}**).
 - Brush up on your Eigenvectors, Eigenvalues, Pauli Matrices & Grover’s Algorithm
 - Create Singularity ... all atoms of a person by 2045 (I think earlier); **12-Monkeys**
 - Private universes – Is there one for each person? (Schroeder’s cat – I think not)
 - Rearranging atoms to create new objects; Nanotech + Quantum Physics coming!

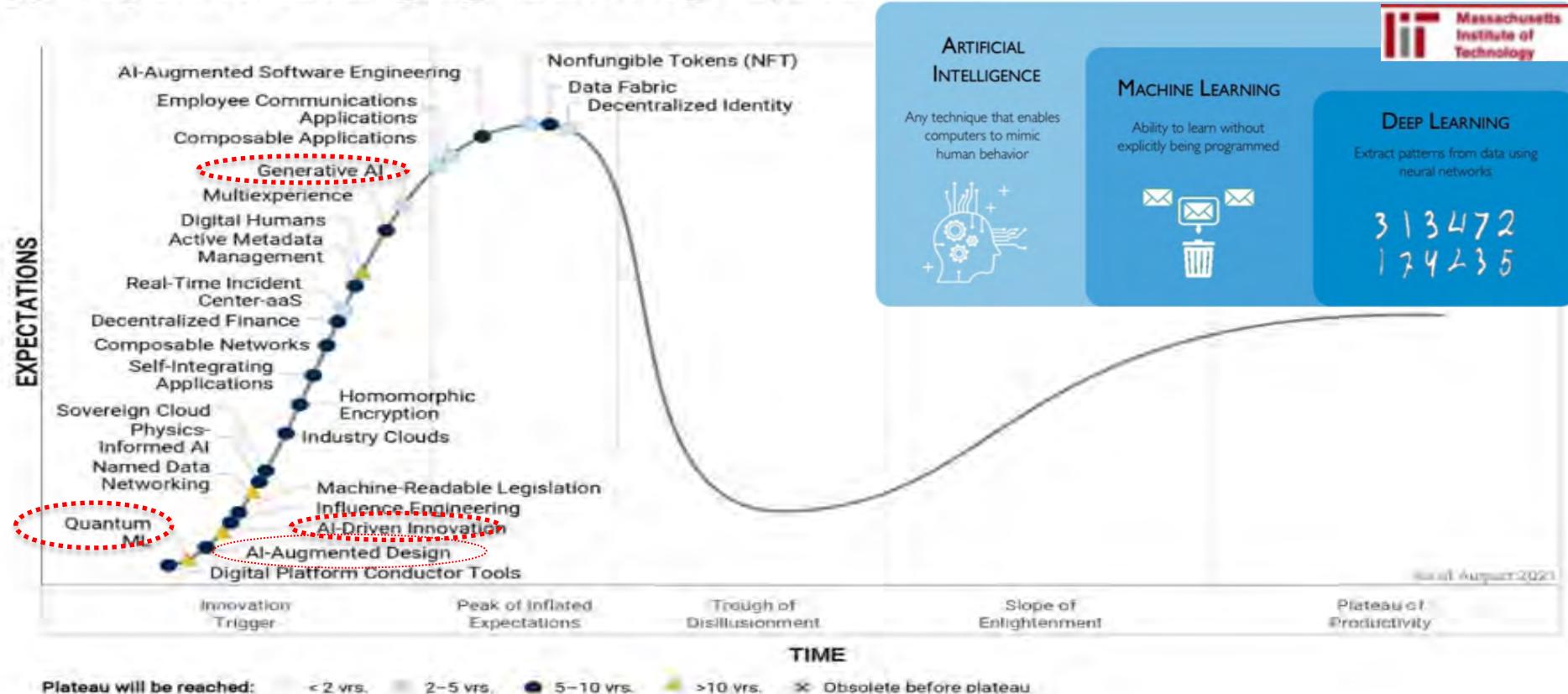
Quantum Computing makes ML Fast Enough!

Google: 47 years to 6 seconds
241M times faster than 2019's



Gartner 2021 hype cycle for Emerging Tech

Hype Cycle for Emerging Technologies, 2021



3 Types of Artificial Intelligence

Artificial Narrow Intelligence (ANI)



Stage-1

Machine Learning

- ▶ Specialises in one area and solves one problem



Siri



Alexa



Cortana

Artificial General Intelligence (AGI)



Stage-2

Machine Intelligence

- ▶ Refers to a computer that is as smart as a human across the board

Artificial Super Intelligence (ASI)



Stage-3

Machine Consciousness

- ▶ An intellect that is much smarter than the best human brains in practically every field

2023:
You're Here

Final Thoughts... world changing fast!

“Those who use things of the world should not become attached to them. For the world in its present form is passing away.”

1 Corinthians 7:31



Star Trek

- Communicator - Motorola Flip Phone
- Phaser - EPM or Stun Gun / Taser
- Tablets (Medical) - Tablet Computers
- Tricorders - Many Medical Devices (below)
- Translators - Google Translate (others)
- Tractor Beam - MIT has it in concept
- Telepresence - Zoom Virtual Conferences
- Geordi's Visor - Robotic Eyes / Implants
- Communicator Badges - Many Security Badges
- Food Replicator - 3D Printer
- Holodeck - VR
- Teleportation - Quantum Entanglement
- Big Screen TV - Everyone has it
- Hands Free Phone - Bluetooth headset / Airpods



MouthLab



Hololens VR Apps Above



Microsoft working on Holodeck

The Digital Transformation Ahead

Digital Transformation 2000 to 2050

A historically significant
change in humanity...



Disconnected
The Dark Ages



Gerd
Müller
PHOTOGRAPH BY GERMAR WILHELM



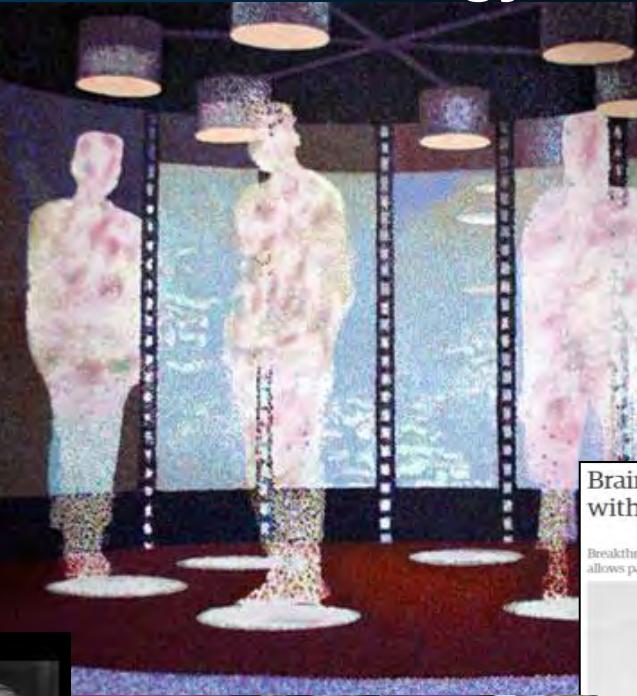
Using
Digital

Wearing
Digital

Implanting
Digital

The Hive
Mind

World now changing Faster! The Singularity: Humans Transcend Biology



Brain implant controls robotic arm - with the power of thought

Breakthrough as neuro-prosthetic device implanted in "higher" brain region, allows paralysed man to control robotic arm just by thinking about it



Quantum Entanglement

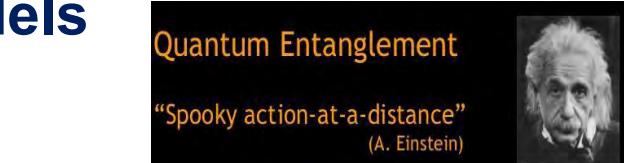
"Spooky action-at-a-distance"
(A. Einstein)



Summary – Apply Technology & W.I.N.

SUBMITTED
FOR YOUR
APPROVAL

- Economic Potential of GenAI
- Economic Impact of Robots
- ML & Oracle - Overview & ADB
- Oracle Generative AI Coming
- Transformers, ChatGPT & Foundation Models
- Oracle Vector DB, GenAI, & Cohere
- Machine Learning Future, Robots & VR

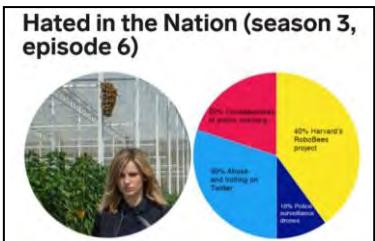


FYI

Black Mirror out Dec. 2011- Dystopian



- Nosedive: (Social Meeting Addiction & Ratings)



- Hated in the Nation
(Cancel Culture)



- Be Right Back (ETER9)



- The Entire History of You →
(Kapture / Google Glass / Google Clips)



Google Clips

- Metalhead (Robot Dog)



A Thing About Machines - People Frustrated



Final Thoughts... Catch your Ride!



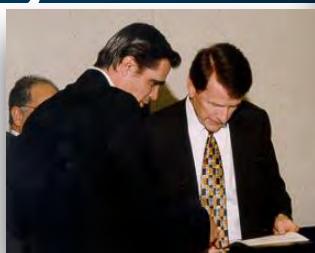
“Things may come to those who wait, but only the things left by those who hustle.”

— Abraham Lincoln



Oracle never caught from behind Oracle's 46th Anniversary in 2023

- Great Sales/Marketing
- Great Database
- Applications Leader
- BI Leader
- In the lead except Cloud
- GAME OVER
- Hardware/Software Engineering!
- Have Everything to Win in Cloud + AI!



 Richard Niemiec
Chief Innovation Officer, Viscosity North America
2d • \$3

Dr. DBA, Ken Jacobs, He will be missed!! Oracle's best advocate of User Groups; Kind, Giving, Positive, Honest, Humble & Smartest Guy in the Room! Sadly, Ken suffered a pulmonary embolism and passed away last Friday at the age c ...see more

 Who is the Dr. pictured below?



In the photo, three men in dark suits are standing together. The man in the center is identified as Ken Jacobs. The background shows a hallway with a '300' sign and other people in the distance.

Dr. DBA – Ken Jacobs (in the middle)

In Memory of Ken Jacobs, Dr. DBA & Joel Kallman

Join Thousands Of Happy Customers And End The Frustration In Tuning Oracle Databases

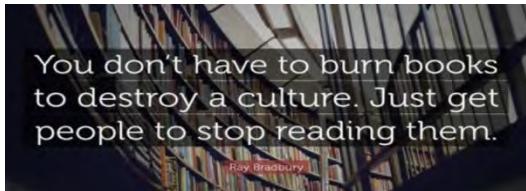
Our services give you the training you need so your Oracle database runs faster and more efficiently. And, you get the credit!

[MEMBERSHIPS](#)[TRAINING](#)[FREE TOOLS](#)[BOOKS](#)

References

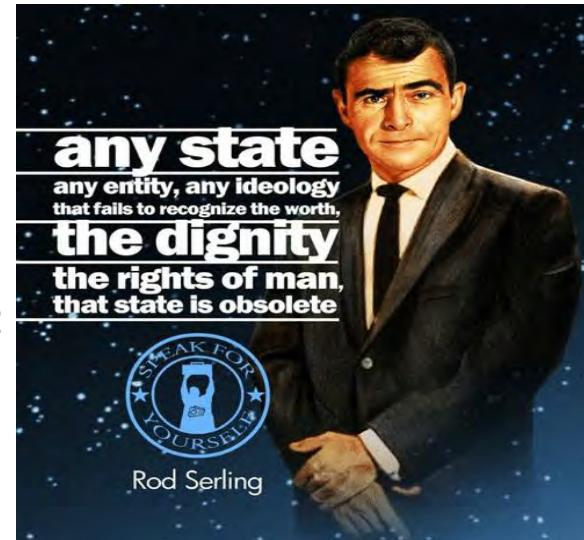


- The Emerging Technology Roadmap, Scott Klososky
- Futurist Gerd Leonhard The Futures Agency, Technology vs. Humanity, Gerd Leonhard, oracle.com & Juan Loaiza / Doug Hood presentations, amazon.com, smartcouncils.org, youtube.com, business coach, libelium.com, monetate, en.wikipedia.org, Netflix, Black Mirror, hometoys.com, FPOV, huffingtonpost.com, theguardian.com, nationalgeographic.com, newscientist.com, enswmu.blogspot.com, dailymail.co.uk, FutureRobot, theguardian.com, thinkhealthwireless.blogspot.com, ge.com, cmswire.com, runningsupplement.co.uk, quickmeme.com, nike.com, thisiswhyimbroke.com, businessinsider.com, slideshare.com, forrester.com, spiceworks.com, mwaintel.com, humancapitalist.com, wired.com and Wired Magazine, shodanhq.com, developer.nokia.com, extremetech.com, Getty Images, Dr. Quantum, Leo Kouwenhoven, Telecom Tech News, BBC Radio, Actimage, MIT & any other company products are the property of their respective companies.



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- References include Rich Niemiec's Exadata Presentation & Oracle 12cR2 Database Performance Tuning Tips & Techniques book, www.oracle.com, en.wikipedia.org, slashgear.com, gifsoup.com, www.amazon.com, Tech Crunch, www.rolta.com, The Twilight Zone, Information Week, Gartner, Computerworld, Quest, Data and Technology Today, Forbes, Quest, Orbit, Computer Weekly, Redmond, Database Trends & Applications, dsp, Dataversity, zdnet, DBVisit, Steve Jones, Kerry Osborne, Julian Dontcheff, Accenture, Quora, Brent Ozar, & Oracle OpenWorld



**THERE IS A FIFTH DIMENSION
BEYOND THAT WHICH IS KNOWN TO
MAN. IT IS A DIMENSION AS VAST
AS SPACE AND AS TIMELESS AS INFINITY.**

Getting Started—Oracle ML/AI Resources



Oracle Advanced Analytics Overview Information

- [Oracle Machine Learning Newest Features and Road Map.pptx](#) presentation
- Blog post: [Simple Guide to Oracle's Machine Learning and Advanced Analytics](#)
- Oracle Advanced Analytics Public [Customer References](#)
- [Oracle's Machine Learning and Advanced Analytics Data Management Platforms](#) white paper on OTN
-
-



YouTube recorded Oracle Advanced Analytics Presentations and Demos, White Papers

- [Oracle's Machine Learning & Advanced Analytics 12.2 & Oracle Data Miner 4.2 New Features YouTube video](#)
- [Library of YouTube Movies on Oracle Advanced Analytics, Data Mining, Machine Learning \(7+ “live” Demos e.g. Oracle Data Miner 4.0 New Features, Retail, Fraud, Loyalty, Overview, etc.\)](#)
- [Overview YouTube video of Oracle's Advanced Analytics and Machine Learning](#)



Getting Started/Training/Tutorials

- [OAA/Oracle Data Miner Workflow GUI Online \(free\) Tutorial Series](#) on OTN
- [OAA/Oracle R Enterprise \(free\) Tutorial Series](#) on OTN
- [Try the Oracle Cloud Now!](#)
- [Getting Started w/ ODM blog entry](#)
- [New OAA/Oracle Data Mining 2-Day Instructor Led Oracle University course](#)
- [Oracle Data Mining Sample Code Examples](#)



Additional Resources, Documentation & OTN Discussion Forum

- [Oracle Advanced Analytics Option on OTN page](#)
- [OAA/Oracle Data Mining on OTN page, ODM Documentation](#)
- [OAA/Oracle R Enterprise page on OTN page, ORE Documentation](#)
- [Oracle SQL based Basic Statistical functions on OTN](#)
- [Oracle R Advanced Analytics for Hadoop \(ORAAH\) on OTN](#)



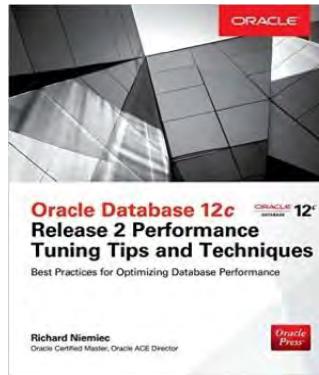
[Analytics and Data Summit](#), All Analytics, All Data, No Nonsense.

March 12-14, 2019, Redwood Shores, CA

Rich's Overview @richniemiec



- Chief Innovation Officer, Viscosity North America: rich.niemiec@viscosityna.com
- Former CEO of TUSC
 - Inc. 500 Company (Fastest Growing 500 Private Companies)
 - 10 Offices in the United States (U.S.); Based in Chicago
 - Oracle Advantage Partner in Tech & Applications
- Former President Rolta TUSC & President Rolta EICT International
- Author (5 Oracle Best Sellers – #1 Oracle Tuning Book for over a Decade):
 - Oracle Performing Tips & Techniques (Covers Oracle7 & 8i)
 - Oracle9i Performance Tips & Techniques
 - Oracle Database 10g Performance Tips & Techniques
 - Oracle Database 11g Performance Tips & Techniques
 - Quick Start Guide to Oracle Query Tuning (2015)
 - Oracle Database 12cR2 Performance Tips & Techniques
- Former President of the International Oracle Users Group
- IOUG Top Speaker in 1991, 1994, 1997, 2001, 2006, 2007
- MOUG Current President & Top Speaker Twelve Times
- National Trio Achiever award - 2006
- Oracle Certified Master & Oracle Ace Director
- Chris Wooldridge Award – 1998, 2012
- Chicago Entrepreneur Hall of Fame - 1998
- MIT Machine Learning & AI
- Purdue Outstanding Electrical & Computer and Engineer Alumni – 2007
- Board Member – TEC, Entrigna, Ask DB Experts
- E&Y Entrepreneur of Year & National Hall of Fame - 2001



Quick FREE notes

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Rich Niemiec

Chief Innovation Officer
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