

The Developer Advocates present

SAP CodeJam

2024



Getting Started with
Machine Learning using SAP HANA



Lisboa, Portugal
Sep 25, 2024



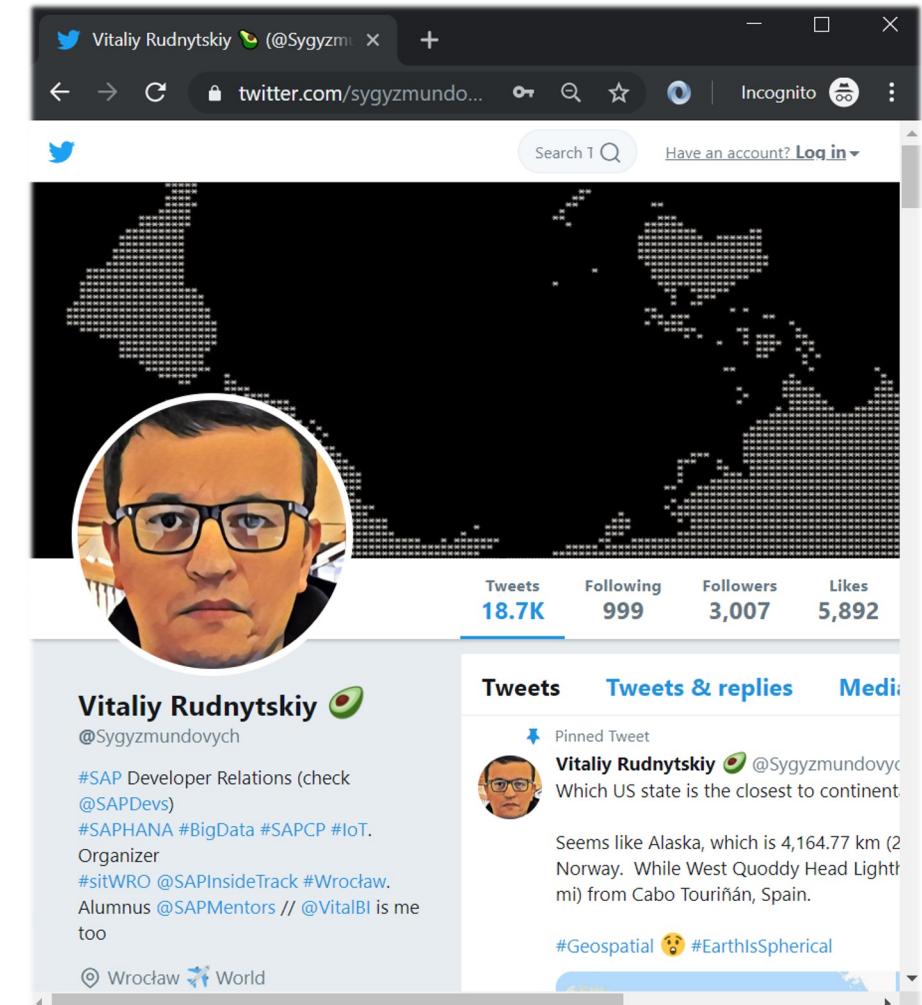
Porto, Portugal
Sep 27, 2024



Witalij Rudnicki

aka @Sygymundovych
aka Vitaliy Rudnytskiy
aka Віталій Рудницький

- 11 years **tech consultant** in SAP BI/BW
- SAP **Developer Advocate**
in SAP Community & Developer Relations
- All things Data
<http://bit.ly/SAPDevsData>
- Based in **Wrocław, Poland**
- Organizer of local SAP Community meetups and **SAP Inside Track**



SAP TechEd

Where ideas get real

The SAP TechEd event brings together developers, practitioners, enterprise architects, and global IT leaders. Joined by SAP experts and partners, they'll unite to explore innovations in app development tools, generative AI, clean core for cloud ERP, and much more.



<https://news.sap.com/2024/08/sap-teched-in-2024-registration-now-live/>:

SAP TechEd Virtual: October 8-9, 2024

SAP TechEd On Tour:

- North America,
- Asian-Pacific and Japan (APJ),
- Europe, the Middle East and Africa (EMEA),
- Latin America and the Caribbean (LAC)

ASUG Tech Connect with SAP TechEd, West Palm Beach, Florida: November 12-14, 2024

Devtoberfest: <https://community.sap.com/t5/devtoberfest/gh-p/Devtoberfest>

1. ABAP and SAP Cloud Application Programming Model
2. Tooling
3. Integration
4. MAD
(Machine Learning, AI, and Data)
5. Frontend



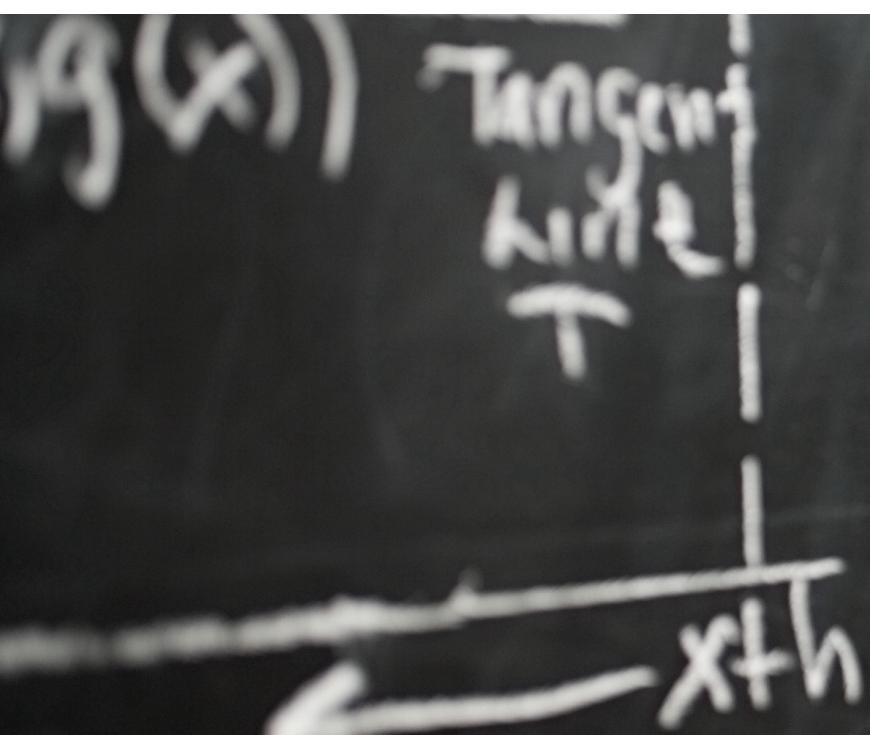
Devtoberfest

SAP TechEd

SAP Developers channel: <https://www.youtube.com/@sapdevs>

The screenshot shows a YouTube video player interface. At the top, the YouTube logo and search bar are visible. The main video frame displays two men in a video conference. On the left, Thomas Jung, a Developer Advocate, is shown with a blue radial background and the SAP logo. On the right, DJ Adams is shown in a room with wooden cabinets and blinds. The video player includes a progress bar at 0:45 / 1:01:20, control buttons (play, pause, volume), and a SAP logo indicating it's powered by Zoom. Below the video, a caption reads "Let's test drive Joule's generative AI features in SAP Build Code together! 1 of 2 (EMEA / APJ)". The video has 34.4K subscribers and 49 likes. A banner at the bottom right promotes "GENERATIVE UI" with the text "Anyone can build GENERATIVE UI with AI SDK 3.0".

A bit of theory before we start

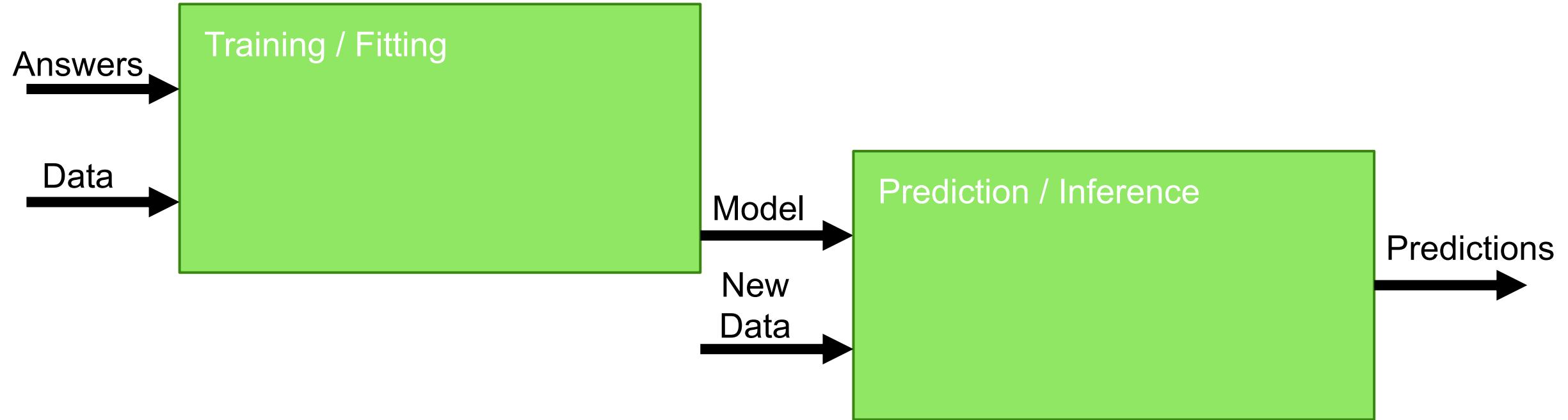


$$f'(x) = \lim_{h \rightarrow 0} \frac{(x+h)^2 - x^2}{h}$$

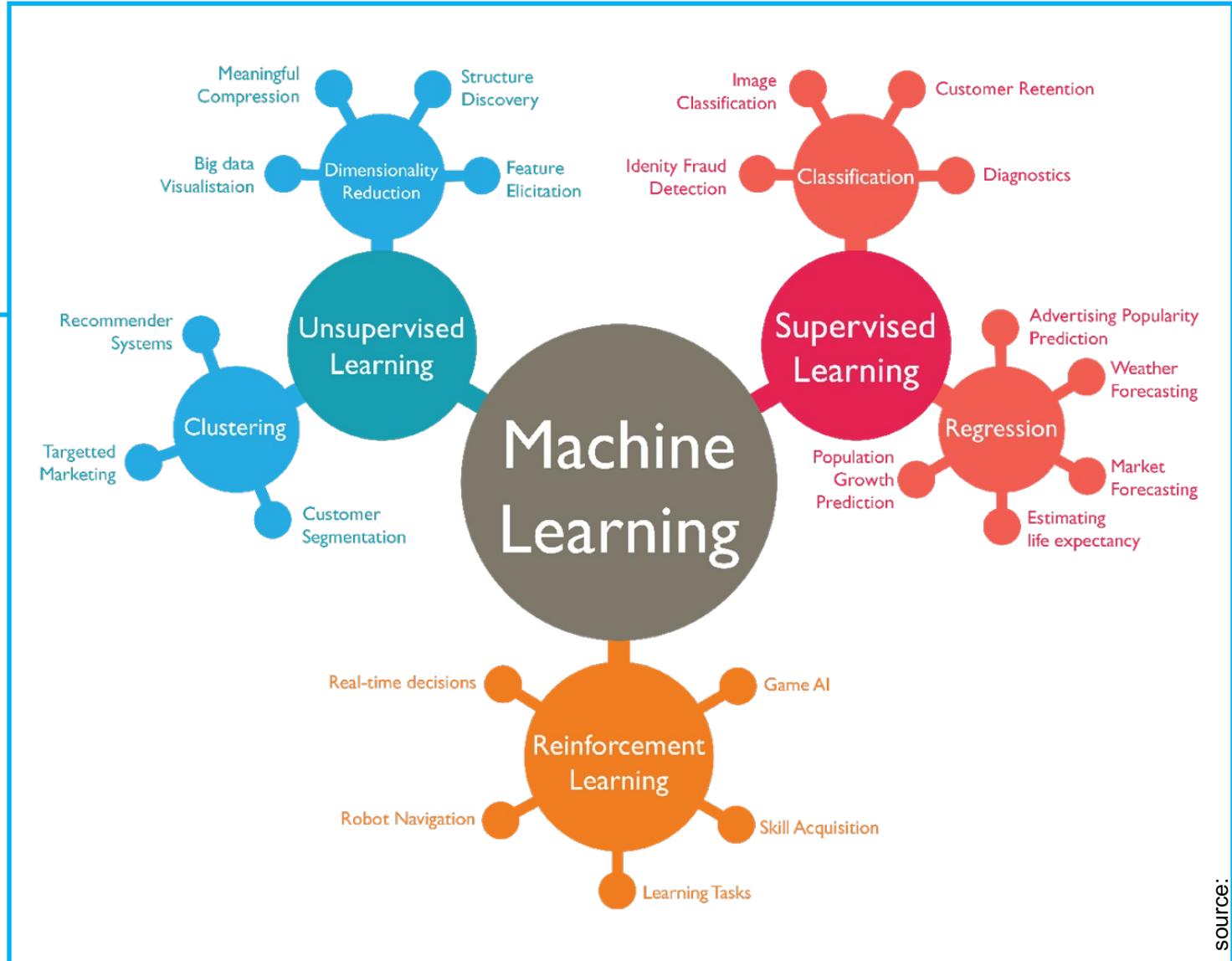
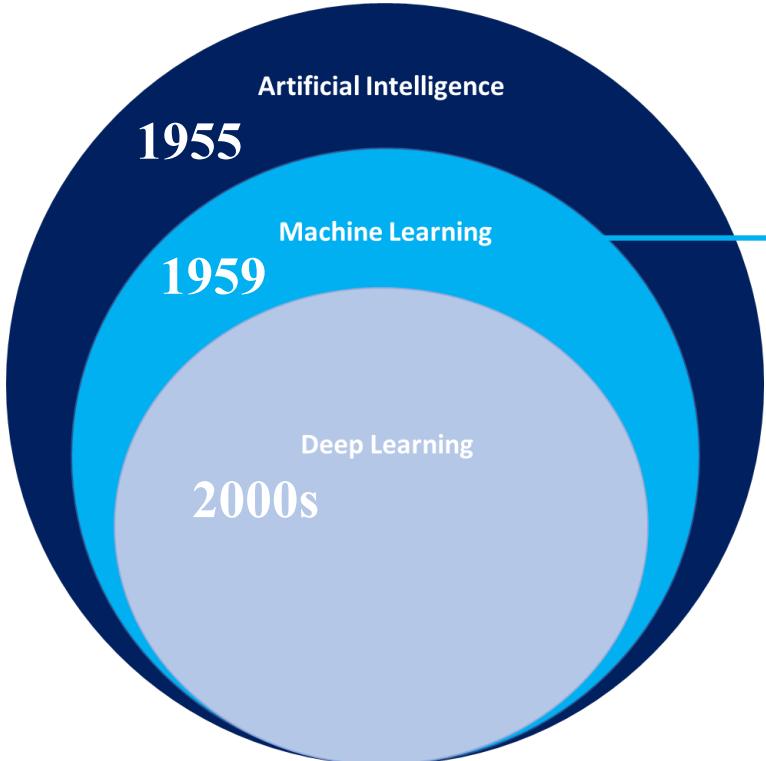
$$= \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - x^2}{h}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{2xh + h^2}{h}$$

Machine Learning



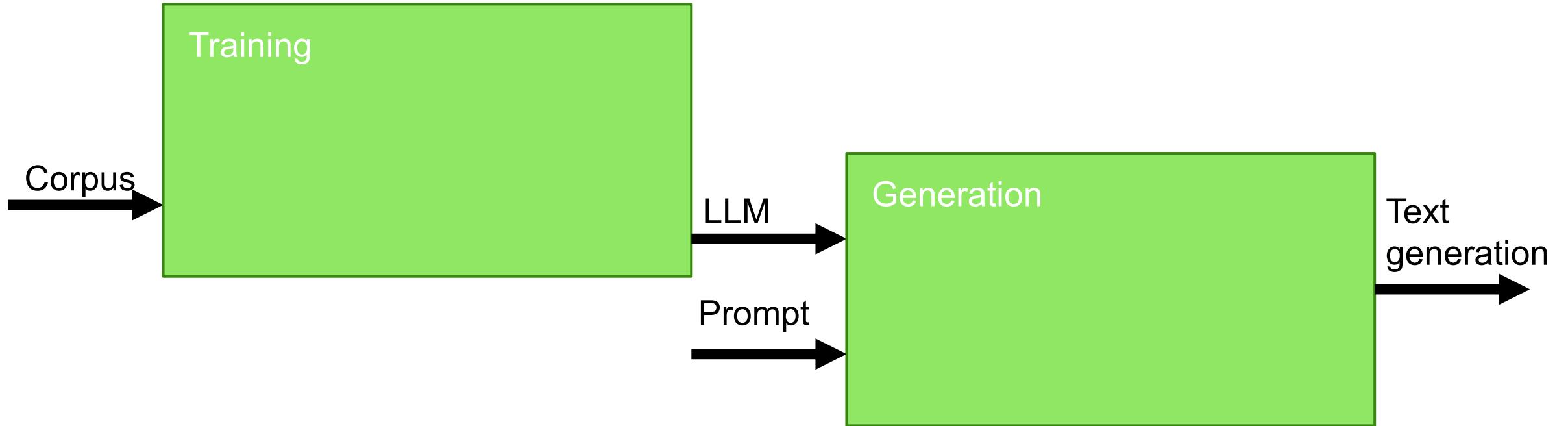
Machine Learning Terminology



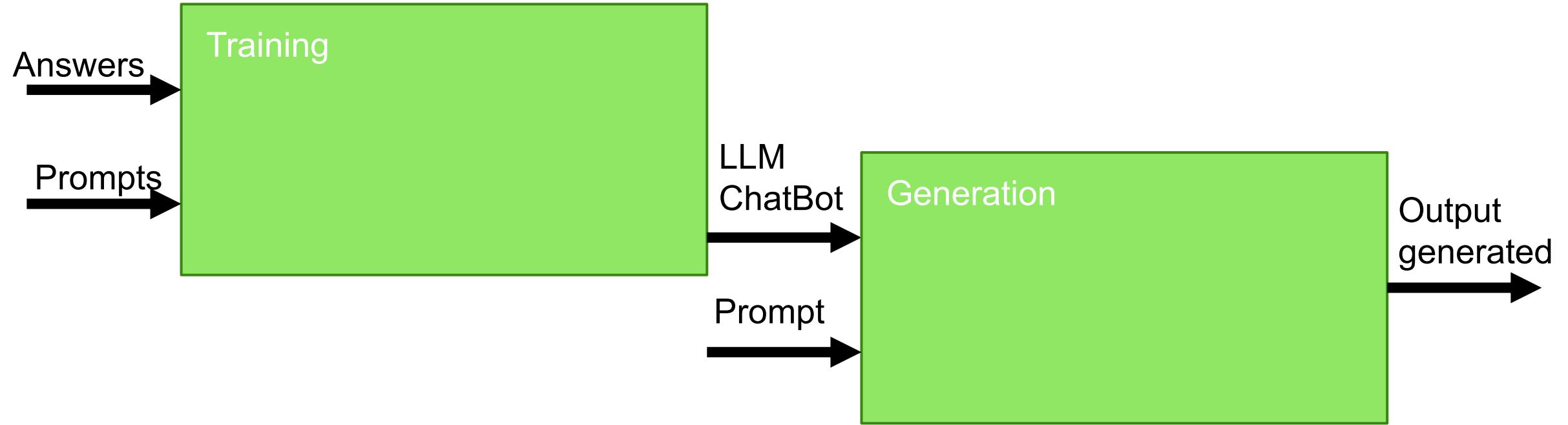
source:

[https://www.researchgate.net/publication/337958773 A Novel Approach for Improving Breast Cancer Risk Prediction using Machine Learning Algorithms A Survey](https://www.researchgate.net/publication/337958773_A_Novel_Approach_for_Improving_Breast_Cancer_Risk_Prediction_using_Machine_Learning_Algorithms_A_Survey)

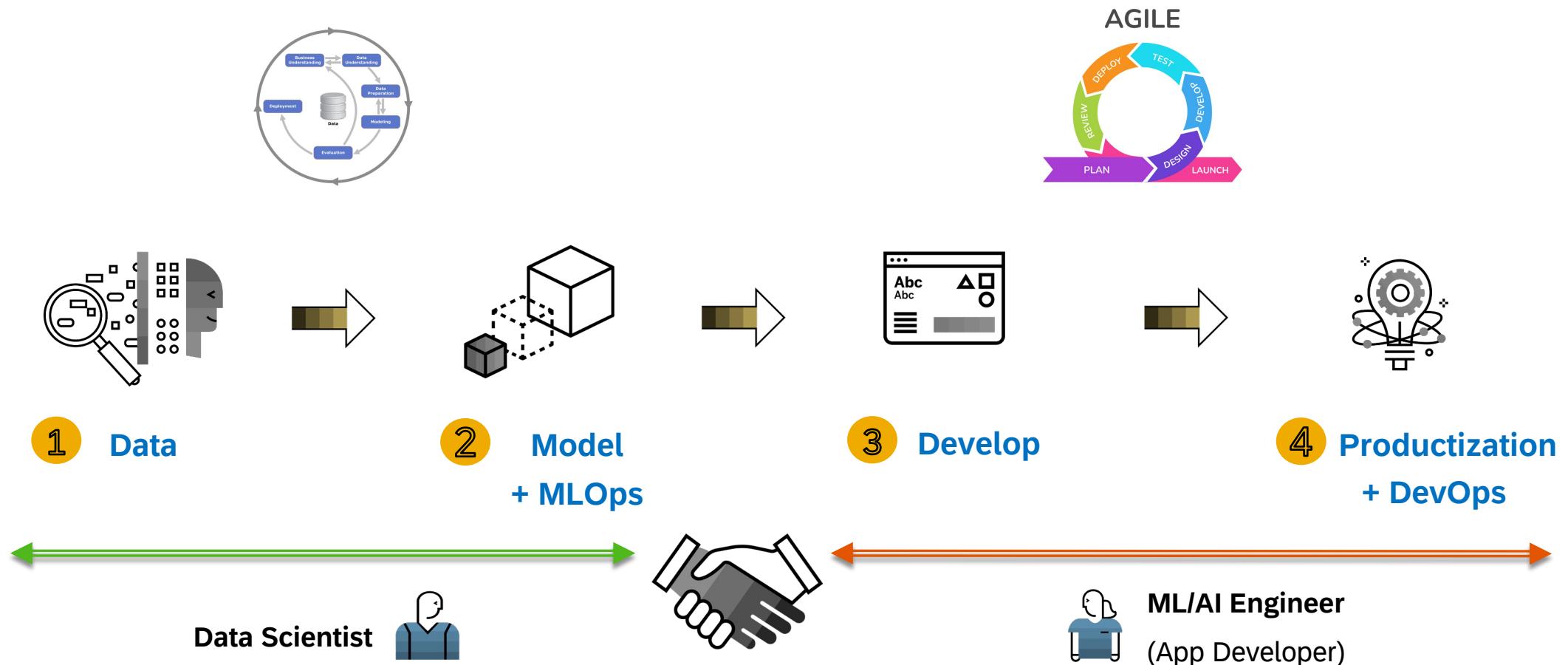
Gen AI – unsupervised phase



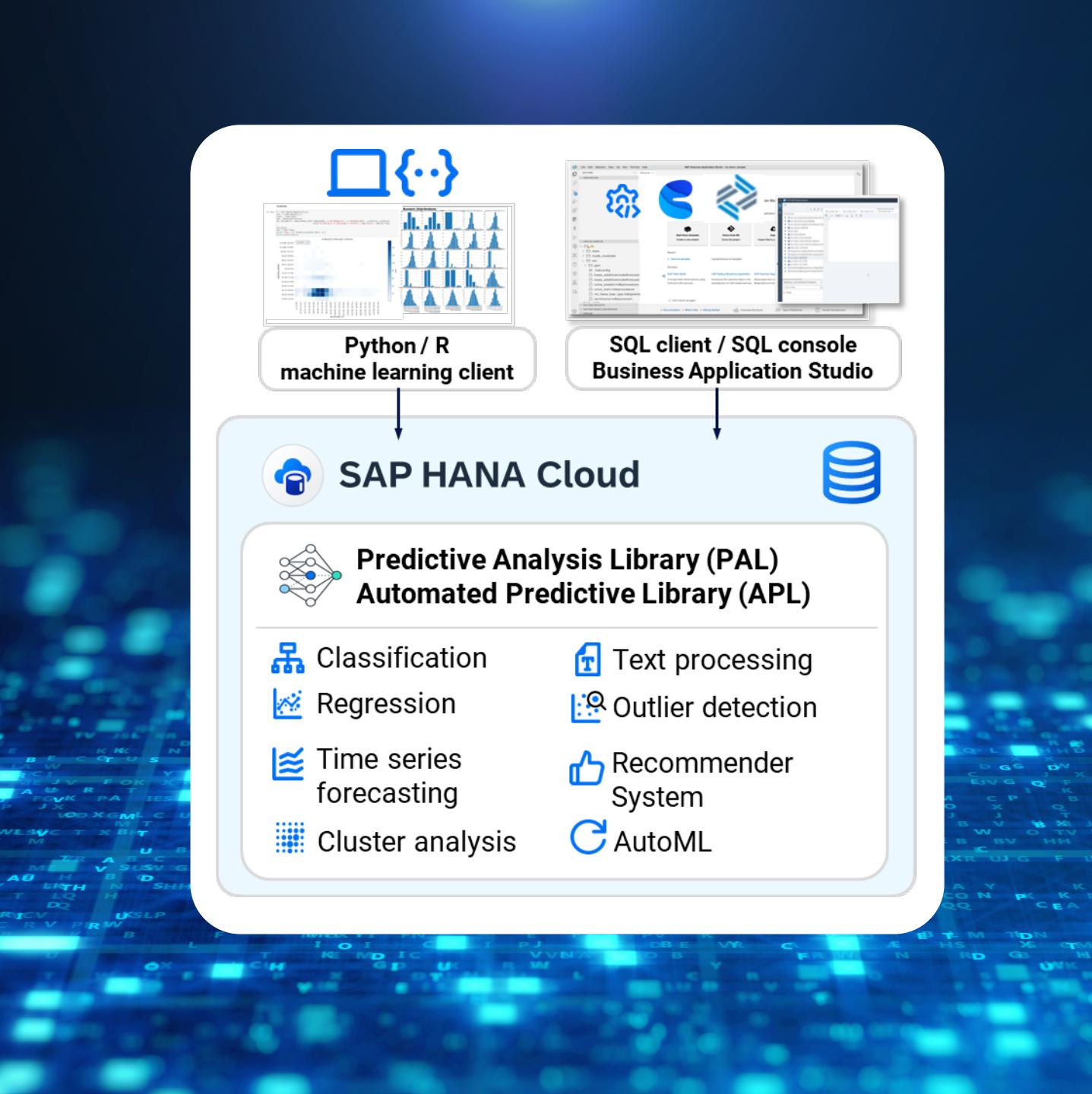
Gen AI – supervised phase



Development Approach | Building an Intelligent Data Application



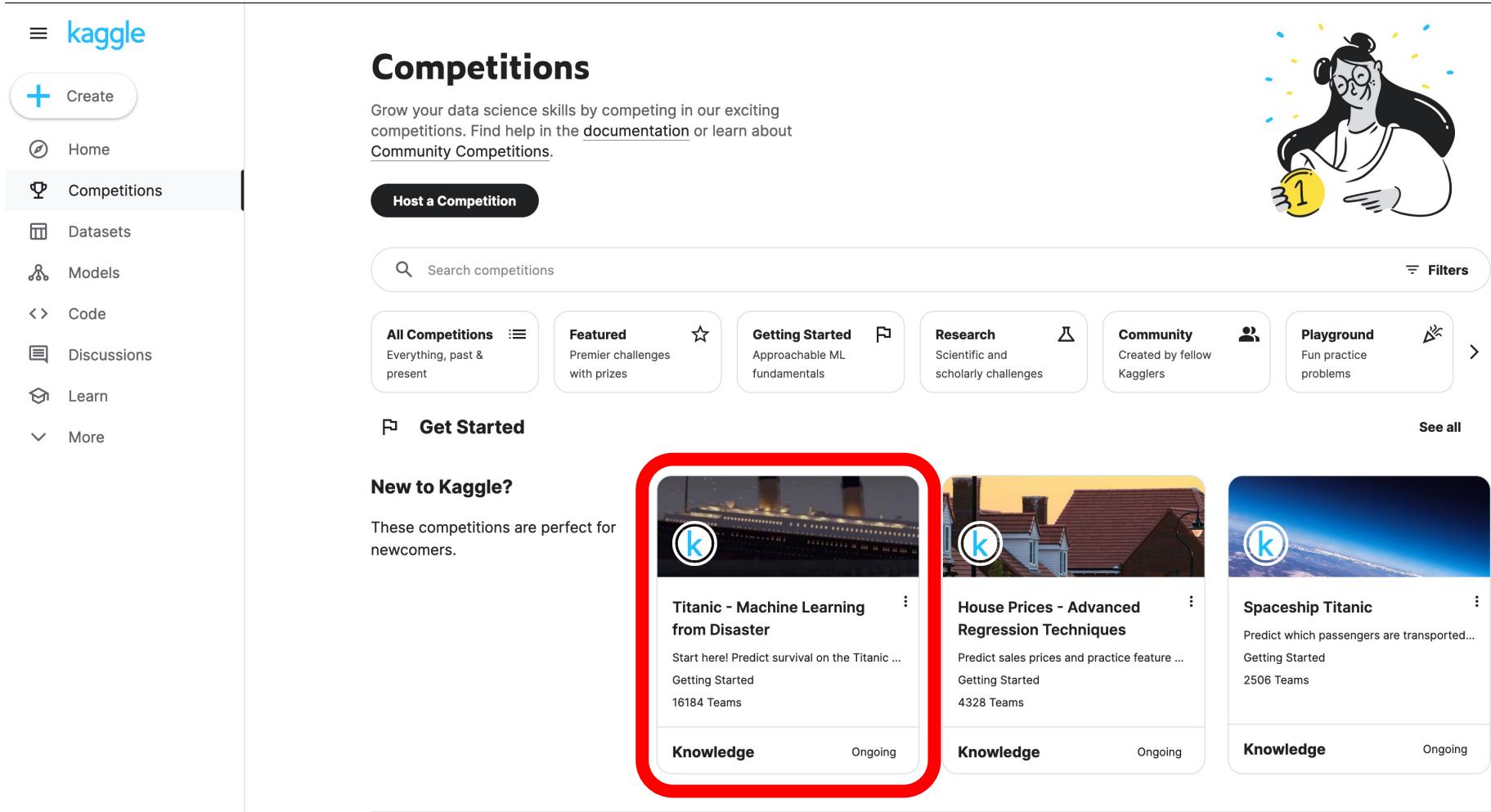
AI and Machine Learning with SAP HANA Cloud database



<https://community.sap.com/t5/technology-blogs-by-sap/what-s-new-in-sap-hana-cloud-september-2024/ba-p/13873862>



Your ML Challenge today:



The screenshot shows the Kaggle Competitions page. On the left is a sidebar with navigation links: kaggle, Create, Home, Competitions (which is selected), Datasets, Models, Code, Discussions, Learn, and More. The main content area has a header "Competitions". Below it is a sub-header: "Grow your data science skills by competing in our exciting competitions. Find help in the [documentation](#) or learn about [Community Competitions](#)". A "Host a Competition" button is present. A search bar with placeholder "Search competitions" and a "Filters" button are below. A horizontal navigation bar includes "All Competitions" (selected), "Featured", "Getting Started", "Research", "Community", and "Playground". A "Get Started" section follows, featuring three competitions: "Titanic - Machine Learning from Disaster" (highlighted with a red box), "House Prices - Advanced Regression Techniques", and "Spaceship Titanic". Each card shows the competition name, a thumbnail image, a brief description, the number of teams, and the status (Knowledge, Ongoing).

Competitions

Grow your data science skills by competing in our exciting competitions. Find help in the [documentation](#) or learn about [Community Competitions](#).

[Host a Competition](#)

Search competitions Filters

All Competitions Everything, past & present **Featured** Premier challenges with prizes **Getting Started** Approachable ML fundamentals **Research** Scientific and scholarly challenges **Community** Created by fellow Kagglers **Playground** Fun practice problems

[Get Started](#) See all

New to Kaggle?

These competitions are perfect for newcomers.

Titanic - Machine Learning from Disaster

Start here! Predict survival on the Titanic ...
Getting Started
16184 Teams

Knowledge Ongoing

House Prices - Advanced Regression Techniques

Predict sales prices and practice feature ...
Getting Started
4328 Teams

Knowledge Ongoing

Spaceship Titanic

Predict which passengers are transported...
Getting Started
2506 Teams

Knowledge Ongoing

Repo: <https://github.com/SAP-samples/hana-ml-py-codejam/>

(→ https://bit.ly/CJ_HANAML)

1. Pre-requisites:

<https://github.com/SAP-samples/hana-ml-py-codejam/blob/main/prerequisites.md>

2. Exercises:

<https://github.com/SAP-samples/hana-ml-py-codejam#the-exercises>

3. Worth watching:

<https://github.com/SAP-samples/hana-ml-py-codejam#additional-learning-material>

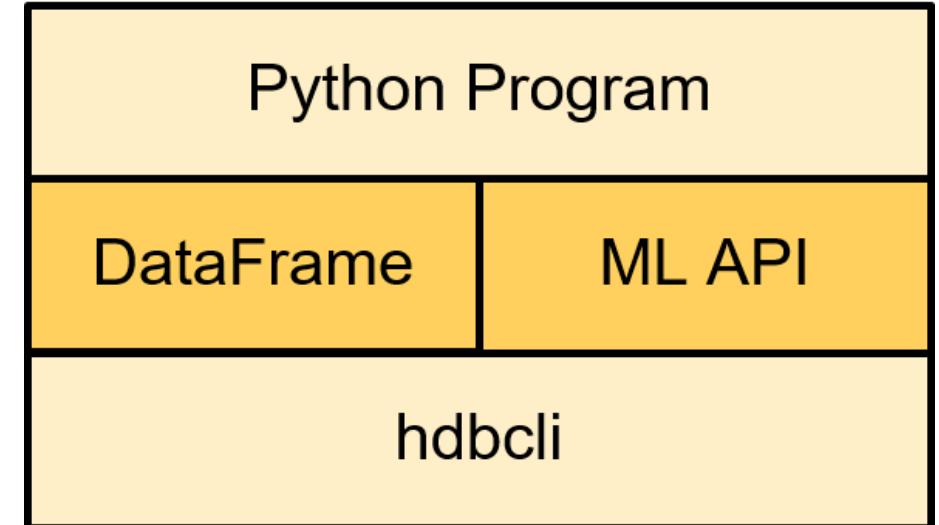
4. Try at home in your SAP BTP Trial:

<https://github.com/SAP-samples/sap-community-developer-challenge-eda-hana>

Understand DataFrame(s)

Data Scientist using Python

Pandas DataFrame <-> HANA DataFrame



SQL / SQLScript



Train datasets in Supervised Machine Learning

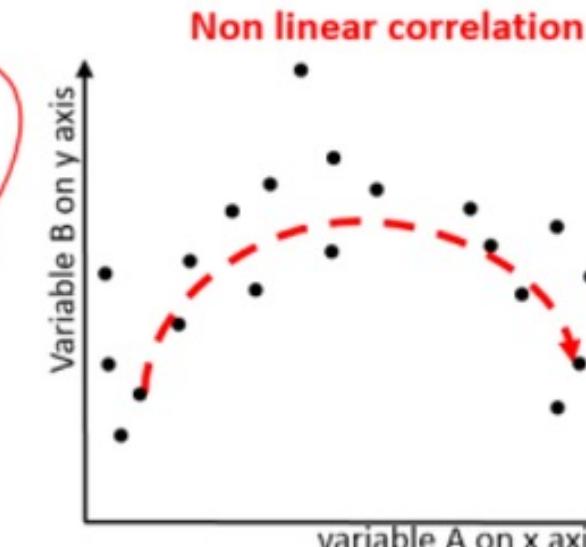
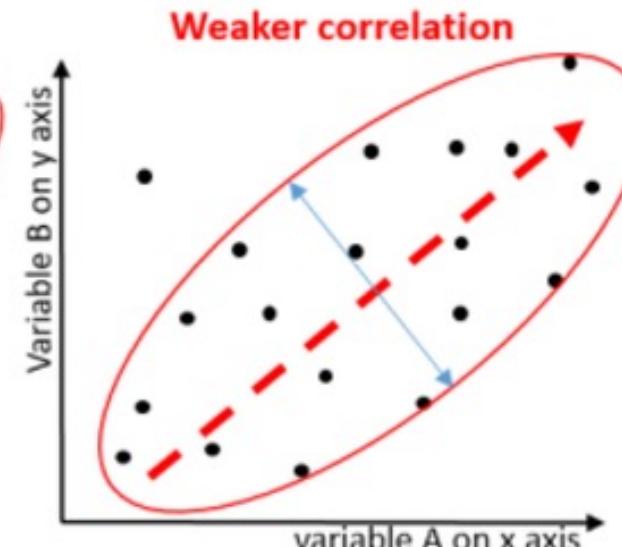
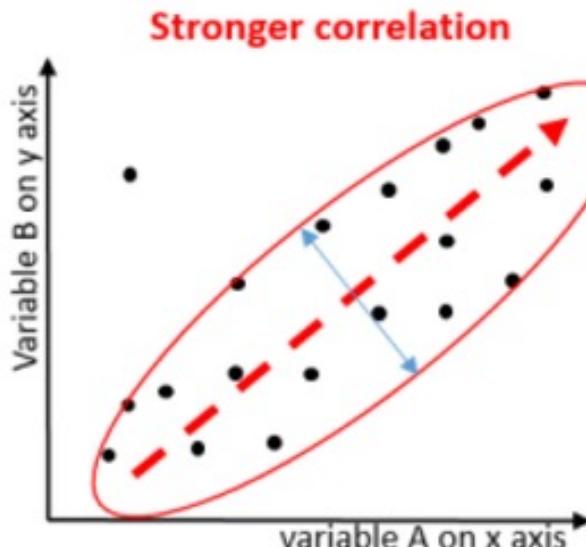
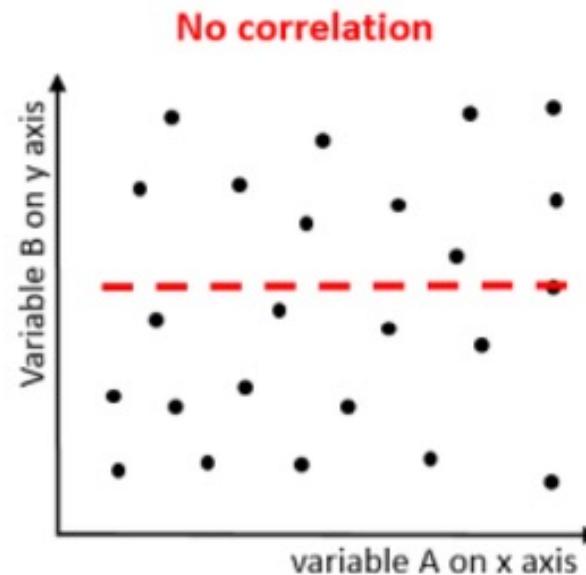
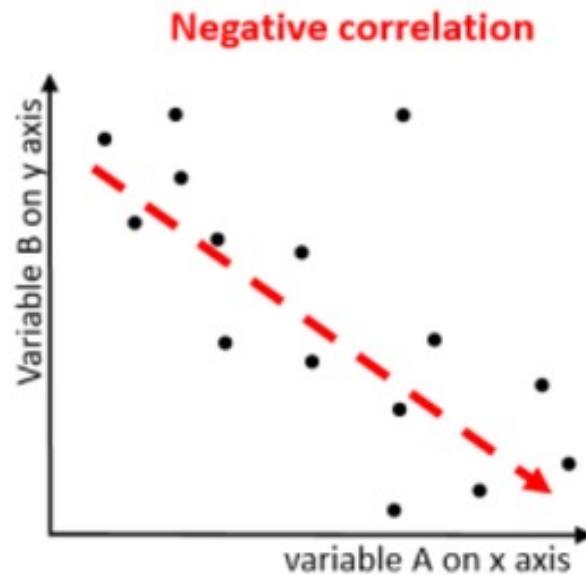
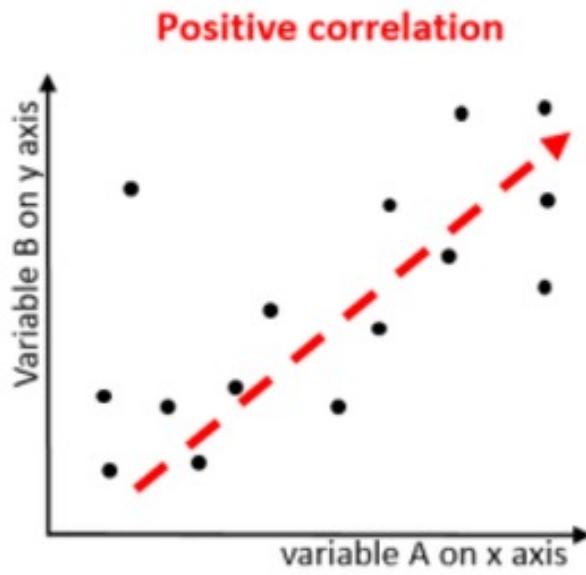
Observations

**(Variables)
Features**

Label

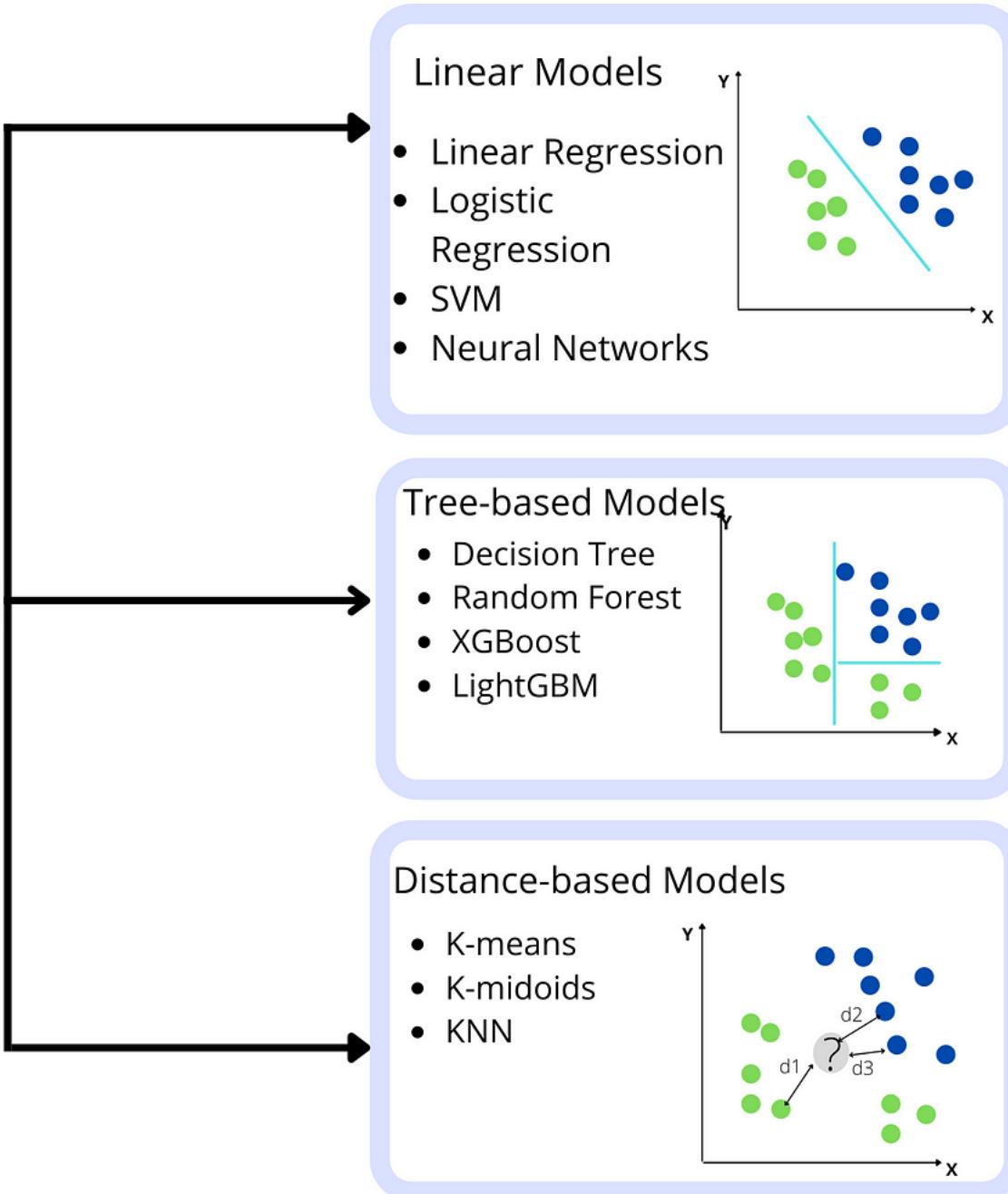
size	edge	color
small	dotted	green
big	striped	yellow
medium	normal	green

Correlation based on direction, form, and dispersion strength

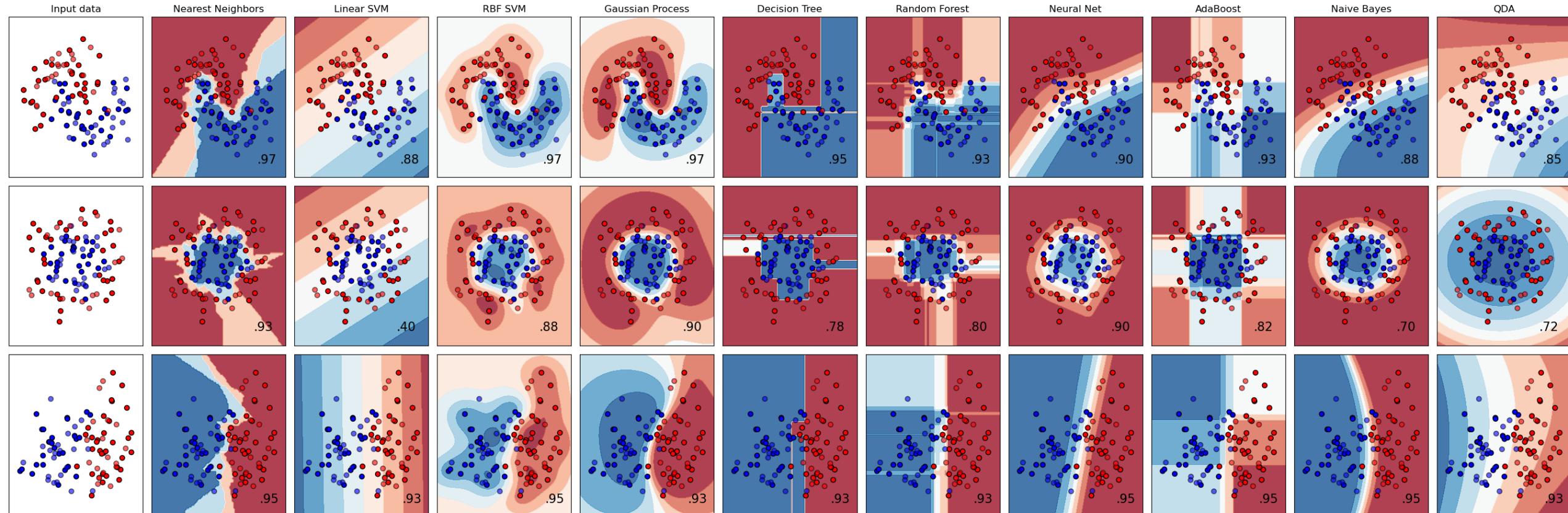


Decision Boundary

Decision
Boundary

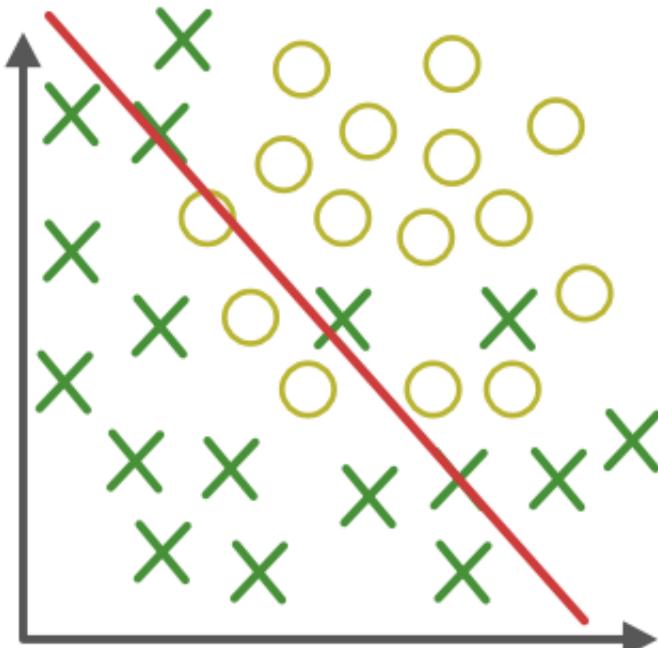


Decision Boundary (different classification algorithms)

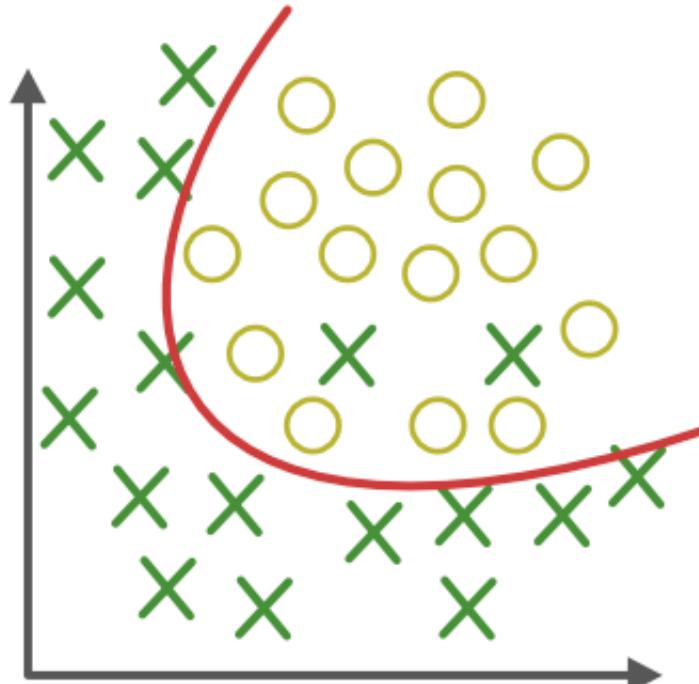


source: https://scikit-learn.org/stable/auto_examples/classification/plot_classifier_comparison.html

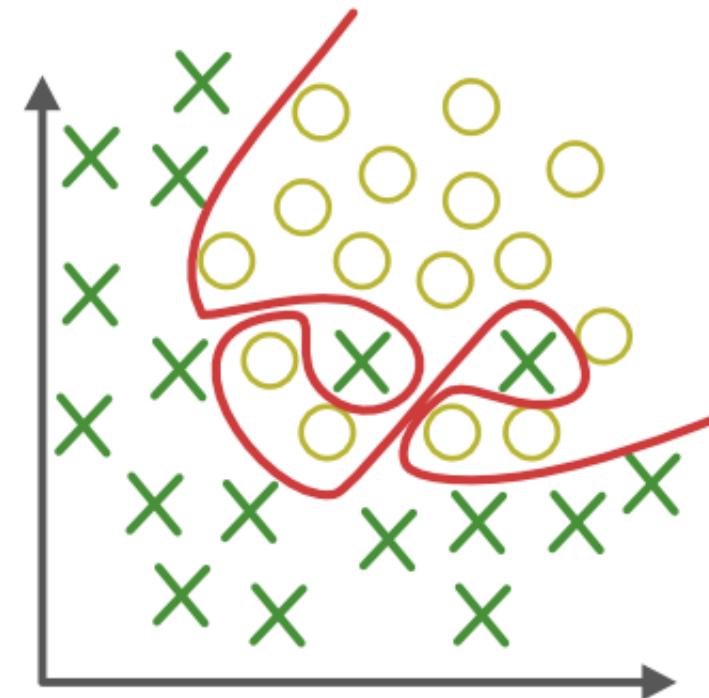
Underfitting and Overfitting



Under-fitting
(too simple to
explain the variance)



Appropriate-fitting



Over-fitting
(forcefitting--too
good to be true)

DG

From “black box”...



Predicted: **wolf**
True: **wolf**



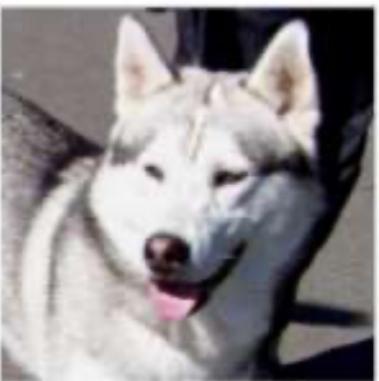
Predicted: **husky**
True: **husky**



Predicted: **wolf**
True: **wolf**



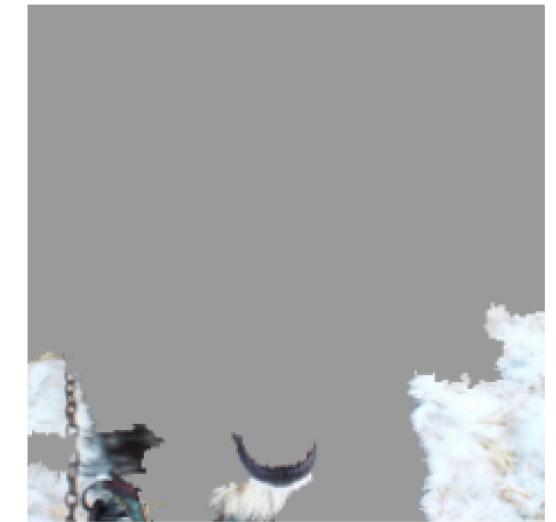
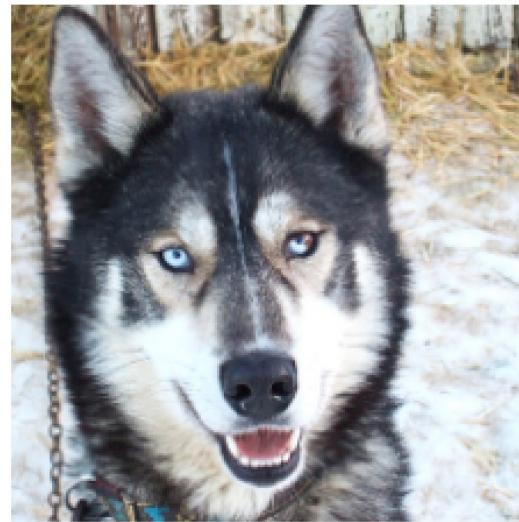
Predicted: **wolf**
True: **husky**



Predicted: **husky**
True: **husky**



Predicted: **wolf**
True: **wolf**

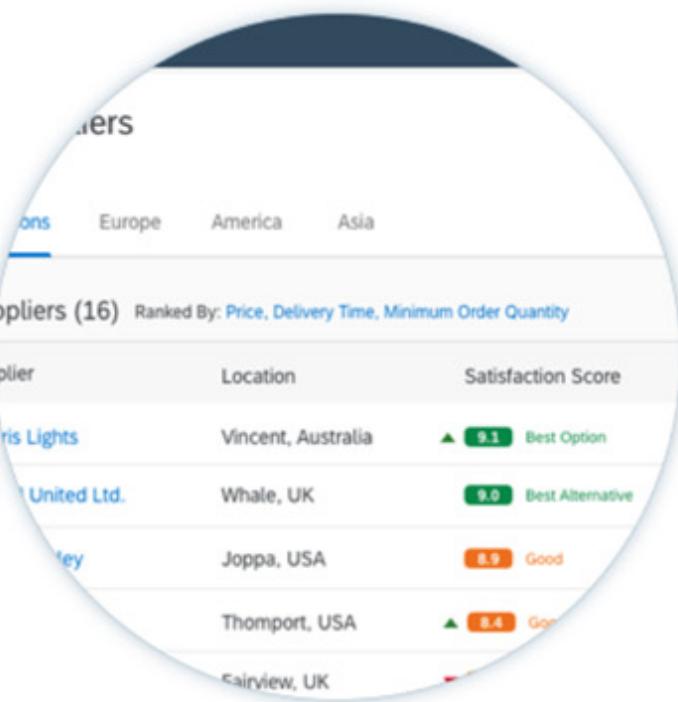


...to **Explainable AI (XAI)**

<https://experience.sap.com/fiori-design-web/explainable-ai/>

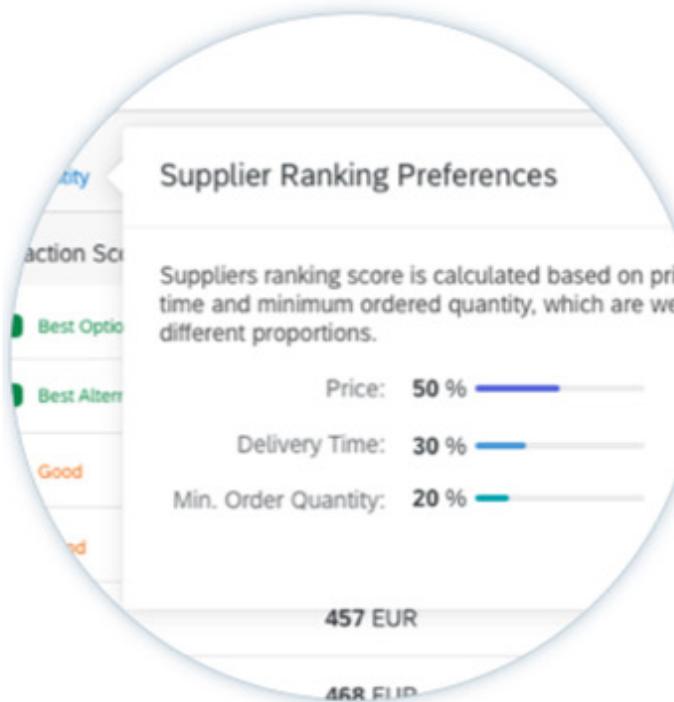
Level 1

WHAT



Level 2

WHY



Level 3

HOW



Minimum

Simple

Expert

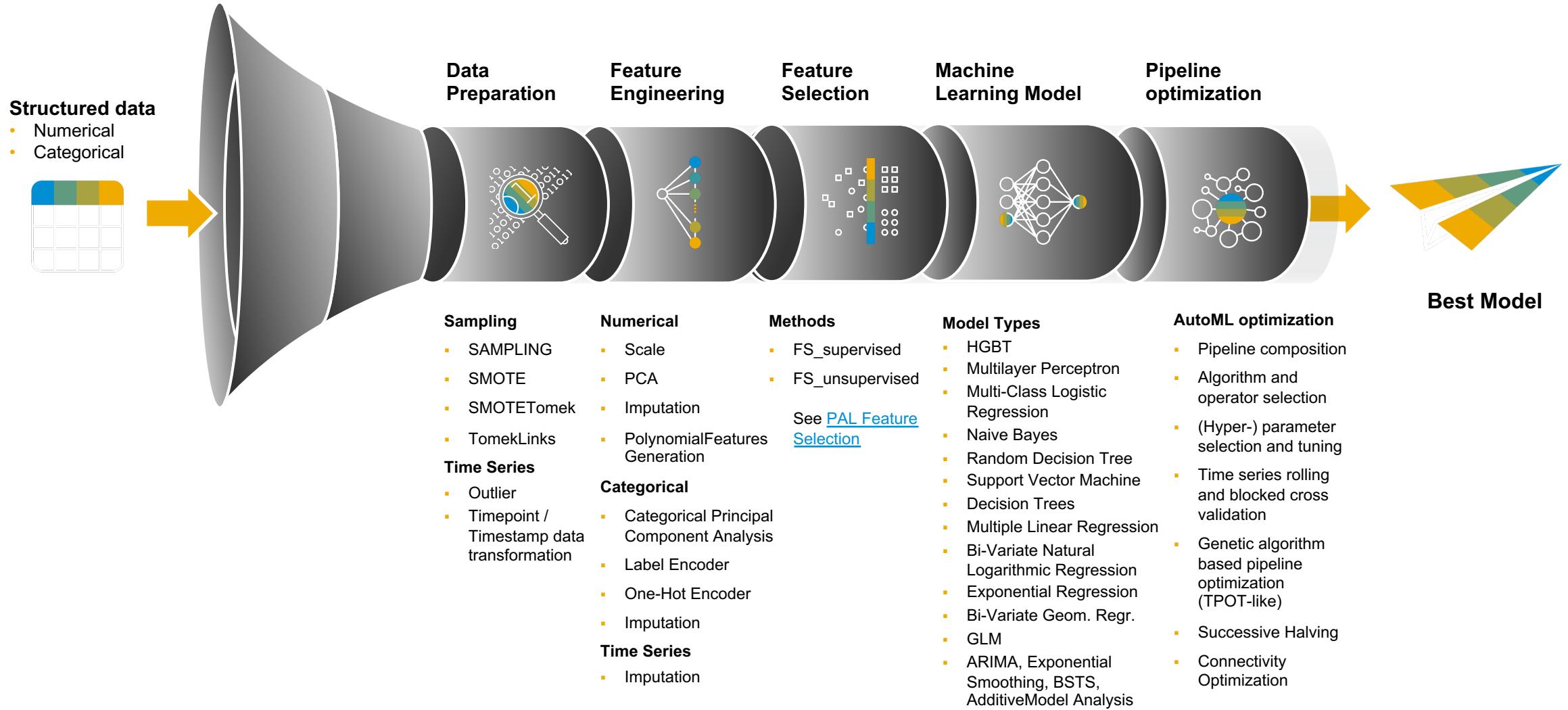
Confusion matrix

In predictive analytics, a **table of confusion** (sometimes also called a **confusion matrix**) is a table that reports the number of true positives, false negatives, false positives, and true negatives.

		Predicted class
		P
		N
Actual class	P	True positives (TP)
	N	False negatives (FN)
N	P	False positives (FP)
	N	True negatives (TN)

source: <https://subscription.packtpub.com/book/data/9781787125933/6/ch06lvl1sec41/looking-at-different-performance-evaluation-metrics>

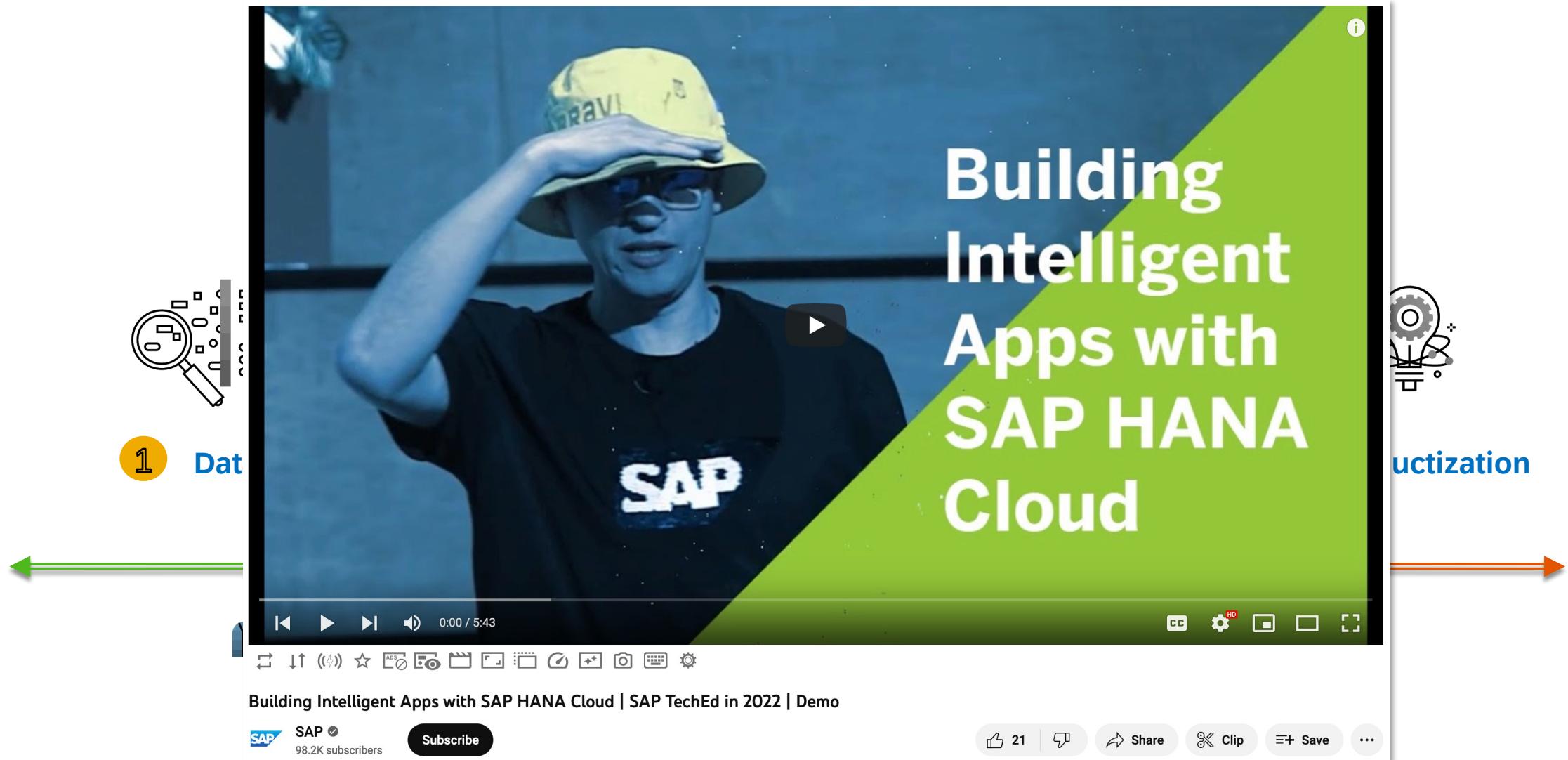
Predictive Analysis Library | Automated Machine Learning – Supported Operators



Additional content



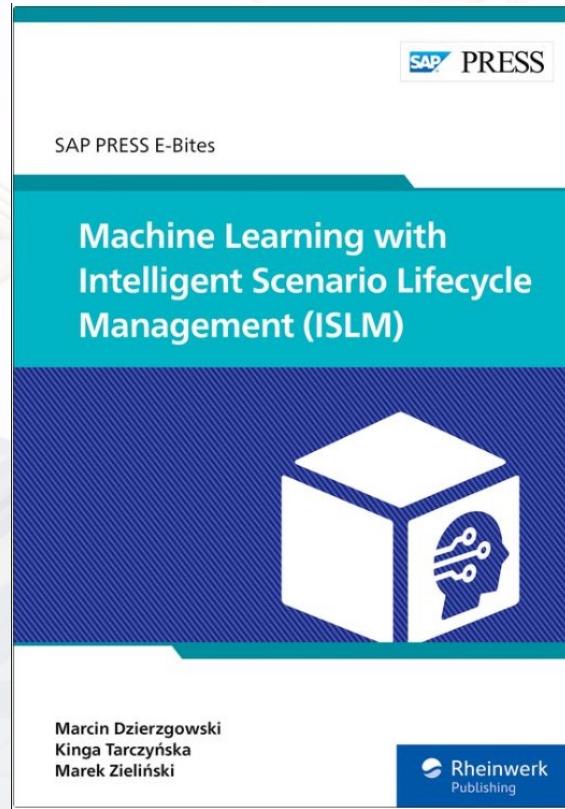
Development Approach | Building an Intelligent Data Application (demo)



Code samples: <https://github.com/SAP-samples/hana-ml-samples>

Screenshot of a GitHub repository page for "hana-ml-samples / Python-API / usecase-examples /". The repository was created by cmog (FairML - Fair Recruiting Model) on f009115 · 3 weeks ago. The page shows a list of code samples with their names, last commit messages, and dates.

Name	Last commit message	Last commit date
..		
diabetes-classification	Create OpenSAP-SAPHANA-HANA Machine Learning Demo (2...	2 years ago
estimate-car-price	update estimate car price	3 years ago
fairml-examples	FairML - Fair Recruiting Model	3 weeks ago
fraud-detection	fraud-detection use case	2 years ago
melbourne-housing-price	Add files via upload	4 years ago
ml-anonymized-data	Tutorial example - ML with HANA-ML Python ML client on HAN...	4 years ago
multimodel-analysis-airroutes	Update README.md	4 years ago
sapcommunity-automl-examples	update community call examples	2 years ago
sapcommunity-hanaml-challenge	Create SAP HANA Cloud Machine Learning Demo - Employee C...	7 months ago



Machine Learning with Intelligent Scenario Lifecycle Management (ISLM)

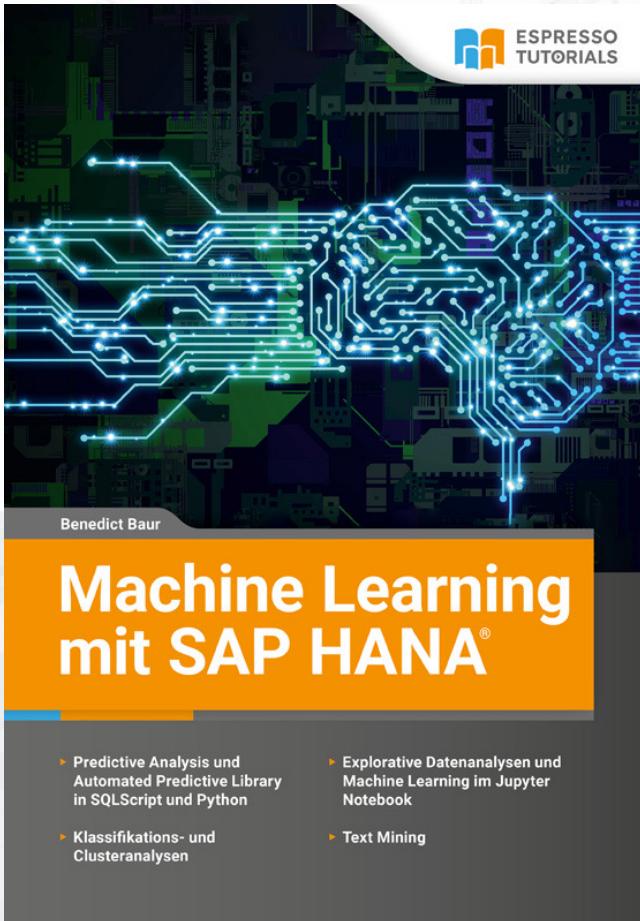
115 pages, 2023, E-Book
ISBN 978-1-4932-2395-4

www.sap-press.de/5668

Update your machine learning skills with Intelligent Scenario Lifecycle Management (ISLM)!

In this E-Bite, you'll develop a complete machine learning application for SAP S/4HANA using SAP HANA PAL, from data preparation and model building to training and prediction generation. You'll learn to use the ISLM framework to simplify machine learning implementation with standard apps for managing intelligent scenarios. Learn the ins and outs of machine learning with ISLM in this how-to guide!

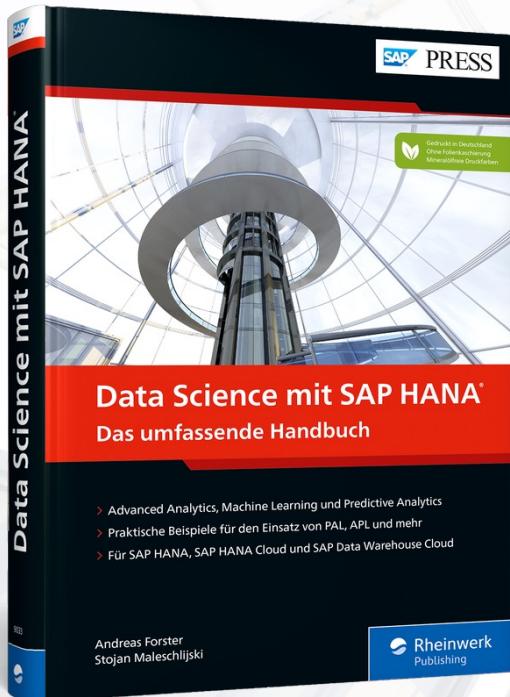
- Learn to use the ISLM framework in SAP S/4HANA
- Develop an end-to-end machine learning scenario with SAP HANA PAL
- Prepare data, train models, and implement predictions with ISLM



Machine Learning mit SAP HANA
von Benedict Baur
320 Seiten, 1. Auflage, ISBN: 9783960121237

Seit einigen Jahren preist die SAP das intelligente Unternehmen als Wettbewerbsvorteil an. Mit diesem Buch springen Sie mitten hinein in die Welt der künstlichen Intelligenz (KI). Erfahren Sie, welche Algorithmen die leistungsstarke In-Memory-Datenbank SAP HANA für das Machine Learning (ML) bereithält. Auf deren Basis lassen sich Muster und Gesetzmäßigkeiten in Datenbeständen erkennen und Vorhersagen treffen, die helfen, Geschäftsprozesse zu verbessern.

- Predictive Analysis und Automated Predictive Library in SQLScript und Python
- Klassifikations- und Cluster-Analysen
- Explorative Datenanalysen und Machine Learning im Jupyter Notebook
- Text Mining



Data Science mit SAP HANA
Das umfassende Handbuch
von [Andreas Forster, Stojan Maleschlijski](#)



Mit SAP HANA, SAP HANA Cloud und SAP Data Warehouse Cloud ist viel mehr möglich als das Speichern großer Datenmengen.

In diesem Buch erfahren Sie, wie Sie die Automated Predictive Library (APL) und die Predictive Analysis Library (PAL) einsetzen können, um komplexe Auswertungen vorzunehmen und Vorhersagen zu treffen. Praktische Beispiele zu Klassifizierung, Textanalyse, Clustering, Regression u.v.m. zeigen Ihnen die vielfältigen Möglichkeiten auf und lassen sich direkt auf Ihre Anwendungsfälle übertragen.

- Advanced Analytics, Machine Learning und Predictive Analytics
- Praktische Beispiele für den Einsatz von PAL, APL und mehr
- Für SAP HANA, SAP HANA Cloud und SAP Data Warehouse Cloud

SAP HANA Cloud Multi-model Further Learning

SAP HANA Cloud Basic Trial

- 30-days own-schema shared-instance
- <https://www.sap.com/products/technology-platform/hana/guided-experience.html>

SAP HANA Cloud Trial

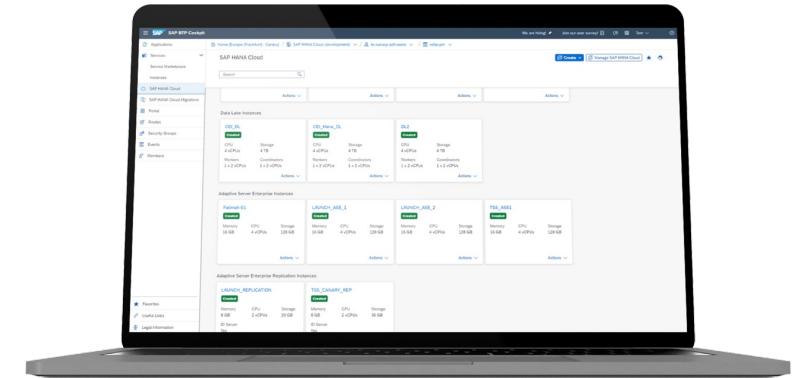
- 3x30-days own-instance in SAP BTP Trial
- 16GB RAM, 1 vCPU
- <https://developers.sap.com/tutorials/hana-trial-advanced-analytics.html>

SAP HANA Cloud Free Tier

- 30 GB RAM, 2 vCPUs
- <https://developers.sap.com/mission.hana-cloud-database-get-started.html>

SAP TechEd 2023 exercises

- DAT285v - Building Intelligent Data Applications with SAP HANA Cloud: <https://github.com/SAP-samples/teched2023-DA285v>
- DA263 - Build Innovative Business Applications with Database Services: <https://github.com/SAP-samples/teched2023-DA263>



Our Business AI is embedded across the portfolio

Relevant

Reliable

Responsible

Joule

The AI copilot that truly understands your business

Embedded AI capabilities

SAP Cloud ERP

SAP Supply Chain Management

SAP ERP
Human Capital Management

Spend Management
and SAP Business Network

SAP Customer Relationship Management

SAP Business Technology Platform

Customized AI

AI Foundation

on SAP Business Technology Platform

AI ecosystem partnerships and investments



Please, support Ukrainian business 💙💛 eg. Ugears Mechanical Models

<https://ugearsmodels.com/>

Free shipping on all orders of €60 or more!

UGEARs
Mechanical Models

CATALOG ▾ BEST DEALS CUSTOMER SERVICE ▾ UGEARs WORLDWIDE GIFT IDEAS ❤️

English ▾

NEW RELEASE

SERENITY'S DREAM YACHT

NASA SPACE SHUTTLE DISCOVERY

RESCUE HOVERCRAFT

STEGOSAURUS

LEARN MORE

SELF ASSEMBLY

Details are already cut and ready to assemble

MECHANICAL

The models produce motion

EDUCATIONAL

Perfect for family projects through hands-on STEM learning

<https://ugearsmodels.com/catalogue/preorder5/>



Thank you // Дякую // Obrigado!

Contact information:

Witalij Rudnicki, SAP Developer Advocacy

