

The Developer Advocates present

SAP CodeJam

2024



Getting Started with
Machine Learning using SAP HANA



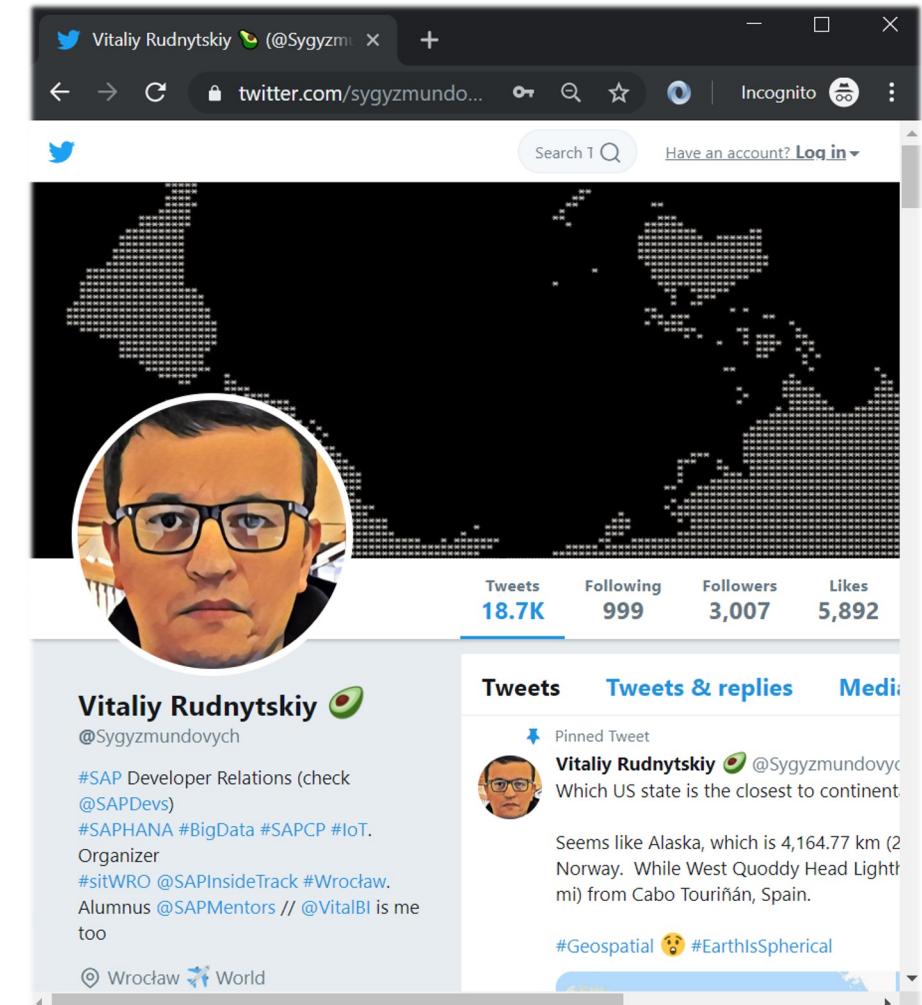
Wrocław, Poland
Oct 30, 2024



Witalij Rudnicki

aka @Sygymundovych
aka Vitaliy Rudnytskiy
aka Віталій Рудницький

- 10 years **tech consultant** in SAP BI/BW
- 10+ years as 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**



Events not be missed



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://www.sap.com/events/teched/virtual.html>:

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://www.youtube.com/playlist?list=PL6RpkC85SLQDHz97qsNTNAE2jnUKj8X5d>

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



Devtoberfest

SAP TechEd

June Developer Challenge: SAP HANA multi-model, incl. Vector Engine

The Timeline

Just check the challenges each Wednesday during the following four weeks to get the new one.

Mark your calendars! Here's the game plan:

June 5th	Start of the Challenge	Setup exercise	Submissions
June 12th	Week 2	Words as Vectors	Submissions
June 19th	Week 3		
June 26th	Week 4		
July 3rd	Final deadline		

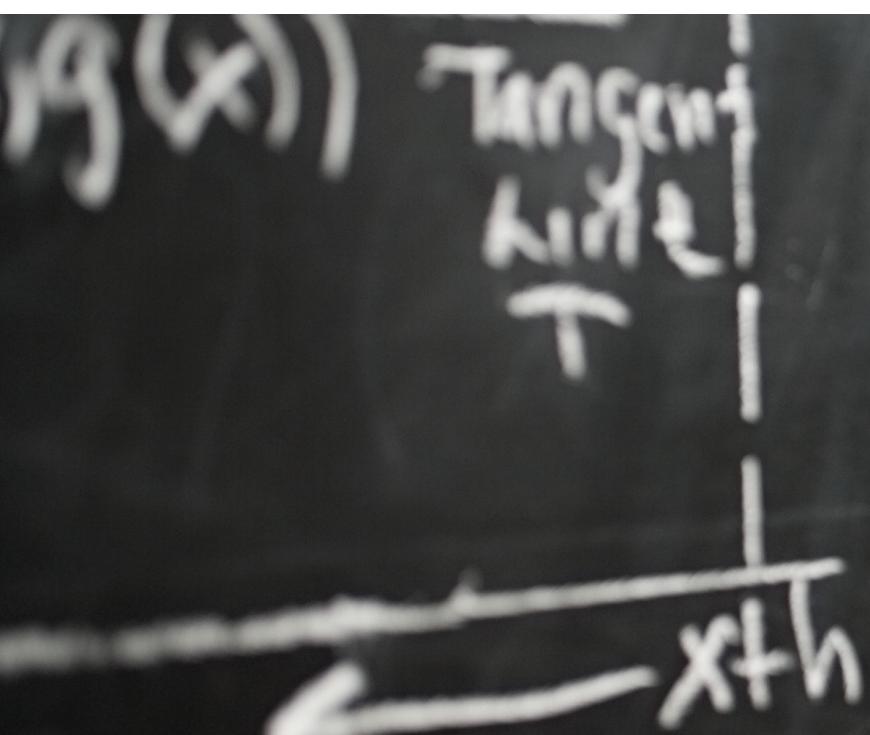
Ready, Set, Code!

Have fun, experiment boldly, and good luck!



source: <https://community.sap.com/t5/application-development-blog-posts/developer-challenge-sap-hana-multi-model-using-python-in-sap-business/ba-p/13722560>

A bit of theory before we start



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

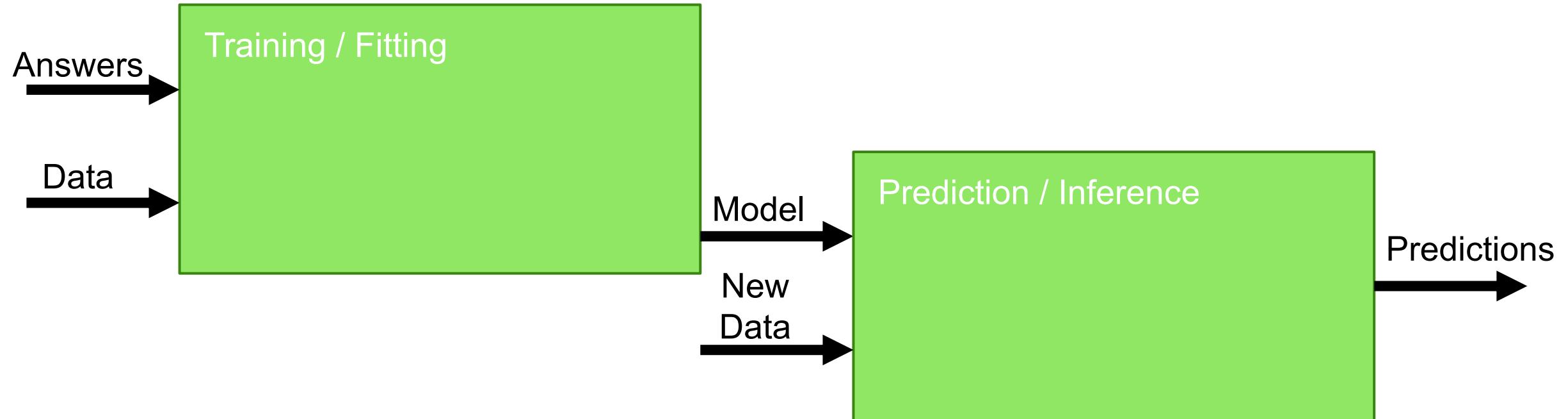
$$= \lim_{h \rightarrow 0} \frac{x^2 + 2xh + h^2 - x^2}{h}$$

$$= 1$$

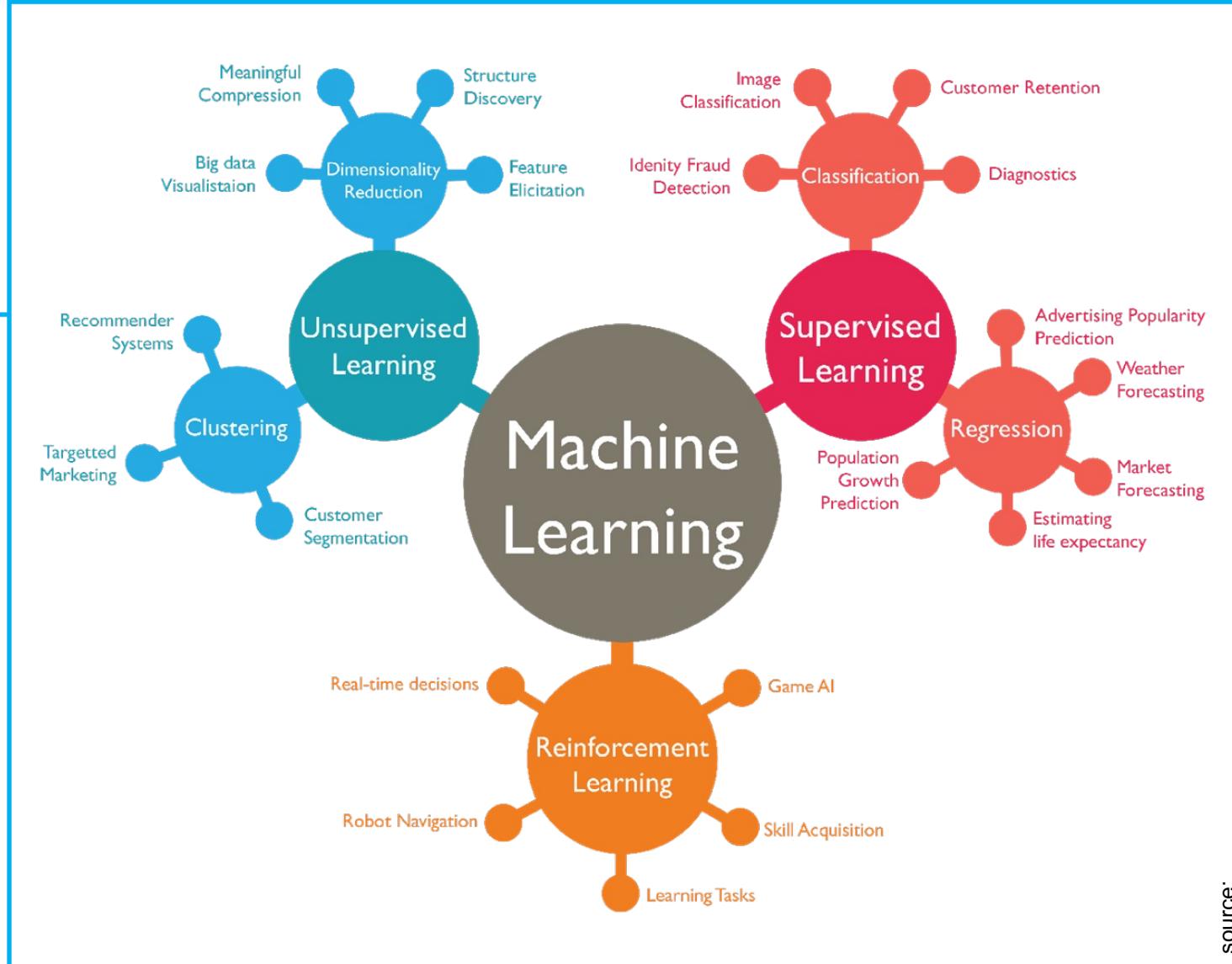
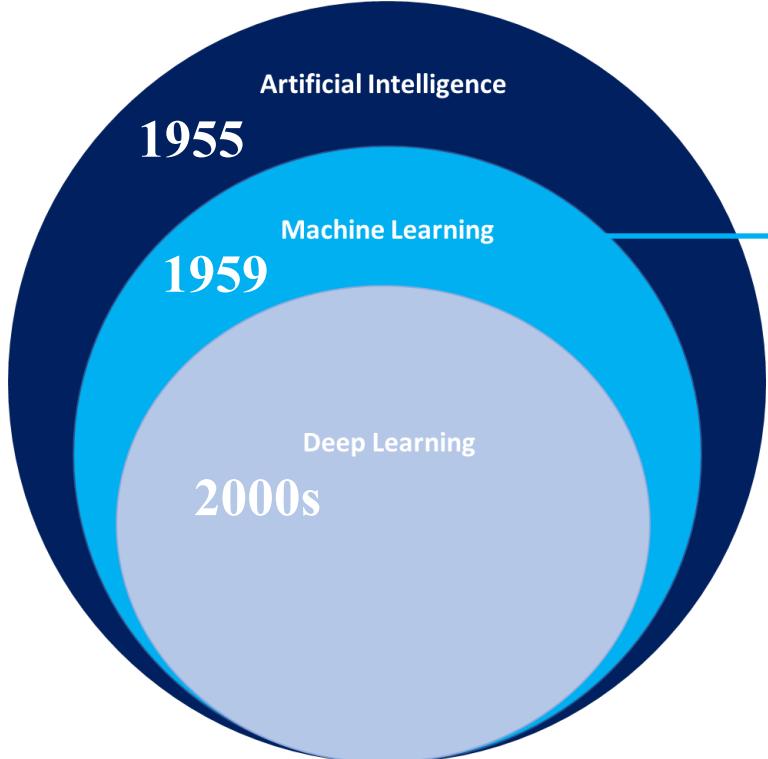
$$= 2x$$

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

Machine Learning



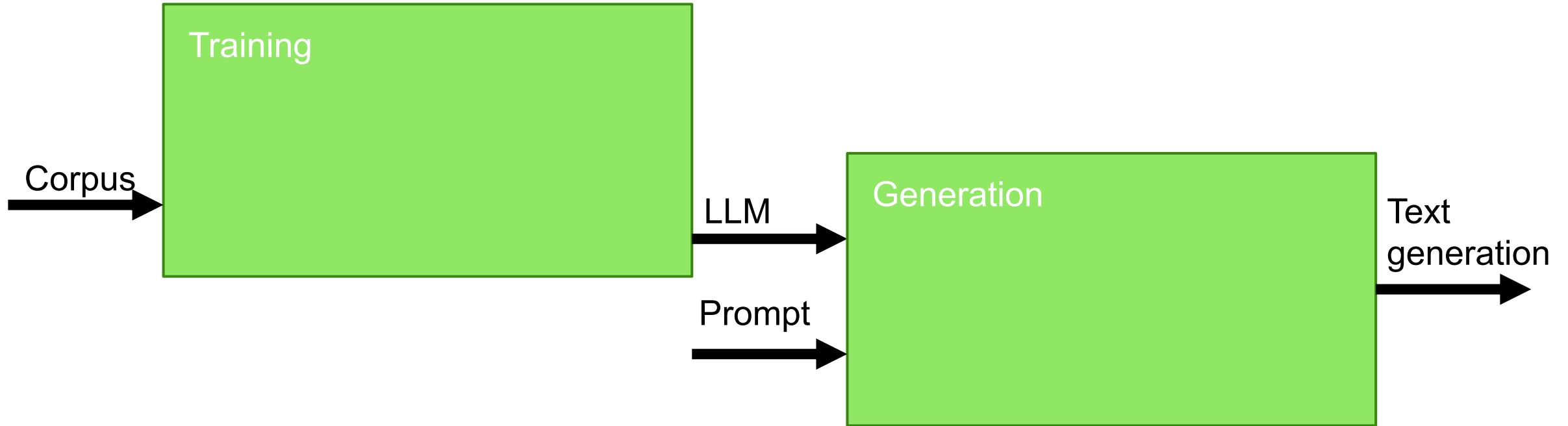
Machine Learning Terminology



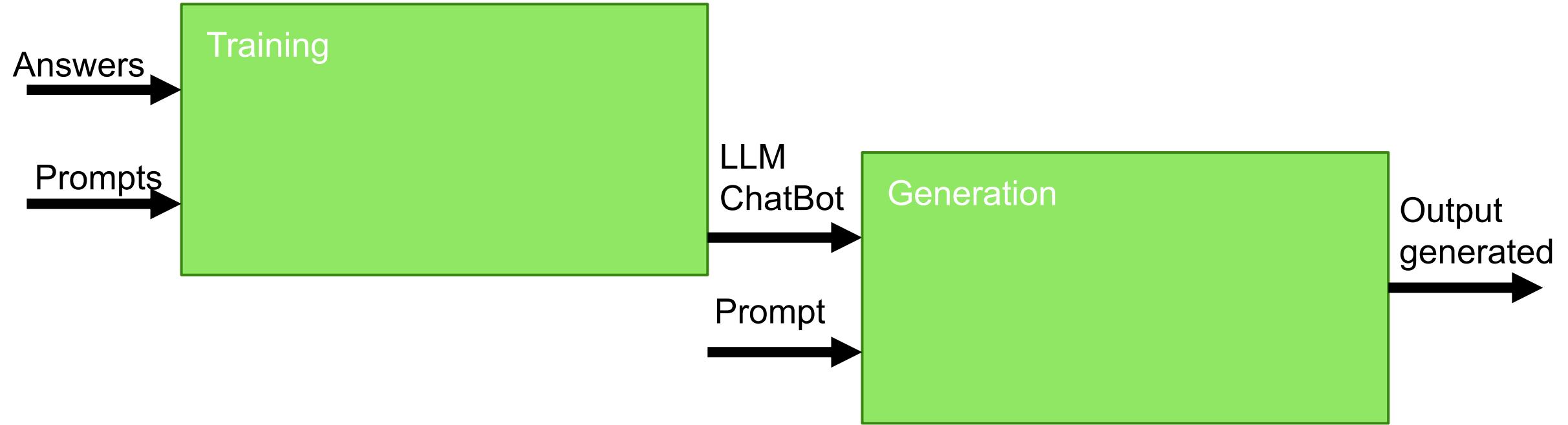
source:

<https://www.researchgate.net/publication/337958773> A Novel Approach for Improving Breast Cancer Risk Prediction using Machine Learning Algorithms A Survey

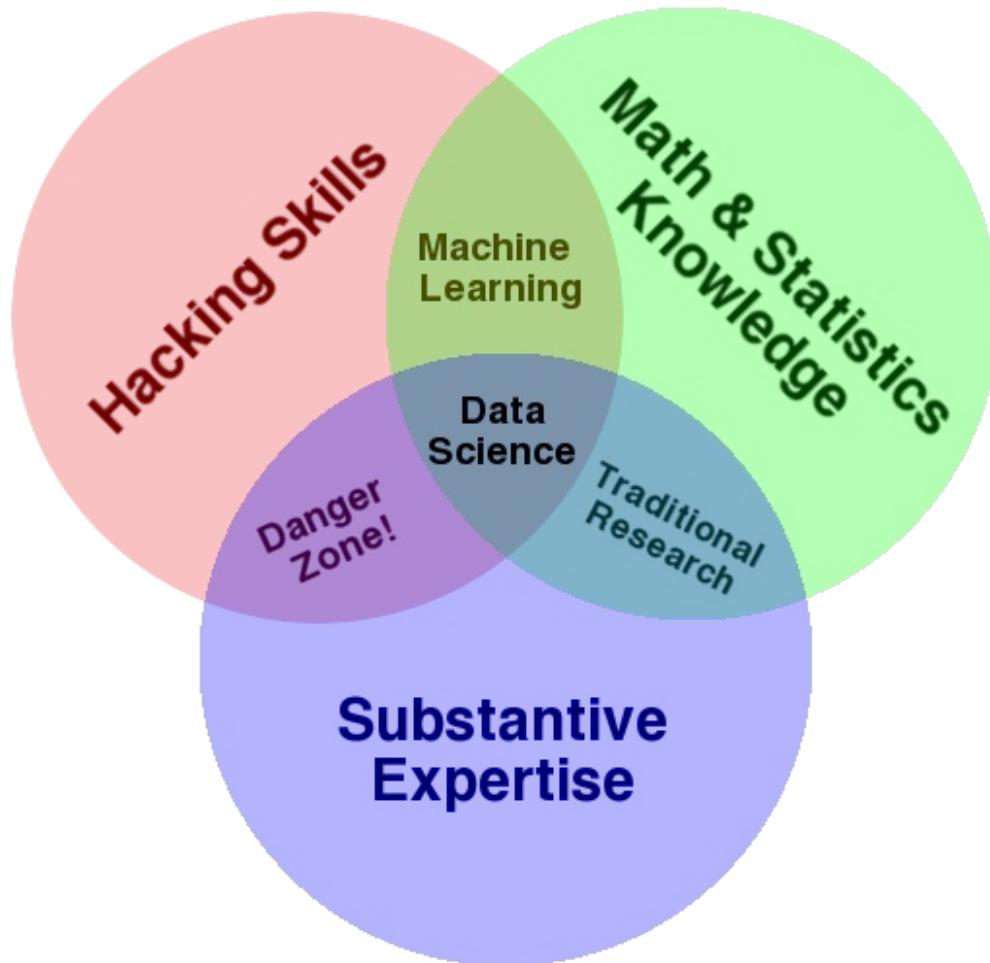
Gen AI – unsupervised phase



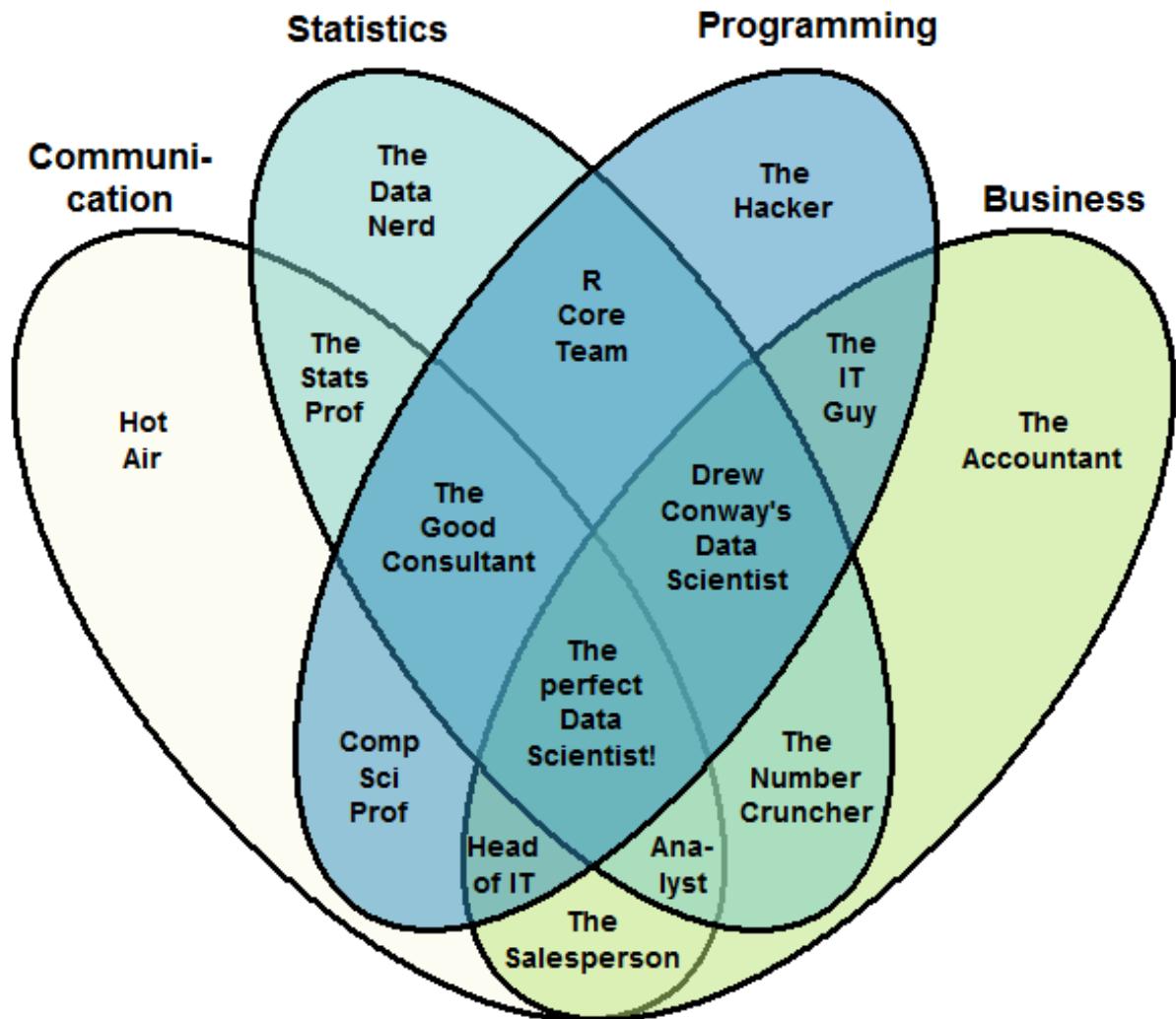
Gen AI – supervised phase



Who is the Data Scientist?

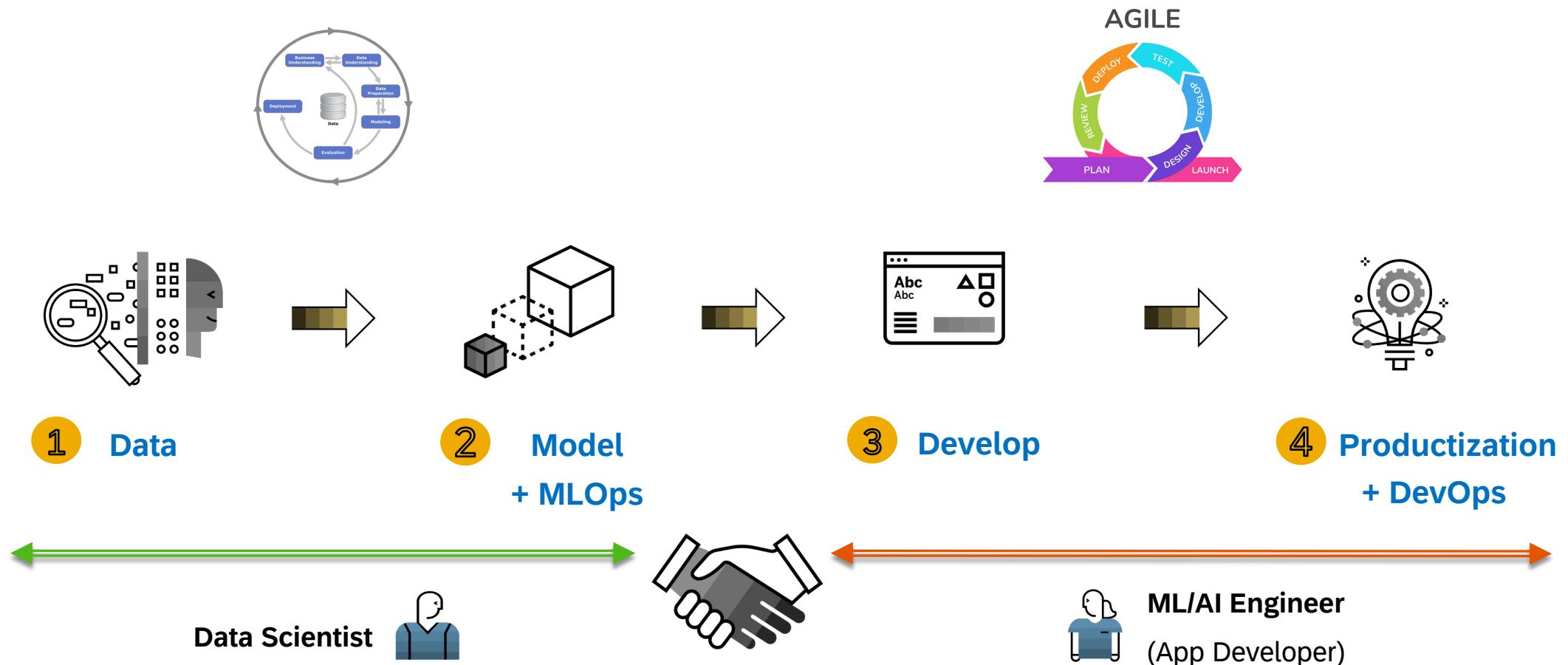


Drew Conway's Data Scientist Venn Diagram

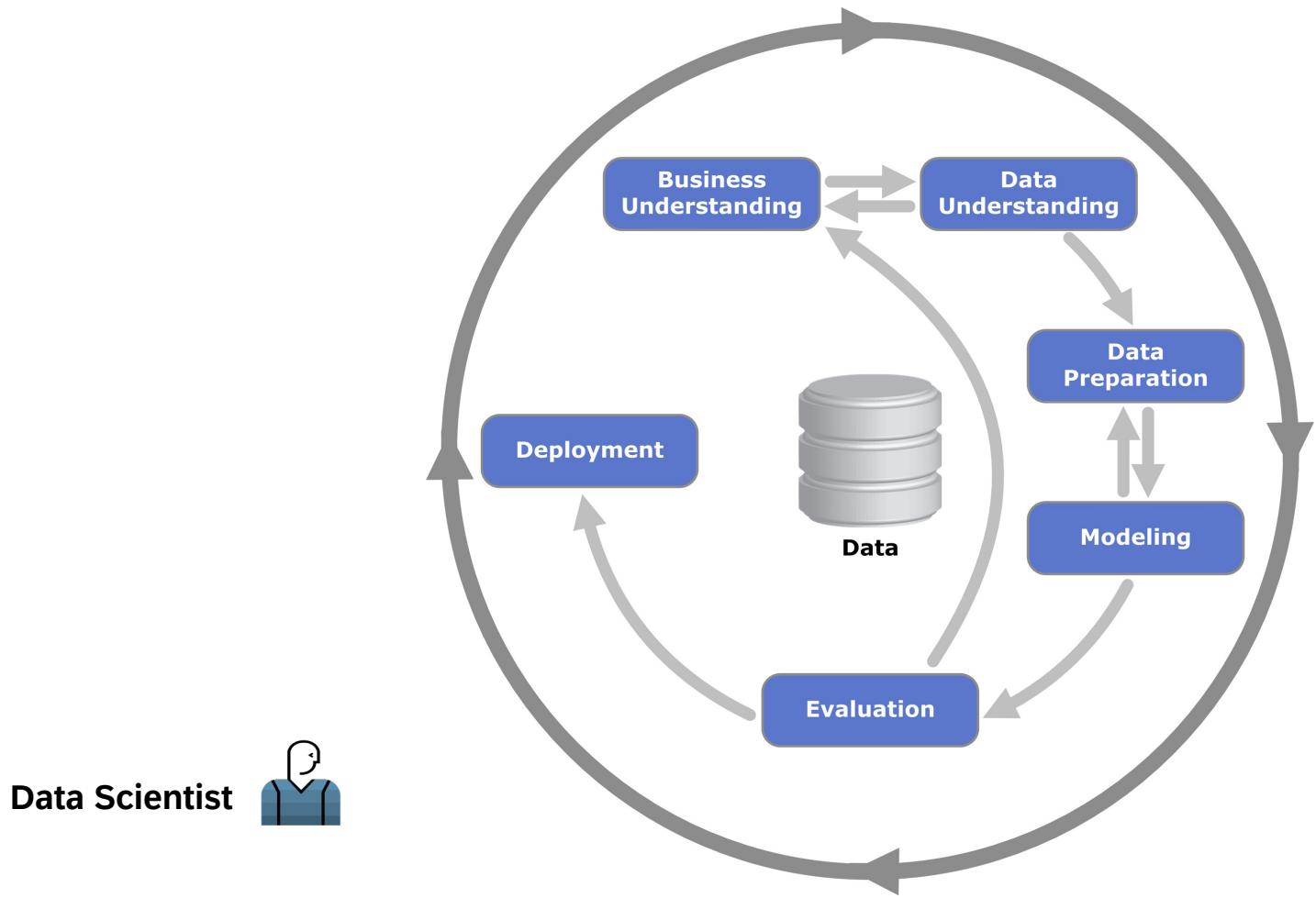


Stephan Kolassa's Data Scientist Venn Diagram

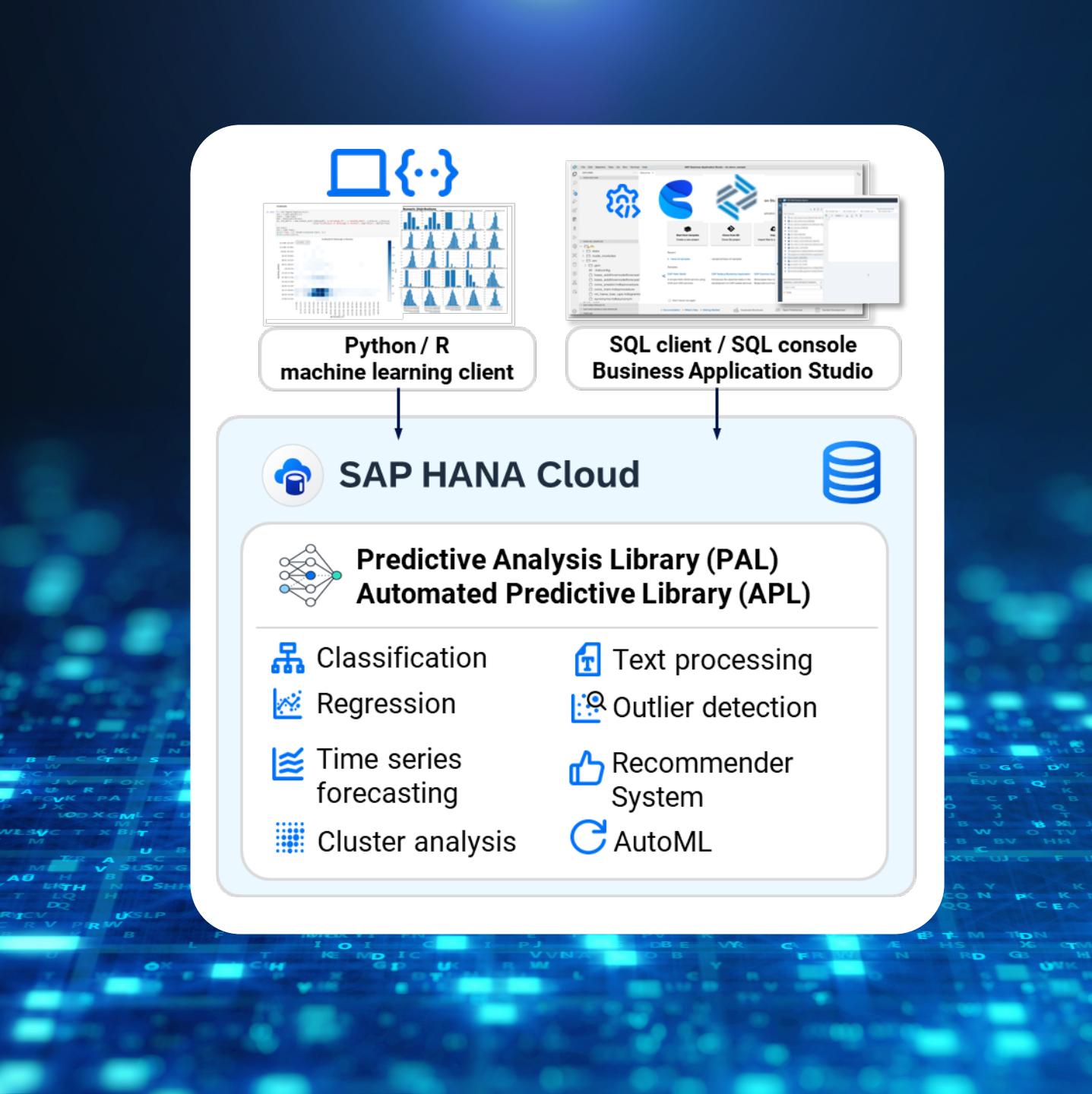
Development Approach | Building an Intelligent Data Application



Development Approach | Training a Model



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>



Exercises



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>

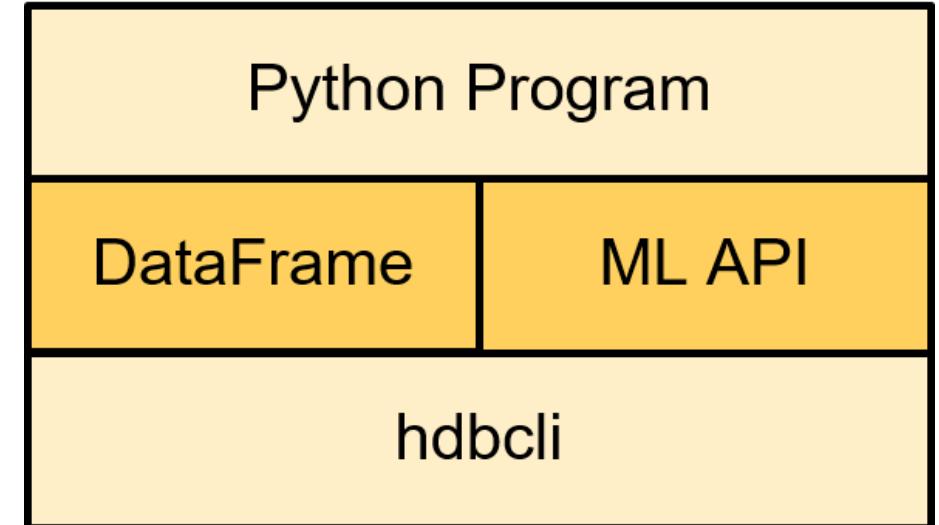
4. Try at home in your SAP BTP Trial:

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

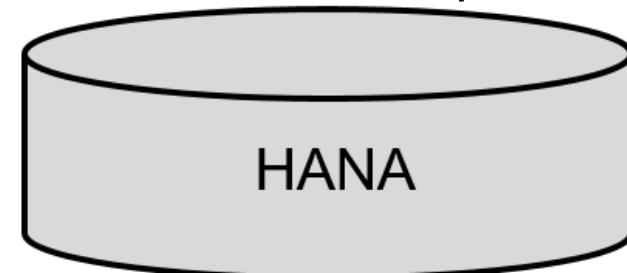
Understand DataFrame(s)

Data Scientist using Python

Pandas DataFrame <-> HANA DataFrame

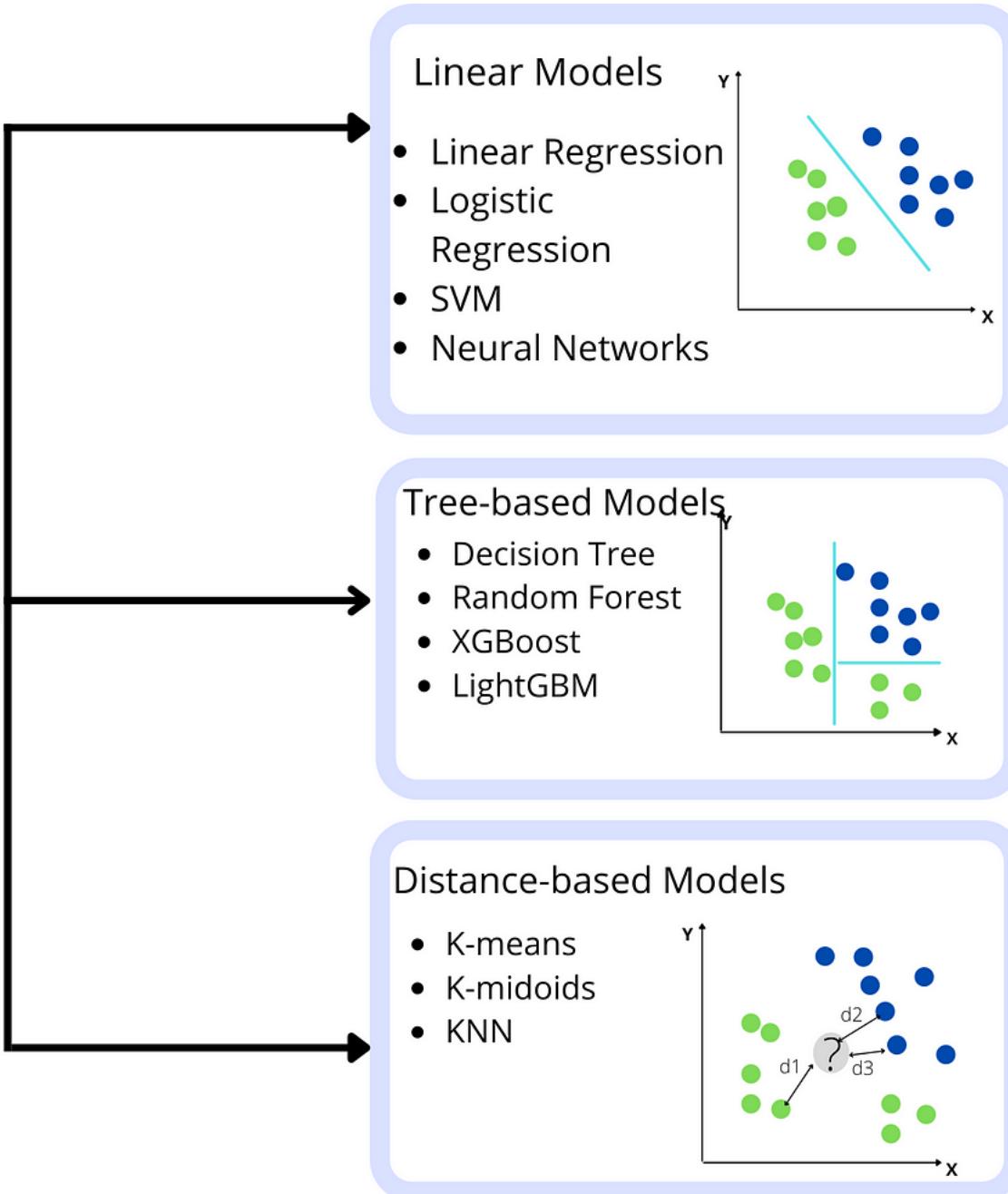


SQL / SQLScript

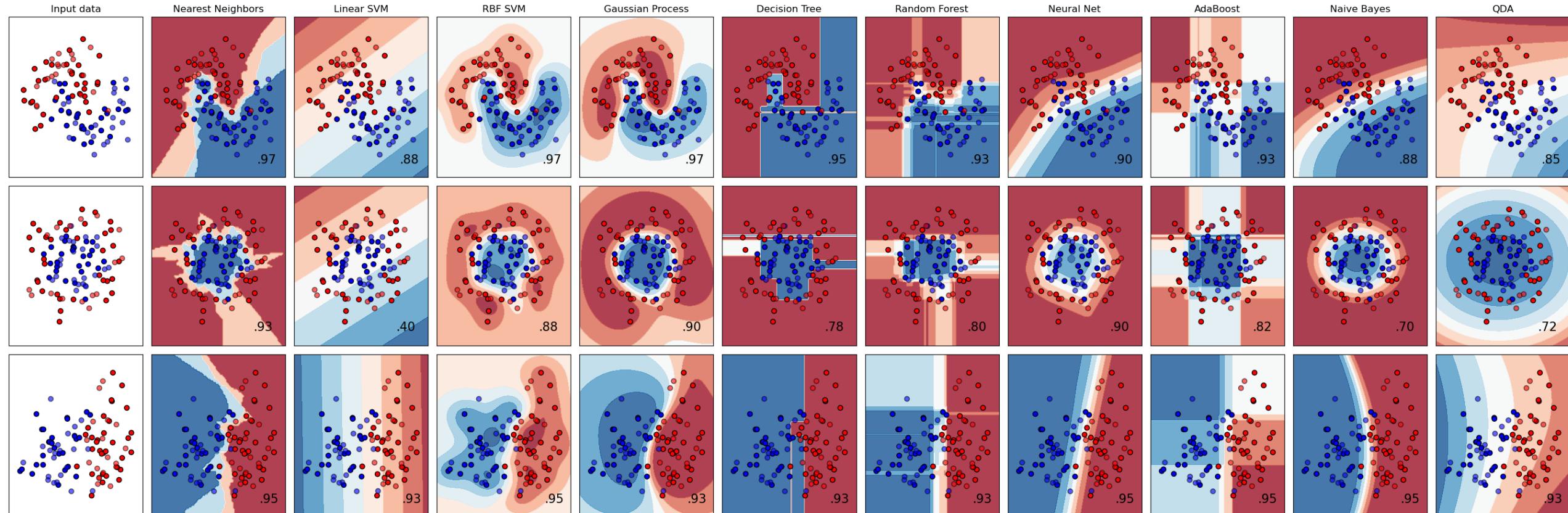


Decision Boundary

Decision
Boundary

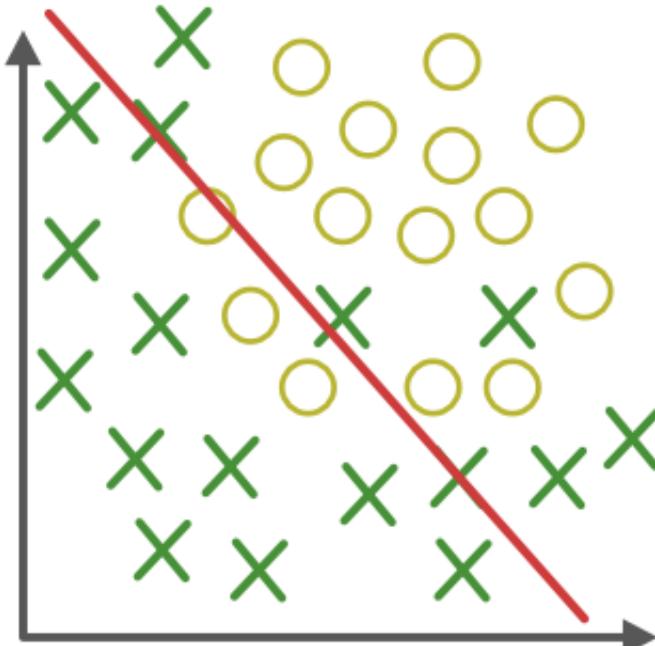


Decision Boundary (different classification algorithms)

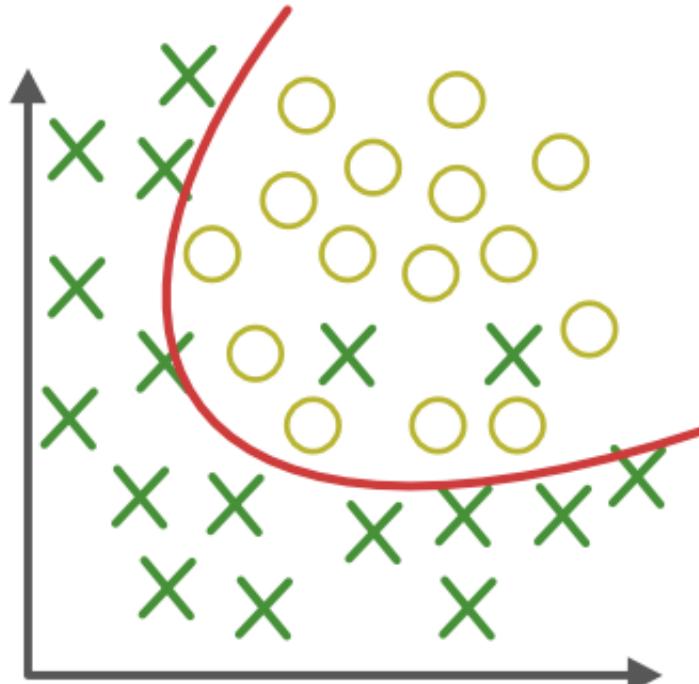


source: https://scikit-learn.org/stable/auto_examples/classification/plot_classifier_comparison.html

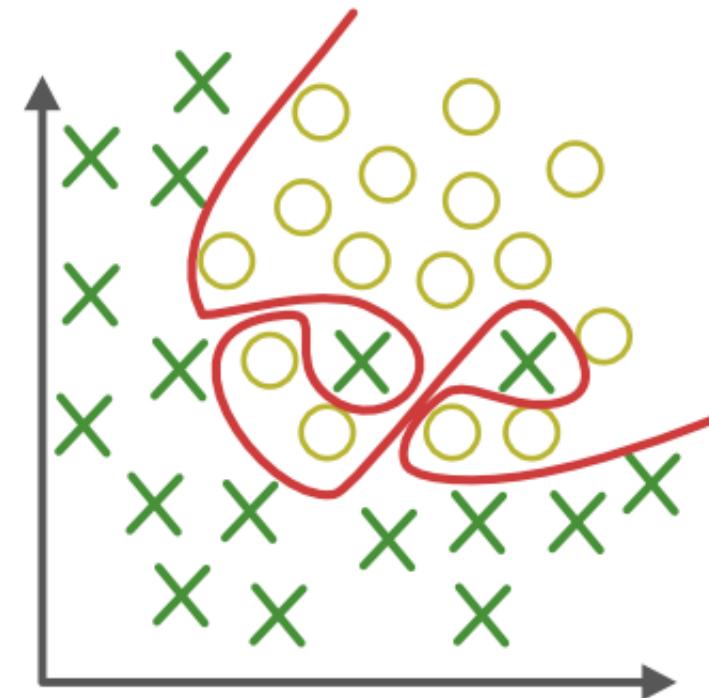
Underfitting and Overfitting



Under-fitting
(too simple to
explain the variance)



Appropriate-fitting

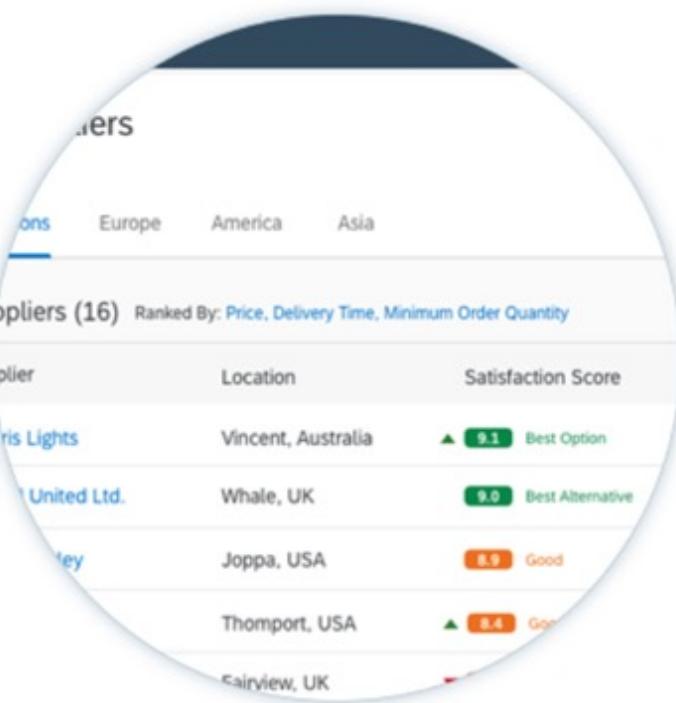


Over-fitting
(forcefitting--too
good to be true)

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

Level 1

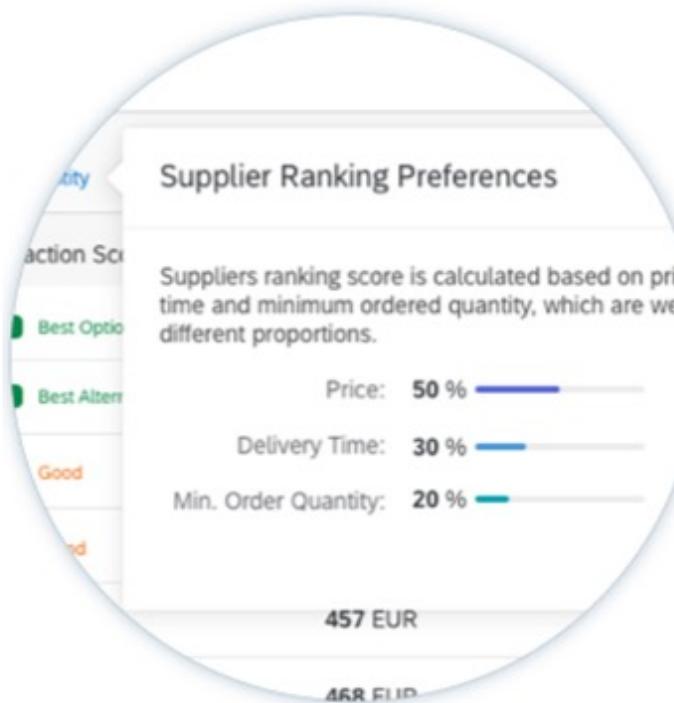
WHAT



Minimum

Level 2

WHY



Simple

Level 3

HOW



Expert

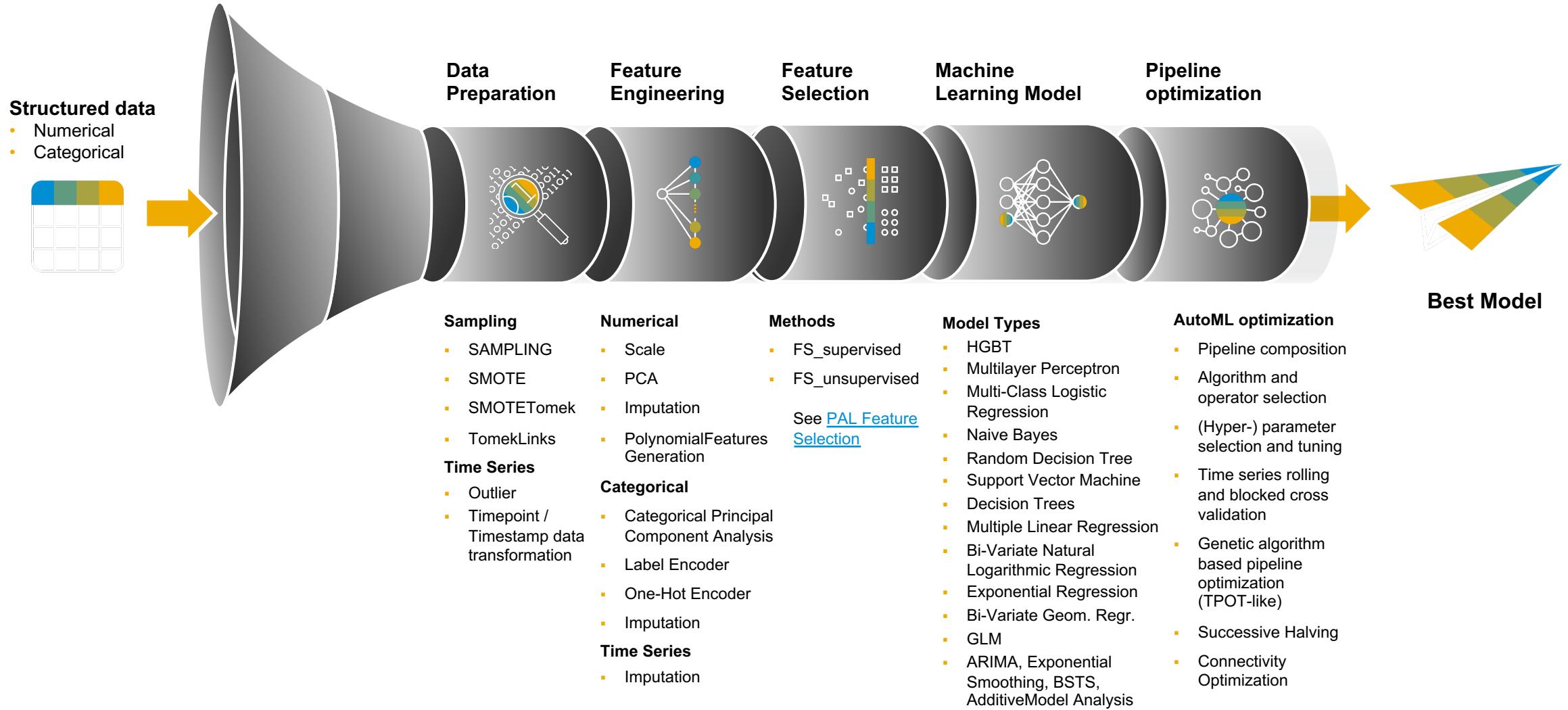
Confusion matrix

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>

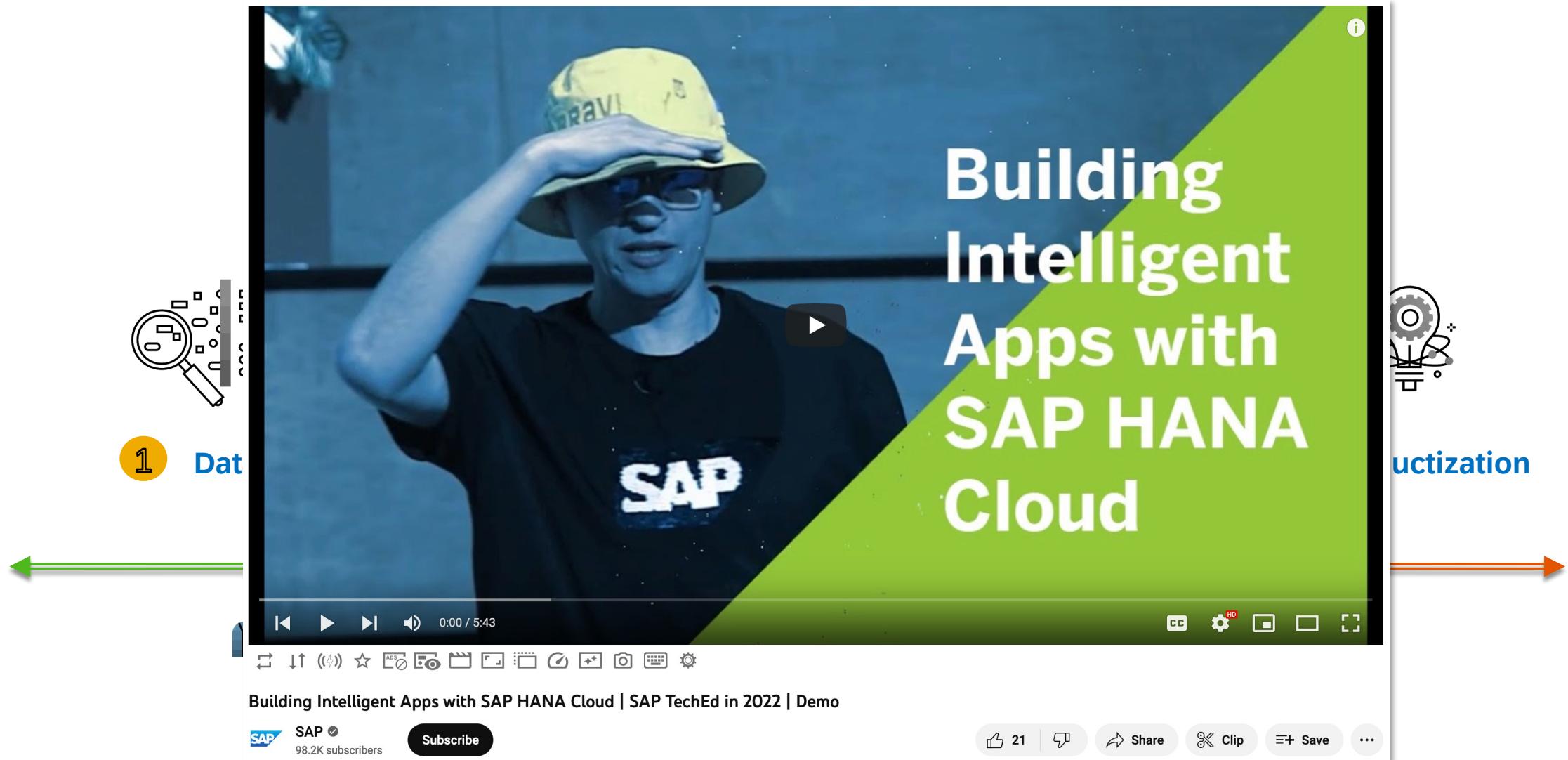
Predictive Analysis Library | Automated Machine Learning – Supported Operators



Additional content



Development Approach | Building an Intelligent Data Application (demo)



● Embed the latest from SAP HANA's AI functions into your SAP BTP Application

Devtoberfest

● MAD (Machine Learning, AI, and Data)

**Embed the latest
from SAP HANA AI functions
into your SAP BTP App**

Christoph Morgen, SAP



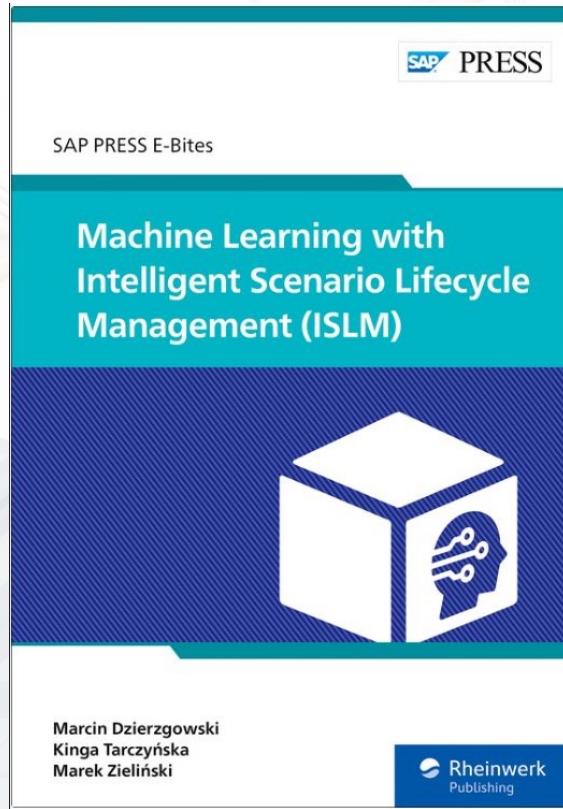
SAP TechEd

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 page shows a list of code samples with their names, last commit messages, and dates.

The repository was created by cmog (FairML - Fair Recruiting Model) on f009115 · 3 weeks ago. There is a History link available.

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)

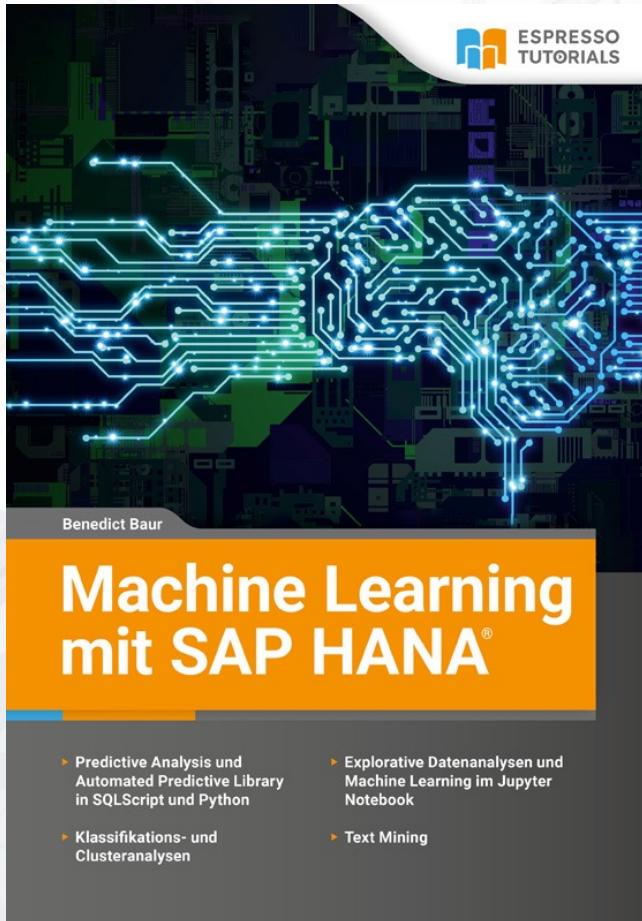
115 pages, 2023, E-Book
ISBN 978-1-4932-2395-4

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



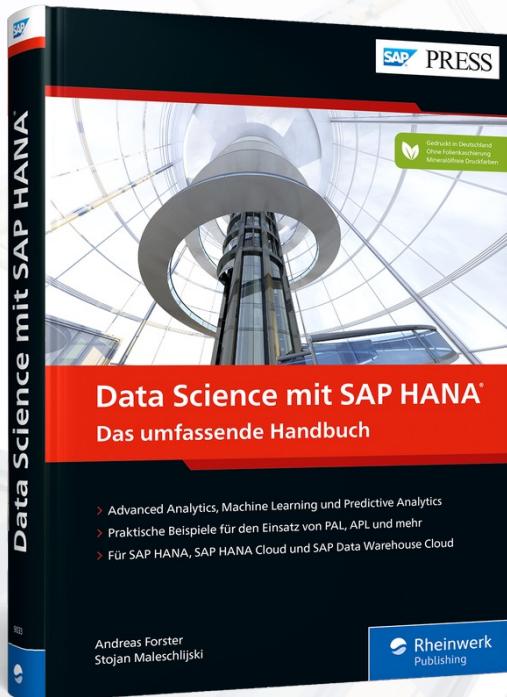
Machine Learning mit SAP HANA

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



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

Data Science mit SAP HANA

Das umfassende Handbuch

von [Andreas Forster, Stojan Maleschlijski](#)

<https://www.rheinwerk-verlag.de/data-science-mit-sap-hana/>

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

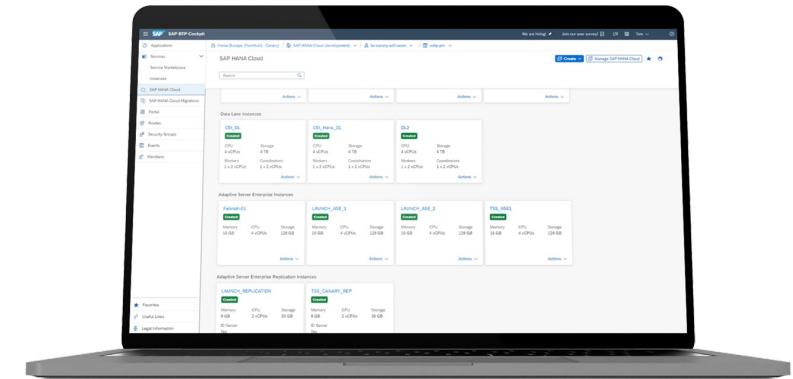
- 3x30-days own-instance in SAP BTP Trial
- 16GB RAM, 1 vCPU
- <https://developers.sap.com/tutorials/hana-trial-advanced-analytics.html>

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>



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Thank you // Дякую // Obrigado!

Contact information:

Witalij Rudnicki, SAP Developer Advocacy

