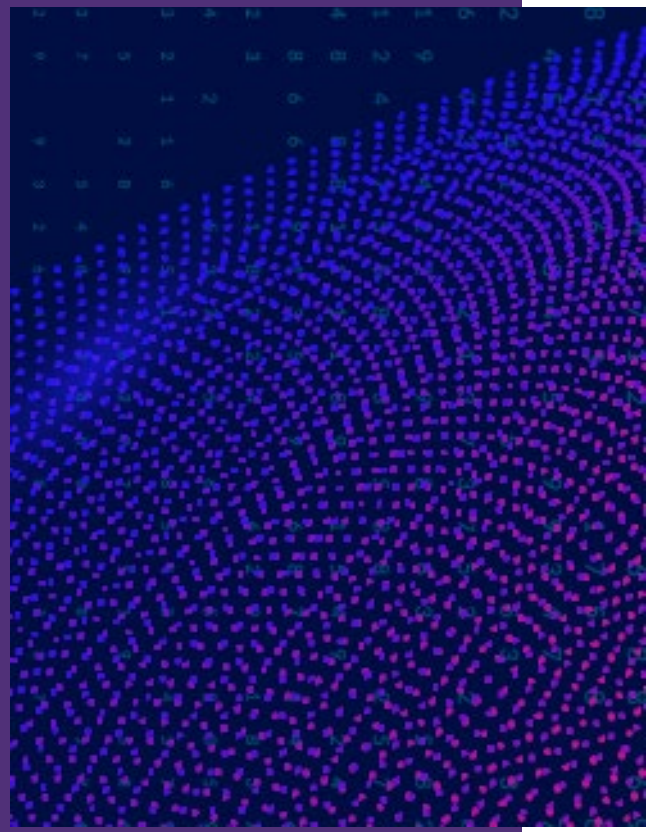
Artificial Intelligence in Supply Chain: State of the Art & 2020 Radar

The Positive Way

WAVESTONE

France Supply Chain by Aslog

Foreword

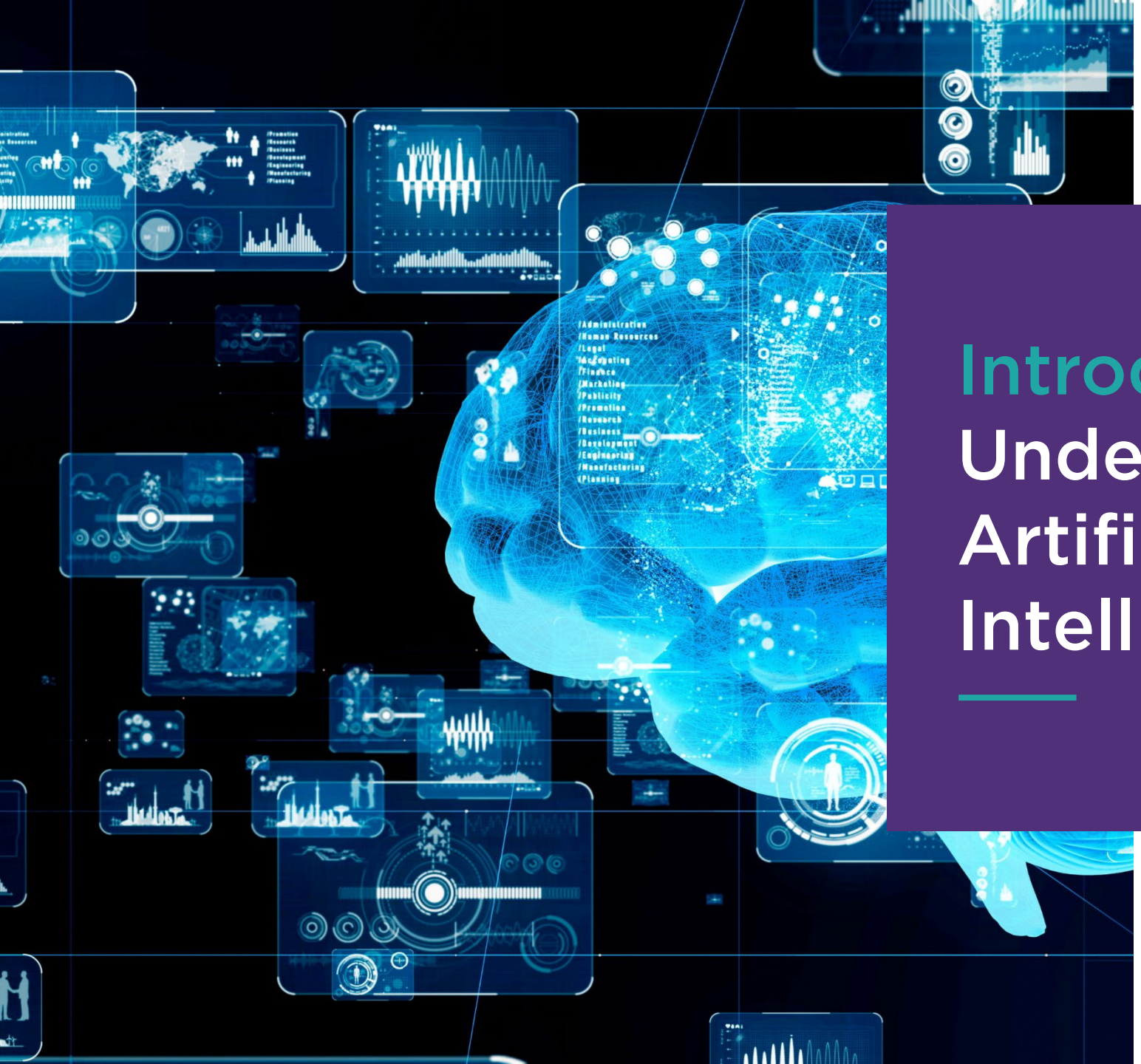


Many tools on the market are not very dynamic and are based on fixed data.

Machine Learning's algorithms work continuously and allow different hypotheses to be modeled based on larger data sources.

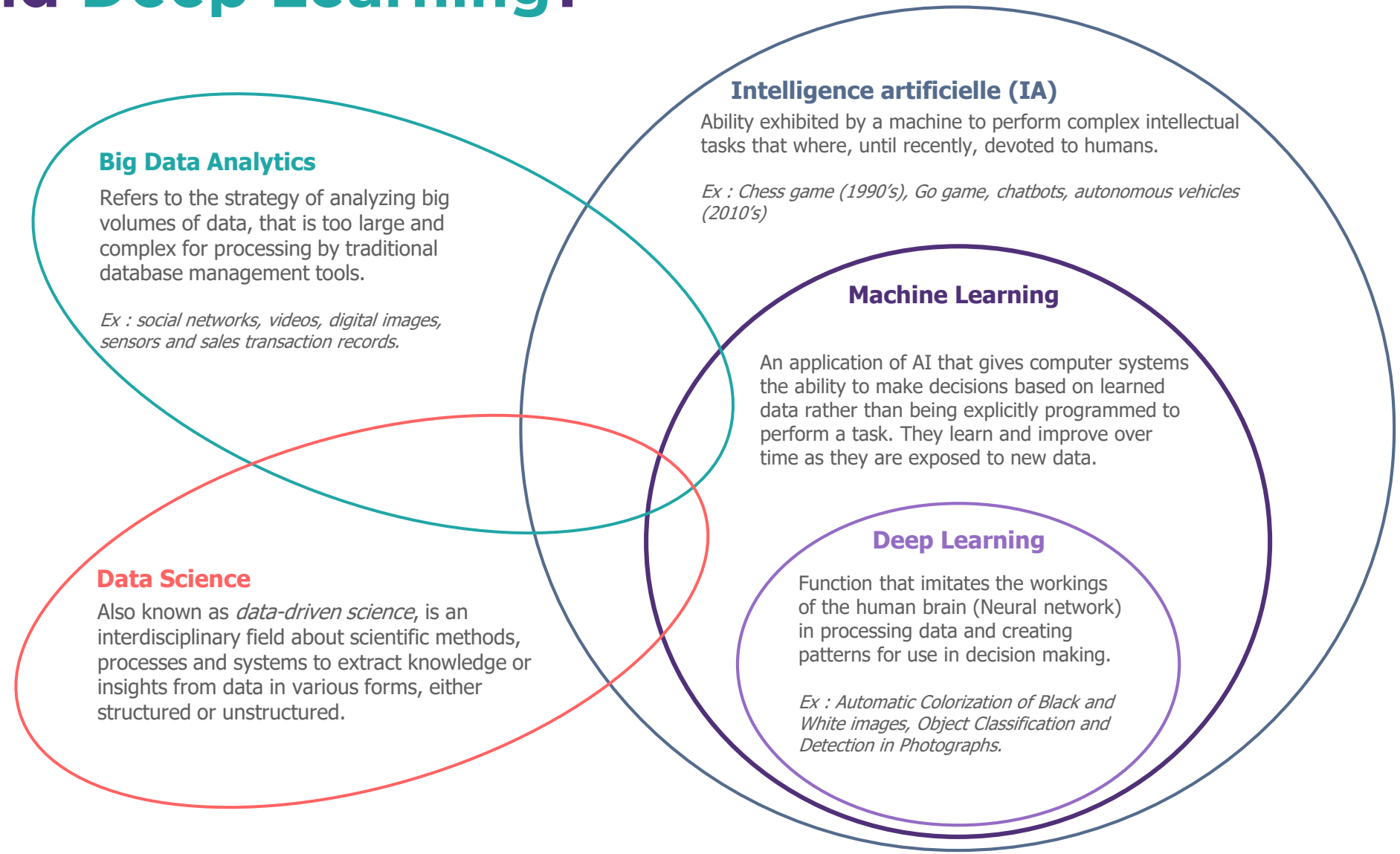
This technology then provides companies with **increased reactivity and allows them to have the necessary agility in the field of Supply Chain**.

Before presenting our Supply Chain & AI Radar and in order to have the necessary reading keys, **it seems important to make a small detour through a definition of Machine Learning, the main algorithms found in it and different use cases**.



Introduction
Understanding Artificial Intelligence

What are the differences between Machine Learning, Big Data Analytics, Artificial Intelligence, Data Science and Deep Learning?



The different types of data

Discrete data
(classification)

- Learns the parameters of the boundary between data categories
- Then applies the boundary to new data to predict their category

Continuous data
(regression)

- Learns the parameters of the model linking data input and output
- Then applies this model to new data input to predict the data output

The different types of data

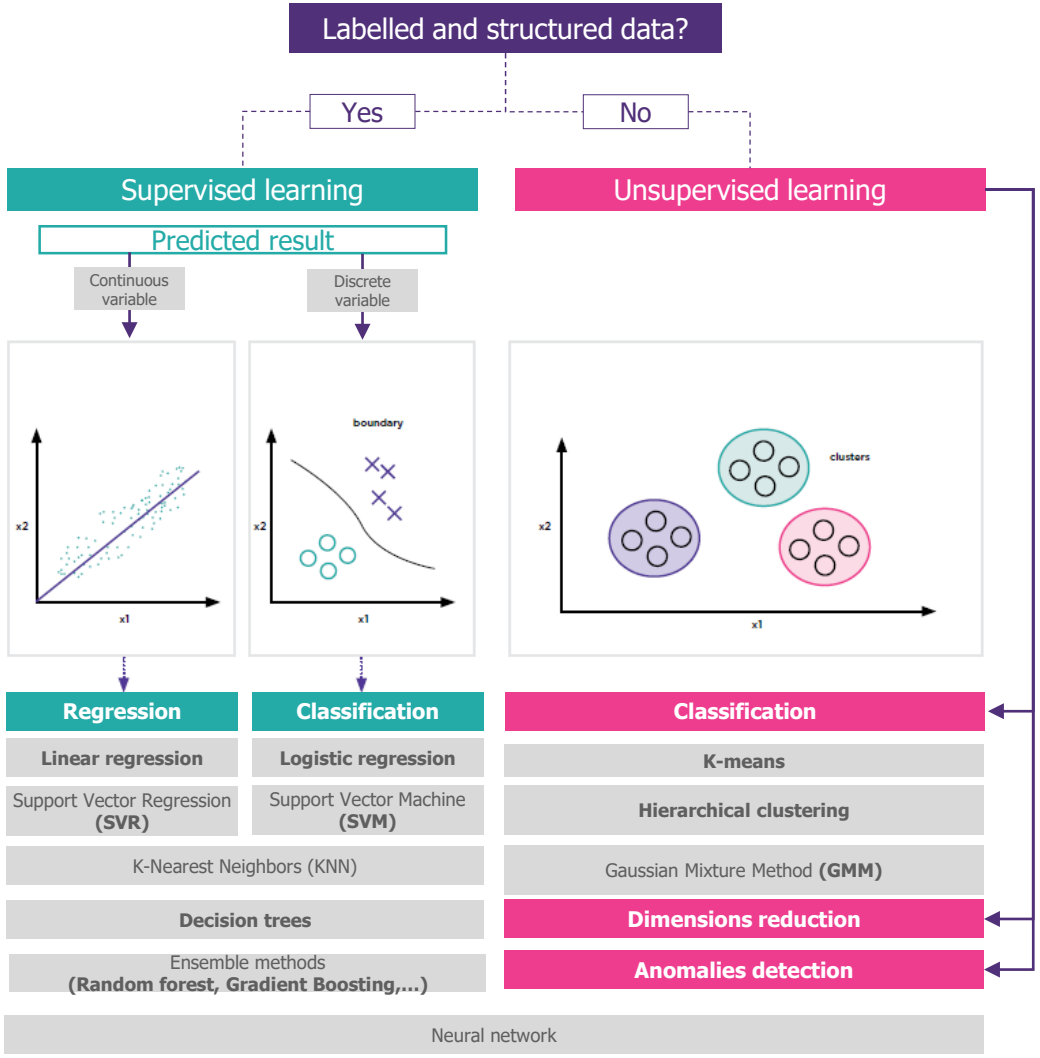
Labelled data

Data that are well defined, with a name, description, characteristics or definition; they can be understood by themselves with a tag, class or label.

Unlabelled data

Data that do not have meaningful tag or definition and do not make any sense by themselves.

The different types of IA algorithms



Supervised learning

"I know how to classify this data, I just need a classifier to sort it."

Objective: Develop predictive model
Learning based on both input and output data

Unsupervised learning

"I have no idea how to classify this data, can you(the algorithm) create a classifier for me?"

Objective: Discover an internal representation from data input data.
Learning based on no data output.
Tries to split data input into sub-groups where data are considered homogeneous

Examples of application to the Supply Chain

Area	Use Cases	Examples	Expected Benefits	AI Algorithm typology
Data	Data Capture	Collect exogenous data (weather, prices, pictures on IG, comments on blogs, …) to structured data that could enrich SC processes	Support other SC processes with exogenous data	Supervised learning (text or image classification), unsupervised learning (topic modeling on text)
Commercial Strategy / Strategic Planning	Clustering / Assortment Planning	Check correlations with multiple types of data, group stores with similar behaviors and propose adequate assortments	Stock levels Customer satisfaction Growth adaptability	Unsupervised clustering methods (K-means, CAH)
	Network modeling and optimization	Build a digital twin manufacturing, warehousing and transport networks in order to optimize them	Flows cost reduction Manufacturing cost reduction	Graph Theory (Dikjstra algorithm)
	Supply Chain Agility	Simulate sustainable upside or downside across end-to-end SC	Growth/Decline adaptability	Supervised learning
Tactical Planning	Stock positioning & sizing	Optimize location and stock level per product	Stock levels Customer satisfaction	Supervised learning
	Demand Planning	Improve forecast accuracy using exogenous data	Stocks levels Manufacturing capacity Product availability	Supervised learning for regression (Linear Regression, Gradient Boosting, Random Forest), Time Series
Operational / Execution	Stock Replenishment	Improve stock levels and/or product availability using exogeneous data	Stock levels Product availability	
	Supply chain Execution Supervision	Proactively alert customers in case of delivery problems and propose alternative solutions	Customer satisfaction	Non supervised (anomaly detection) combined with supervised/ ensemblist methods

Few tools have developed their own Artificial Intelligence algorithms.
Most of them use open source Artificial Intelligence libraries like Tensorflow, and adapt or incorporate them into their tools covering those use cases where AI brings value.

Objectives and methodology

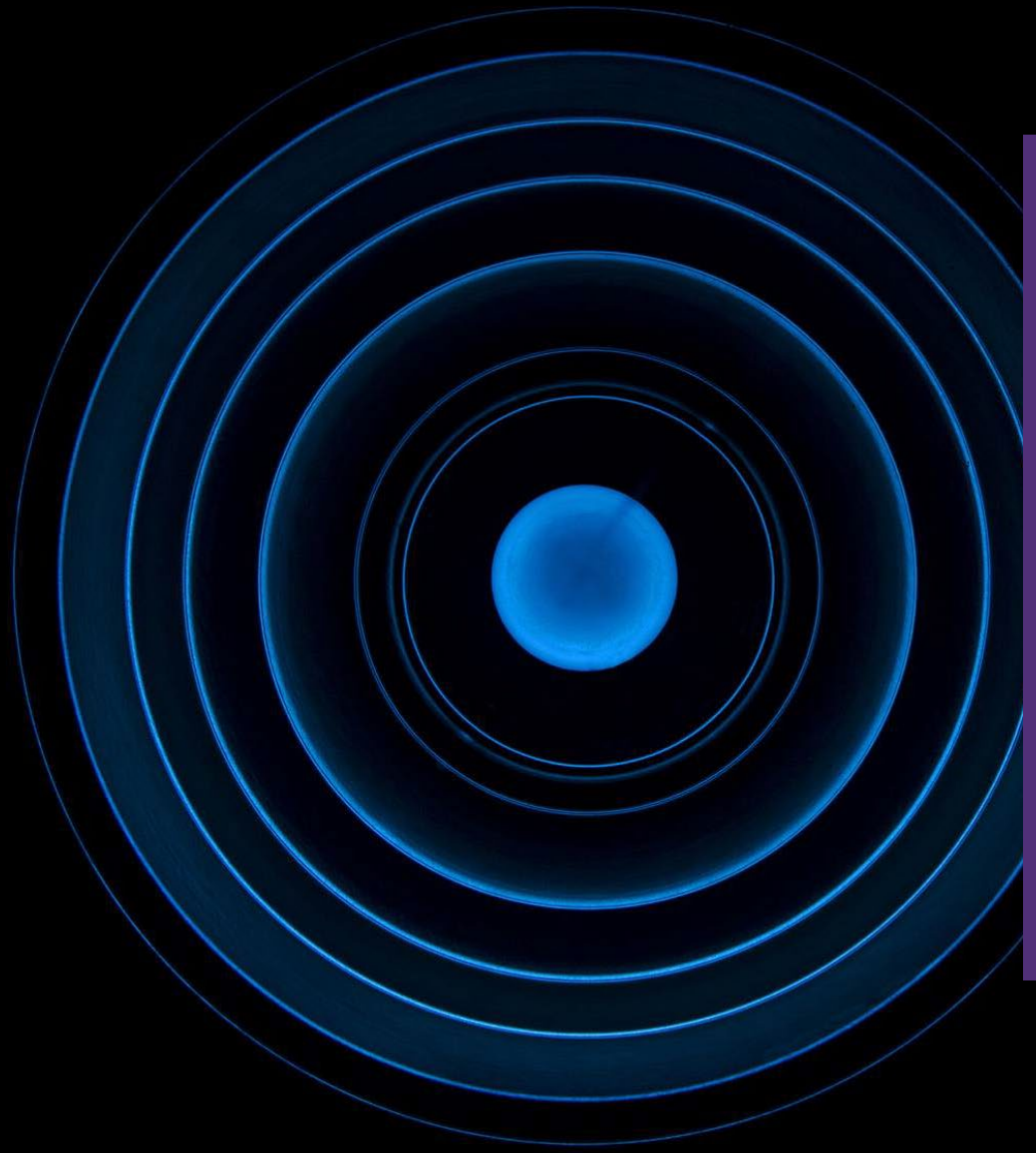
Methodology

/ **The objective of this radar** is to give **an overview** of main tools providing Supply Chain solutions **using AI.**

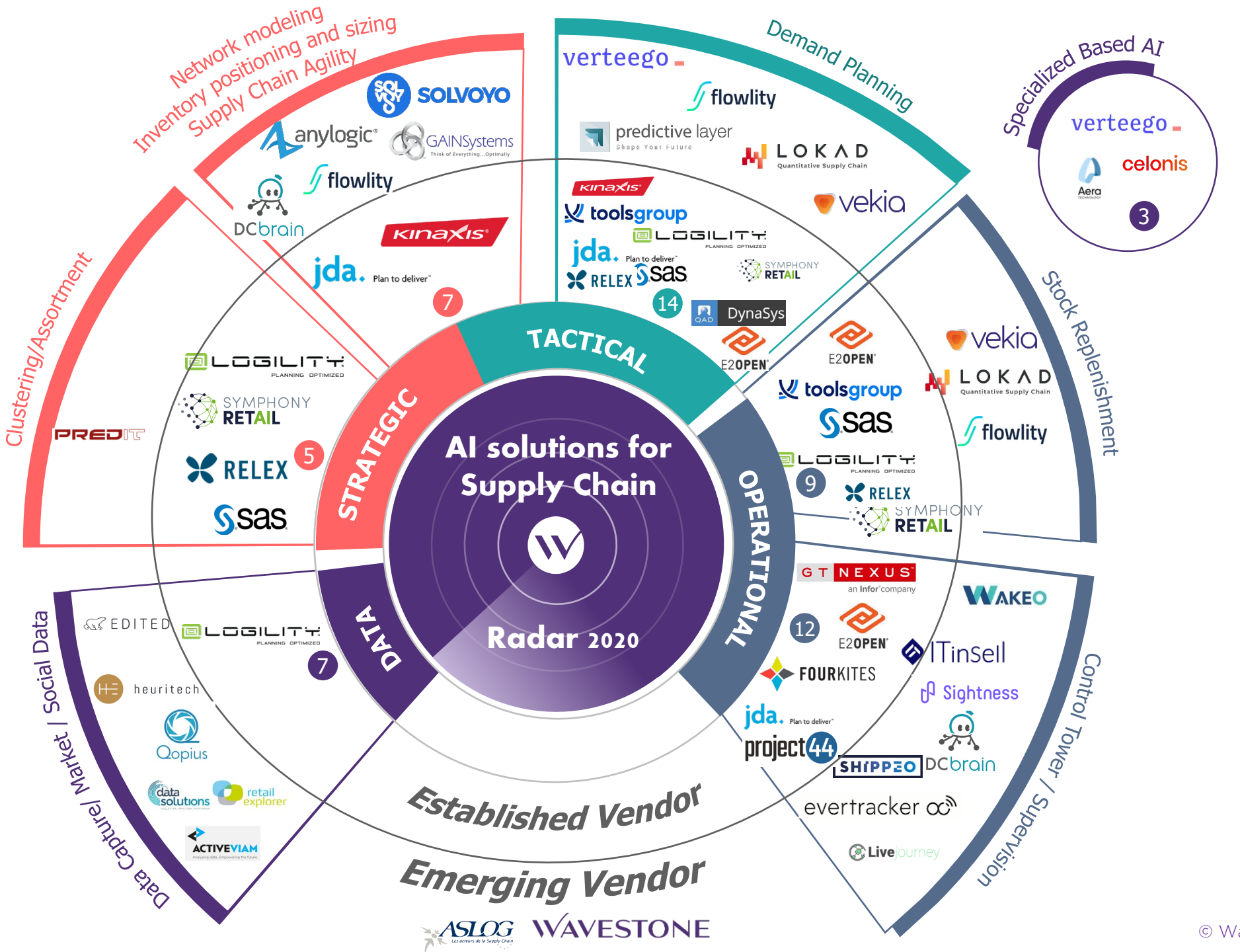
- This radar is not exhaustive as new players and technologies emerge frequently and fast.
- Information described in this document is based on information released by editors, it has not been verified by external sources

/ **Tools are grouped along different dimensions**:

- **Technology:**
  - Multi purposes AI Platform: kind of a tool box, could cover any use cases in Supply Chain
  - Process specialized AI: focus on one or several SC processes
- **Main processes** grouped by:
  - Data
  - Commercial Strategy/ Strategic Planning
  - Tactical Planning
  - Operational / Execution



2020 AI & Supply Chain Radar



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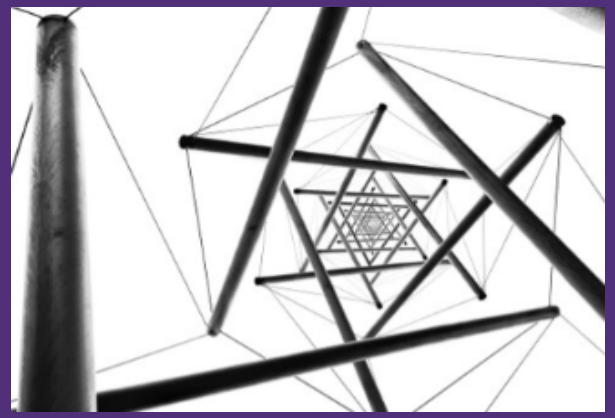
Discover our publications about Supply Chain and Artificial Intelligence



The Supply Chain Post-Crisis

Three key trends and a big dilemma

Covid-19 and AI

Artificial Intelligence Appears to Be the Key Answer to Resolve the Crisis

IA & Cybersecurity

Protecting Tomorrow's World Today

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Wavestone

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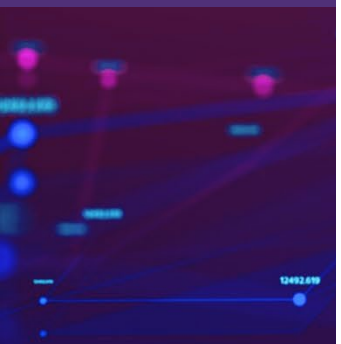

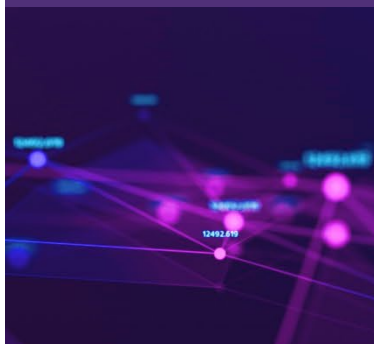

France Supply Chain, by Aslog

France Supply Chain federates more than 400 companies from all sectors, with 2000 professionals working together to promote and build tomorrow's Supply Chain.

France Supply Chain, a neutral and independent association, carries the stakes of the Supply Chain. As early as 1972, visionary men sensed that this function would be decisive for all companies. For more than forty years, professionals of the sector have made France Supply Chain the reference partner.
France Supply Chain is the privileged interlocutor of institutions and public authorities on all questions related to the sector.