

A futuristic white autonomous bus with a robot driver is shown on a winding mountain road. The bus has a sleek, modern design with large windows and a prominent front grille. The robot driver is seated in the driver's seat, wearing a white and blue suit. The background features a dramatic mountain landscape with snow-capped peaks and a clear blue sky with scattered clouds. The road is paved and has a guardrail on the side.

Intelligence Artificielle – En route vers l'avenir

4 juin 2024
Jean Hennebert

iCoSys

Institute of Artificial Intelligence
and Complex Systems

PLAN

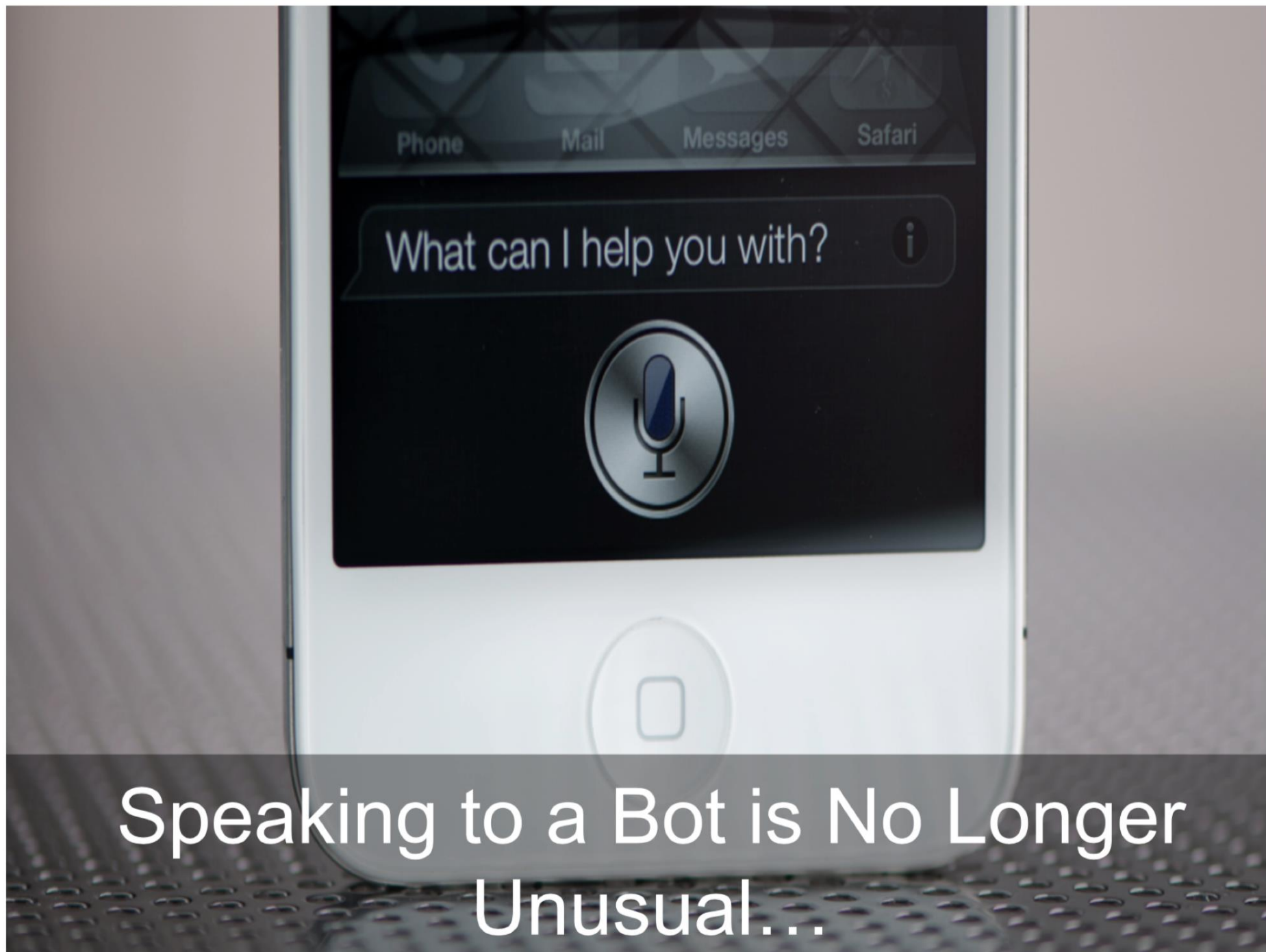
1. Le boom de l'IA
2. Le machine learning et le deep learning
3. Quelques exemples d'applications

iCoSys

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and Complex Systems

And Deep Learning is at the epicenter of this revolution.





Speaking to a Bot is No Longer
Unusual...

DALL·E 2 can create original, realistic images and art from a text description. It can combine concepts, attributes, and styles.

TEXT DESCRIPTION

An astronaut Teddy bears A
bowl of soup

riding a horse lounging in a
tropical resort in
space playing basketball with
cats in space

in a photorealistic style in the
style of Andy Warhol as a
pencil drawing



DALL·E 2



<https://openai.com/dall-e-2/>



OpenAI

<https://chat.openai.com/chat>

gpt-4 ↕

🗑️ Compare ↩️

SYSTEM

Enter system instructions

USER

What could be the next innovations related to public transport and more specifically to bus transport ?

ASSISTANT

1. **Autonomous Buses:** The technology around self-driving vehicles is evolving rapidly. In the future, one could expect to see autonomous buses as a common mode of public transportation. This would reduce costs, increase safety, and potentially lead to more efficient routes.
2. **Smart Bus Stops:** The future may see smart bus stops equipped with Wi-Fi, charging ports, real-time scheduling information, and more.
3. **Eco-Friendly Buses:** As sustainability becomes a greater concern, we can expect to see more energy-efficient, low-emission buses. These might include electric buses, hydrogen fuel cell buses, and more.
4. **On-Demand Buses:** Similar to ride-sharing apps, there might be on-demand bus services that adjust their routes based on the real-time needs of passengers, reducing wait times and offering more direct routes.
5. **In-Transit Entertainment:** As connectivity becomes universal, buses may offer in-transit entertainment like movies, music, games, etc., through individual screens or personal devices.
6. **Connected Buses:** Internet of Things technology can be used to connect buses and provide real-time information to passengers and transportation managers. This will involve the use of sensor-based systems to track vehicle locations, identify maintenance issues, manage traffic, etc.
7. **Increased Accessibility**



Les voitures conduisent
toutes seules



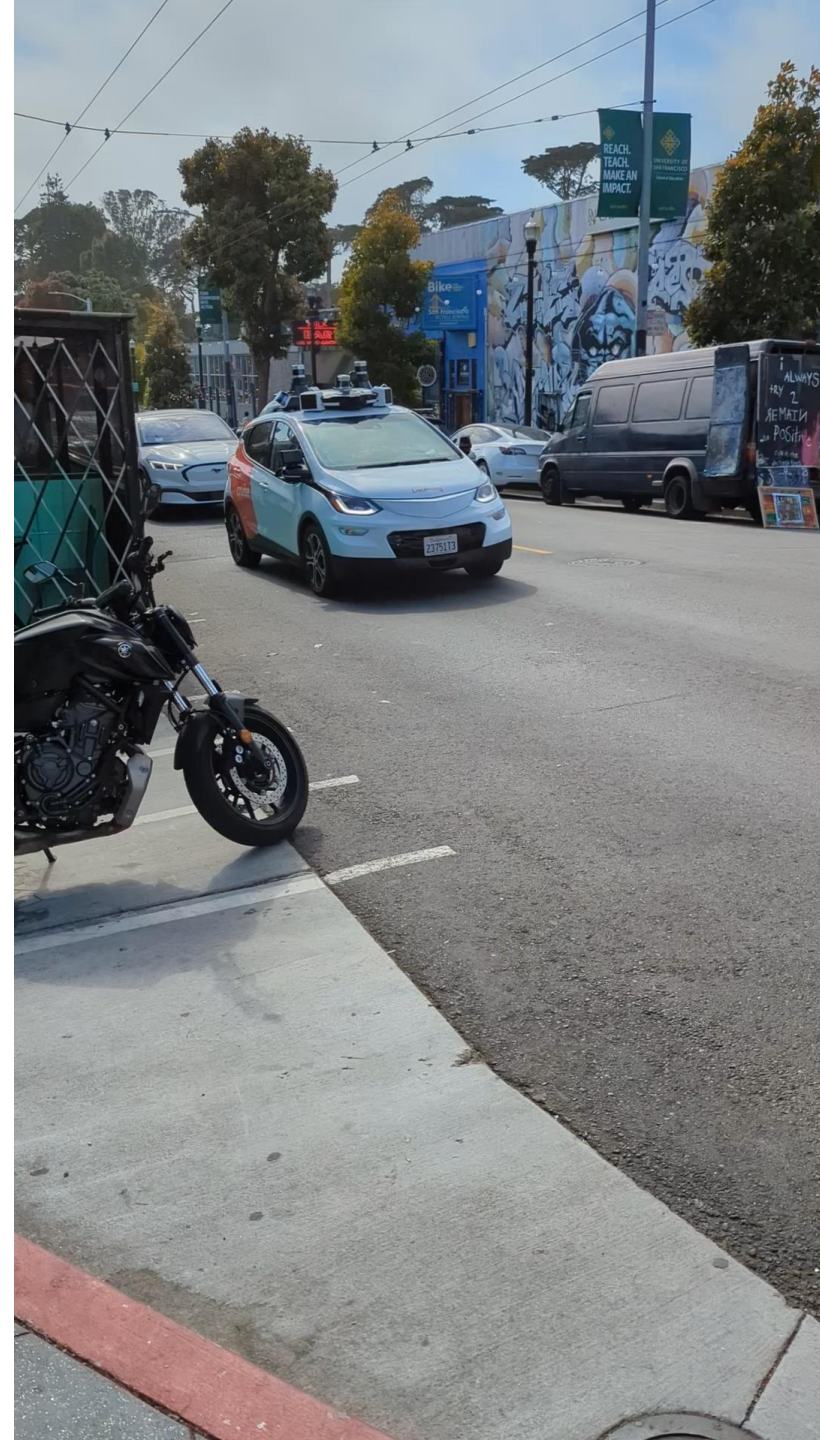
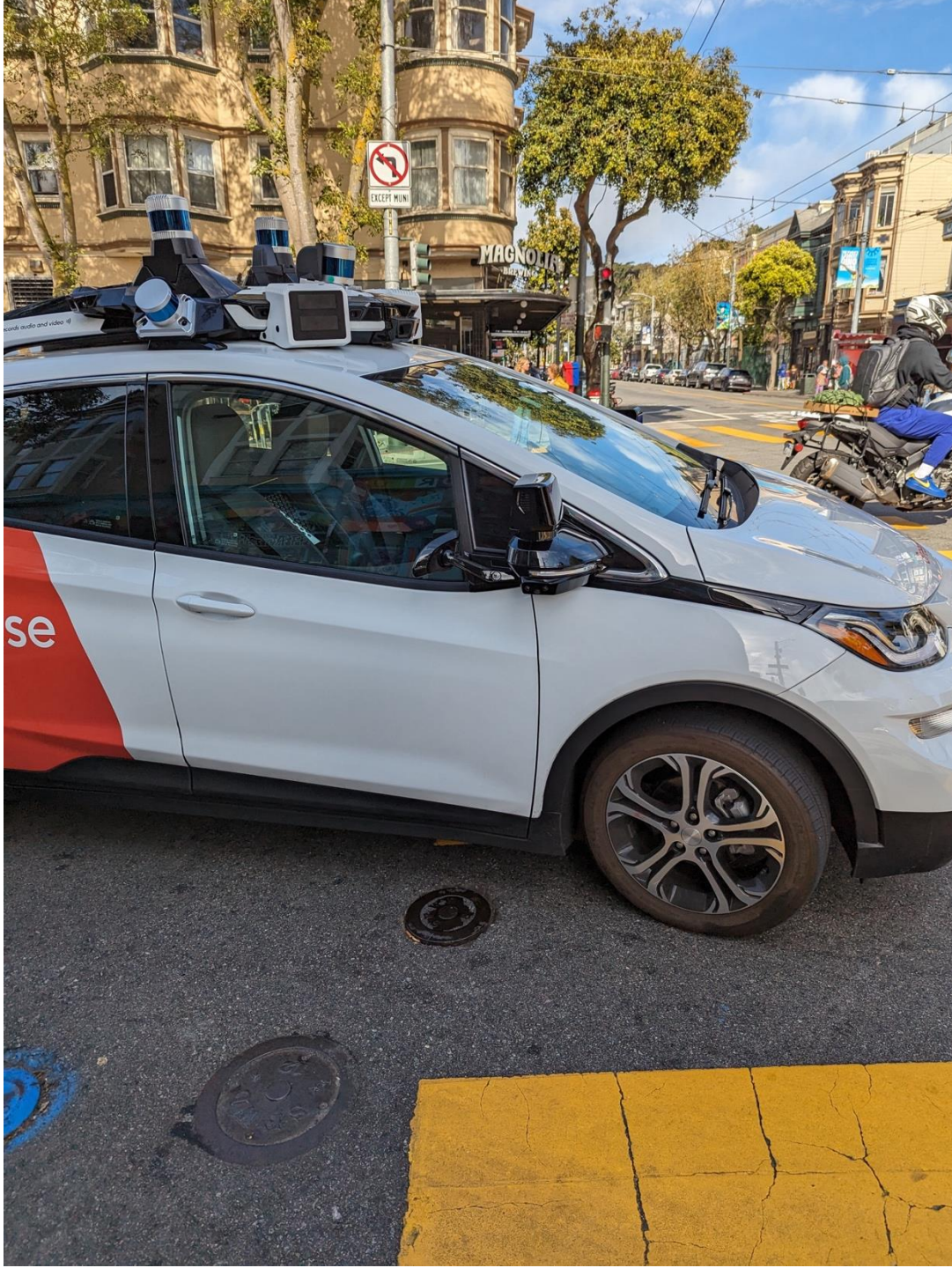
1 minute read · April 26, 2023 9:38 AM GMT+2 · Last Updated 11 days ago

Pony.ai gets permit for driverless robotaxi services in China's Guangzhou

Reuters



A logo of the autonomous driving technology startup Pony.ai is seen on a screen during an event in Beijing, China May 13, 2021. REUTERS/Tingshu Wang



Comment en est-on arrivé là ?

PLAN

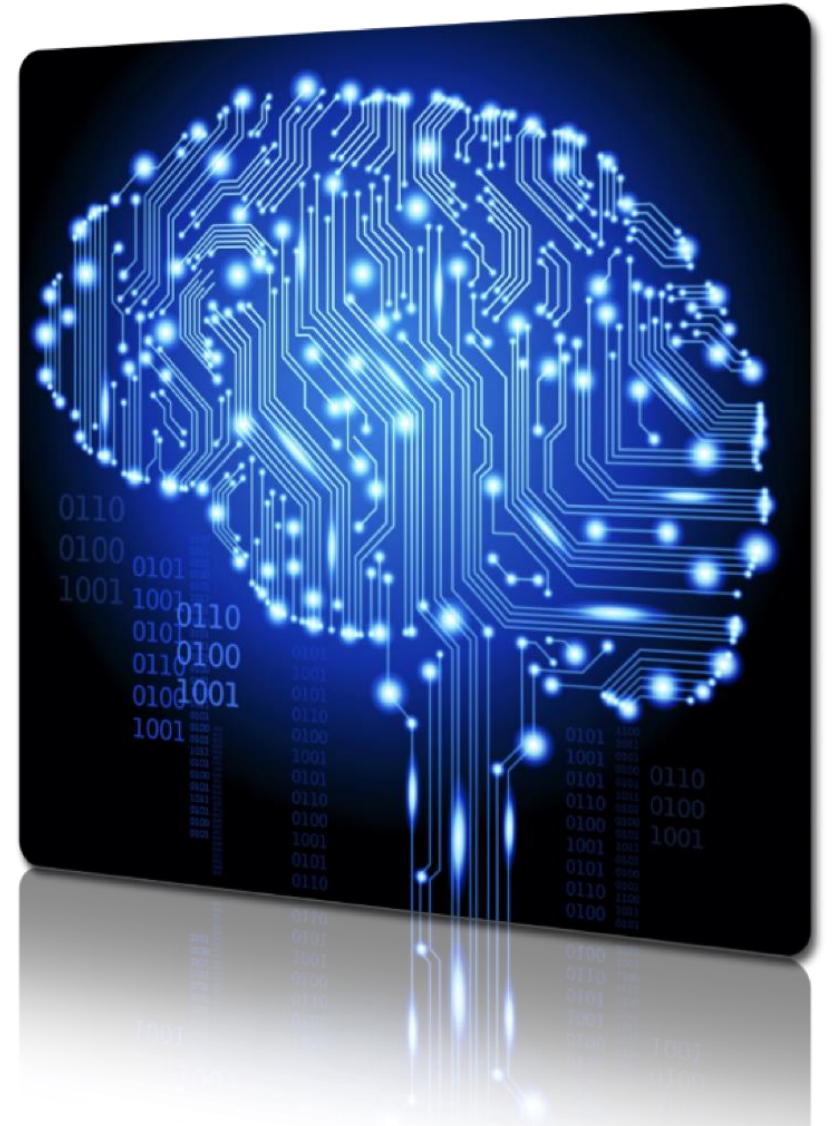
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**Qu'est ce que le Machine Learning ?
Qu'est ce que le Deep Learning ?**

Prenons un exemple: reconnaisseur de chiffres



Prenons la place de la machine un instant

2



...

...

4



...

...

7



...

...





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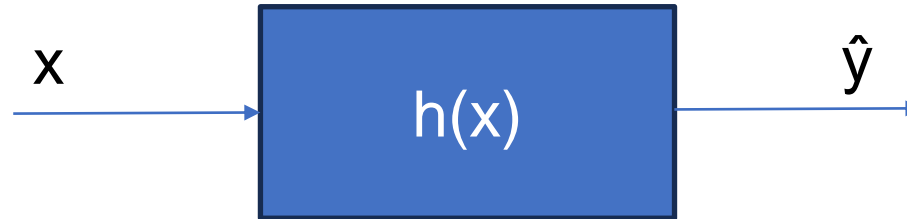
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Prenons la place de la machine un instant

x Entrée	$h(x)$ Fonction de transformation	\hat{y} Sortie estimée	y Sortie désirée
	→	2	2
	→	4	4
	→	1	7
	→	0	0

La «vérité»

Que se passe-t-il dans le processus d'apprentissage ?



- La machine va tenter de trouver une fonction $h(x)$ qui va réduire la différence entre la valeur estimée \hat{y} et la valeur désirée y
 - La qualité des données d'entraînement est primordiale
 - Les ambiguïtés des données d'entraînement rendent le système imparfait
 - Ce qui n'est pas dans le set d'entraînement n'est pas appris par la machine
 - Le biais dans les données d'entraînement rendent la machine biaisée

Nous allons donner des exemples à la machine pour toutes les catégories désirées



La machine doit être exposée à toutes les **variabilités** pour apprendre correctement

Nous allons donner beaucoup
d'exemples à la machine

"[Machine Learning is the] field of study that gives computers the ability to learn without being explicitly programmed."

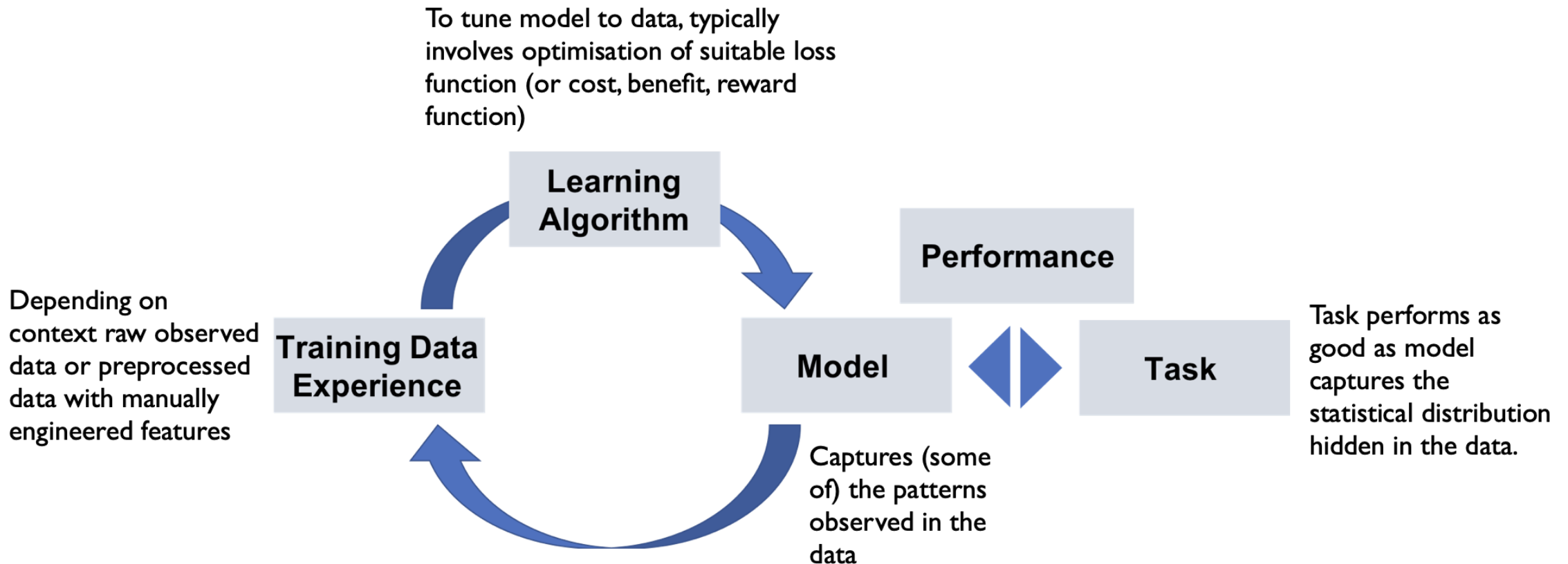
Arthur Samuel, 1959

What we want is a machine that
can learn from experience

Alan Turing



Learning involves shaping a model (hypothesis function) that can capture the structure seen in the data.

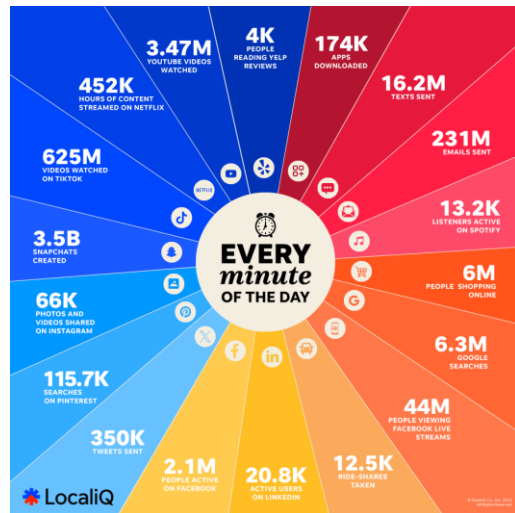


Qu'est-ce que le deep learning ?

- Une nouvelle tendance du machine learning
- A la convergence de 3 éléments:

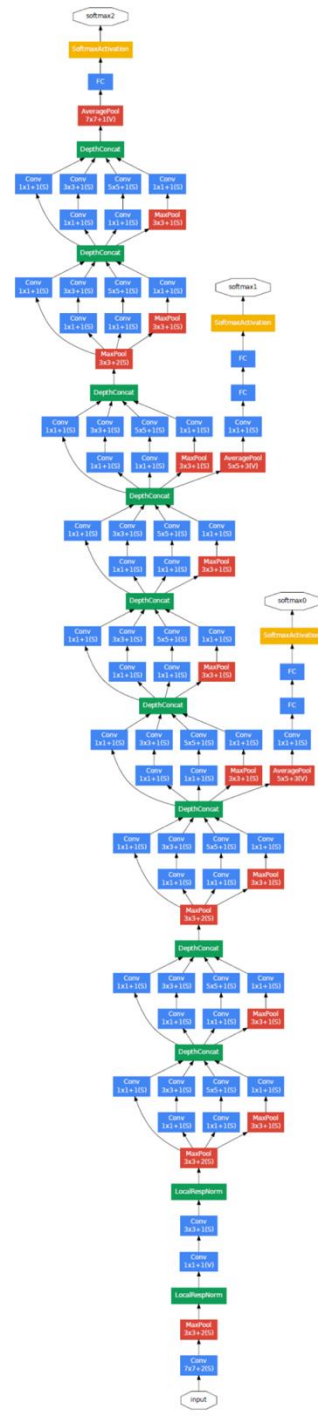
Larger quantities of data
text, audio, images, videos, ...

New algorithms
CNN, RNN, Transformers ...



Deep Learning

Better computer performance
GPU, distributed computing ...



PLAN

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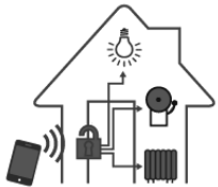
Institute of Artificial Intelligence
and Complex Systems

Axes de recherche d'iCoSys



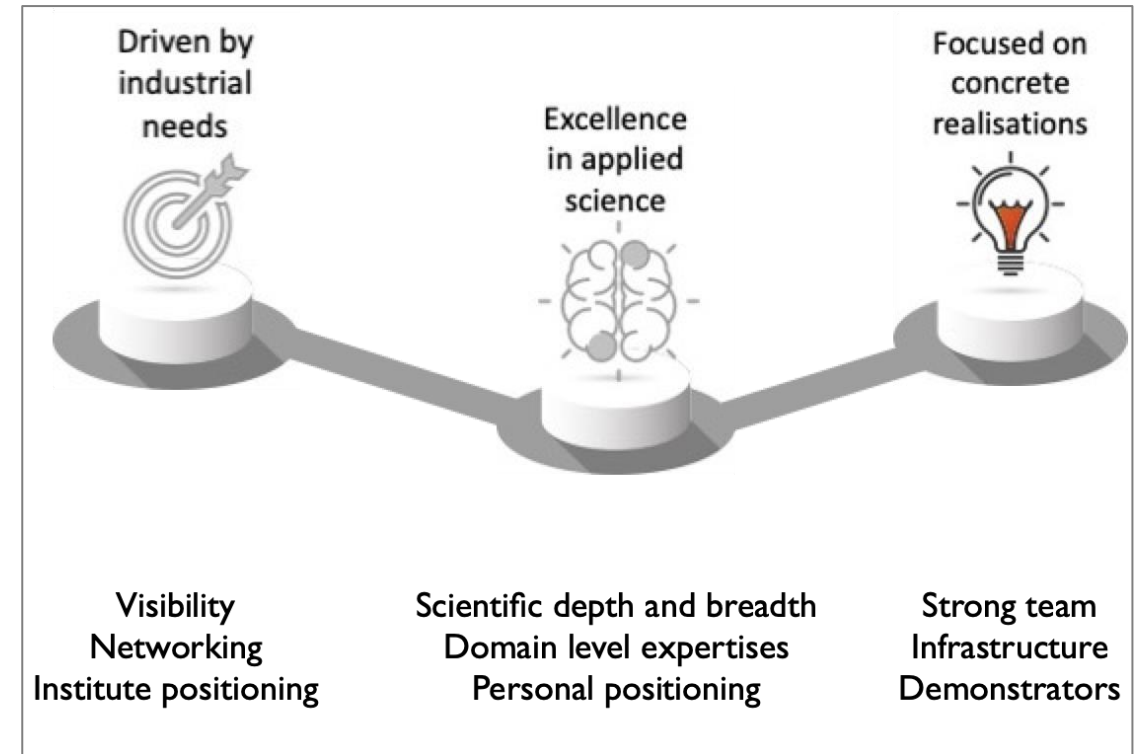
- **Axes technologiques**

- Deep learning
- Calcul distribué



- **Axes applicatifs**

- Analyse de documents
- Industrie 4.0
- Smart living



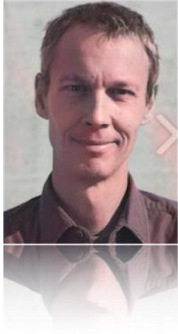
<https://icosys.ch/>

Equipe iCoSys

Bapst Frédéric



Bruegger Pascal



Chabbi Houda



Fischer Andreas



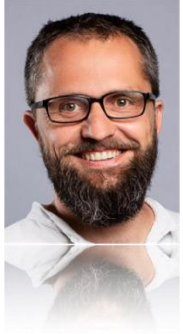
Hennebert Jean



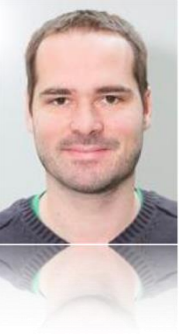
Janka Ales



Sébastien Rumley



Beat Wolf



- 40 personnes, x3 en 10 ans
- 4 startups en 2 ans
- impact sur la formation bachelor (Ingénierie des Données) et master (Data Science)

Projets liés à la digitalisation et l'industrie 4.0

Innosuisse - Swiss Innovation Agency



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

LIEBHERR

IMMOMIG 



MORPHEAN



NEUR.ON

UNIVO 

TRANSLAT



ETAT DE FRIBOURG
STAAT FREIBURG
STATE OF FRIBOURG

FRIBOURG, THE PLACE TO GROW!

Promotion économique PromFR
Wirtschaftsförderung WIF
Development Agency FDA



npr
Nouvelle
politique régionale

INNO SQUARE

groupe e

celsius
groupe e

WAGO

starrag 

RICHEMONT

word

asyril

**grade
sens**

HFR
hôpital fribourgeois
freiburger spital

ALSTOM

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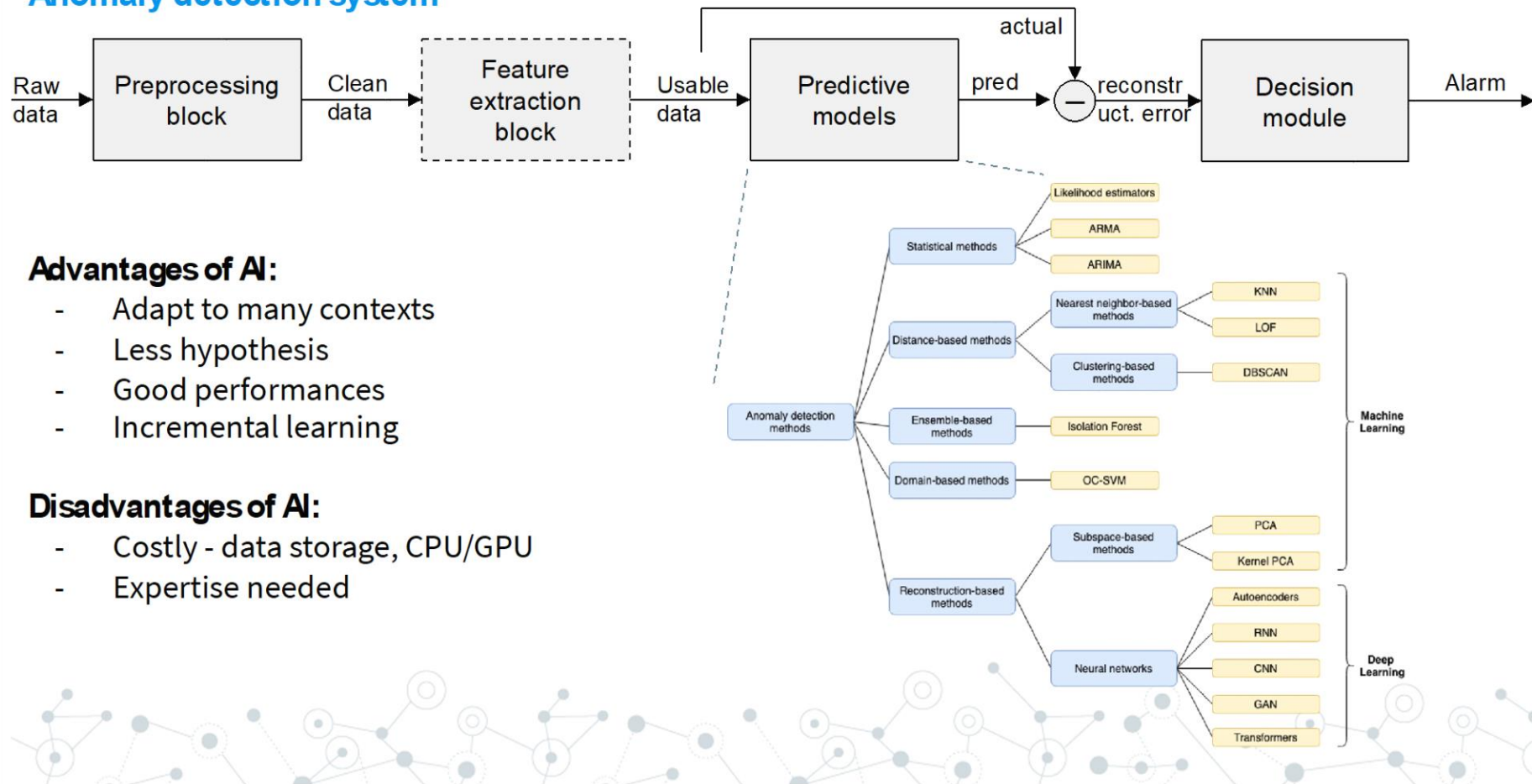
YSR

SoftDesign OFY Sàrl

Hes·SO

Maintenance prédictive par IA

Anomaly detection system



Advantages of AI:

- Adapt to many contexts
- Less hypothesis
- Good performances
- Incremental learning

Disadvantages of AI:

- Costly - data storage, CPU/GPU
- Expertise needed

LIEBHERR

groupe e

celsius
groupe e

ALSTOM

asyrîl

TRANSLAT

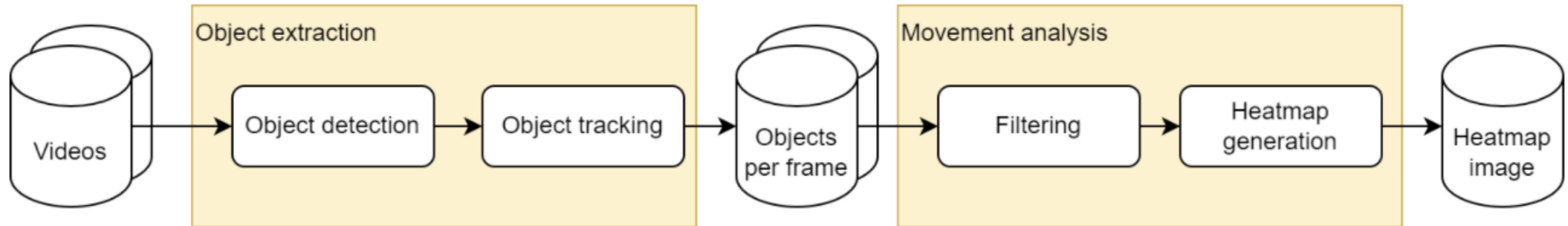
LYSR



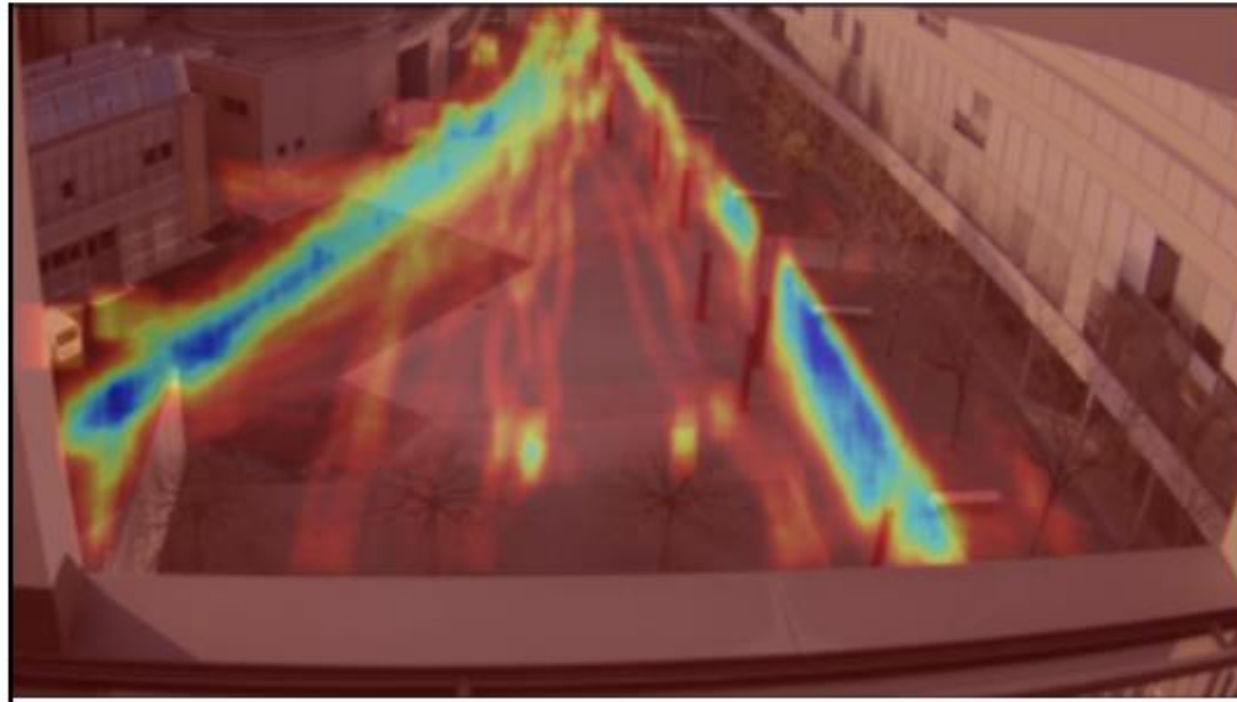
Utilisation de l'IA pour
mettre en priorité les
opérations de
maintenance prédictive

Consommation
anormale d'eau
chaude sanitaire.

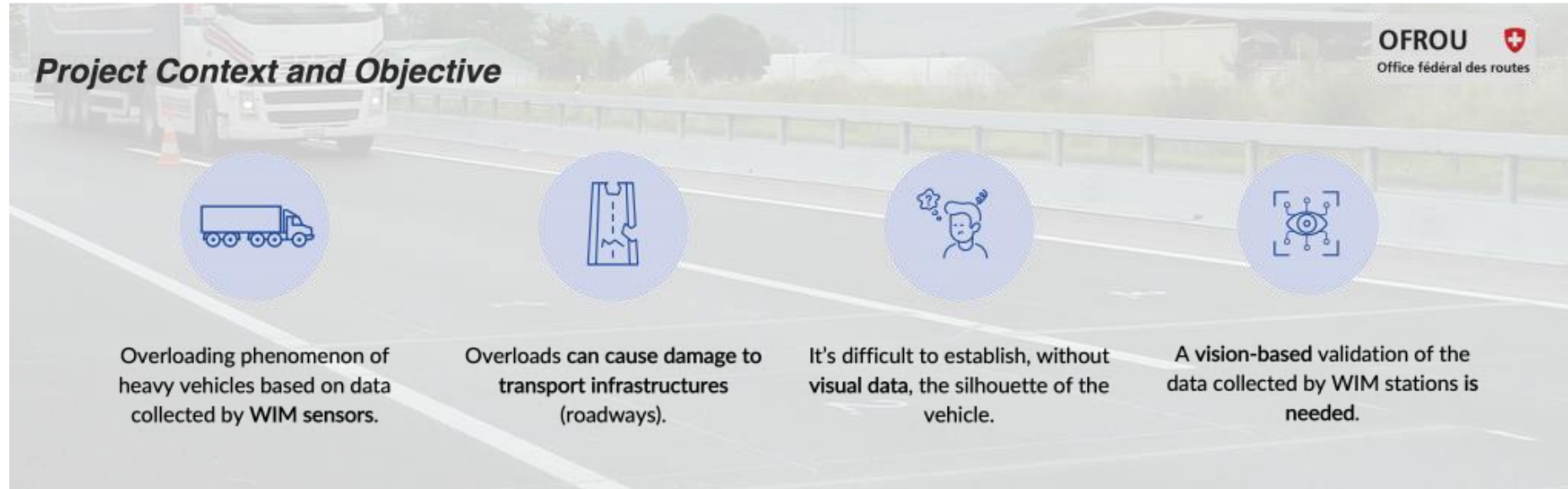
GreenNum – Analyse des flux de mouvements dans l'espace public



<https://icosys.ch/greennum>



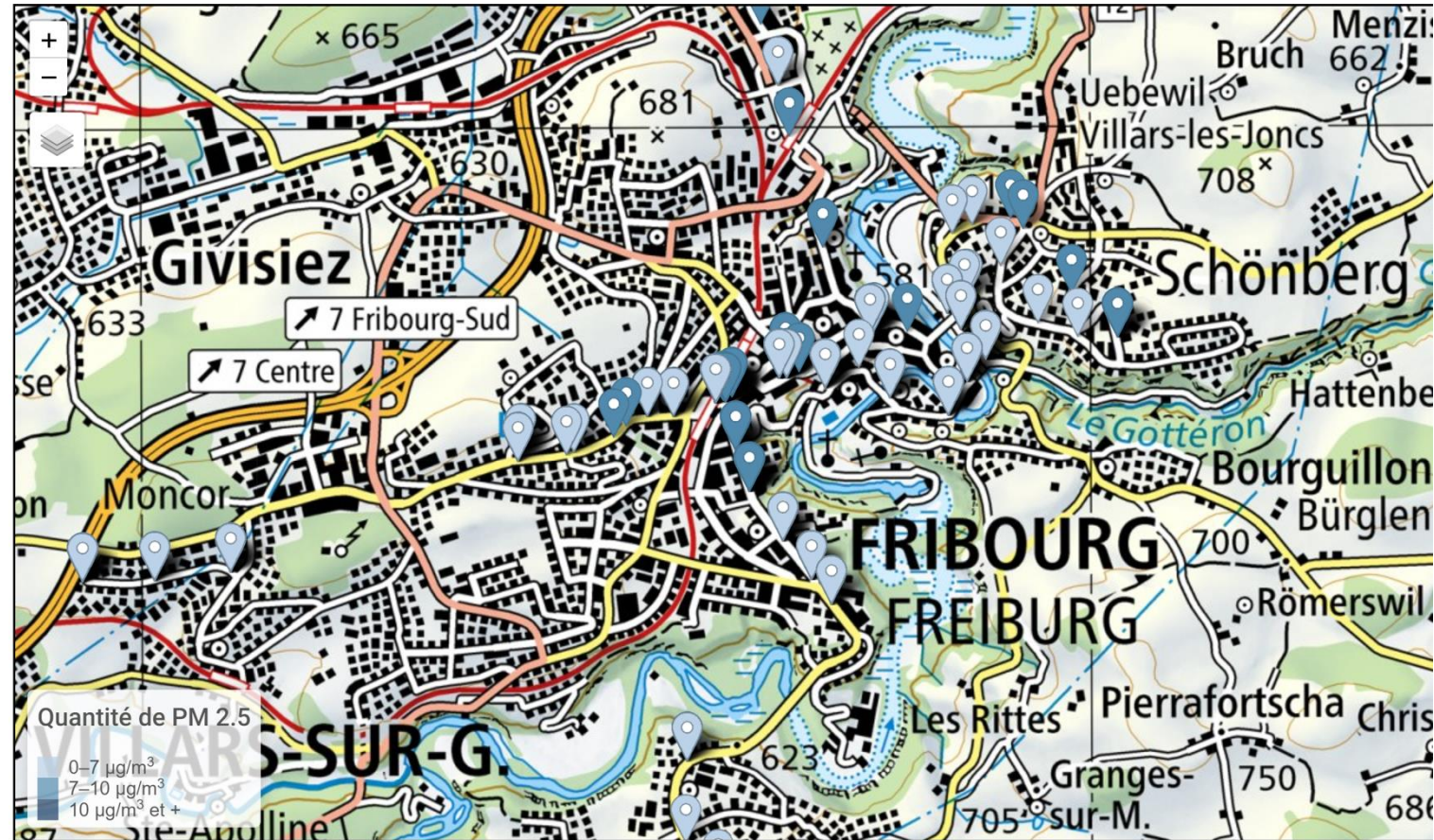
WIM – Analyse des poids lourds pour l'OFROU



Projet “MoDus SAIN” (ASTRA – OFROU)

- Bus TPF pour mesurer la densité de particules fines en ville de Fribourg
- Collaboration: HEIA-FR, ville de Fribourg, Service cantonal de l’environnement, Decentlab, Franic SA, iav, TPF

capteur de particules fines
et gps



Niveau de particules fines à chaque arrêt de bus – 11/11/2023

A lean **green way** to deliver the goods

→ [View product details and specifications](#)



Reliably cost-effective ×

Cut package-delivery costs by an average of two-thirds and boost the profit margins of your online delivery business. Your customers, too, enjoy lower shipping expenses. **LOXO** also solves the growing problem of a lack of delivery staff. It is easy to load and always ready for deliveries, with a best-in-class package capacity.

Autonomy made safe and compliant +

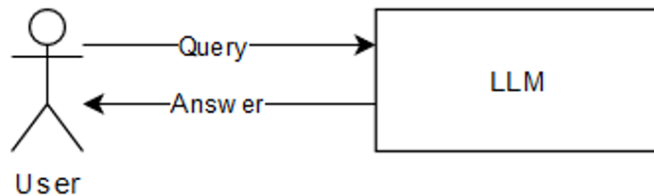
Emission-free and sustainable +

Convenient on-demand delivery +

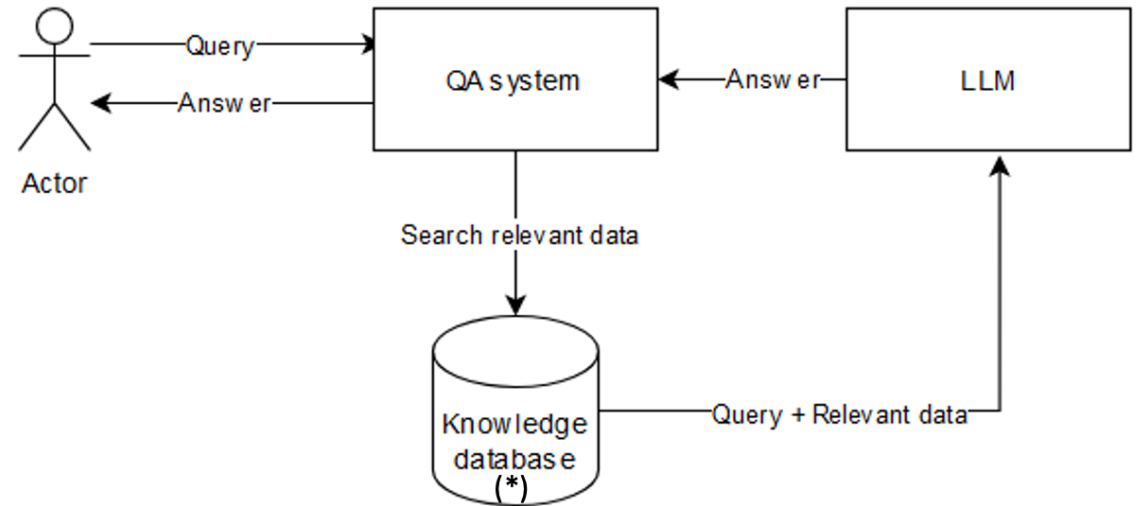
Private ChatBot

Large Language Models + RAG

Without RAG



With RAG

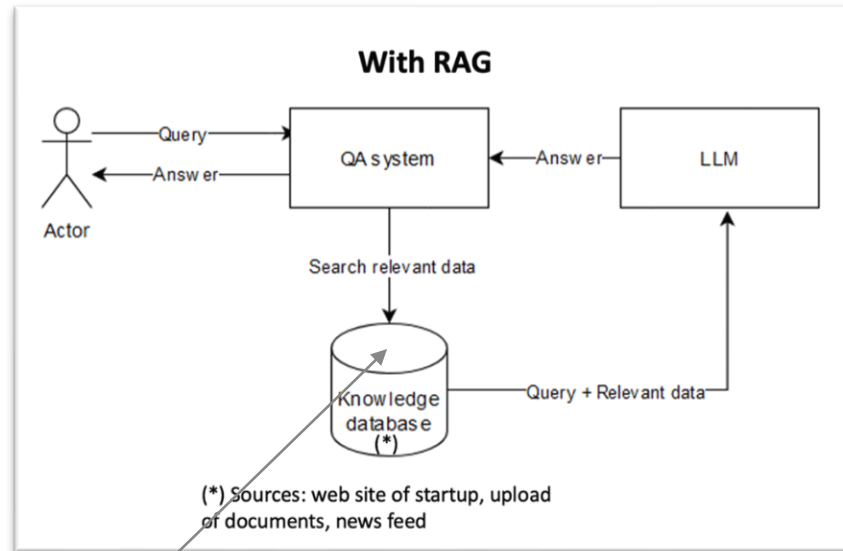


Avantages du RAG

- Adapter le LLM à un contexte donné
- Inclure des connaissances dynamiques
- Utiliser des “petits” LLM
- Éviter les hallucinations
- Travailler avec des documents propriétaires
- Permettre le déploiement sur site

(*) Sources: web site of startup, upload of documents, news feed

Démonstration sur les documents de l'UTP



Venez me trouver pour une démo live.

Chatbot

Before using this chatbot go to the Swiss AI Center's [App](#) and vectorize your document with the **Document Vectorizer service**.

Data disclaimer : The data you upload to this chatbot is temporarily stored on the Swiss AI Center's server and deleted after the end of the session.

The content of the conversation you have with the chatbot is not stored.

Usage disclaimer: This chatbot is for testing and demo purposes. It does not provide service delivery guarantee.

Extra info

Reset



Qu'est-ce que le swisstrolley?



Le SwissTrolley plus est un trolleybus efficace, fiable et flexible, permettant l'exploitation entièrement électrique sur des lignes à contact partielle. Il offre 100% de récupération d'énergie pendant le freinage et consomme jusqu'à 15% lessive d'énergie par rapport à un trolleybus standard. Il contribue à smoother les pics de courant du réseau électrique.

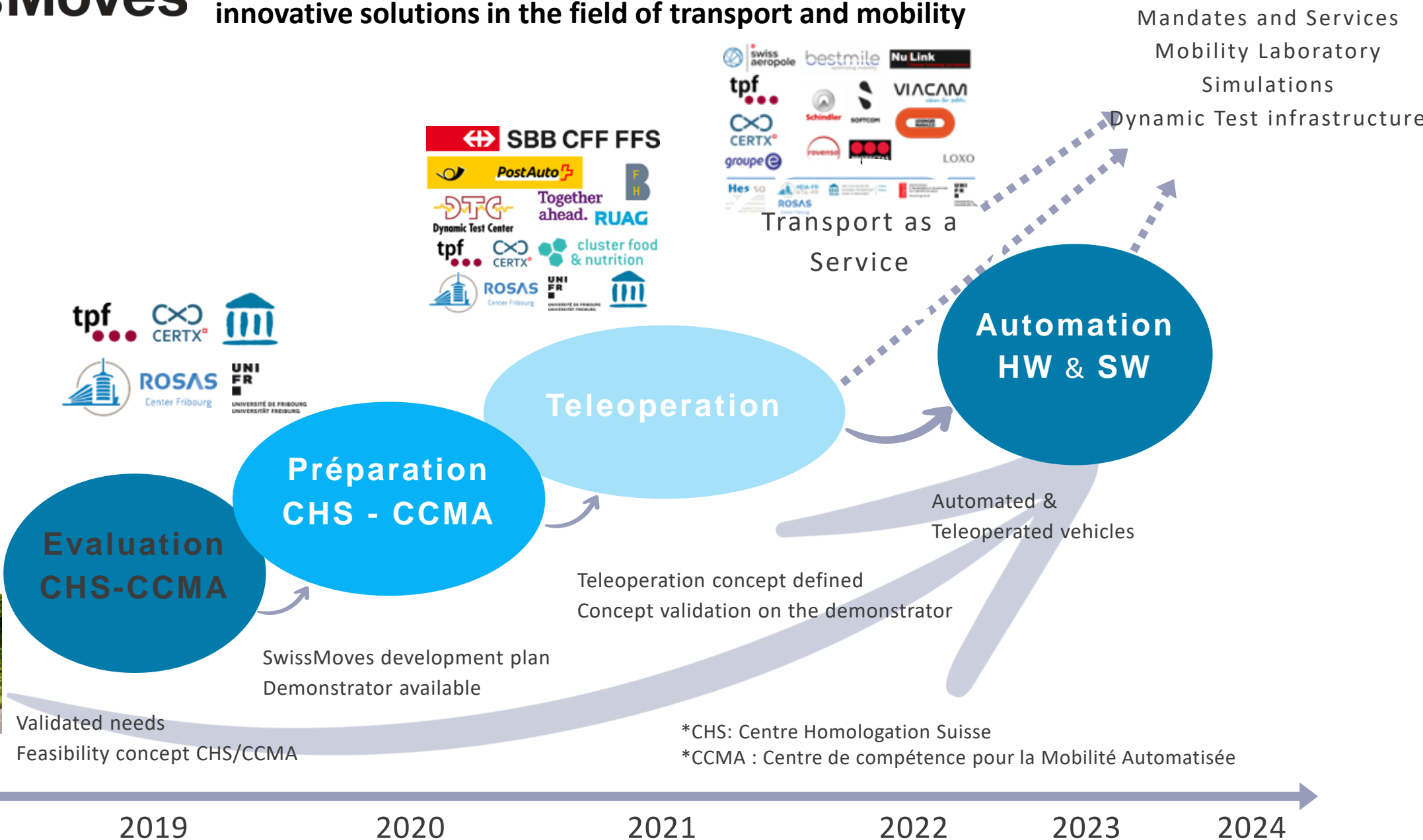
Transports publics en Suisse représentent environ 5,5% de la consommation totale d'énergie, malgré qu'ils assument 24% du transport de personnes et 37% du trafic de marchandises. Les mesures courtes et moyennes sont prises pour améliorer leur part modale, mais des efforts importants doivent être faits pour assurer l'approvisionnement en énergie durable à long terme en Suisse, particulièrement pour les transports publics, et surtout leur secteur routier.





SwissMoves

association of interdisciplinary experts that researches and develops innovative solutions in the field of transport and mobility



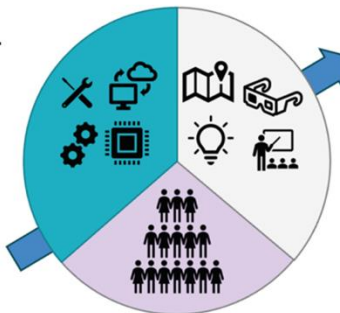
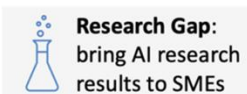
Swiss AI Center for SMEs

Accelerating the adoption of AI by SMEs

- **Coverage:** 7 cantons, 5 engineering and 2 business management schools of HES-SO
- **Animation team:** 18 profs-ingénieurs-chercheurs
- **Entry point to:** local expertises of 150+ AI engineers and researchers

APPLIED RESEARCH

Accelerate AI prototyping for business driven use cases.



SERVICES FOR SMEs

Support methodology based on needs mapping, use-cases and workshops

SWISS AI CENTER DEVELOPMENT

Access to 150+ AI engineers, close to your location, develop your network.

Les hautes écoles

La HES-SO réunit 28 hautes écoles qui proposent dans les sept cantons de Suisse occidentale 43 formations Bachelors et 25 Masters dans les domaines Design et Arts visuels, Economie et Services, Ingénierie et Architecture, Santé, Musique et Arts de la scène, Travail social.





Travaillons ensemble



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