



Centre de Recherche
en Numérique de Sfax
مركز البحث في الرقمية بصفاقس

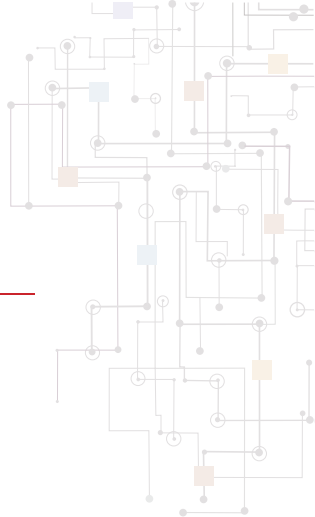
IoT, AI, Machine Learning

research & innovation issues

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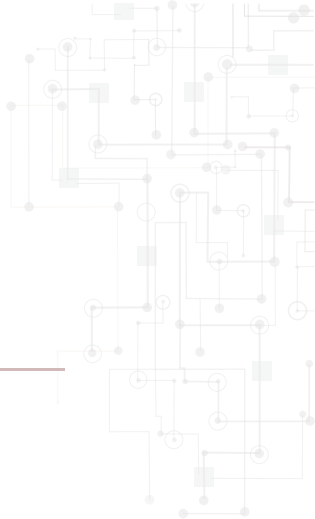
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1. Introduction
2. Research and innovation trends & issues
3. Some IoT and AI projects at CRNS



Introduction



Relationship between AI, Machine learning, and Deep learning

Artificial Intelligence (AI)

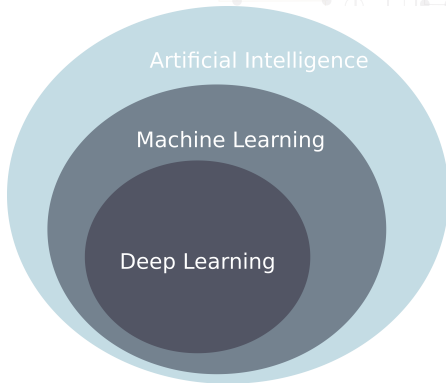
- "AI involves machines that can perform tasks that are characteristic of human intelligence"

Machine Learning (ML) :

- "the ability to learn without being explicitly programmed"
- Machine Learning is simply a way to achieve AI

Deep learning (DL) :

- One of many approaches of machine learning
- Inspired by the structure and function of the brain (Artificial Neural Networks) to simulate Human like decision making



Relationship between IoT and AI

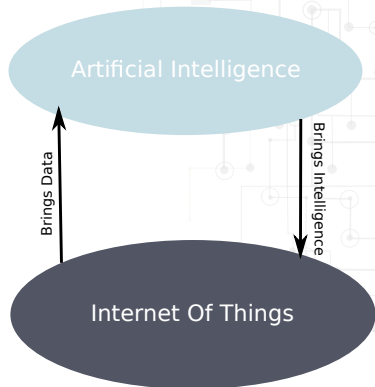
AI and IoT are Inextricably Intertwined

Like relationship between human brain and body :

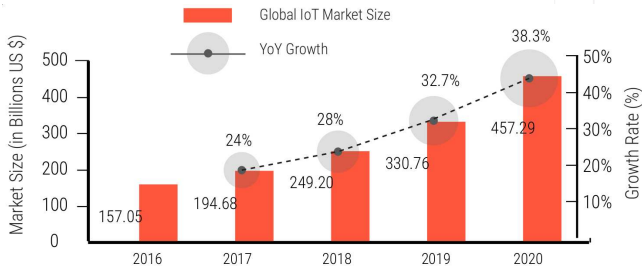
- All of the connected sensors that make up the Internet of Things are like our bodies, they provide the raw data of what's going on in the world
- AI like our brain, making sense of that data and deciding what actions to perform

Unleashing each other's potential

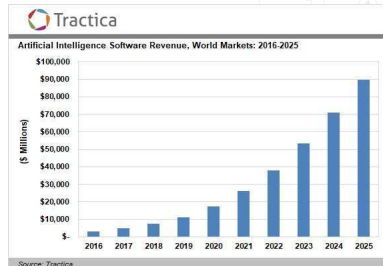
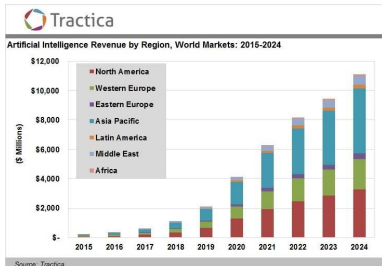
- IoT makes better AI
- AI makes IoT useful



IoT and AI markets grow jointly



[Sources: GrowthEnabler Analysis/MarketsandMarkets]



Research and innovation trends & issues



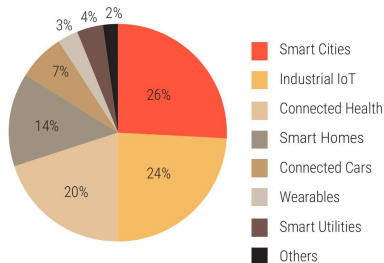
Some trending sectors

- Artificial Intelligence in Healthcare
- Transportation : self-driving cars, autonomous vehicles, autonomous drones *etc.*
- Algorithmic financial trading strategy performance management
- Industry 4.0

Some trending research orientations

- Deep learning
- Unsupervised learning
- *etc.*

Global IoT Market Share by Sub-Sector



[Source: GrowthEnabler Analysis]

Legislative issues

- Self-driven cars (governemnets not yet ready)
- Insurance, who takes the responsibility ?
- Validation, and certification (*e.g.*, FDA approval)
- *etc.*



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Data collection issues

- Medical use case : difficult patient medical data collection (*e.g.*, unbalanced positive vs negative data)
- Huge amount of data to annotate, make sens of data without annotation ?
- *etc..*



Walled Off Internet

- Breaking up internet in national (prevent cross boarder attacks, economic protectionis, prevent loosing government power relative to global online companies)
- Major problem for the concept and practice of global IoT



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Cloud attacks

- Cloud providers will be one of the principle targets of cyberattacks
- cybersecurity is still under-resourced in comparison to the potential scale of the threat.



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Botnet attacks

- Millions of new connected consumer devices make a wide attack surface for hackers
- IoT botnets can direct enormous swarms of connected sensors to cause damaging and unpredictable spikes in infrastructure use



Lack of confidence

From Gemalto (cybersecurity firm) recent research on the impact of security on the development of the IoT :

- 90% of consumers lack confidence in the security of IoT devices.
- 54% of consumers own an average of four IoT devices, but only 14% believe that they are knowledgeable on IoT device security
- 65% of consumers are concerned about a hacker controlling their IoT device, while 60% are concerned about data being leaked



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Understanding IoT

- How to increase the ability for people to understand the changes and their implications more clearly, and to take concrete actions to take advantage of the potential upside ?
- Converting IoT data to insights and financial values
- Enabling more and more viable business cases



Some IoT and AI projects at CRNS



Project Idea

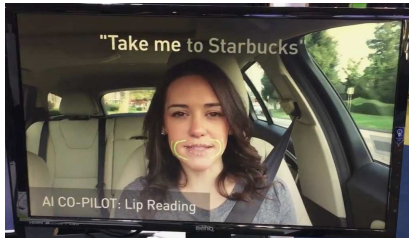
Bringing IoT and AI solutions inside car's cockpit for driver wellbeing and safety

Partners

- Digital Research Center of Sfax (CRNS)
- A prominent international automotive supplier

Project main parts :

- Intuitive Driver-Car-Interaction
- Prediction of driver heart strokes¹



1. Credits go to Dr. Afef Mdhafar

Objective :

Intuitive Driver-Car-Interaction using standard cockpit internal monitoring sensors

- Sensors :
 - 3D and or 2D cameras
 - microphone
- Computer vision techniques :
 - gaze tracking
 - speech recognition
 - lip-reading
 - face detection and tracking
- Speech recognition and lip-reading systems are complementary when audio information is noisy or corrupted



Objective :

Predict health strokes using connected medical sensors²

Health parameters collection

- ECG
- blood pressure
- SPO2
- Seat sensors
- Weight scale sensor
- Steering wheel sensors
- *etc.*

Analyze collected data

- Complex Event Processing
- Machine Learning
- Predict heart attacks
- Trigger alerts



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Wellbeing at car's cockpit (2/2)

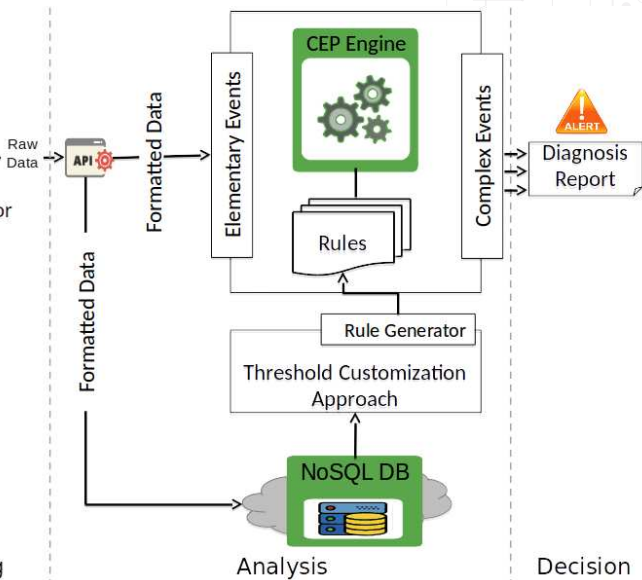


Body Scale Sensor



ECG
Temperature

Monitoring



3

3. Credits go to Dr. Afef Mdhafar



Thanks for your attention

