

Du monde réel au digital, mais où est la frontière ?

Dr Ir. Sébastien Combéfis





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***“Any teacher that can be replaced with a computer,
deserves to be.” — David Thornburg***

L'informatique...

- Science et technique du traitement de l'**information**

Par extension, l'industrie directement dédiée à ces sujets

- Modification majeure de la **communication** entre les hommes

Et apparition de communication homme-machine et M2M

- Apparition d'une nouvelle **structure du travail**

On doit travailler de concert avec ce monde numérique

...est partout

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CHANGES COMING

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By [Tripti Lahiri](#) • March 12, 2019



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By Tripti Lahiri · March 12, 2019

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Ils font le plein d'essence, leur compte en banque est vidé: "Il y en avait quand même pour 384 euros"

Sébastien De Bock, publié le **05 mars 2019 à 08h29** | [Commentaires](#)

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EMAIL SIGN UP BECOME A MEMBER

Los Angeles Times

WEALTHY PARENTS IN ADMISSIONS SCANDAL UNDER INTENSE PRESSURE TO MAKE...

NO SOCCER EXPERIENCE, BUT SHE STILL GOT A SPOT ON ELITE UCLA TEAM IN COLLEGE...

DISNEY-FOX DEAL IS COMPLETE: CEO BOB IGER'S BIG SWING COULD CHANGE MEDIA INDUSTRY

A PILOT WHO HITCHED A RIDE ON A LION AIR 737 SAVED THAT PLANE. THE NEXT DAY, THE...

BAY AREA FIXING HOW IT WORKS FOR

BUSINESS

These hotel workers are on call 24/7 and they don't even want tips

By HUGO MARTIN OCT 14, 2017 | 6:00 AM

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Robots

 Tim Adams

@TimAdamsWrites Sun 29 Jul 2018 07.00 BST

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The robot will see you now: could computers take over medicine entirely?



Bay Are fixing hi work for

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LATEST SESSIONS QUARTZ

CHANGES COMING
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World UK

By Tripti Lahiri - Mar 11, 2019
**The
Observer**
Robots

Tim Adams
M... Tim Adams
Mar 29 at 12:24H
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Science News

from research organizations

A simulator allows patients to experiment how their vision will improve before surgery

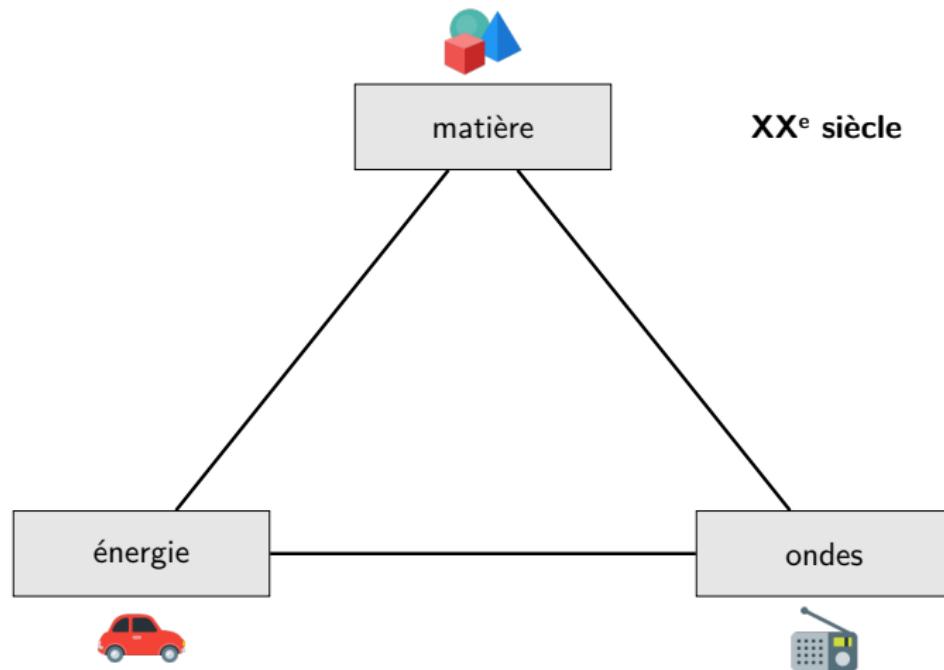
The new technology, which is about to be launched on the market, consists of a lightweight binocular helmet

Date: February 7, 2019

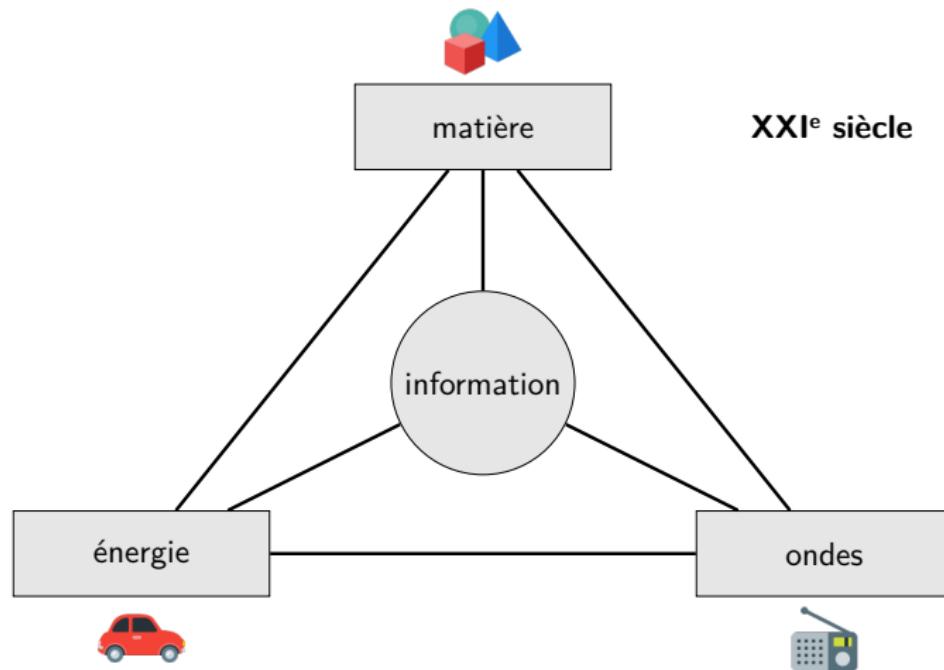
Source: Spanish National Research Council (CSIC)

Summary: Thanks to a new wearable visual simulator, patients and surgeons are able to see the

Du triangle...



...au tétraèdre



De l'objet et son métier...

- À chaque objet était associé un **métier spécifique**

Situation au milieu du XX^e siècle



Différents ingénieurs, différentes usines, etc.

...à l'unification numérique

- Transformation numérique démarrée fin du XX^e siècle

Texte, image, son, etc. sont complètement unifiés
- On assiste aujourd'hui à la numérisation de tous les domaines

Sciences, art, loi, histoire, archéologie, médecine, etc.
- Deux attitudes par rapport au schéma mental à adopter
 - Faire rentrer l'IT dans le mindset du XX^e siècle
 - Construire un nouveau mindset, intégrant l'IT

Informatique (1)

- Une **définition** générale de l'informatique comme science

Fait intervenir les quatre concepts-clés de l'informatique

L'informatique permet de faire des calculs sur de

l'information

à l'aide d'**algorithmes**, de **programmes** et de **machines**.

Informatique (2)

■ Information

Codage sous forme de données numériques

■ Algorithme

Mécanisme conceptuel de calcul systématique

■ Programme

Écriture précise d'un algorithme dans un langage approprié

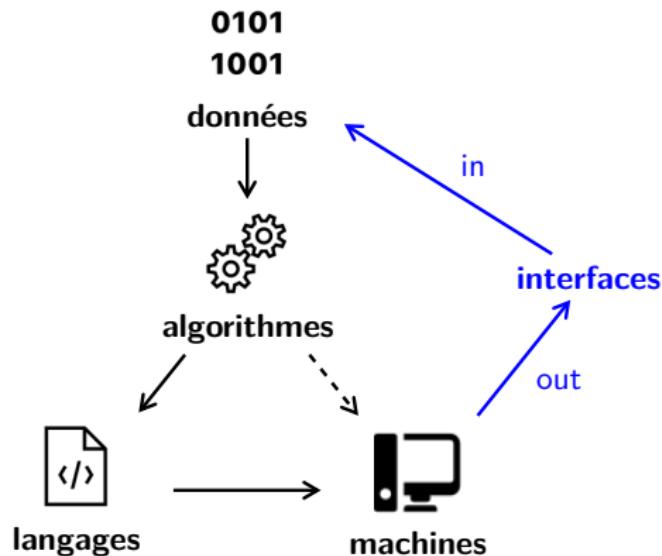
■ Machine

Object matériel pour exécuter un programme

Les piliers de l'informatique

- L'informatique repose sur **quatre piliers**

Et avec une interface permettant de gérer les communications



Histoire



Machine à calculer

- L'informatique a commencé avec des **machine à calculer**

Machine de Babbage en 1836, première machine analytique



Informatique personnelle

- IBM Personal Computer (PC) introduit en 1981

L'ordinateur et l'informatique s'introduit dans les familles



Internet

- Un réseau mondial de machines connectées
Les machines peuvent s'échanger des données entre elles
- Célébration des 30 ans du web cette année

THE VERGE



TWEET



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ENTERTAINMENT

THE WORLD WIDE WEB TURNS 30: OUR FAVORITE MEMORIES FROM A TO Z

By [Verge Staff](#) | Mar 12, 2019, 9:10am EDT

Illustrations by [Alex Castro](#)



SHARE



In this day 30 years ago, Tim Berners-Lee submitted a proposal with the dreary title “Information Management” to his superior at the European physics laboratory CERN.

It began by asking how future scientists would keep track of their increasingly large

Paul Otlet

- Paul Otlet, inventaire et visionnaire belge a imaginé internet

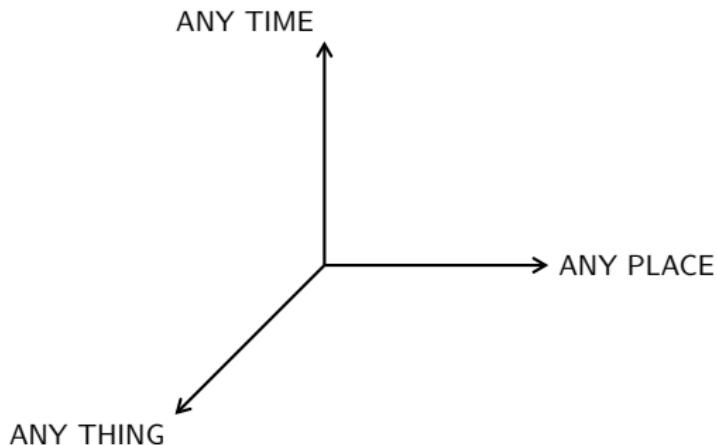
Grand réseau de connaissances basé sur les documents

- Répertoire bibliographique universel, le Mundaneum



Applications sur internet

- Outre le web, d'autres **applications** naissent sur internet
E-mail, voix/image, réseaux sociaux, internet des objets...
- Positionnement des applications selon **trois axes**



Supercalculateur

- Le retour des **supercalculateurs** et la course à la puissance

Calcul haute performance plutôt général ou spécifique

The screenshot shows the HPCwire website homepage. The header includes navigation links for Tabor Network (DataNami, EnterpriseAI, HPCWire Japan, Advanced Scale Forum, HPC on Wall Street) and social media icons for Twitter, Facebook, LinkedIn, and YouTube. The main navigation menu on the left lists Home, Technologies, Sectors, AI/ML/DL, Exascale, Specials, Resource Library, Events, Job Bank, About, and Solution Channels. A prominent news banner on the right features a woman and a man in a server room, with a blue overlay containing a Wi-Fi icon and a smartphone icon. The headline reads "AI-Focused 'Genius' Supercomputer Installed at KU Leuven" by Tiffany Trader. Below the banner, the date April 24, 2018, is shown, followed by a detailed description of the supercomputer's deployment and its purpose.

TABOR NETWORK: DATAAMI ENTERPRISEAI HPCWIRE JAPAN ADVANCED SCALE FORUM HPC ON WALL STREET

HPCwire

Since 1987 - Covering the Fastest Computers in the World and the People Who Run Them

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AI/ML/DL
Exascale
Specials
Resource Library
Events
Job Bank
About
Solution Channels

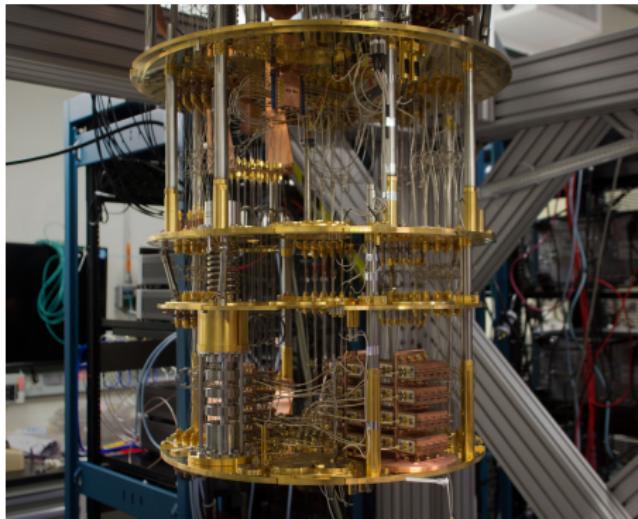
AI-Focused 'Genius' Supercomputer Installed at KU Leuven
By Tiffany Trader

April 24, 2018

Hewlett Packard Enterprise has deployed a new approximately half-petaflops supercomputer, named Genius, at Flemish research university KU Leuven. The system is built to run artificial intelligence (AI) workloads and, as part of the Flemish Supercomputing Center (VSC), it will be available to both academia and the industry to foster scientific advances and promote economic growth and innovation in Flanders, the northern region of Belgium. Research efforts will be aimed at molecular modelling, engineering, physics,

Ordinateur quantique

- Manipulation de plus de deux états à la fois avec un **qubit**
Versus le traditionnel bit qui possède uniquement deux états
- Nouveau **paradigme de programmation**





Domaine

Cloud et edge computing

- Dématérialisation de services accessibles de partout

Puissance de calcul, mémoire, stockage, sécurité, mobilité, etc...
- Avec l'**edge computing** qui rapproche le calcul des clients
 - Depuis l'appareil « intelligent » et connecté
 - ...vers des unités de traitement
 - ...jusqu'à une base de données dans le cloud

Blockchain

- Base de données décentralisée et sécurisée de **transactions**

Utile en cas d'absence d'une autorité de confiance

- Plusieurs **types d'applications** possibles

- Création d'une monnaie virtuelle pas contrôlée par une banque
- Tracking et traçabilité de produits

Réalité virtuelle/augmentée

- Création de **mondes virtuels** complètement contrôlés
 - Avec ou sans superposition au monde réel*
- Puissance de calcul liée aux images permet du **temps réel**
 - Jeux et applications de détente
 - Simulation de conditions difficiles pour formation
 - Aide au pilotage, à l'entretien, au manufacturing

Big data

- Analyse systématique de données et **extraction d'informations**
Information pertinente pour l'application visée
- Plusieurs **types d'informations** pouvant être inférées
 - Suspicion automatique de fraude sur une carte de crédit
 - Optimiser des couts, améliorer la productivité, etc.
 - Étude et prédition de comportement pour la sécurité

Intelligence artificielle

- Réalisation de **tâches cognitives** à l'aide de l'informatique

Traditionnellement effectuées par l'humain

- Comprends une pléthore de **technologies** pour
 - Reconnaître de formes : texte, image, son...
 - Prendre des décisions basées sur des éléments rationnels
 - Apprendre par l'expérience ou l'inférence statistique

Service



Biologie

- Découverte de nouvelles protéines en **simulant les repliements**

Accélérer l'évolution, complètement en virtuel...

The screenshot shows a news article from the Michigan Medicine Health Lab website. The header includes a logo for "HEALTH LAB" with a large yellow "M", navigation links for "BODY WORK", "HEALTH TECH", "INDUSTRY DX", "LAB REPORT", "MED-U", and "ROUNDS", and a search icon. The article by "Kelly Malcom" on February 28, 2019, at 1:18 PM is titled "Designing New Proteins Could Lead to Cancer Treatment". The text discusses U-M researchers leading the field in successful protein creation, which could lead to a newer, more effective class of drugs. To the right, there are sections for "Wellness Tips & Inspiring Stories" featuring stories about cancer care, heart health, children's health, and lifestyle topics like "Pay-to-Play". A large image of a protein structure composed of various colored ribbons (green, red, blue, yellow) is displayed at the bottom.

BODY WORK HEALTH TECH INDUSTRY DX LAB REPORT MED-U ROUNDS

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LAB REPORT Kelly Malcom February 28, 2019 1:18 PM

Designing New Proteins Could Lead to Cancer Treatment

U-M researchers lead the field in successful protein creation, a tactic that could lead to a newer, more effective class of drugs.

Wellness Tips & Inspiring Stories

Check out these stories from Michigan Medicine's blog on healthy living

1 CANCER CARE How Colon and Rectal Cancer Differ

2 HEART HEALTH TAVR Leads to 'Beginning of a New Life'

3 CHILDREN'S HEALTH 5 Things to Know About Spinal Anesthesia for Infants

4 LIFESTYLE Does "Pay-to-Play" Put

Science de l'environnement

- L'informatique permet de **monitorer la nature** et l'aider

Calcul et design de corridors pour préserver des ours...

The screenshot shows the National Science Foundation (NSF) website. At the top, there is a logo with the letters 'NSF' inside a blue circle, followed by the text 'National Science Foundation' and 'WHERE DISCOVERIES BEGIN'. On the right side of the header, there are links for 'Contact' and 'Help', and a search bar with a magnifying glass icon. Below the header, there is a navigation menu with links for 'Research Areas', 'Funding', 'Awards', 'Document Library', 'News', and 'About NSF'. A sidebar on the left is titled 'News' and includes links for 'All News', 'For News Media', 'Multimedia Gallery', 'News Archive', 'NSF Director's Newsletter', 'Search News', 'Special Reports', and 'Speeches and Lectures'. The main content area features a news article titled 'Discovery' with the sub-headline 'Computers play a crucial role in preserving the Earth'. The article discusses how NSF-funded researchers developed computing methods to help pastoralists monitor their environment. It includes a photograph of several people in a field, a smaller image of a person looking at a computer screen, and a link to a larger version of the image. Another image shows a black bear in a tree. The footer of the page includes a note about researchers developing computing methods to monitor the environment.

Contact | Help

Search

Research Areas Funding Awards Document Library News About NSF

News

All News

For News Media

Multimedia Gallery >

News Archive

NSF Director's Newsletter

Search News

Special Reports

Speeches and Lectures >

Home > News

Discovery

Computers play a crucial role in preserving the Earth

From bears to birds to herders: NSF-funded researchers develop computing methods to cultivate a sustainable environment, economy and society



A focus group of Kenyan pastoralists helped the research team develop the GrazeIt app.

[Credit and Larger Version](#)



Researchers developed computing methods to...

Santé

- L'informatique ouvre les portes à des **nouvelles thérapies**

La réalité virtuelle permet de traiter des phobies

medgadget

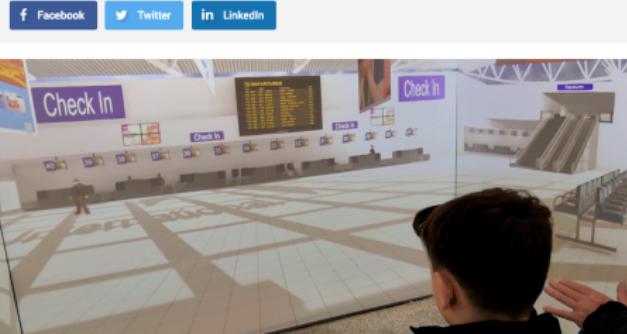
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Virtual Reality Room Helps Kids With Phobias Overcome Fears

FEBRUARY 20TH, 2019

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PEDIATRICS, PSYCHIATRY



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"NaoTrac" the First Autopilot Surgical Robot for Brain Surgery

Sociologie

- Analyse de **comportement humain** et de la société et leurs liens

Permet par exemple de surpasser des risques systémiques

ADVANCED SCIENCE NEWS

HEALTHCARE • SUSTAINABILITY • TECHNOLOGY • BASIC RESEARCH • VIDEOS 中国

Q f t y m

Environment

Computational Sociology Helps Overcoming Systemic Risks

By Babak Mostaghaci

Posted on September 19, 2018



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3. Research Metrics: h-index
4. Tumor-Targeting Nanoprobe with a Novel Cell Membrane...
5. Inorganic Perovskite Solar Cells: Towards Low Cost....
6. Research Metrics: Altmetrics
7. Printable Water Sensor
8. Metallic Metasurface: How to Stay Under The Radar?
9. Preventing Fire in Electric Vehicles
10. Walking the Silk Road with David Kaplan

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31

Art

- Des ordinateurs capables de créer de l'art, inventer, imaginer

Plusieurs « œuvres » ont été créées par des machines

The screenshot shows a news article from The Guardian. At the top, there's a dark blue header with the text "Support The Guardian", "Available for everyone, funded by readers", "Search jobs", "Sign in", "Search", and "International edition". Below the header is the main title "The Guardian" in large white letters. The main content area has a white background. On the left, there's a sidebar with the heading "Artificial intelligence (AI)" in orange, the author's name "Arthur Miller", the publication date "Mon 4 Mar 2019 07.00 GMT", and social sharing icons for Facebook, Twitter, and Email. Below these are two small numbers: "401" and "349". The main article text asks "Can machines be more creative than humans?" and discusses a computer-generated artwork auctioned at Sotheby's. It includes two small images of the artwork. To the right of the article is an advertisement for "luminus" with the text "Calculez le prix de votre nouvelle chaudière EN 5 MINUTES".

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Artificial intelligence (AI)

Arthur Miller
Mon 4 Mar 2019 07.00 GMT

401 349

Can machines be more creative than humans?

A computer-generated artwork is going to auction at Sotheby's - but will AI art have staying power?



Advertisement

luminus

Calculez
le prix de votre
nouvelle chaudière

EN 5 MINUTES

Monde digital

101

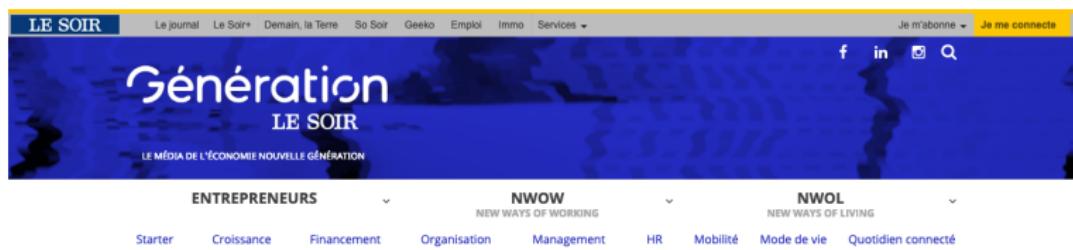
Éducation

- L'informatique s'empare de l'**éducation**, et inversement

A-t-on les outils pour comprendre et appréhender l'informatique ?

- Gros glissement de **vocabulaire**

*Informatique vs **numérique** et programmation vs **codage***



Faut-il forcément apprendre à coder pour trouver un boulot ?

De plus en plus d'écoles proposent à qui veut de se former au code informatique. Bonne ou mauvaise idée ? Les avis divergent. Pour certains, d'ici 10 ans, nous devrons tous coder un minimum. Pour d'autres, c'est l'intelligence artificielle s'en chargera. Tour d'horizon des points de vue.

Interaction sociale

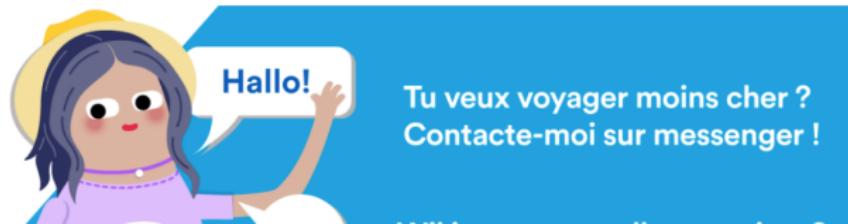
- L'interaction entre humains passe par la machine

Va-t-on pouvoir s'en satisfaire ? Osera-t-on encore interagir ?

- La SNCB « engage » Céline, chatbot qui vend des billets

The screenshot shows the header of the BX1 website. It includes a menu icon, a search icon, and the BX1 logo with the text "Média de Bruxelles". To the right is a weather forecast: "En ce moment" (Cloudy, 16°C), followed by forecasts for VEN (Sunny, 18°C), SAM (Cloudy, 13°C), DIM (Cloudy, 11°C), and LUN (Cloudy, 10°C). There is also a "Réveillez-nous" (Wake me up) button with a bell icon. Below the header is a navigation bar with links: "Dernier JT", "Direct TV", "Direct info", "Mon BX1", and social media icons for Twitter, Facebook, YouTube, and Instagram. At the bottom, there is a footer with links: "Attentats de Bruxelles", "Rue de la Loi", "Penser la Justice", "Notre blog mobilité", and "Élections 2019".

La SNCB lance un robot sur sa messagerie Facebook



Vie privée

- La protection de ses données personnelles devient cruciale

Et il y a tout ce qu'on ne voit/image pas...

The screenshot shows a news article from Forbes. At the top, there's a navigation bar with links for Billionaires, Innovation, Leadership, Money, Consumer, Industry, Lifestyle, Featured, BrandVoice, Lists, and Advisor. A search icon is also present. Below the header, it says "111,397 views | Mar 10, 2019, 04:05am". The main title of the article is "(Updated) 2 Billion Unencrypted Records Leaked In Marketing Data Breach -- What To Do Next". Below the title, there's a bio for the author, Davey Winder, who is a Contributor to Cybersecurity. He is described as reporting and analysing breaking cybersecurity and privacy stories. There are social media sharing icons for Facebook, Twitter, LinkedIn, and Google+. A large image at the bottom left shows a crumpled piece of paper with the words "DATA BREACH" written in red. To the right of the article, there's a sidebar with a photo of white methamphetamine crystals and a caption: "The driver was said to have used a suspended license and when he was searched, bags of methamphetamine dropped out of his cap." Below this, there's an advertisement for Telenet Business featuring a woman smiling and text in Dutch: "BEGIN MET EEN STRAF NETWERK VAN TELENET BUSINESS." and "NU 2 MAANDEN GRATIS".

Contrôle du monde

- Le monde est contrôlé par une poignée de personnes

Les grosses boites internationales sont-elles les seules ?

Google, Apple, Facebook, Amazon... versus Baidu, Alibaba, Tencent, Xiaomi

The screenshot shows the homepage of Leaders League. At the top, there is a navigation bar with links for NEWS & TRENDS, RANKINGS, ZONES & TOPICS, ABOUT US, PRODUCTS, EVENTS, and CONTACT US. Below this is a secondary navigation bar with links for BUSINESS & LEADERSHIP, TRANSACTIONS & FINANCE, REGULATION & LAW, INNOVATION & MARKETING, and PEOPLE. On the left side, there is a sidebar with social media sharing icons for Print, Email, LinkedIn, and Twitter. The main content area features a large image of two men, Satya Nadella and Jack Ma, with the headline "GAFA vs BATX: To Rule Them All". Below the headline is the date "07-03-2019". To the right, there is a video player titled "INTERVIEW" showing a man speaking, with the caption "Pierre Naudet, Chairman & CEO, AccorHotels". At the bottom right, there are links for CONTACT US and ABOUT US.

Pollution numérique

- La **quantité folle de données générées sur terre coutent cher**

Quel impact ont-elle sur la consommation et sur notre Terre

N°10. L'impact d'internet

Internet, polluant ?!

Si je fais une requête sur Google



j'allume 1 ampoule de 12W pendant 2h

Si j'envoie une photo de vacances à mes amis par email *



*une pièce jointe de 1Mo à 10 destinataires

je fais 500m en voiture

Si nous laissons nos boxes allumées 24h/24



nous consommons inutilement 3TWh/an, soit le tiers d'un réacteur nucléaire

Remplacement de l'humain

- La machine finit par savoir **faire des tâches** mieux que l'homme

L'être humain est-il voué à disparaître ?

[Agenda](#)[Initiatives](#)[Reports](#)[Events](#)[About](#) [English](#)[TopLink](#)[Industry Agenda](#)[Artificial Intelligence and Robotics](#)[Justice and Legal Infrastructure](#)[Digital Economy and Society](#)

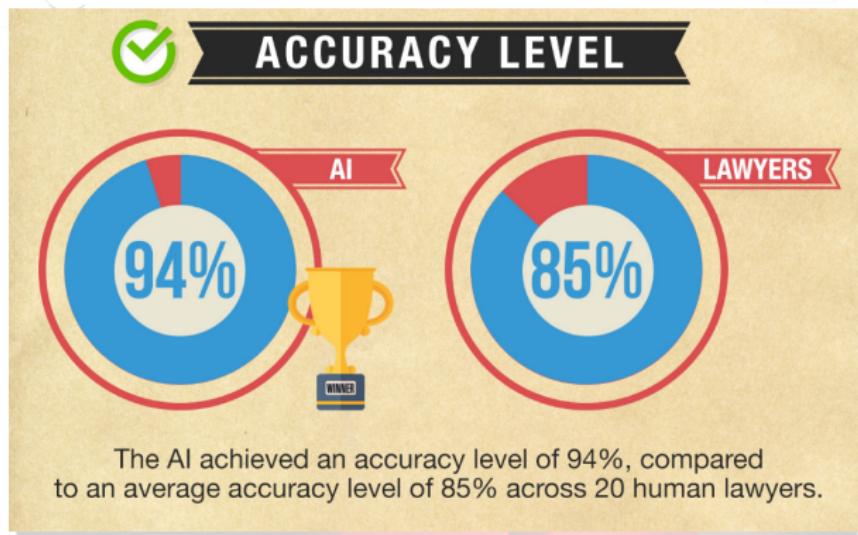
This AI outperformed 20 corporate lawyers at legal work



Remplacement de l'humain

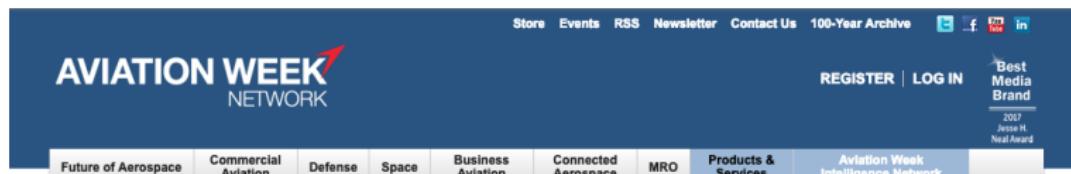
- La machine finit par savoir faire des tâches mieux que l'homme

L'être humain est-il voué à disparaître ?



Interaction homme-machine

- L'humain doit **interagir avec la machine** pour l'utiliser
À quel point comprendre la machine et son fonctionnement ?
- **Asiana 214**, le pilote pensait qu'un mode était activé... non



The screenshot shows the homepage of Aviation Week Network. At the top, there's a navigation bar with links for Store, Events, RSS, Newsletter, Contact Us, and a 100-Year Archive, along with social media icons for Twitter, Facebook, YouTube, and LinkedIn. Below the navigation is the 'AVIATION WEEK NETWORK' logo. To the right, there are buttons for 'REGISTER | LOG IN' and a 'Best Media Brand 2017 Jesse H. Neal Award' badge. The main menu below the logo includes categories like Future of Aerospace, Commercial Aviation, Defense, Space, Business Aviation, Connected Aerospace, MRO, Products & Services, and Aviation Week Intelligence Network.

HOME > ASIANA CRASH PUTS FOCUS ON TRAINING, AUTOMATION



Step **INSIDE** the next evolution

Asiana Crash Puts Focus On Training, Automation

Airspeed eroded, despite six eyes on the Asiana 777 flight deck

John Croft | Aviation Week & Space Technology

Jul 15, 2013



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TODAY'S TECHNOLOGY,
TOMORROW'S INNOVATION.

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BOOTH 711

L3
Technologies

AVIATION WEEK
Fleets&MRO
FORECASTS

2019
DATA NOW
AVAILABLE!

Complications and distractions aside,
over-reliance on automation systems
appears to have trumped basic flying

Ce qui est sûr...

≡ SECTIONS HOME SEARCH

The New York Times

1.  Months After John McCain's Death, Trump Keeps Feud With Him Alive

2.  New Zealand to Ban Military-Style Semiautomatic Guns, Jacinda Ardern Says

3.  A 'Disgusting' Yale Professor Moves On

4.  Confusion, Then Prayer, in Cockpit of Doomed Lion Air Jet

ARCHIVES | 2001

The World: In Silica Fertilization; All Science Is Computer Science

By GEORGE JOHNSON MARCH 25, 2001



EXCEPT for the fact that everything, including DNA and proteins, is made from quarks, particle physics and biology don't seem to have a lot in common. One science uses mammoth particle accelerators to explore the subatomic world; the other uses petri dishes, centrifuges and other laboratory paraphernalia to study the chemistry of life. But there is one tool both have come to find indispensable: supercomputers powerful enough to sift through piles of data that would crush the unaided mind.

Last month both physicists and biologists made announcements that challenged the tenets of their fields. Though different in every other way, both discoveries relied on the kind of intense computer power that would have been impossible to marshal just a few years ago. In fact, as research on so many fronts is becoming increasingly dependent on computation, all science, it seems, is becoming computer science.

Ce qui est sûr...

≡ SECTIONS HOME SEARCH

The New York Times

1.  **Fabrication numérique**

2.  A 'Disgusting' Yale Professor Moves On

3.  Confusion, Then Prayer, in Cockpit of Doomed Lion Air Jet

ARCHIVES | 2001

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Conception numérique

Ce qui est sûr...

≡ SECTIONS HOME SEARCH

The New York Times

1.  Computational Biology

2.  A 'Disgusting' Yale Professor Moves On

3.  Confusion, Then Prayer, in Cockpit of Doomed Lion Air Jet

ARCHIVES | 2001

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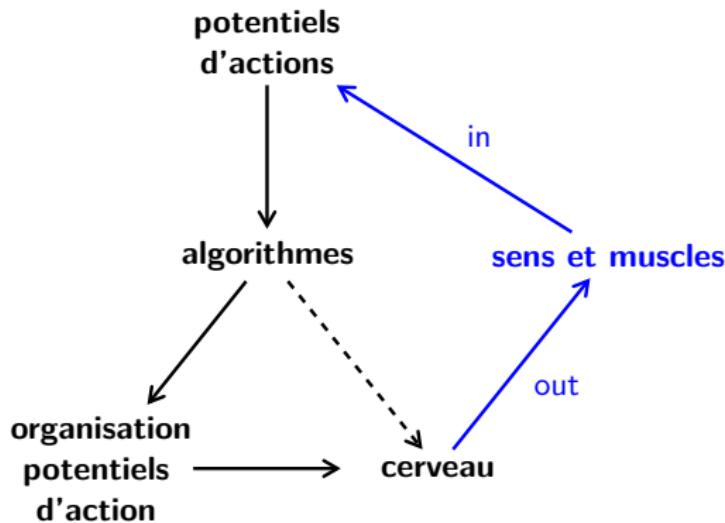
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Computational Linguistics

...ce qui est flou...

- A-t-on vraiment inventé quelque chose ?

N'est-on pas en train de faire comme avant, mais plus vite ?



...et ce qui est moins sûr

- Le monde numérique est-il **meilleur** ou pire qu'avant ?

Nous aide-t-il vraiment à vivre une meilleure vie réelle ?

- Peut-on faire **confiance** au monde numérique ?

Peut-on autant se fier à une machine qu'à un humain ?

- Doit-on **comprendre** la machine pour l'utiliser ?

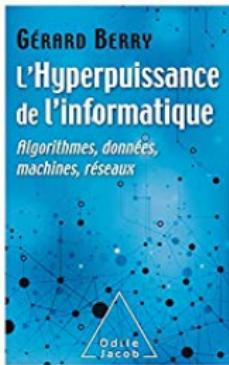
Faut-il cohabiter avec les machines ou les contrôler ?

“The best way to predict the future is to invent it.” —
Alan Kay

FUTURES



Références



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Charles-Edouard Bouée

EN COLLABORATION AVEC
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Confucius
et les automates

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