LE PANORAMA MONDIAL DES TECHNOLOGIES

Les enseignements clés du rapport d'Amy Webb 2020

DEFI
LA MODE DE FRANCE

Amy WEBB est une référence absolue en matière de technologies et de prospective aux Etats-Unis. Elle est une futuriste quantitative.

Elle est professeur de prospective stratégique à la NYU Stern School of Business, fondatrice du Future Today Institute, un cabinet de prospective et de stratégie de référence qui aide les dirigeants et leurs organisations à se préparer à des futurs complexes.

Amy WEBB est également chercheur invité à la Säid School of Business de l'université d'Oxford, chercheur senior non résident au Centre GeoTech du Conseil atlantique, chercheur dans le cadre du programme de leadership États-Unis-Japon et chercheur en prospective au Centre de prospective stratégique du Government Accountability Office des États-Unis.

Ses interventions à SxSW constituent des rendez-vous incontournables. Malgré l'annulation de cette manifestation, suite à l'épidémie du COVID, SxSW a organisé une conférence en ligne.

Ce document vous en présente les principaux enseignements. Les informations sont issues des documents d'Amy WEBB

01 Qu'est ce que le futur

L'amour de la certitude.
La tentation toujours humaine de trouver des liens de causalités simples : du type si A alors B.
Le rêve de la solution unique.

→

Impossibilité de la prévision absolue

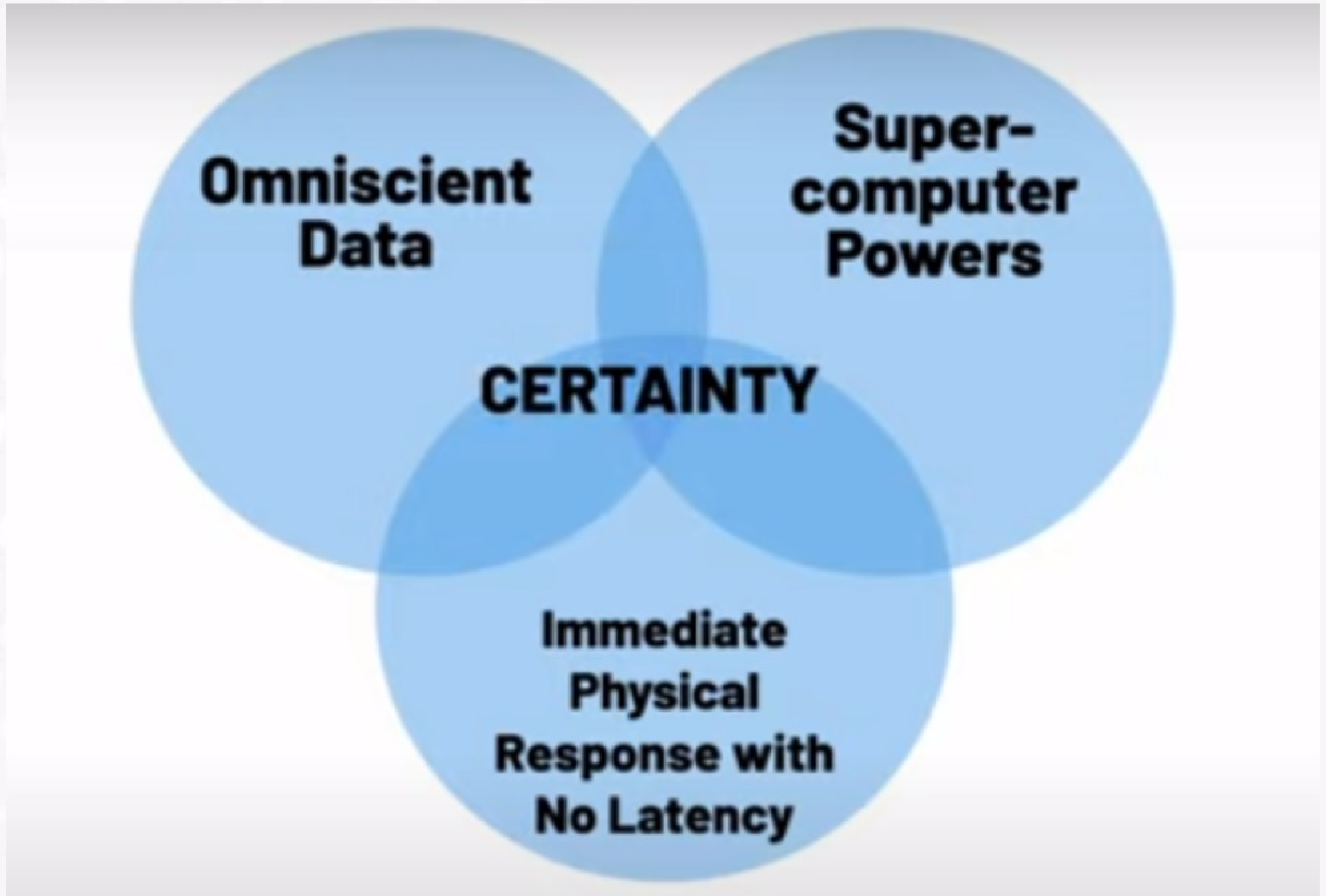
Exemple de la voiture sur une route verglacée. La certitude nécessiterait tout à la fois :

L'accès à une data considérable

Aussi bien en physique, que pour l'épaisseur de la glace, la matière des pneus, la vitesse, l'orientation, l'humidité etc...

Des capacités de calculs hors normes

Une réaction physique immédiate, sans temps de latence



L'IMPOSSIBILITE DE PREDIRE LE FUTUR

Une multiplicité de futurs possibles.

ALORS QUE FAIRE ?

+ ACCEPTER L'INCERTITUDE

+ ETRE ENGAGE, A L'ECOUTE DES SIGNAUX

+ ETRE PRET AUX DECISIONS INCREMENTALES ET AUX EVOLUTIONS

SURTOUT SE PREPARER

02 LE PANORAMA 2020 DES TECHNOLOGIES

400 tendances technologiques analysées

9 conclusions majeures

11 sources externes de disruption mais aussi de cibles des technologies

Un rapport d'une grande densité à consulter même si parfois extrême

→ https://futuretodayinstitute.com/

Les points d'intérêt et de surprise d'Amy Webb sur les douze derniers mois

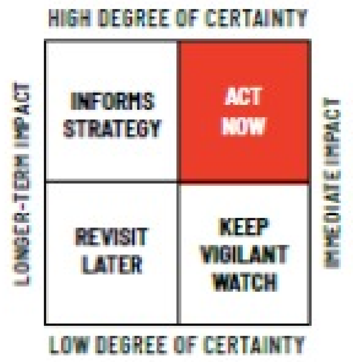
La prospective naît d'une grande curiosité et d'une attention extrême à des signaux faibles, à des évolutions, des amplications, des découvertes. Voici le moodboard d'Amy Webb

- Tout être humain est aujourd'hui scoré et pas seulement en Chine
- Se préparer à rencontrer son jume au digital
- Les ordinateurs quantiques vont émerger
- Bientôt les robots seront courants dans toutes les entreprises
- Les grands de la tech investissent dans l'agriculture
- Nos domiciles produisent des émissions digitales
- Les médicaments synthétiques, les microbes modifiés peuvent résoudre un grand nombre de problèmes mais suscitent la peur
- Un nouveau complexe militaro-industriel se met en place
- La conquête spatiale prend un nouvel élan

UN RAPPORT TRES COMPLET ET TRES PEDAGOGIQUE

13TH YEAR ON THE LIST

Artificial Intelligence



A.I. represents the third era of computing.

KEY INSIGHT

Artificial intelligence (A.I.) represents the third era of computing, one that could usher in a new period of productivity and prosperity for all. It has potential to act as a force multiplier for good, helping to address humanity's most complex challenges: how to mitigate climate change, how to increase the global food supply, how to develop safer infrastructure, how to manage cybersecurity threats and how to diagnose and eradicate diseases. However, A.I. also carries risks: gender, race and ethnic bias continues to negatively influence the criminal justice system; countries differ in their regulatory approaches; it enables the creation and spread of fake news and misinformation; it threatens privacy and security; and it will inevitably displace swaths of the workforce. There is no central agreement on how A.I. should develop during the next several decades. Many facets of artificial intelligence have made our list since we first started publishing this report 13 years ago. Because A.I. itself isn't the trend, we identified different themes within A.I. that you should be following. You will also find the technology intersecting with other trends throughout this report.

WHAT YOU NEED TO KNOW

In its most basic form, artificial intelligence is a system that makes autonomous decisions. A.I. is a branch of computer science in which computers are programmed to do things that normally require human intelligence. This includes learning, reasoning, problem solving, understanding language and perceiving a situation or environment. A.I. is an extremely large, broad field, which uses its own computer languages and relies on computer networks modeled on our human brains.

WHY IT MATTERS

The global A.I. market should grow 20% annually between 2020 and 2024, while global economic growth generated by A.I. could reach $16 trillion by the end of this decade.

DEEPER DIVE

Weak and Strong A.I.

There are two kinds of A.I.—weak (or "narrow") and strong (or "general"). Narrow A.I. systems make decisions within very narrow parameters at the same level as a human or better, and we use them all day long without even realizing it. The anti-lock brakes in your car, the spam filter and autocomplete functions in your email and the fraud detection that authenticates you as you make a credit card purchase— these are all examples of artificial narrow intelligence. Artificial general intelligence (AGI) describes systems capable of decision-making outside of narrow specialties. Dolores in Westworld, the Samantha operating system in Her, and the H.A.L. supercomputer from *2001: A Space Odyssey* are anthropomorphized representations of AGI—but the actual technology doesn't necessarily require humanlike appearances or voices.

There is no single standard that marks the distinction between weak and strong A.I. This is problematic for researchers covering A.I. developments and for managers who must make decisions about A.I.

In fact, we have already started to see real-world examples of functioning AGI. In 2017 researchers at **DeepMind**, a lab owned by the same parent company as **Google**, announced that A.I. had taught itself how to play chess, shogi (a **Japanese** version of chess) and Go (an abstract strategy board game)—all without any human intervention. The system, named AlphaZero, quickly became the strongest player in history for each game. The team has been publishing important discoveries at an impressively fast pace. Last year, the DeepMind team taught A.I. agents to play complex games, such as the capture the flag "game mode" inside the video game Quake III. They, like humans, had learned skills specific to the game as well as when and how to collaborate with other teammates. The A.I. agents had matched human player ability using reinforcement learning, in which machines learn not unlike we do—by trial and error.

While we haven't seen an anthropomorphic A.I. walk out of DeepMind's lab, we should consider these projects as part of a long transition between the narrow A.I of today and the strong A.I. of tomorrow.

Neural Networks and Deep Neural Networks

A neural network is the part of a system in which information is sent and received, and a program is the set of meticulous instructions that tell a system precisely what to do so that it will accomplish a specific task. How you want the computer to get from start to finish—essentially, a set of rules—is the "algorithm."

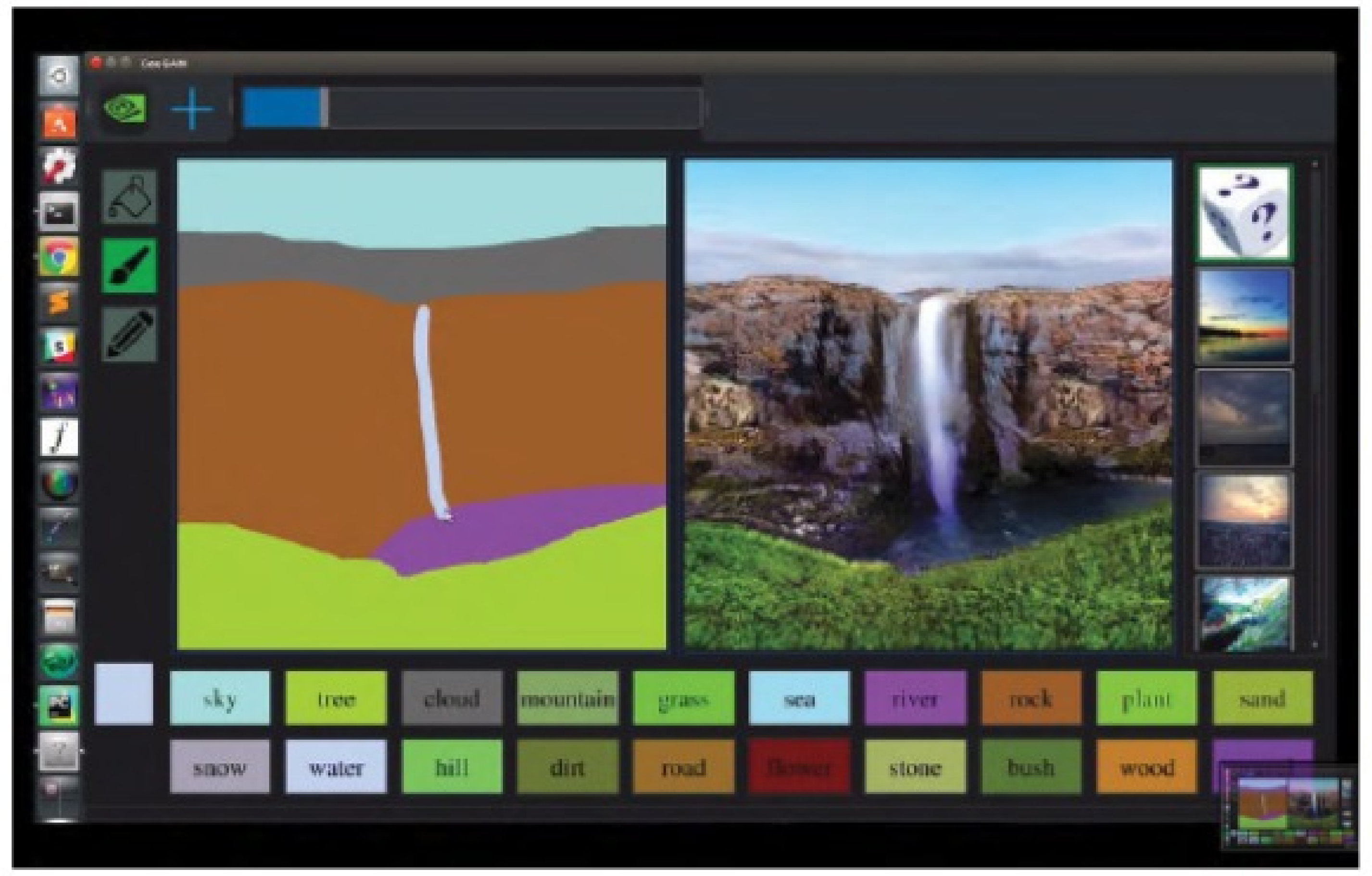
A deep neural network is one that has many hidden layers. There's no set number of layers required to make a network "deep." Deep neural networks tend to work better and are more powerful than traditional neural networks (which can be recurrent or feedforward).

Machine Learning and Deep Learning

A.I. pioneer **Arthur Samuel** popularized the idea of machine learning in 1959, explaining how computers could learn without being explicitly programmed. This would mean developing an algorithm that could someday extract patterns from data sets and use those patterns to predict and make real-time decisions automatically. It took many years for reality to catch up with Samuel's idea, but today machine learning is a primary driver of growth in A.I.

Deep learning is a relatively new branch of machine learning. Programmers use special deep learning algorithms alongside a corpus of data—typically many terabytes of text, images, videos, speech and the like. Often, these systems are trained to learn on their own, and they can sort through a variety of unstructured data, whether it's making sense of typed text in documents or audio clips or video. In practical terms, this means that more and more human processes will be automated, including the writing of software, which computers will soon start to do themselves.

Artificial Intelligence cont.



Nvidia's A.I. turns your hand-scrawled doodles into photorealistic landscapes.

Companies Building the Future of A.I.

Nine big tech companies—six American, and three Chinese—overwhelmingly drive the future of artificial intelligence. In **the U.S.**, it's the **G-MAFIA: Google**, **Microsoft**, **Amazon**, **Facebook**, **IBM** and **Apple**. In **China** it's the **BAT: Baidu**, **Alibaba** and **Tencent**. Those nine companies drive the majority of research, funding, government involvement and consumer-grade applications of A.I. University researchers and labs rely on these companies for data, tools and funding. The Big Nine A.I. companies also wield huge influence over A.I. mergers and acquisitions, funding A.I. startups and supporting the next generation of developers.

Artificial Intelligence and Personal Data

Artificial intelligence requires robust, clean data sets. For example, manufacturers with large data sets can build machine learning models to help them optimize their supply chain. Logistics companies with route maps, real-time traffic information and weather data can use A.I. to make deliveries more efficient.

But a significant amount of our personal data is also driving the growth of A.I. Called "personally identifiable information," or PIIs, these are discrete units of data we shed simply by using our computers, phones and smart speakers. Our personal data is treated differently around the world. The **California Consumer Privacy Act (CCPA)**, which took effect in January of 2020, limits the ways in which companies can use personal data, while the **European Union's General Data Protection Regulation (GDPR)** requires companies to gain consent before collecting and processing someone's personal data.

From Small Bits to Huge Bytes

As smart gadgets become affordable and recognition systems more common in the workplace and public spaces, a significant amount of personal data will be collected – orders of magnitude more than is today. By 2025, it is estimated that 463 exabytes of data will be created every single day – that's equivalent to 77 billion Netflix movie streams. However, more data isn't necessarily better, especially when data saturation doesn't effectively tell a complete story.

For this reason, we believe that companies will eventually unify our PIIs into more comprehensive "personal data records," or PDRs for short. This single unifying ledger would pull together all of our PIIs, i.e. all of the data we create as a result of our digital usage (think internet and mobile phones). But it would also include other sources of information: our school and work histories (diplomas, previous and current employers); our legal records (marriages, divorces, arrests); our financial records (home mortgages, credit scores, loans, taxes); travel information (countries visited, visas); dating history (online apps); health information (electronic health records, genetic screening results, exercise habits); and shopping history (online retailers, in-store coupon use).

Who Will Own Your Data in the Future?

Ideally, you would be the owner of your PDR. It would be fully interoperable between systems, and the big tech companies would simply act as custodians. However, given the lack of enforceable norms, standards and guardrails, we believe that in the future your PDRs would be owned and held by one of the big tech companies.

During his 2020 presidential run, businessman **Andrew Yang** proposed that Congress pass a new law establishing data as a property right for individuals, giving them the right to protect how it is collected and used, and a way for them to share in the economic value generated as a result of their data.

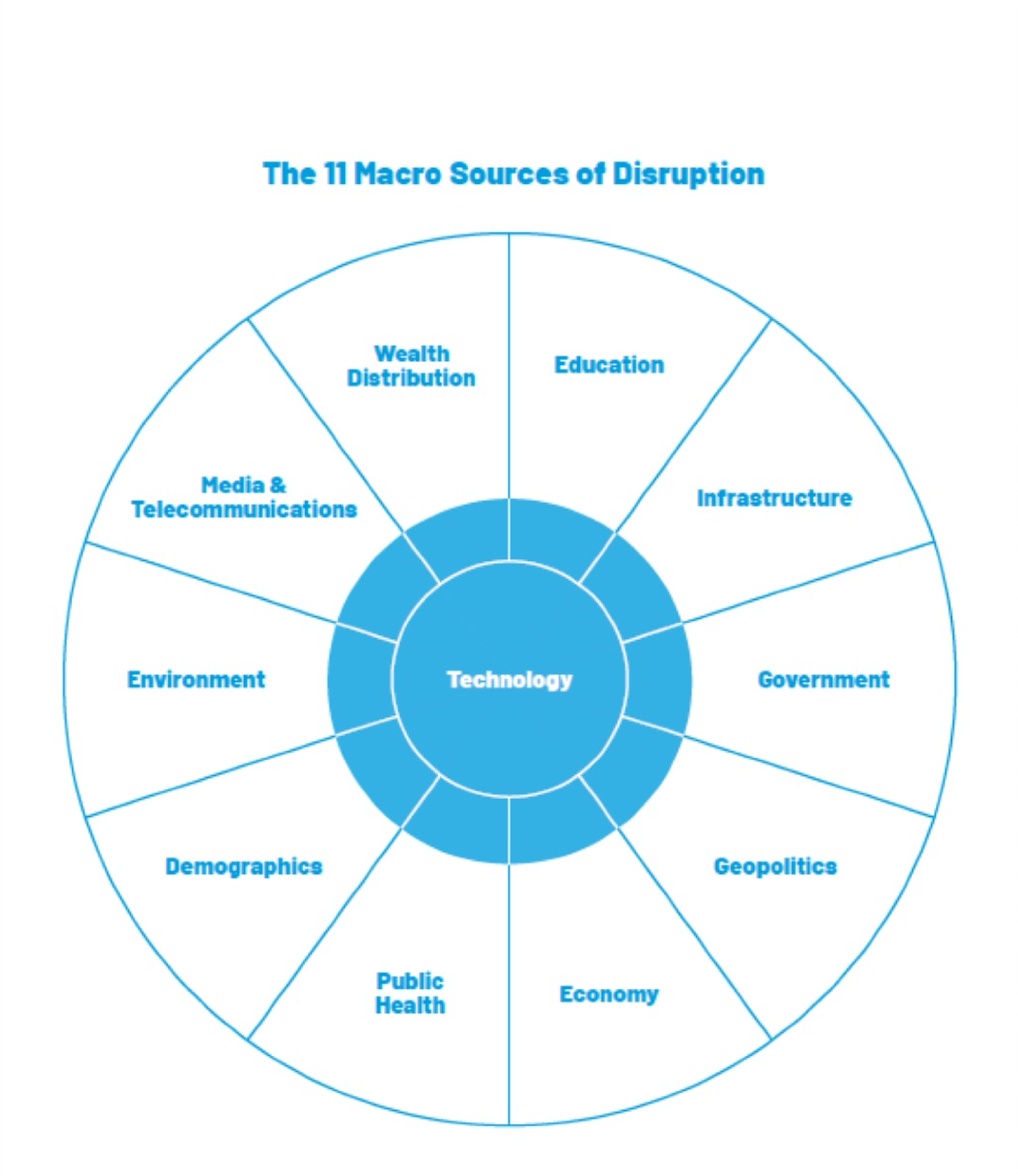
Enabling Future Generations to Inherit Your Data

Your PDR could be heritable—a comprehensive record passed down to and used by your children. This would enable an A.I. system to learn from your family's health data, which could someday aid in precision medicine. It could also help track and untangle a family member's finances after their death. Heritable PDRs could also help families pass down memories of loved ones to further generations.

Imagine being able to set permissions on all of the content you consume—news stories, movies, songs, sporting events, lectures—and then passing down insights to your children or other loved ones. The content we consume shapes our worldviews and actions, and a window into that content could help others more deeply understand you, for better or worse.

THE IMPACT

The long-term impact of A.I. will depend on choices we make in the present. As **ANI (artificial narrow intelligence)** becomes a ubiquitous presence in business, education, research and governing, it is imperative that leaders make informed decisions.



Les 11 sources et cibles de disruption

- Les organisations sont impactées par des décisions externes en dehors de leurs champs de contrôle.
- Les technologies impactent en retour ces 11 sources de disruption.
- Les 11 sources de disruption :
    - La répartition de richesse
    - L'éducation
    - Les infrastructures
    - Les pouvoirs publics
    - La géopolitique
    - L'économie
    - La santé publique
    - La démographie
    - L'environnement
    - Les médias et les télécommunications

03

Le sujet central :
LE MONDE DE SYNTHESE

Dans sa conférence, Amy WEBB a mis en évidence une tendance macro qui englobe 22 tendances regroupées en 4 champs :

- Intelligence Artificielle
- Robotique et connectivité
- Média et communications de synthèse
- Biologie de synthèse

→ Pour Amy Webb nous entrons dans la décennie de synthèse

Intelligence artificielle

- Compétition pour financer l'IA
- IA pour les découvertes scientifiques
- Algorithmes évolutifs
- Jumeaux digitaux et cognitifs
- IA dans le cloud
- IA pour finaliser des images

Robots et connectivité

- 5 G
- Fabrication accélérée de robots

Media et contenu de synthèse

- Génération de contenus
- GANs
- Espaces bioniques virtuels
- Clonage automatique de voix
- Lunettes intelligentes
- Informatique 3D
- Continuum d'assistants virtuels
- Personnages de synthèse

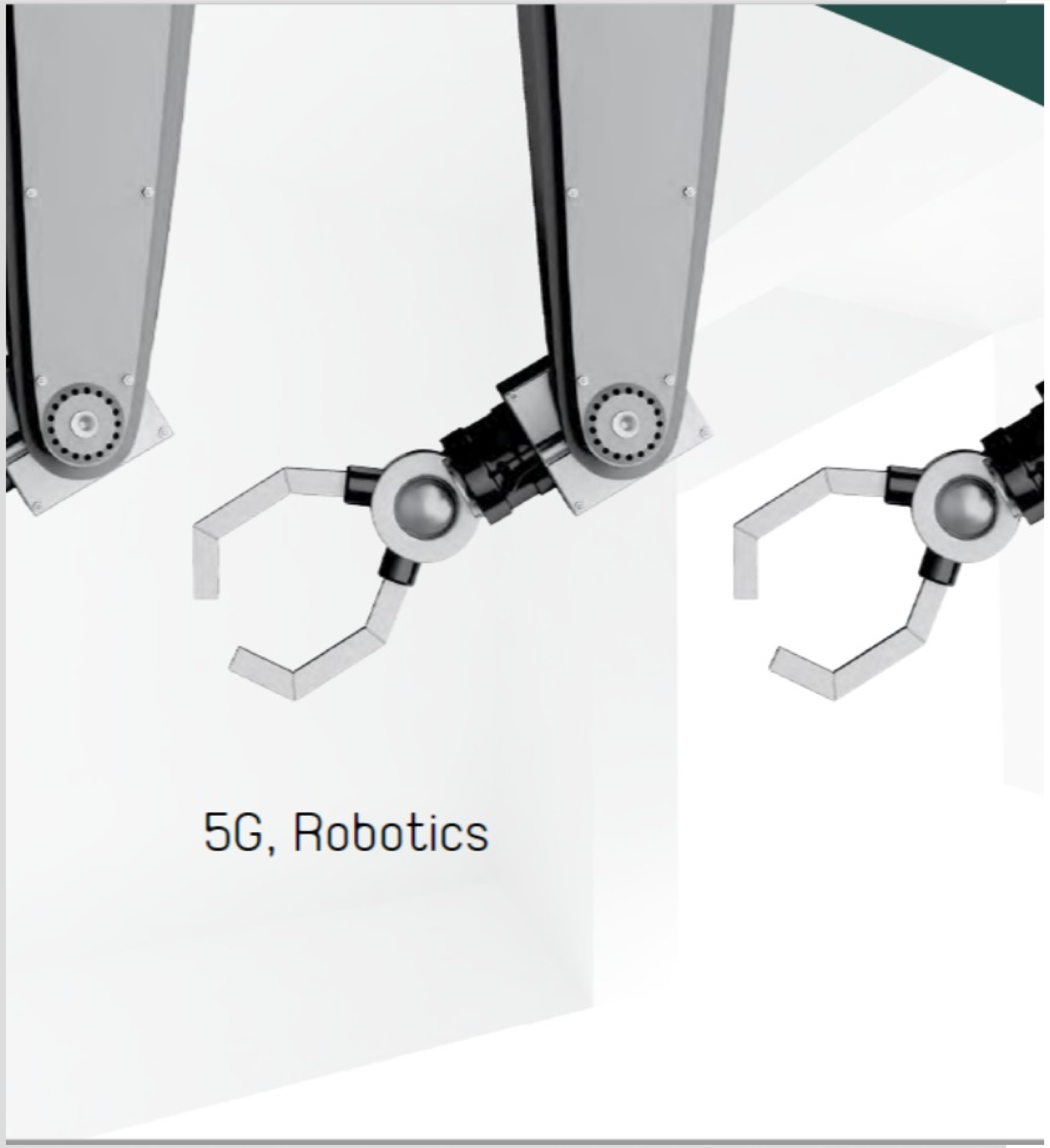
Biologie de synthèse

- Biologie de synthèse
- Manipulation génétique du bétail
- Créer des virus
- Nouveaux organismes vivants
- Recréer environnement terrestre
- Nourriture de synthèse

Intelligence Artificielle

L'IA ne constitue pas une technologie en tant que tel mais la troisième évolution de l'informatique.

- Elle se déploie dans tous les secteurs.
- Avance des US et de la CHINE
- Aujourd'hui, on peut mobiliser des capacités de calcul dans le cloud : cela va décupler son utilisation.
- Le marché de l'IA devrait croître de 20% par an d'ici 2024
- Une accélération des découvertes scientifiques grâce à l'IA
- IA émotionnelle



5G et robotique

La 5G va provoquer une vague de nouveaux businss dans tous les secteurs par l'immédiateté. La robotique va se déployer dans plusieurs directions :

- Des robots conceptualiseront et fabriqueront des robots
- Collaboration
- Autonomie grâce à la puissance des échanges de données
- Des essaims de robots autonomes et programmables
- Automatisation de tâches y compris dans les bureaux
- Robots souples
- Robots personnels

Média et contenu de synthèse

Des technologies d'une grande puissance :

- Clonage de voix, d'images
- Création d'univers de synthèse totalement réalistes
- Création de personnages de synthèse interragissant dans un environnement évolutif
- Nouvelles formes de création grâce aux GANs
- Génération automatique de contenus, d'articles
- Assistants digitaux ubiquitaires, interconnectés, prenant des décisions en fonction de nos émotions

Biologie synthétique

La découverte de la technologie CRISPR fait rêver à un monde où l'homme pourrait à sa guise modifier les génomes et la vie :

- Créer de "robots" moléculaires
- Créer de nouveaux organismes vivants
- Modifier les humains et les animaux
- Modifier à façon des virus, des bactéries pour des applications précises
- Développer des technologies pour recréer les conditions terrestres
- Nourriture de synthèse

Aucun futur n'est encore écrit - Amy Webb a proposé deux scénarii extrêmes

Elle a lancé un appel à la communauté de SxSW pour aller vers le scénario optimiste

Le scenario catastrophe

Un monde qui rappelle Aldous Huxley

- Capitalisme vautour
- Notation omniprésente des êtres humains et surveillance de masse
- Déterminisme des différentes étapes de la vie via des algorithmes
- La guerre entre les différentes "catégories" génétiques ; entre les êtres augmentés et les autres

Le scenario optimiste

Un monde où les technologies seront au service de l'humanité entière :

- Confiance et collaboration
- Un scoring au service des êtres humains
- Des biotechnologies positives
- Les technologies de synthèse au service des problèmes du monde : éducation, pauvreté, maladies, environnement