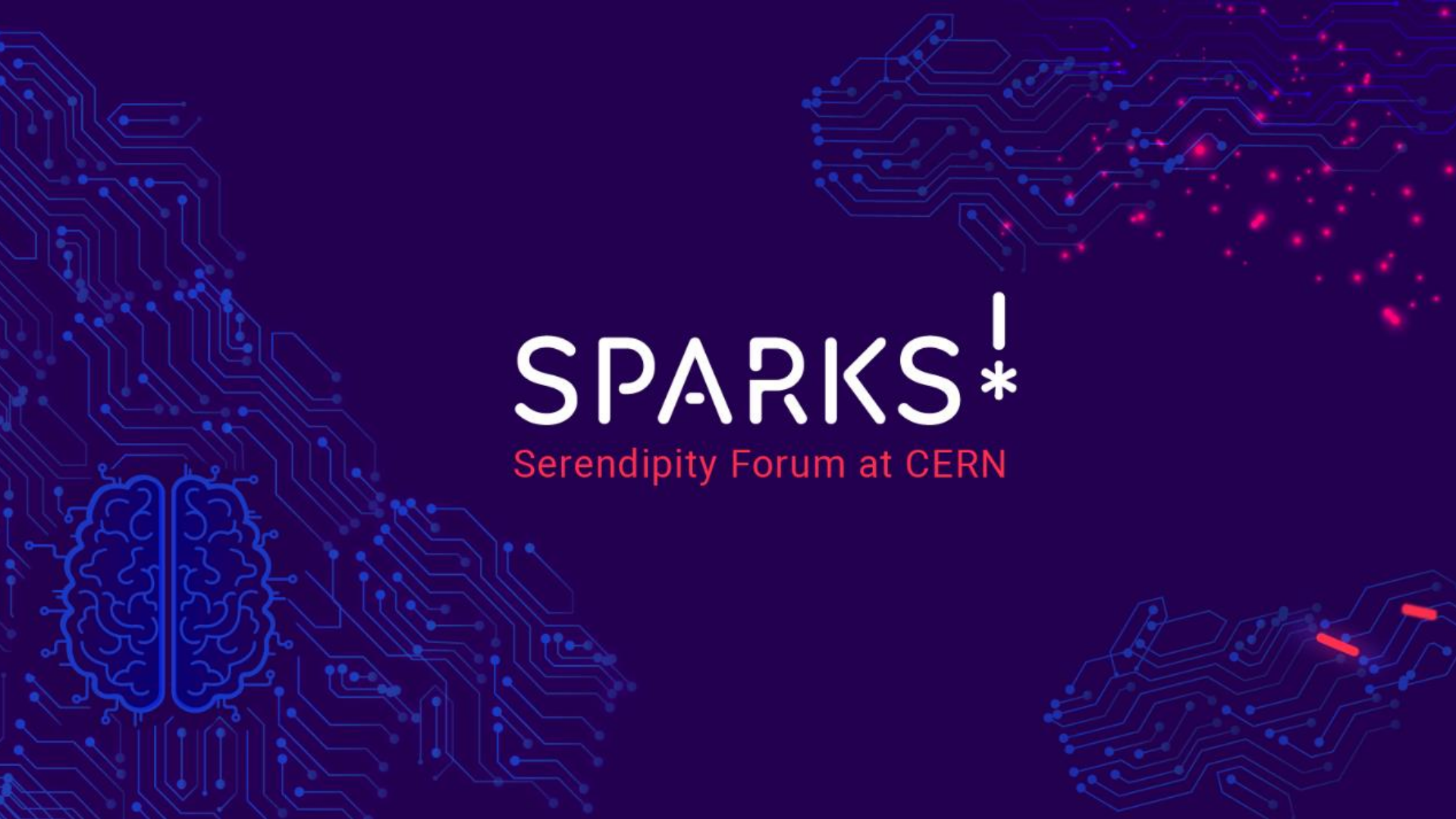
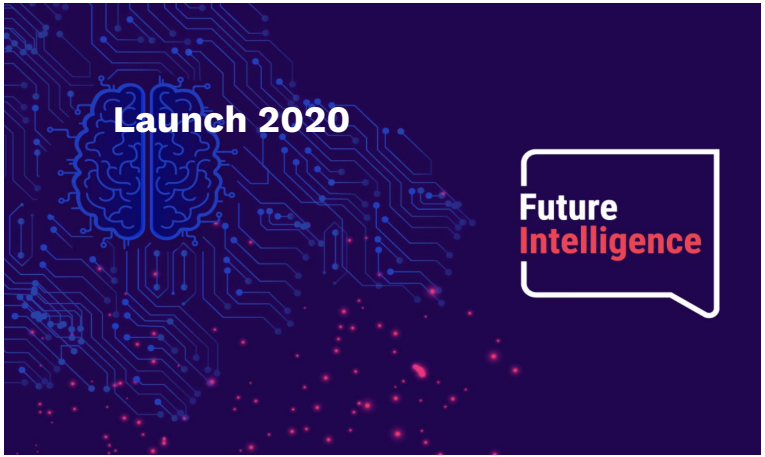

SPARKS!*
Serendipity Forum at CERN


TEDxCERN

- *To spark innovation in issues related to STEM that are relevant to society and necessary for CERN.*
- *Three pilot annual events leading to Science Gateway*
- *The theme of the first event - **Future Intelligence.***


Launch 2020
Future
Intelligence


Podcast Series
Future
Intelligence


Forum
17 September
Future
Intelligence


Public Event
18 September
Future
Intelligence


Launch
November 2020
Future
Intelligence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Future Intelligence

The CERN Sparks! Podcast - Future Intelligence

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Artificial intelligence is transforming our world. Hear the sparks fly as Mark Rayner and Abha Eli Phoboo collide pairs of the leading coders, neuroscientists, entrepreneurs, philosophers, psychologists and physicists who are shaping the future. Then join us for the first edition of the Sparks! Serendipity Forum at CERN in September.

CERN - the European Organization for Nuclear Research, is the largest particle physics laboratory in the world. Established in 1954, it is derived from the French acronym *Conseil européen pour la recherche nucléaire*. We probe the fundamental structure of the particles that make up everything around us.

sparks.cern/podcast

#6 Fast and slow AI — with Francesca Rossi and Daniel Kahneman

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#5 Ethical AI — with Nyalleng Moorosi and S. Matthew Liao

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#4 Experimental AI — with Maurizio Pierini and Michael Doser

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#3 Creative AI — with Anima Anandkumar and John Ellis

#2 Quantum AI — with Maria Spiropulu & Vivienne Ming

#1 Brainy AI — with Stuart Russell and Tomaso Poggio

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Aug 17, 8:00 AM

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Forum
17 September 2021
Future
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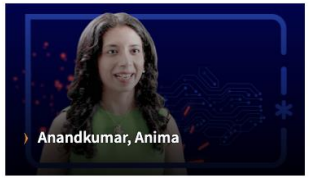
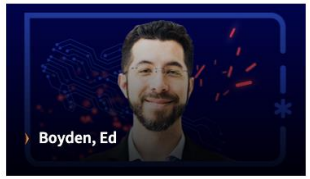
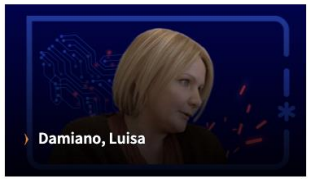






Perspective | Open Access | Published: 18 June 2021

Nobel Turing Challenge: creating the engine for scientific discovery

Hiroaki Kitano

npj Systems Biology and Applications **7**, Article number: 29 (2021) | Cite this article

Abstract

Scientific discovery has long been one of the central driving forces in our civilization. It uncovered the principles of the world we live in, and enabled us to invent new technologies reshaping our society, cure diseases, explore unknown new frontiers, and hopefully lead us to build a sustainable society. Accelerating the speed of scientific discovery is therefore one of the most important endeavors. This requires an in-depth understanding of not only the subject areas but also the nature of scientific discoveries themselves. In other words, the "science of science" needs to be established, and has to be implemented using artificial intelligence (AI) systems to be practically executable. At the same time, what may be

Strong AI

Constructing AI

Breaking out of the rut

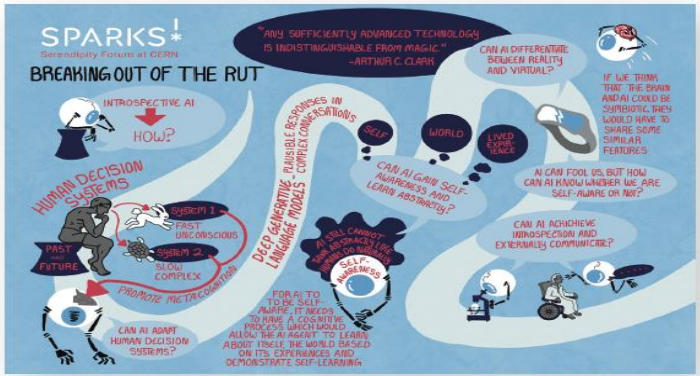
Good or evil

Sparking curiosity

Rewriting the world

Sparking creativity


SPARK!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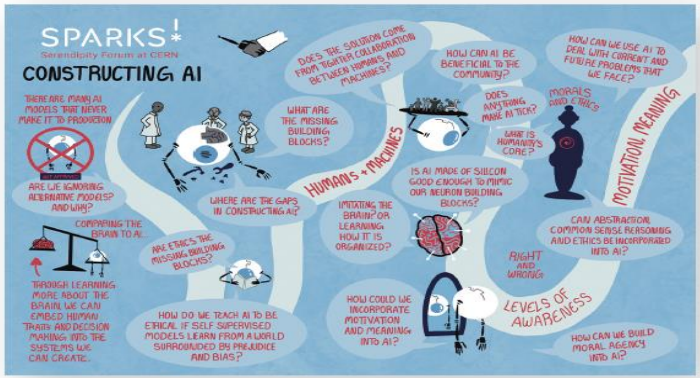
Serendipity Forum at CERN
BREAKING OUT OF THE RUT
"ANY SUFFICIENTLY ADVANCED TECHNOLOGY IS INDISTINGUISHABLE FROM MAGIC."
-ARTHUR C. CLARK
INTROSPECTIVE AI
HOW?
HUMAN DECISION SYSTEMS
SYSTEM 1
FAST UNCONSCIOUS
SYSTEM 2
SLOW COMPLEX
PAST
FUTURE
PROMOTE METACOGNITION
CAN AI ADAPT HUMAN DECISION SYSTEMS?
DEEP GENERATIVE - PLAUSIBLE RESPONSES IN COMPLEX CONVERSATIONS - LANGUAGE MODELS
SELF
WORLD
LIVED EXPERIENCE
CAN AI GAIN SELF-AWARENESS AND LEARN ABSTRACTLY?
AI STILL CANNOT THINK ABSTRACTLY LIKE HUMANS DO BECAUSE...
SELF-AWARENESS
FOR AI TO TO BE SELF-AWARE, IT NEEDS TO HAVE A COGNITIVE PROCESS WHICH WOULD ALLOW THE AI AGENT TO LEARN ABOUT ITSELF, THE WORLD BASED ON ITS EXPERIENCES AND DEMONSTRATE SELF-LEARNING
CAN AI DIFFERENTIATE BETWEEN REALITY AND VIRTUAL?
IF WE THINK THAT THE BRAIN AND AI COULD BE SYMBIOTIC, THEY WOULD HAVE TO SHARE SOME SIMILAR FEATURES
AI CAN FOOL US BUT HOW CAN AI KNOW WHETHER WE ARE SELF-AWARE OR NOT?
CAN AI ACHIEVE INTROSPECTION AND EXTERNALLY COMMUNICATE?


SPARKS!
Serendipity Forum at CERN
GOOD AND EVIL
WE HAVE TO CONSIDER THE VOICES OF LOTS OF PEOPLE - PHILOSOPHERS, SOCIOLOGISTS, AND PSYCHOLOGISTS TO HELP US MAKE BETTER DECISIONS THAT ARE ALIGNED WITH HUMAN VALUES.
ETHICS
DECISION MAKING SYSTEMS, NOT RULES
WE ARE ALL IN CHARGE OF RESHAPING OUR SOCIAL STRUCTURES
ASIMOV'S ROBOT LAWS
· UTILITARIANISM
· DEONTOLOGY
· VIRTUE ETHICS
WHO MAKES THE RULES?
IF SOMETHING DOES NOT HAVE CONSCIOUSNESS, HOW CAN IT BE MORAL?
HOW DO MORALS AND ETHICS WORK FOR AI?
DOES AI REQUIRE A MORAL MODEL?
ARE ETHICS THE MISSING BUILDING BLOCK?
HOW TO BALANCE RIGHTS AND ETHICS?
WHAT SORT OF ETHICAL INQUIRY SHOULD INFORM THE RULES?
AGENTS WE NEED TO CONSIDER WHEN BUILDING AI: THOSE WHO RESEARCH AND PRODUCE AI, USE AND REGULATE AI AS WELL AS THOSE IMPACTED BY AI'S DECISIONS
FREEDOM OF SPEECH VS HARMFUL NARRATIVE OPINIONS TOWARDS SCIENTIFIC DISCOURSE
RISKS OF AI AND PERSONAL HARM?
HUMAN MISTAKES, MORALS, BIAS, RIGHT/WRONG, PREJUDICE
WHAT JUSTIFIES SOME OF THE DECISIONS MADE BY AI?
CAN AI LEARN TO MAKE DECISIONS IN AN ETHICAL WAY?
AI CONSTRUCTION OF ROMAN EMPERORS SHOULD THEM TO HAVE LIGHTER SKIN TONES THAN WOULD HAVE BEEN REALISTIC
WHAT CAN WE DO TO BEAT BIAS?
CONSIDERING SOCIOLOGICAL DISPARITIES, WHO WILL BE AFFECTED BY AI?
WHO SHOULD BE IN CHARGE?
DATA BIAS
DISTORTION AND ETHICS
ARE HUMANS CHECKING THESE DECISIONS?
CAN SELF-SUPERVISED MODELS LEARN FROM A WORLD WITH BIAS?


SPARKS!
Serendipity Forum at CERN
CONSTRUCTING AI
THERE ARE MANY AI MODELS THAT NEVER MAKE IT TO PRODUCTION
ARE WE IGNORING ALTERNATIVE MODELS? AND WHY?
COMPARING THE BRAIN TO AI
THROUGH LEARNING MORE ABOUT THE BRAIN WE CAN EMBED HUMAN TRAITS AND DECISION MAKING INTO THE SYSTEMS WE CAN CREATE..
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WHAT ARE THE MISSING BUILDING BLOCKS?
WHERE ARE THE GAPS IN CONSTRUCTING AI?
HUMANS + MACHINES
ARE ETHICS THE MISSING BUILDING BLOCKS?
HOW DO WE TEACH AI TO BE ETHICAL IF SELF SUPERVISED MODELS LEARN FROM A WORLD SURROUNDED BY PREJUDICE AND BIAS?
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DOES ANYTHING MAKE AI TICK?
MORALS AND ETHICS
WHAT IS HUMANITY'S CORE?
IS AI MADE OF SILICON GOOD ENOUGH TO MIMIC OUR NEURON BUILDING BLOCKS?
IMITATING THE BRAIN OR LEARNING HOW IT IS ORGANIZED?
HOW COULD WE INCORPORATE MOTIVATION AND MEANING INTO AI?
HOW CAN WE USE AI TO DEAL WITH CURRENT AND FUTURE PROBLEMS THAT WE FACE?
MOTIVATION, MEANING
CAN ABSTRACTION, COMMON SENSE REASONING AND ETHICS BE INCORPORATED INTO AI?
RIGHT AND WRONG
LEVELS OF AWARENESS
HOW CAN WE BUILD MORAL AGENCY INTO AI?


SPARKS!
Serendipity Forum at CERN
SPARKING CREATIVITY
NEURAL RENDERING
TWO NEURAL NETWORKS COMPETING TO BECOME MORE ACCURATE
AI LEARNING
TRIAL AND ERROR
MANY PATHS TO LEARN
WILL WE BE ABLE TO TELL HUMAN ART AND AI ART APART?
WHAT IS CREATIVITY?
IS CREATIVITY JUST COMBINING THINGS IN UNEXPECTED WAYS?
NEW WAYS FOR AI TO LEARN
CAN AI THINK OUTSIDE THE BOX?
AS MACHINES BECOME MORE INTELLIGENT, COULD THEY BECOME MORE CREATIVE?
DOES INTELLIGENCE HAVE TO DO WITH CREATIVITY AND VICE VERSA?
CAN AI BE CREATIVE?
AUTONOMOUS CREATIVITY IN MACHINE LEARNING IS NOT IMPOSSIBLE...
WILL AI MATCH OR EXCEED HUMAN INTELLIGENCE?
WHAT DO WE MEAN BY AUGMENTED CREATIVITY?
CAN WE EXTEND OUR THINKING BEYOND HOW WE VIEW AI?
COULD AI HAVE THE POTENTIAL TO BE AS CREATIVE AS HUMANS?


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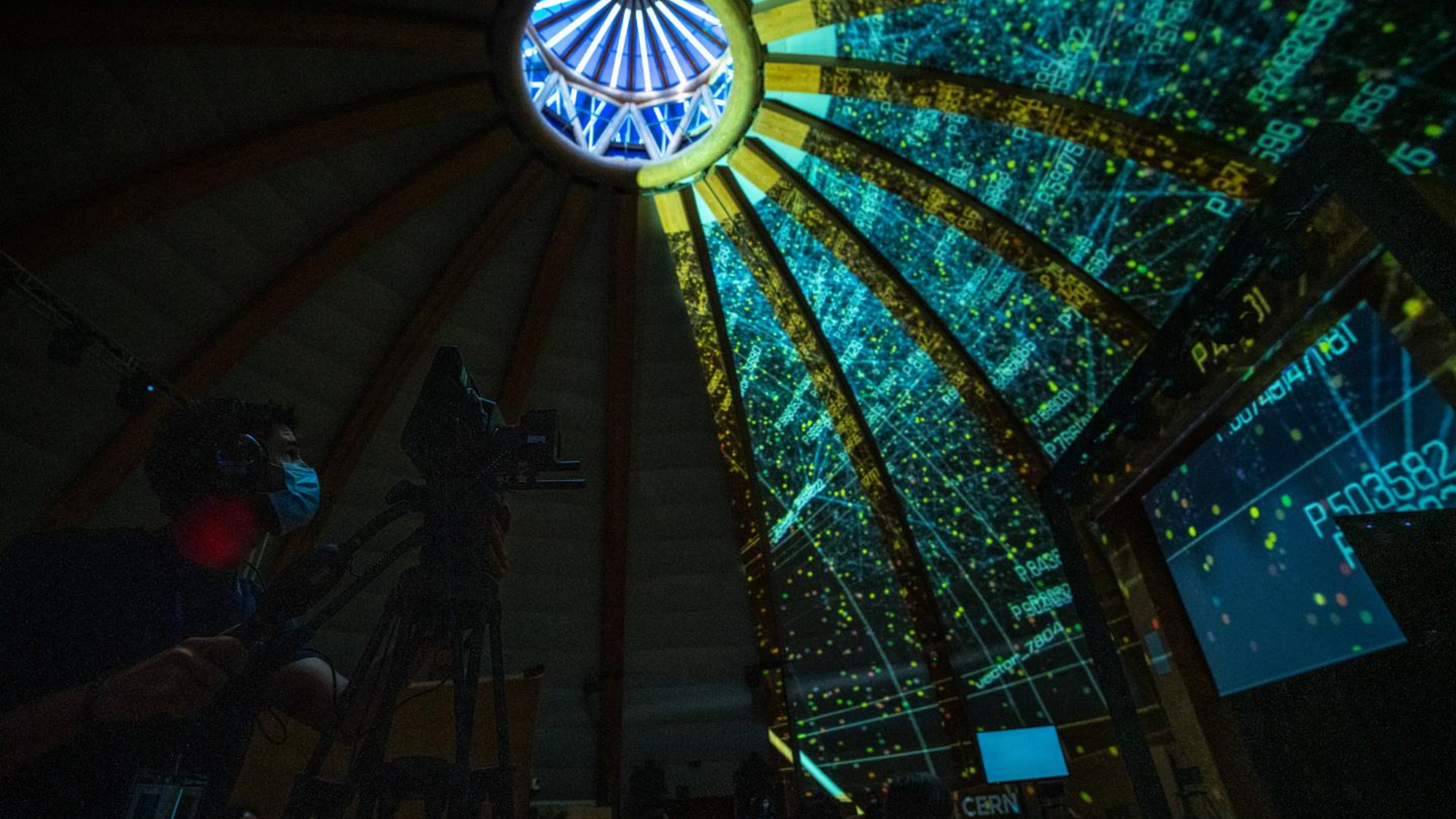
18 September
Future
Intelligence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Weather prediction


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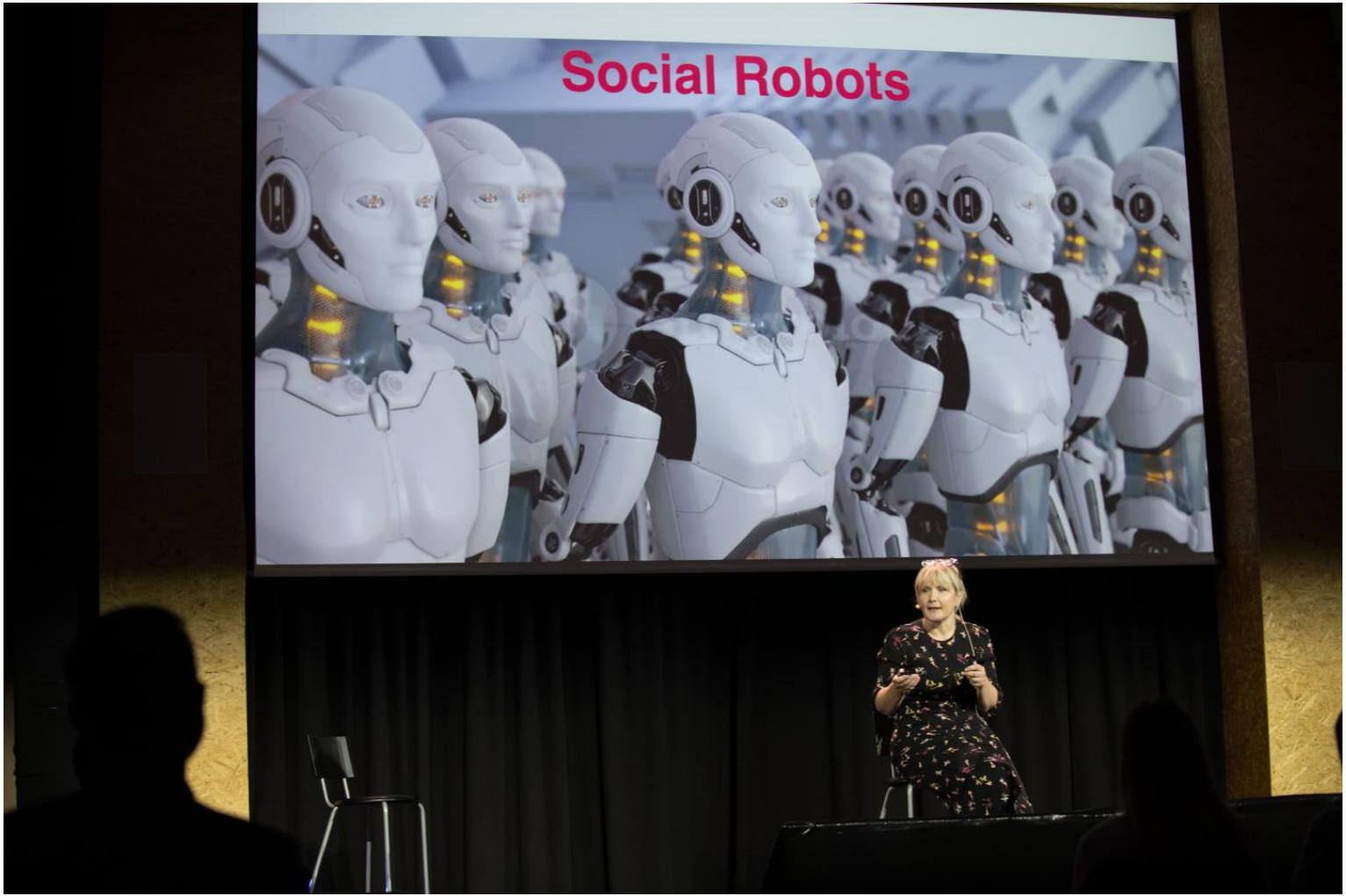
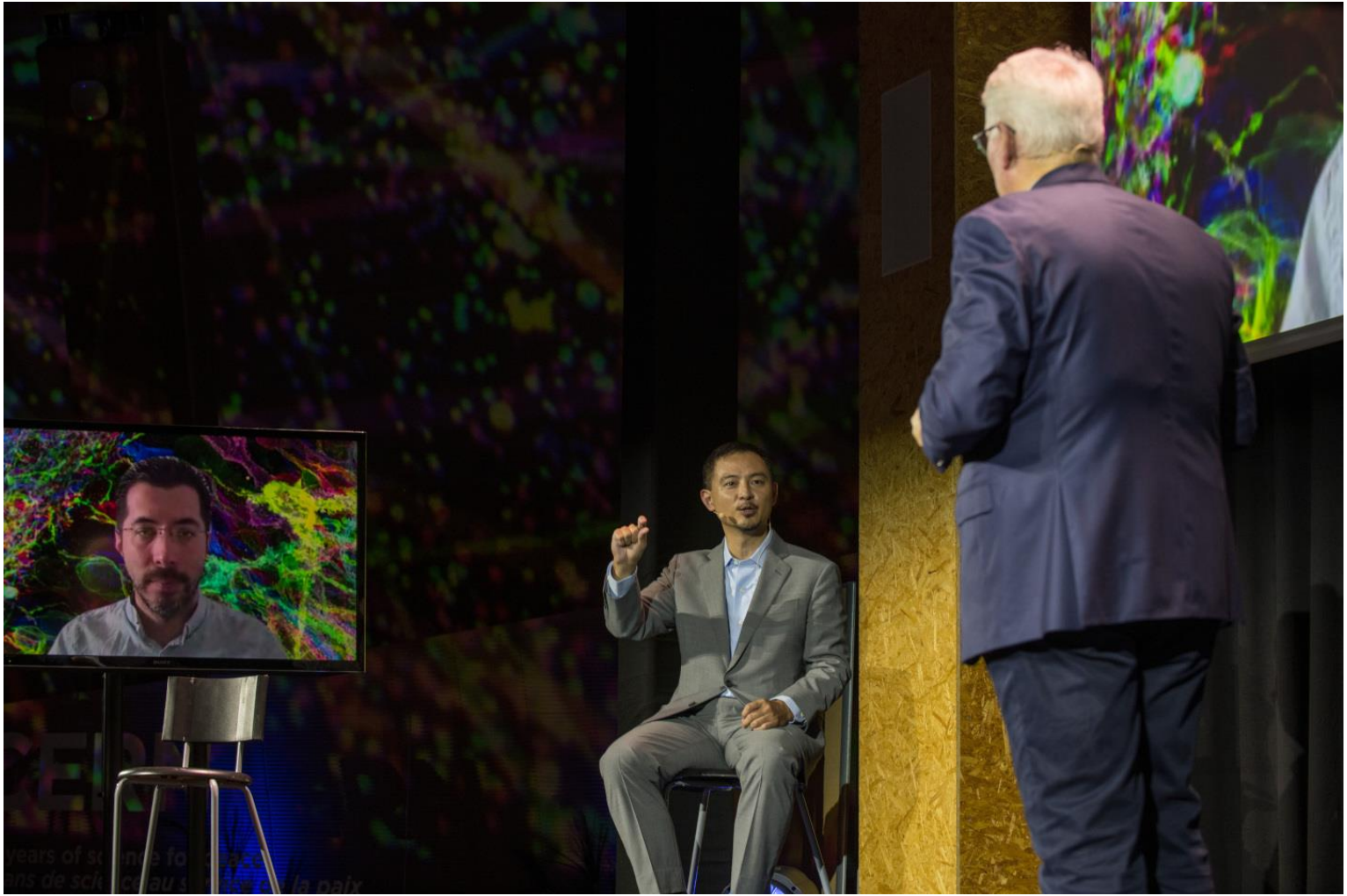

Social Robots

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Sparks! Could AI be perceived as creative ?

CERN

FORGING THE FUTURE OF AI

The first Sparks! Serendipity Forum at CERN will bring together world experts in artificial intelligence in a spirit of multidisciplinary collaboration. Mark Rayner spoke to some of the participants in the run-up to the September event.

Lens flaring like forests The CMS collaboration's Jennifer Ngadiuba and Maurizio Pierini (right) and Nvidia's Simon Layton (left) and Kevin Stuart (left) at the TEDx event in Geneva, where they explained how they used AI to speed up the Large Hadron Collider's data processing. (Courtesy: Jean-Marc Ducluzeau/TEDxGeneva)

Feild Stevens through the sole. Hydrogen, a symbol to say it knows an electron will a molecule. Short hand away, standing into other molecules and multiplying the effect. The time pressure rises, liberating a new supply of electrons. A spark lights up the dark.

This is one of the metaphors for the Sparks! Serendipity Forum – a new annual event at CERN designed to encourage interactions between experts in many different disciplines and between experts in many different disciplines and the issues of the day. The first edition, which will take place from 12 to 18 September, will focus on artificial intelligence (AI). Fifty leading thinkers will explore the future of AI in topical groups, with the outcomes of their exchanges to be written up and published in the autumn.

"The absence of causal inference in practical machine learning touches on every aspect of AI research, application, ethics and policy"

Vedrana Illig is a software architect and researcher interested in trends in the field of AI entrepreneur

AI is orders of magnitude faster than traditional numerical simulations. On the other side of the coin, simulations are being used to train AI in domains such as robotics where real data is very scarce

Antonio Agudo Ramos is the co-founder and CEO of Aerial Robotics, where he is also director of machine learning research at VYCOM.

Sparks! will be a forum for "out-of-the-box" thinking, with diverse technological connections. Such ideas that can be essential in the long-term success of the field.

The likelihood of sparks flying depends on the way this is to take the temperature, CERN Courier spoke to a sample of the Sparks! participants to preview themes for the September event.

Back to the future

In the 1980s, AI research was dominated by code that emulated logical reasoning. In the 1990s and 2000s, attention turned to solving big problems using probabilistic reasoning. Huge strides forward in the past decade have injected logical reasoning, however, into deep-learning neural networks, giving them powerful new capabilities.

2020 revealed unexpectedly fragile technological and socio-cultural infrastructures. How we learn our conversations and research about AI in these contexts looks as important as the research itself

Gemma Roig is head of the Computer Vision and Machine Learning Group at the Goethe University Frankfurt and co-founder of the Xplainable Artificial Intelligence Lab

upon layer of artificial neurons discern the relationships between inputs and outputs. Such "deep learning" has been transformative, fuelling innumerable innovations, from self-driving cars to searches for particles at the LHC (see p16). But many Sparks! participants think that the time has come to reimagine neural networks.

Geneva is the home not only of CERN but also of the UN negotiations on lethal autonomous weapons. "The major powers must put the evil genie back in the bottle before it's too late

Stuart Russell is professor of computer science at the University of California, Berkeley and coauthor of the most widely used AI

"Current deep learning systems, no matter the current machine learning hardware that we have, that lacks a notion of causality, seems to be very severely limited in its ability to understand in the way that people think," says Nobel-prize-winning cognitive psychologist Daniel Kahneman. "Current AI is like Bloom one eyes like look, which usual ignores not include reasoning about that look," agrees AAAI president-elect Francesca Rossi. "Leveraging what we know about how people reason and the brain can help build more robust, adaptable and

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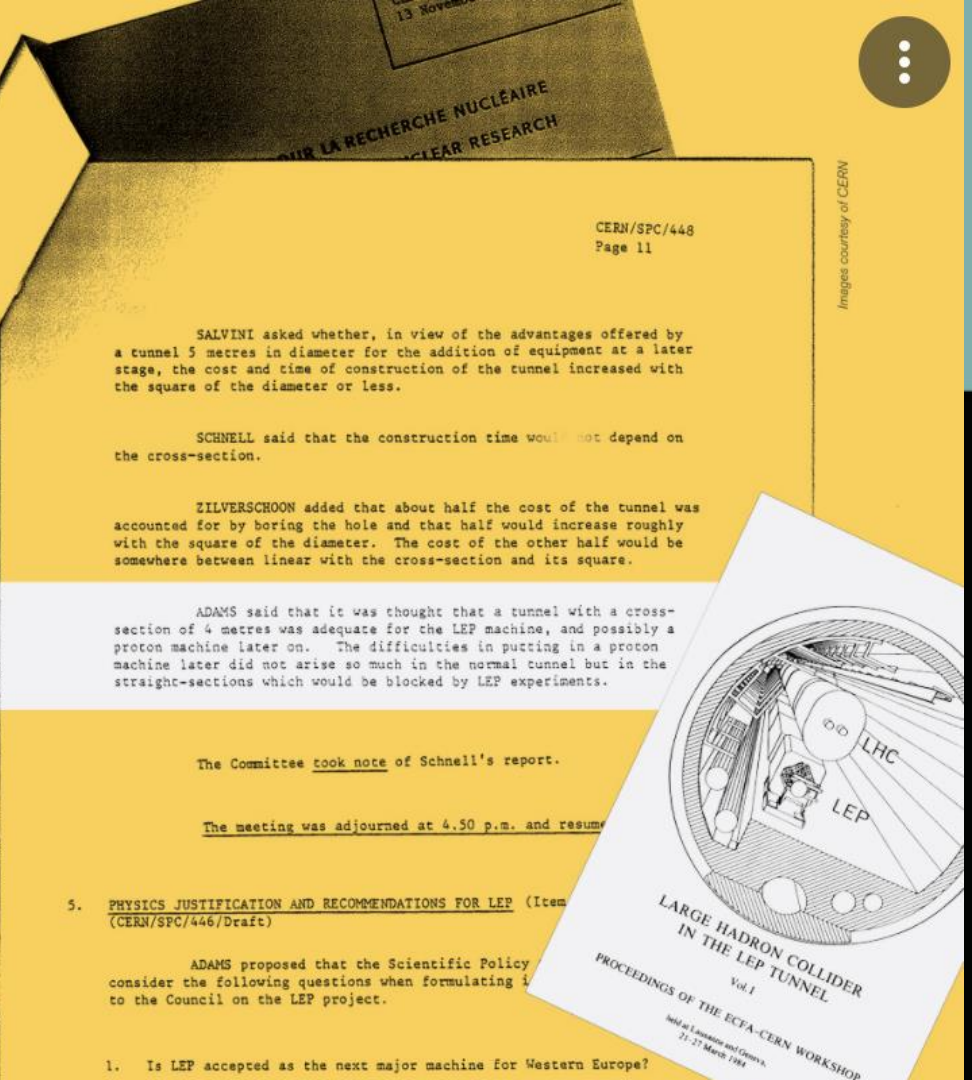

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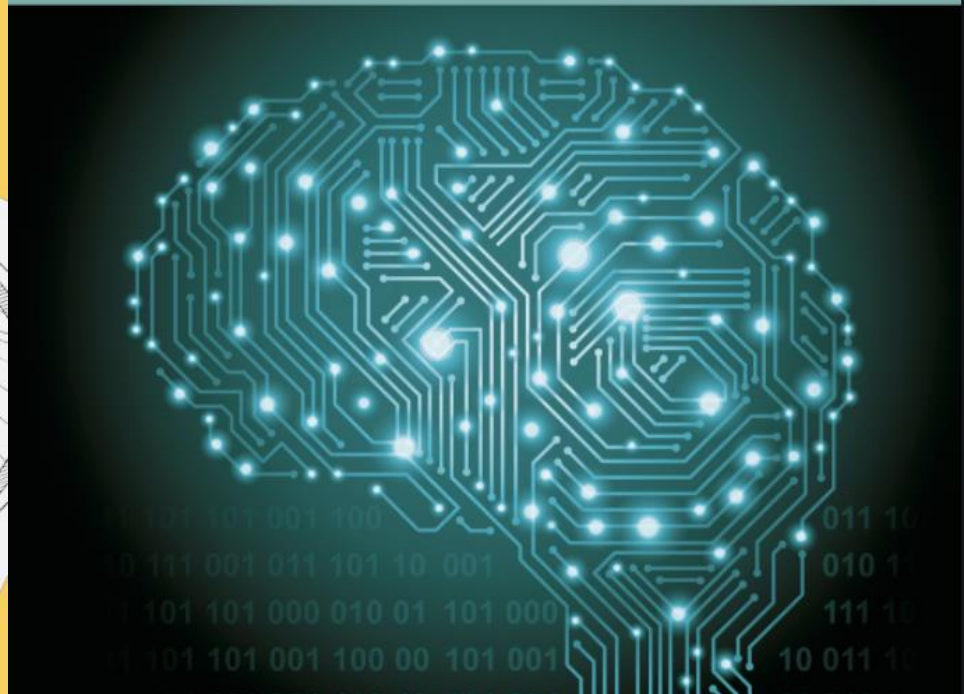


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Fondation
Didier et Martine
Primat

Key Messages

- Sparks is a public event that builds on our learnings from TEDx events, adding a strong academic component
- The goal is to mix external experts with our own scientists
- The objective is for Sparks to become one of the flagship events at Science Gateway, exploring topics of relevance to society and importance to CERN!
- This first edition delivered a launch, a series of podcasts, a forum and a public event reaching in total more than **70K people**
- We hope to continue to produce Sparks through external funds in the future