

Quantum computing and AI: En route to a sustainable future

Pan-EMEA media event at IBM Research, Zurich, Switzerland

7 Dec. 2022

Arrival to Zurich, train transfer to Thalwil.

Check-in at the Belvoir Hotel, Säumerstrasse 37, 8803 Rüschlikon

6pm – Welcome drinks and dinner at the Moosegg restaurant, Säumerstrasse 31, 8803 Rüschlikon

8 Dec. 2022

8am – Arrival to IBM Research, registration, morning coffee

8:20am – Welcome, housekeeping rules

8:30-8:45am – **What's New and What's Next – in science and tech to help the world**

Welcome keynote by Alessandro Curioni, VP of IBM Research Europe and Africa

8:45-9:00am – **The importance of transformational innovation for business**

Panel discussion

Moderated by Katia

- Alessandro Curioni, IBM Fellow, Vice President Europe and Africa and Director IBM Research – Zurich
- Christian Keller, Chairman & General Manager, IBM Switzerland

MORNING SESSIONS

9:00-9:20am – **Adieu to serendipity: New applications of AI in sustainable material discovery**

Panel discussion

Moderated by Katia

- Teo Laino (RXN),
- Matteo Manica (GT4SD)
- Peter Staar (Deep Search)

Traditionally, we either stumble upon a new material in a lucky accident (think graphene) or rely on a long and expensive trial-and-error process. But for our changing climate, we need solutions for mitigation and adaptation - and we need them fast.

Cutting-edge AI is there to help.

IBM's Deep Search AI, a cloud platform, and its accompanying toolkit Deep Search for Scientific Discovery (DS4SD) rapidly comb through all the published literature on a specific subject. Then there is GT4SD, an AI-powered open-source library that accelerates hypothesis generation to help create a new material. And RoboRXN, our AI-powered robotic factory the size of a fridge that can create a molecule remotely.

In this session, we will talk about the most recent milestones by the teams constantly pushing the limits of these technologies. And we will describe how clients like the Cleveland Clinic in the US are using them.

9:20-9:45am – On the heels of COP27: Boosting EMEA's sustainability efforts with AI

Solomon Assefa, VP, IBM Research Climate mitigation and adaptation lead

To curb global warming and the effects of climate change, we must cut some 51 billion tons of carbon emitted into the atmosphere every year to zero and limit global temperature rise to 1.5 degrees Celsius. This presentation will delve into the main topics presented at COP 27 – our key projects aimed at addressing climate change. Solomon will tell you about:

- Emerging IBM technologies to help businesses reach sustainability milestones
- IBM Environmental Intelligence Suite & Geolab – a rich, diverse and continuously updated catalog of geospatial-temporal data (maps, satellite, weather, drone, IoT)
- Sustainable computing – classical and quantum
- Flood detection – a link to the next session

9:45-10:15am – Flood detection: A Climate Network to save the planet

Panel discussion

Moderated by Katia

- Anne Jones
- Solomon Assefa
- Thomas Brunschwiler
- STFC representative (TBC)

To fight climate change, access to available climate data and its timely interpretation and analysis is vital. To help us make sense of the data with the help of AI, we've launched a Climate Network, aimed at greatly speeding up climate change research and applications.

In this panel discussion, you will learn about our work with STFC (Science and Technology Facilities Council) at the Hartree Centre in the UK on the use of hybrid cloud computing infrastructure and cutting-edge AI to transform massive amounts of weather-related data into tangible weather predictions and climate change projections – specifically focusing on flood detection.

10:15-10:30am – Q&A session on AI for sustainability and climate change

A session involving all the morning presenters answering questions from the audience

COFFEE BREAK – 15 min

10:45-11:00am – Quantum 101: Mimicking nature to push the limits of computation

Matthias Mergenthaler

11:00-11:15 – Quantum Keynote – Unpacking IBM Quantum Summit announcements and our Roadmap milestones

Heike Riel

In this presentation, we will dive into our latest milestones in hardware (Osprey) and software (error mitigation). Jay will explain where we are with quantum computing and how we will make them more powerful than classical computing by perfecting the hardware, solving the necessary software problems, creating new quantum circuits in collaboration with the global quantum community – en route to achieving 4,000+ qubits in 2025.

11:15-11:35 – Can quantum be the key to unlock a sustainable future?

Moderated by Leonid

- Ivano Tarvenelli
- Client (TBC)

This talk will discuss the various ways quantum computers could help us create novel sustainable materials for energy storage, come up with innovative ways to develop new batteries – with or without lithium, contribute to solutions to generate power, playing a role in mitigating climate change.

11:35-11:55 – Qubits and neurons to turbocharge the world of finance

Panel discussion

Moderated by Leonid

- Stefan Woerner / Quantum
- Christa Zoufal / Quantum
- Client (TBC)
- Haris Pozidis / AI

Stefan will detail the latest research results of our work with HSBC and how quantum computing can help the world of finance by much better assessing financial risk, and other applications.

Then we'll move to Haris – who will talk about the Telum processor and the AI specifically developed to faster and more accurately detect and address financial fraud. Telum is part of our latest mainframe, IBM z16 – which is also quantum-safe. We will talk more about Quantum-Safe Cryptography in one of the afternoon sessions.

11:55-12:10 – Q&A with the audience on all things quantum

An opportunity for the audience to ask any question on quantum, its theory, applications and the future.

LUNCH & 1:1 Interviews – 12:15-13:00

LAB VISITS – 13:00-14:00

- Quantum lab, Matthias Mergenthaler
- RXN lab, Teo Laino
- Tape lab, Mark Lantz
- Photonics lab, Thilo Stoeferle

AFTERNOON SESSIONS

14:00-14:15 – Securing your business with next-gen technologies

Keynote, Marc Stoecklin, Head of Security Research department, Zurich

Cyberattacks are on the rise, with cybercriminals getting ever smarter. But so are security researchers, always striving to be a step ahead of the most sophisticated hacker – to keep you, your data and your business safe. In this keynote, Marc will outline the latest innovations to protect sensitive data – including against the future quantum computers:

- Using quantum-safe cryptography,
- With the help of Confidential Computing, which protects data in transit,
- And with the holy grail of encryption – the Fully Homomorphic Encryption, which allows manipulations on encrypted data.

Marc will also mention the latest research to store cold data securely using the good old tape, to address cyberattacks against the software supply chain, to faster detect a cyber incident with the latest cyberthreat mitigation technologies, and our work on blockchain security.

14:15-14:35 – Why businesses must move to Quantum-Safe cryptography today

Panel discussion

Moderated by Leonid

- Vadim Lyubashevsky
- Mike Osborne
- Client (TBC)

Earlier this year, the U.S. National Institute of Standards and Technology (NIST) selected four quantum-safe cryptographic schemes for standardization consideration, developed with the help of IBM cryptographers and industry partners. These schemes are set to become the world's new industry-wide cryptography standards by 2024. There are already offerings with quantum-safe encryption, such as IBM Tape, and IBM's recently released z16 and LinuxONE Emperor 4 systems that protect against software and physical attacks.

The panelists will discuss:

- Why it's vital that businesses start migrating to new algorithms already today, when quantum computers are not yet powerful enough to break modern encryption,
- How companies can actually identify what parts of the network they need to migrate – to begin their crypto-migration journey,
- How long would that journey take and how crypto experts can help your business to get there.

14:35-14:50 – Vintage? Not so fast! Hyperscalers turn to IBM's tape for secure data storage

- Mark Lantz
- Lee Jesionowski

Moderated by Leonid

In the age of cloud, tape is still alive and well – and is one of the industry's most enduring technologies. IBM Research has been pushing the limits of data storage, and the world's hyperscalers including Google, AWS, Microsoft and Facebook still rely on secure and cheap

tape to archive their data. They store it for years to reuse it and run analytics – as well as to meet IT compliance requirements.

At IBM, Diamondback is a tape library that holds a set of cartridges and drives and uses a robotic system to automatically load and unload the cartridges. It sports a very innovative design and offers the most capacity of comparable tape libraries on the market.

The presenters will tell you everything about tape and tape libraries – and why even in the 21st century, the good old tape is as cool as ever.

COFFEE BREAK and INTERVIEWS - 30 min

BREAKOUT SESSION 1

15:20-15:45 – From Confidential Computing to Fully Homomorphic Encryption

Panel discussion

- Hani Jamjoom
- Ronen Levy

Moderated by Katia

Making data safe in the cloud is crucial in our digital world. Enter confidential computing.

This technology aims to ensure that your data in rented cloud infrastructure stays encrypted even when in active use – during, say, training machine learning models or indexing the data. The past few years have seen huge leaps in confidential computing, with many tech giants betting on it, including Intel, Google, ARM, Microsoft, and others. IBM Z, widely used in the financial industry, is a secure, reliable and scalable platform for confidential computing.

While confidential computing relies on dedicated hardware and the robustness of the software stack in the secure enclave to keep your data safe, researchers are also pursuing what's known as Fully Homomorphic Encryption (FHE) – a way to manipulate data without decrypting it at all.

This session will present the latest research in both fields – and outline our future projects.

BREAKOUT SESSION 2

15:20-15:45 – Blockchain security and decentralized trust

Panel discussion

- Elli Androulaki
- Gabi Zodik

- Client (TBC)

Moderated by Leonid

This session will delve into our latest blockchain security research, and showcase how our clients – the Bank of France among them – are using it.

END