How Deep Tech Is Shaping Our Future

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01 Introduction

Our world has undergone disruption at an unprecedented scale over the past few years. The global pandemic exposed very deep flaws in our current systems, but also opened up exciting opportunities for innovation and advancement. As nations and global communities recover from the pandemic and reinvent themselves for the new realities, Tech must also reinvent itself to shape our future by serving as the force multiplier for "Good."

→ COVID-19 and the continuing prospect of future zoonotic infectious diseases jumping from animals to humans

→ Climate change accelerating: heat waves, wildfires, hurricanes, flooding, drought

→ Geopolitical pressures focused on critical strategic technologies and resources such as semiconductors, AI and data, sustainable energy, food, and materials

→ Cyberattacks accelerating against consumers, enterprises, and key infrastructure

→ The dramatic boom and bust cycles of web3/crypto

At the same time, we continue to see rapid advances and disruptions in science and technology. Some recent examples include:

→ Quantum Computing: multiple demonstrations of "quantum supremacy" and R&D grade quantum computers, as part of an international race between nation states

→ The Data Tsunami: according to Statista, total global data creation reached 64 zettabytes (64 billion terabytes) in 2020, and is projected to grow almost 3x by 2025. This data explosion creates many opportunities to accelerate innovation, but also highlights key bottlenecks that we must overcome for scalable compute, protection of privacy, and sustainable energy use.

→ Next Gen AI: the rise of new AI technologies such as large language models and text-to-image generative AI are forcing us to rethink the possibilities and dangers of AI for our societies.

→ Data Driven Healthcare: we are in the midst of a revolution in biology and healthcare driven by the Data Flywheel, which has led to incredible advances in computational drug discovery, RNA therapeutics, stem cell therapeutics, personalized medicine, and synthetic biology

All these changes combine to drive accelerating demand for e-commerce, mobility, and virtual engagement (communication, entertainment, education, work); energy and food security; and health/environmental/physical security, so that we have the freedom and flexibility to navigate a constantly changing environment.

We at Walden Catalyst Ventures are partnering with world-class entrepreneurs to build Deep Tech infrastructure technologies and platforms to shape our future. These include:

→ Foundational hardware technologies that enable compute and harness the power of Open Source and Ecosystems to scale beyond Moore's Law

→ Infrastructure software platforms that scale, democratize, and safeguard data and AI

→ Web3 infrastructure technologies that scale decentralized apps

→ Biology 2.0: data platforms that drive the convergence of Biology + Technology

02 Foundational Hardware

The timescale for hardware innovation is traditionally measured in years and decades. This is because standard hardware design and manufacturing are expensive and capital intensive, which led to centralized design and manufacturing with long turnaround times, controlled by a few large companies.

At the same time, the end of Moore's Law means that we can no longer rely on new semiconductor process generations to provide automatic boosts in productivity and energy efficiency; instead, we need to squeeze out improvements by optimizing at the system level. This has led to the rise of open-source and modular hardware architectures, as well as optimized, domain-specific hardware/software systems to accelerate strategic workloads such as networking, machine learning, database, and web3 infrastructure.

Open Source and Modular Hardware

Open Source and Modular Hardware

The semiconductor industry is applying the lessons learned from the software world to drive towards the open source RISC-V CPU architecture as the successor to ARM and x86. Leading the way here are pioneering companies such as Rivos[1], which promises to democratize, modularize, and accelerate future compute architectures. The RISC-V architecture's adoption has been accelerated by the geopolitical pressures around CPU architectures, but its greater long-term impact may be that it could become the core of a new software-like, modular stack of open source IP that makes it economically attractive for much smaller companies to design optimized SoCs and entire hardware systems for new AI, IoT, and web3 applications. However, the risk is that the same geopolitical pressure could lead to the rise of separate, balkanized technology ecosystems.

Database Acceleration

Database Acceleration

The insatiable demand for data analytics has put enormous pressure on the database infrastructure, whose function is to serve up the data queried by analytics and AI algorithms run by the modern enterprise. Much as GPUs and NPUs accelerate machine learning workloads to improve performance and energy efficiency, Speedata[2] has developed a first-of-its-kind Analytics Processing Unit (APU) to accelerate big data analytic workloads, improve performance, and reduce cost and energy consumption.

03 Infrastructure Software Platforms

Scaling and Democratizing the Data Pipeline
The modern data stack is rapidly evolving to address the dual challenges of exponentially growing demand for data analytics, and the shortage of experts in data and AI infrastructure technologies. On the data infrastructure side, Voltron Data[3] is addressing these challenges by advancing the Apache Arrow Open Source ecosystem to build scalable, modular, and composable analytics for more efficient data analytics and data transport.

On the machine learning side, enterprises have the difficult and costly challenge of hiring highly specialized experts to develop, train, and deploy AI-based analytics. MindsDB[4] is democratizing machine learning by enabling the large talent pool of SQL database developers to use the power of machine learning to run predictive analytics. And to ensure the quality and accuracy of AI models, Galileo[5] has developed a comprehensive platform for managing the quality of AI models across training and production.

Confidential Computing

Confidential Computing

The holy grail of data analytics is to be able to harness the power of data across diverse organizations while protecting the confidentiality and privacy of the separate data owners. Confidential Computing is a new technology to enable this, by protecting data while performing computation in cryptographically hardened infrastructure. Opaque[6] is the first Confidential Computing platform that enables secure data sharing, multi-party analytics, and machine learning on encrypted data, leveraging the MC^2 Open Source ecosystem.

Harnessing AI for Natural Language Processing

Harnessing AI for Natural Language Processing

In the past few years, we have witnessed a revolution in Natural Language Processing (NLP), or the ability of machines to understand and generate natural text. Language is one of the most powerful elements in human cognition, and NLP is driving an explosion of new use cases. AI21 Labs[7] has built state of the art language models that will create a future where people can leverage AI to help them better read, write, and communicate.

04 Web3 Infrastructure

Web3 communities are building decentralized Data Economies that strive to be more fair, safe, and efficient. To enable that, the blockchain architectures underlying web3/crypto require three characteristics, known as the Scalability Trilemma: Decentralized, Scalable, and Secure.

ZKP, Improving Scalability and Privacy of Blockchains

Traditionally, however, only two out of the three were achievable simultaneously. Recently, blockchains employing an advanced cryptographic technology known as zero knowledge proof (ZKP) are poised to achieve all three. This is driving rapid growth of new use cases and ecosystems around these ZKP-powered blockchains. In the future, ZKP also promises to enable new application paradigms that protect data confidentiality, validate identity, promote transparency and trust via mathematically rigorous guarantees, and scale with energy efficiency. ZKP will be a foundational element of the tech stack to scale web3, much as TCP/IP scaled the Internet.

Ingonyama, Lowering the Barrier of Entry to ZKP

One bottleneck for scaling ZKP is the computational complexity of the cryptographic primitives underlying zero knowledge proofs. But we can learn from our past: inspired by GPUs/NPUs combined with deep learning frameworks that enable machine learning to scale, Ingonyama[8] is developing energy efficient HW and SW acceleration of ZKP primitives and building open source communities to enable ZKP to scale.

05 Biology 2.0

Traditionally, the pace of innovation in biology and medicine was measured in decades, limited by the reliance on manual experiments and tests that took months and years for each idea to be checked. With the advances in experimental and computational/AI techniques to analyze, predict, and design molecular structures for proteins and RNA, we are beginning to treat biology as a Big Data problem and benefiting from data flywheel effects.

Creating New Fields of Biology

This has led to advances in traditional biotech fields such as RNA therapeutics, stem cell, immunotherapy, and cell therapy, but has also created new fields such as Synthetic Biology, which is the application of software and engineering principles to redesign living cells to sustainably produce meat substitutes, food additives, industrial chemicals, personal care products, etc.

The most spectacular example of TechBio is the COVID-19 mRNA vaccine, developed at a record-breaking speed that would not have been possible even a few years ago. mRNA technology enables genetic codes, which is the “software” representing the genetic encoding of molecular structures, to be loaded into a molecular machine, which is the “hardware” that ultimately manufactures the therapeutic products in the body’s own cellular factories.

A foundational technology that made this possible is the computational analysis and design of molecular structures, and there is now an explosion of potential new therapeutics based on computational design. One company leading the way is Peptone[9], which is harnessing physics and AI-driven modeling and design of disordered proteins to tackle some of the most important and challenging therapeutic targets.

The Rise of Personalized Medicine

Another rapidly growing area in Biology 2.0 is personalized medicine, which started by focusing on tailored drugs or therapies based on genomic data for the patient or the disease. Recently, Artera[10] has leveraged data from histopathology image data and other clinical data to generate insights via AI technologies such as computer vision, to personalize therapies and to improve outcomes for cancer patients. In the stem cell field, Greenstone[11] is pioneering the use of a computational platform integrated with human induced pluripotent cells (hiPSCs) technology to discover new personalized therapeutics.

06
Conclusion

Rapid pace
of innovation

As the current decade progresses, we can expect the rapid Pace of innovation to continue, driven by robust advances in basic sciences and applied technologies, as well as rising demand from consumers and enterprises for innovative solutions.

Helping visionary
entrepreneurs build reality

Walden Catalyst is excited about the opportunity to partner with founders who are building the solutions for tomorrow.

Sources

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1 — Rivos
https://www.rivosinc.com/

2 — Speedata
https://waldencatalyst.com/portfolio/speedata
https://www.speedata.io/

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3 — Voltron Data:
https://waldencatalyst.com/portfolio/voltron
https://voltrondata.com/

4 — MindsDB
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https://mindsdb.com/

5 — Galileo
https://waldencatalyst.com/portfolio/galileo
https://www.rungalileo.io/

6 — Opaque Systems
https://waldencatalyst.com/portfolio/opaque-systems
https://opaque.co/

7 — AI21 Labs
https://waldencatalyst.com/portfolio/ai-21
https://www.ai21.com/

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https://medium.com/@ingonyama

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https://artera.ai/

11 — Greenstone
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