EE Times

Silicon 100

Startups Worth Watching in 2024

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Foreword

By Anne-Françoise Pelé

In the transition from billions to trillions, every million counts.

With trillion-dollar valuations, multibillion-dollar government subsidy programs and the billions invested in new semiconductor fabs, it is common to overlook the myriad startups and small and medium-sized companies with revenues and fund-raising in the millions of dollars. Yet these silent innovators could well be the Nvidia of tomorrow.

In June, Nvidia joined the exclusive $3 trillion club, leaving Alphabet, Amazon and Meta in the dust. Nvidia's shares soared by over 200% in the past year, and some optimistic analysts predict that the AI chip company will pursue its ascent to a market value of nearly $5 trillion in the year ahead.

Nvidia's Blackwell-architecture GPUs pack 208 billion transistors, but the race doesn't stop there. In an IEEE Spectrum report, TSMC chairman Mark Liu and chief scientist H.-S. Philip Wong stressed the absolute necessity for the semiconductor industry to keep pace with the exponential growth of AI compute beyond large language models and generative AI. In 10 years' time, AI systems will require a GPU with a trillion transistors, i.e., a GPU with 10× as many devices as today. And Liu and Wong believe that 3D chiplets will be the key to building the world's first trillion-transistor GPU.

The semiconductor industry is cyclical by nature, with episodes of high demand followed by episodes of low demand. According to Deloitte, by autumn 2023, it was in the midst of its seventh downturn since 1990. In 2024, however, the consulting firm forecasts global sales of $588 billion. This figure is not only 13% higher than in 2023 but also 2.5% higher than the industry's record sales of $574 billion in 2022. The semiconductor industry remains on course to reach a total of $1 trillion in global revenue by 2030, and every company—whether active in AI chip design, advanced materials and components, or advanced packaging and test, and whether generating billions or millions in revenues—will have its part to play.

Peter Clarke, a veteran technology and business journalist who has compiled and curated the EE Times Silicon 100 list since its inception in 2004, has navigated the tumultuous seas of startups and market competition to the shores of success and beyond. Clarke has identified 100 promising startups, which he brings to the attention of industry analysts, hands-on consultants and venture capitalists to help them set their course, trim their sails and reach their desired destination.

Yet the Silicon 100 is not EE Times' annual ranking of the "best startups." Its value lies in the meticulous examination of objective criteria, such as the startups' fundraising activity, strategic alliances, scalability and addressable markets, along with the caliber of their founders and advisers. Its value also derives from Clarke's analysis, which addresses key questions, such as:

- Is green generative AI dreaming the impossible dream?
- Can hybrid quantum computing systems deliver value now?
- Are chiplets the answer to extending Moore's Law?
- Is RISC-V the future of processors?
- Are European startups making a comeback? What makes the U.K. a hotbed for entrepreneurship and innovation?
- How are lingering China–U.S. trade tensions affecting Chinese semiconductor startups?

The EE Times Silicon 100 maps out the high-potential, high-impact technologies that will shape the future of the electronics and semiconductor industry. This year's edition has maintained its technological categorization at 24 areas, ranging from materials and packaging at a fundamental extreme to quantum computing and security at the highest level of abstraction. While this categorization helps provide a structured overview, it is worth pointing out that many startups operate in more than one category.

The EE Times Silicon 100, now in its 24th edition, highlights the vibrancy of an industry and research community with a constant drive to innovate. Since its launch in 2004, it has weathered the test of time, reflecting geopolitical uncertainty, supply chain difficulty and the recent AI frenzy. It will face further boom and bust cycles. But it will never cease to inspire generations of engineers and encourage aspiring entrepreneurs and investors to take action.

Anne-Françoise Pelé
is editor-in-chief of
EE Times Europe.

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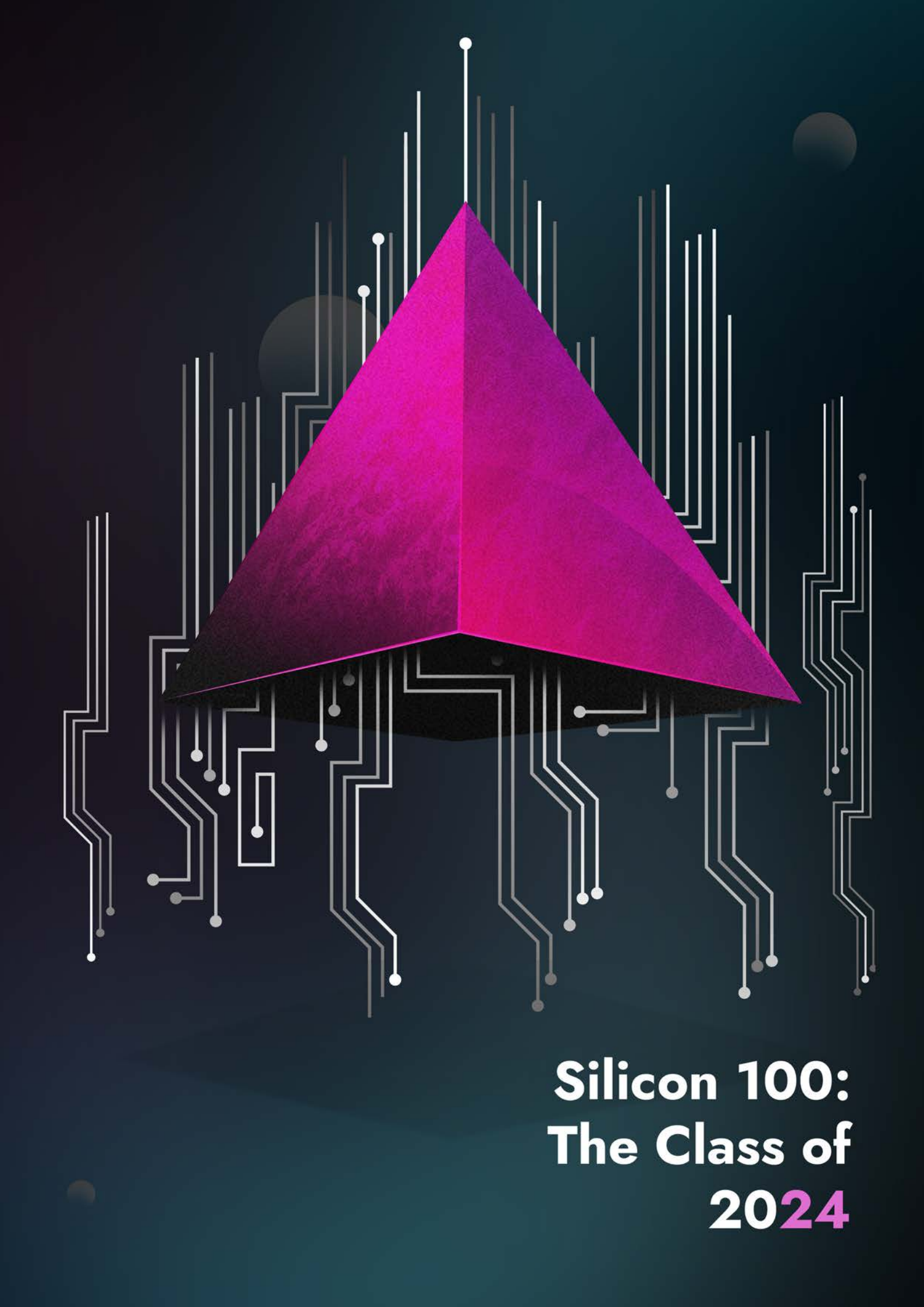


Silicon 100: The Class of 2024

AI Drives the Silicon 100 as Europe Displaces China's Startups

By Peter Clarke

This year marks the 20th anniversary of the birth of the Silicon 60 in a publication called Silicon Strategies, an online sister publication of EE Times.

The Silicon 60 started in 2004 as a list of interesting startup companies from across the electronics and semiconductor domain (see Silicon Strategies' 60 emerging startups). Names of note on that first list included Alphamosaic, Icera Semiconductor, Jazz Semiconductor, Matrix Semiconductor and Transitive.

While keeping the same remit, the list grew to become the Silicon 100 in 2020. To this day, the list adopts a narrow definition of "technology," favoring hardware-based companies of interest to engineers over technology startups primarily based on software or services, or those seeking to sell to end users.

Back in 2004, venture capital investment in promising academic or corporate spinoff companies was still predominantly a U.S. phenomenon, with more than half the startups based there. Other regions around the world arguably had a similar quality of academic research to the U.S. but often lacked the capital or the technology expertise within financial circles to drive investment.

U.S. companies driving the leading edge of technology also helped inform local universities about what could or should be studied. Other regions had the disadvantage of fewer experienced executives who had made their fortune in a previous ride on the startup merry-go-round—and could run a suitably critical eye over startups' technology and business plans and choose whether to invest.

The U.S. in general and Silicon Valley in particular have always been at the forefront of the semiconductor startup economy, and to some extent, that leadership has been self-perpetuating. Silicon Valley and a few other locations in the U.S. have acted as magnets for companies and entre-

preneurs. Gradually, other regions have endeavored to catch up, although there is often too much technology push and not enough market pull. Various authorities and government funds are working to jump-start their technology base, but international success is yet to come, as this year's Silicon 100 demonstrates.

Four technology trends and two geographic trends stand out from last year's Silicon 100:

- Increasing levels of activity around artificial intelligence—from an already high base in 2023
- A continued, gradual rise in quantum computing representation
- A jump in chiplet activity
- A correspondingly reduced representation of non-processor activity
- A reduced Chinese presence on the list
- An increased European presence

The first trend is somewhat reminiscent of the cosmological Big Bang.

We are now at a time when many of the first set of dedicated AI processor startups, formed back in the last decade, have been acquired or have matured beyond the scope of the Silicon 100. However, as those "stars" are consumed by the industry giants or just dim out of existence, they are being more than replaced by a younger generation of luminaries.

The AI sector is evolving so rapidly that it's extremely difficult to predict the shape of the industry these startups will be working to intersect in three, four or 10 years' time. But the extreme financial returns demonstrated by market leader Nvidia and others are prompting venture capitalists to focus again on hardware, and we continue to see very large scale-up sums invested in AI companies. Individual rounds of several hundred million dollars are not unusual. But while players in nearly all regions can source multiple instances of a few million dollars to form startups, the large scale-up bets still tend to be placed in the U.S. and China.

This year's cohort

For this 24th iteration of the emerging startups list, 61 companies have been retained from version 23, while 39 startups have been brought onto the list. This maintains the relatively high rate of churn from the previous year. The totals for the companies joining the list in 2021, 2022 and 2023 were 29, 31 and 40, respectively. The Silicon 100 v24 brings the total number of companies admitted to the list to 645 since the release of v1.0 in April 2004.

The median age of the Silicon 100 companies is five years, with 49 of them founded in 2018 or earlier and 51 founded in 2019 or later. For cohorts included in editions of the Silicon 60, the average gradually shifted from three years to four years. The greater maturity being shown today possibly reflects greater technology complexity and longer startup incubation. This means many startups remain stealthy and barely worth following for the first two or three years, even if journalists and analysts are aware of their existence.

A sector in tumult

Of the current list of companies, just as in 2023, 15 are associated with AI in the data center, an area dominated by experienced GPU vendor Nvidia.

This is due in part to increased efforts by South Korea and China to compete, as well as technology-driven companies' efforts to introduce techniques such as compute-in-memory. Another factor is the settling of the market. Rather than compete head to head with Nvidia, new players often seek to complement it or fit into Nvidia-defined data center architectures by addressing bottlenecks in the server ecosystem. They may focus on networking silicon, as Dream Big Semiconductor and Enfabrica do, or on data processing, as Jaguar Microsystems has done with its data processing units.

However, the rapid adoption of AI for multiple software applications and the exponential increase in the complexity of AI models, particularly those for generative AI applications, are raising sustainability questions about AI scaling because of the energy consumed.

The number of startups targeting AI at the edge has increased from eight in 2023 to 11 in 2024. Many are offering techniques to reduce the power consumption of machine-learning inference so that it can be performed on limited resources at the edge. These include the use of subthreshold voltage operation and in-memory computation of the parallel multiplication that lies at the heart of many of the neural-network-based algorithms. Another approach is "sparsification," which aims to reduce computational complexity with minimal impact on result accuracy.

The success of these techniques has yet to be confirmed by market traction, which of course depends on many more factors than basic technical efficiency. Such chips and related software must also bring a low cost of ownership and be easy to use and program.

Certainly, the rapid uptake of generative AI and large language models is providing a stimulus for new startups to propose approaches and for more established ones to reoptimize forthcoming silicon and business plans.

Sustainability

Software applications are arriving with AI-driven natural-language interfaces and AI-driven copilots that interpret humans' intentions. But as the models used within generative AI grow exponentially to include billions and even trillions of parameters, sustainability concerns are casting a pall over the prospects for continued development of AI.

This has led at least one startup to question the necessity of artificial neural networks for AI and machine-learning algorithms. Literal Labs was founded in March 2023 by Alex Yakovlev and Rishad Shafik, two professors at Newcastle University (Newcastle upon Tyne, U.K.) who have been researching Tsetlin machines.

The Tsetlin machine is an AI algorithm that operates on the principles of propositional logic. It was named after Soviet-era mathematician Michael Lvovitch Tsetlin, who invented the Tsetlin automaton. The machine is a form of learning automaton designed for pattern learning using logical rules.

Literal Labs claims that Tsetlin machines can provide an approach to AI that is up to 10,000× more energy-efficient than con-

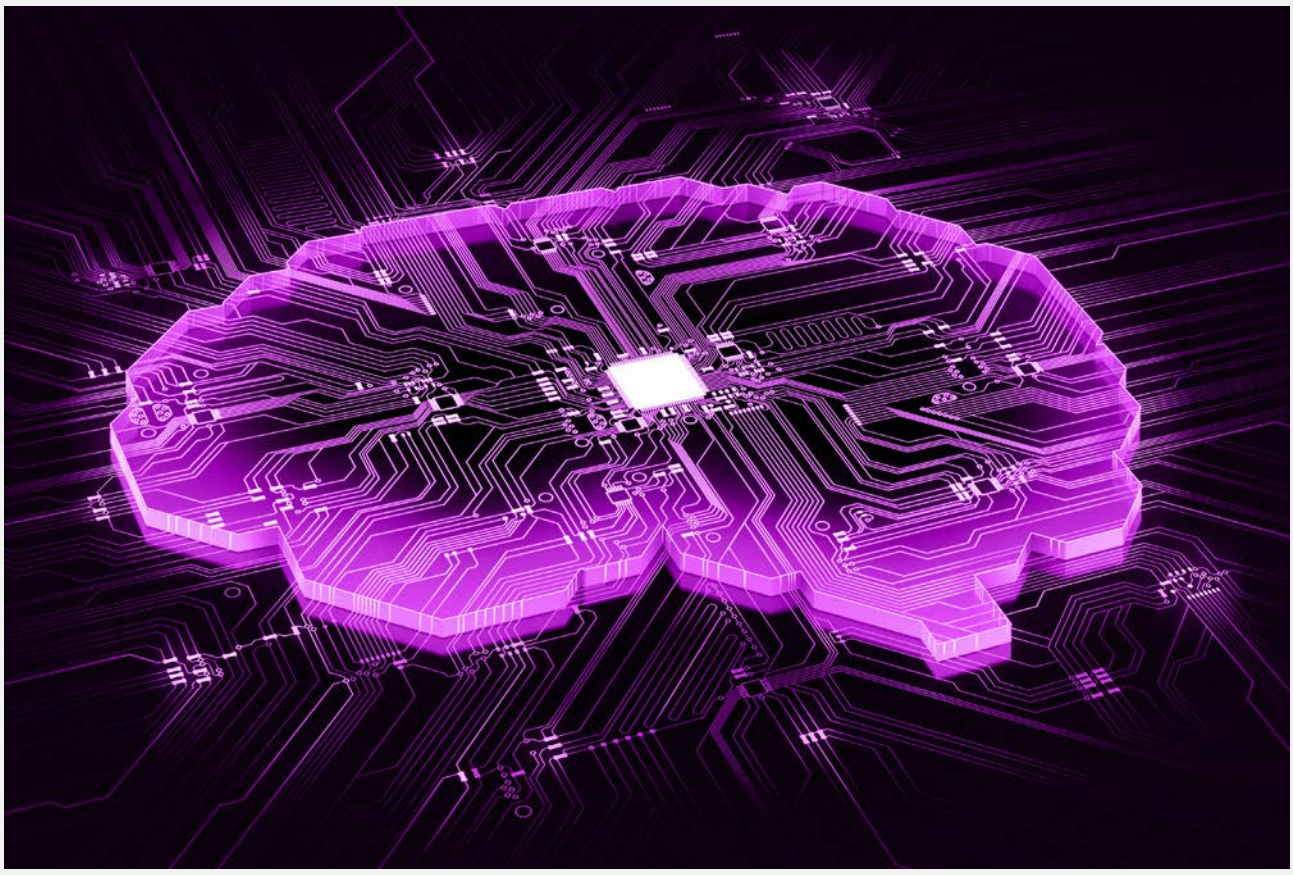


IMAGE: ADOBE STOCK

ventional neural networks. The company has persuaded two prominent U.K. semiconductor executives that the approach is worth investigating commercially. Noel Hurley, a former vice president at processor IP licensor Arm, has joined Literal Labs as CEO, and Jem Davies, who led the graphics and AI initiatives at Arm, has joined the board as a non-executive director.

If this approach resonates with customers, it could be highly disruptive in what is clearly the most important technology development in decades.

Beyond its technology, Literal Labs is interesting because it illustrates the challenges that startups face. In the rapidly evolving electronics sector, success often hinges on the strategic resolution of a minor yet crucial issue that can be swiftly monetized. The winning formula? Develop a targeted, defensible solution that addresses this need. The journey thereafter may well be influenced by serendipity—a company finding itself in a market niche at the opportune moment, having gained the attention of a heavyweight supporter such as Nvidia or Apple.

The startups that dare to address something others consider fundamental—be that using the laws of physics or in computational architecture—risk an uphill battle in an industry where reliance on the "ecosystem" is ubiquitous. Incremental design innovations or the fusion of technologies within the safe confines of CMOS technology ensure ongoing access to essential industry supports such as EDA, lithography and foundry services. By contrast, those pursuing more radical innovations often lack the ecosystem's backing, leaving them to navigate the challenging terrain alone.

Analysis by technology category

For the last few iterations of the Silicon 100, we have been classifying the list by technology. Such a division is inevitably arbitrary, as many companies operate in multiple areas. While changes in the less populated categories are not sufficient to determine a trend, moves in some of the larger categories—or collections of categories—do provide points of note and discussion.

The trend is toward increased representation of fundamental, power-related technologies and complex ICs for AI and a corresponding reduction of the "middle ground" around analog/mixed-signal devices and sensors. For example, one new entry is focused on indoor photovoltaics, and another is creating long-life batteries based on energetic electrons released by nuclear decay.

AI and quantum computing show increased levels of representation on the Silicon 100.

One middle-ground area that is an exception to the rule is displays, where microLED displays hold much promise. While the technology has yet to break through commercially, venture capital is supporting a number of startups in this area.

However, the overarching trend continues to be for startups and their venture capital supporters to pile into what could be generalized as AI processing. That focus is covered by three categories in version 24 of the Silicon 100: photonic acceleration, GPU-to-data-center-AI and edge AI.

In aggregate, across these categories, the number of startups has gone from 22 two years ago to 27 last year to 32 in this year's Silicon 100, with edge AI startups gradually increasing as a proportion of those numbers. Back in 2017, there were about six startups basing their hopes on machine learning.

Quantum and chiplets

Quantum computing, while still some way from commercial maturity, is also seeing much startup activity. The Silicon 100 reflects this trend; the number of startups in this category has gone up from five entries two years ago to nine companies in v24.

Quantum computing stands on the brink of a revolution—or perhaps a gold rush.

The advent of versatile and cost-effective quantum processors promises to reshape industries, beginning with cryptography, database management and simulations of complex physical and chemical phenomena. The ripple effect is expected to revolutionize medical research and beyond. From there, we expect to witness a surge in quantum-enhanced methods to boost the efficiency of tasks traditionally handled by classical computers.

Thus far, quantum computing's growth has been stymied by the stringent requirement of near-absolute-zero temperatures for classical qubit operation. Fortunately, there are many ways to embody quantum-state information; not all have such stringent requirements, but those are less

mature. A variety of quantum techniques is being pursued by scores of startups.

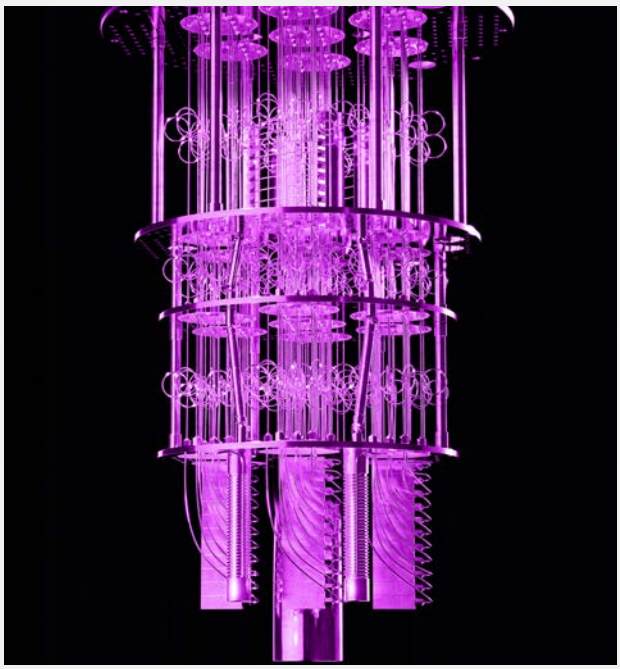
The potential significance of quantum computing is such that these companies and their backers are prepared to take the risk of being radical. For now, however, there is no killer application.

One potential route to a quantum killer app could be the synergy between the parallelism of AI algorithms and quantum computing. The idea of using qubit processors to attack the complexity of AI has an obvious appeal. Success may well come from a hybrid form of computing. Look to quantum startups that are partnered with, or at least aligned with, AI market leaders such as Nvidia, AMD, Intel and the hyperscalers.

To make way for this increased representation of quantum, fewer companies that focus on general-purpose processors, MCUs and FPGAs made the list, though there is startup activity around general-purpose RISC-V. Meanwhile, there are the beginnings of a pulse of activity around novel forms of computing based on such principles as thermodynamic physics.

One other category on the rise is chiplet-style packaging and the infrastructure around it.

There was a time when monolithic integration was considered superior for reasons of miniaturization and reliability, but companies at the leading edge have been turning increasingly to multi-die components. Instead of manufacturing a processor on a single large piece of silicon, chiplets allow for multiple smaller chips to be combined to



create a complete processor. This approach offers several advantages: improved yields, once testing for known-good die has been taken into account; heterogeneous integration; and allowing different functions to be implemented in different optimum manufacturing processes.

At present, chiplet assembly is predominantly either a proprietary approach—for example, Foveros within Intel—or one offered by a foundry (such as Taiwan Semiconductor Manufacturing Co. Ltd., or TSMC) with capacity largely allotted to a few major players, such as Nvidia and AMD. Nonetheless, the use of chiplets is becoming an increasingly available option, and standardization efforts are under way to encourage the entry of startups.

Chipletz (substrates), Blue Cheetah Analog Design and Eliyan (die-to-die interconnect), DreamBig Semiconductor (chiplet platform, including hub) and Silicon Box (assembly) have all joined the Silicon 100, ready to benefit from a move toward chiplet manufacturing.

Silicon Box opened a chiplet assembly factory in Singapore in 2023 and has announced plans to open a second factory in Italy. Both Silicon Box and DreamBig Semiconductor were co-founded by Sehat Sutardja and Weili Dai, the co-founders of semiconductor company Marvell Technology. The two companies have a complementary focus.

Analysis by geography

	v20	v21	v22	v23	v24
California	40	35	33	28	28
U.S.	48	48	44	38	38
Canada	5	5	5	4	6
North America	53	51	49	42	44
China	14	19	20	21	13
Europe	22	20	18	23	29
Israel	7	7	10	7	8
Rest of World	4	3	3	7	6

Silicon 100 startups by headquarters location
(Source: EE Times)

Our analysis of Silicon 100 startups by geography shows a gradual decline in the proportion of startups from California and the U.S. in recent iterations. In the latest Silicon 100, however, this trend has abated, and a small jump in startups from Canada means North America's representation has increased for the first time in years.

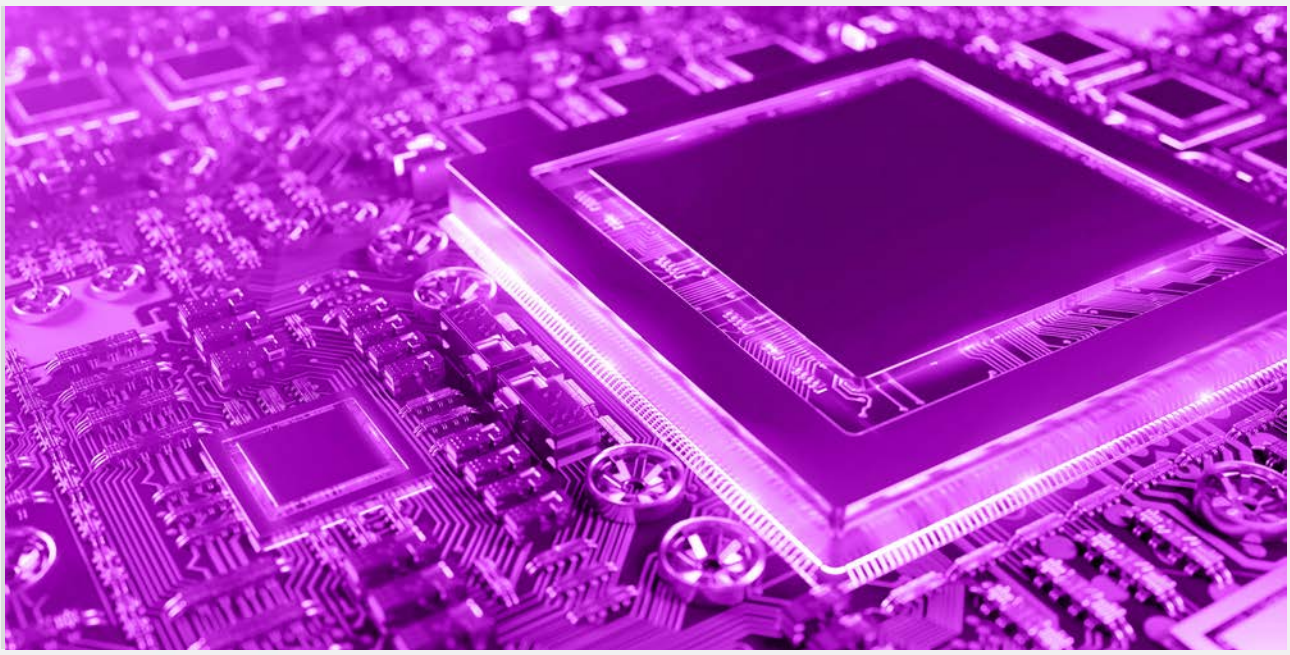
As with listing by technology sector, the geographical listing is somewhat arbitrary. We can only make assignments based on companies' self-declarations. For example, Sapeon, which entered the Silicon 100 in version 24 as part of a new wave of South Korean companies addressing AI, has stated its headquarters is in San Jose, California.

It has been announced that Sapeon and Rebellions (Seoul, South Korea) are planning to merge and relaunch under a new name. However, as of press time, that plan had not been implemented.

California's historical prominence as the creator of Silicon Valley with abundant and informed venture capital has made it a kind of global "downtown" for deep technology. Academic ideas may flourish anywhere, and R&D is often maintained in lower-cost areas of the world, but startup C-suite executives often believe it is better to be in California, where the shakers and movers are.

One region that does not feel this California pull is China. There, the tendency is in the other direction, with expatriate Chinese engineers and executives, often educated in the U.S., being encouraged to return to the People's Republic.

China continues to have high levels of startup activity, but its reduced presence on the Silicon 100 reflects the trade tensions between the U.S. and China. That friction has intensified in recent years and has hit a number of Chinese startups that may have had international aspirations but have been denied access to leading-edge silicon out of foundry TSMC. Such companies may now be forced to focus exclusively on satisfying Chinese demand. This, in turn, drives a decoupling of the semiconductor ecosystems in China and in the rest of the world. As a result, the number of maturing Chinese startups that have left the Silicon 100 has exceeded the number of Chinese startups joining the list in 2024.



The shortfall has been made up by a surge in European startups on the Silicon 100, from 23 to 29.

The U.K. has 12 startups on the current list, up from nine startups in version 23. The U.K., with longstanding entrepreneurial bases in Cambridge, Oxford, Bristol and Edinburgh, has enjoyed strong representation for many years, but it is notable that Belgium and the Netherlands are starting to enjoy the "imec effect," with companies locating near that world-leading nanoelectronics research institute's Leuven, Belgium, base. Spain, meanwhile, hasn't made the Silicon 100 often but is represented this year.

One explanation for the uptick in European startup representation is that semiconductor supply chain issues immediately post-Covid brought home to politicians and financiers in Europe—and elsewhere—the importance of semiconductors to wealth creation and economic security. It is arguable that this epiphany was more transformative in Europe than elsewhere. Certainly, the rate of European startup creation has jumped.

What Europe and other regions sometimes lack, however, are the larger sums needed to scale up promising companies to take on global competition. It remains the case that, for all its activity, Europe has not produced any world-leading companies for several years—at least in terms of revenues.

Israel has always punched way above its weight by population and continues to do so. South Korea has two companies in this year's Silicon 100 listing. What continues to be a conundrum is how poorly Japan and Taiwan are represented on the list.

Whether this is a cultural issue is debatable. After all, Taiwan produced TSMC, which is now the world's leading manufacturer of semiconductors. TSMC was a startup once upon a time, although that was long before the Silicon 60, much less the Silicon 100, was conceived. But the rise of TSMC indicates that there must be an opportunity for start-ups to break through and begin to write the story of their technology sector and their geographical region for the next iteration of the Silicon 100.

Company List by Category

MATERIALS, PROCESSES, INTERCONNECT (CHIPLETS), PACKAGING
AlixLabs A.B.
Black Semiconductor GmbH
Eliyan Corp.
Frore Systems Inc.

PRINTED ELECTRONICS

CHIP MANUFACTURING EQUIPMENT

PHOTOVOLTAICS
Epishine A.B.

ENERGY HARVESTING
Betavolt Technology
(Beijing Betavolt New Energy Technology Co. Ltd.)

GaN, SiC, POWER, ELECTRICITY
Amber Semiconductor Inc.
Ancora Semiconductors Inc.

CHIP, CHIPLET & PACKAGING FOUNDRIES
BelGaN Group B.V.
Chipletz Inc.
Rapidus Corp.
Silicon Box Pte. Ltd.

EDA, CORES, CHIPLET IP, DESIGN SERVICES
Agile Analog Ltd.
Blue Cheetah Analog Design Inc.
Celera Inc.
Expedera Inc.
X-Epic Corp.

ANALOG, MIXED-SIGNAL, PMICs
Nanopower Semiconductor A.S.

MEMORY, STORAGE
Catalog Technologies Inc.
ChangXin Memory Technologies Inc.
Iridia Inc.
Yangtze Memory Technologies Co. Ltd.

BIOELECTRONICS, MEDICAL

MEMS, SENSORS, ACTUATORS, HAPTICS
OQmented GmbH
Paragraf Ltd.
SoundSkrit Inc.
Useful Sensors Inc.
xMEMS Labs Inc.

OPTOELECTRONICS, IMAGE SENSORS
Celestial AI Inc.
Metalenz Inc.
Oculi Inc.

DISPLAY DEVICES, DISPLAYS, DRIVER CHIPS
Helio Display Materials Ltd.
Micledi Microdisplays B.V.
Poro Technologies Ltd.
Q-Pixel Inc.
Raysolve Ltd.
Swave Photonics N.V.

RF & IoT
HaiLa Technologies Inc.
Ixana Inc.
Morse Micro Pty. Ltd.
Pharrowtech N.V.

5G & RF
EdgeQ Inc.
Forefront RF Ltd.
Picocom Ltd.

RADAR, LiDAR, ADAS

Black Sesame Technologies Co. Ltd.
Blickfeld GmbH
SemiDrive Technology Ltd.
(Nanjing SemiDrive Technology Ltd.)

AUDIO, VISUAL PROCESSING

SiMa Technologies Inc.
Syntiant Corp.

GENERAL-PURPOSE PROCESSORS, MCUs, NETWORKING, FPGAs

Alif Semiconductor Inc.
NeoLogic Ltd.
Normal Computing Inc.
Nuclei System Technology Co. Ltd.
Pliops Ltd.
Red Semiconductor Ltd.
Rivos Inc.
SiPearl S.A.
Speedata Ltd.
VyperCore Ltd.

PHOTONIC ACCELERATION, COMPUTATION

iPronics S.A.
Lightelligence Inc.
Lightmatter Inc.
Luminous Computing Inc.
Neurophos Inc.
Salience Labs Ltd.

GPU-TO-DATA-CENTER AI

BiRen Technology Co. Ltd.
Cerebras Systems Inc.
d-Matrix Inc.
DreamBig Semiconductor Inc.
Enfabrica Inc.
Jaguar Microsystems
Moore Threads Technology Co. Ltd.
Neuchips Inc.
NeuReality Ltd.
Rebellions Inc.
SambaNova Systems Inc.
Sapeon Inc.
Tenstorrent Inc.
Untether AI
Vastai Technologies Inc.

EDGE AI

Analog Inference Inc.
Axelera AI N.V.
Blumind Inc.
DeepX Co. Ltd.
Hailo Technologies Ltd.
Literal Labs
(previously Mignon Technologies Ltd.)
Moffett AI
Perceive Corp.
Polyn Technology Ltd.
Quadric.io Inc.
Synthara AG

QUANTUM COMPUTING

IQM Finland Oy
Oxford Ionics Ltd.
Pasqal S.A.
PsiQuantum Corp.
Quantum Machines Ltd.
Quantum Motion Technologies Ltd.
QuiX Quantum B.V.
SeeqC Inc.
Xanadu Quantum Technologies Inc.

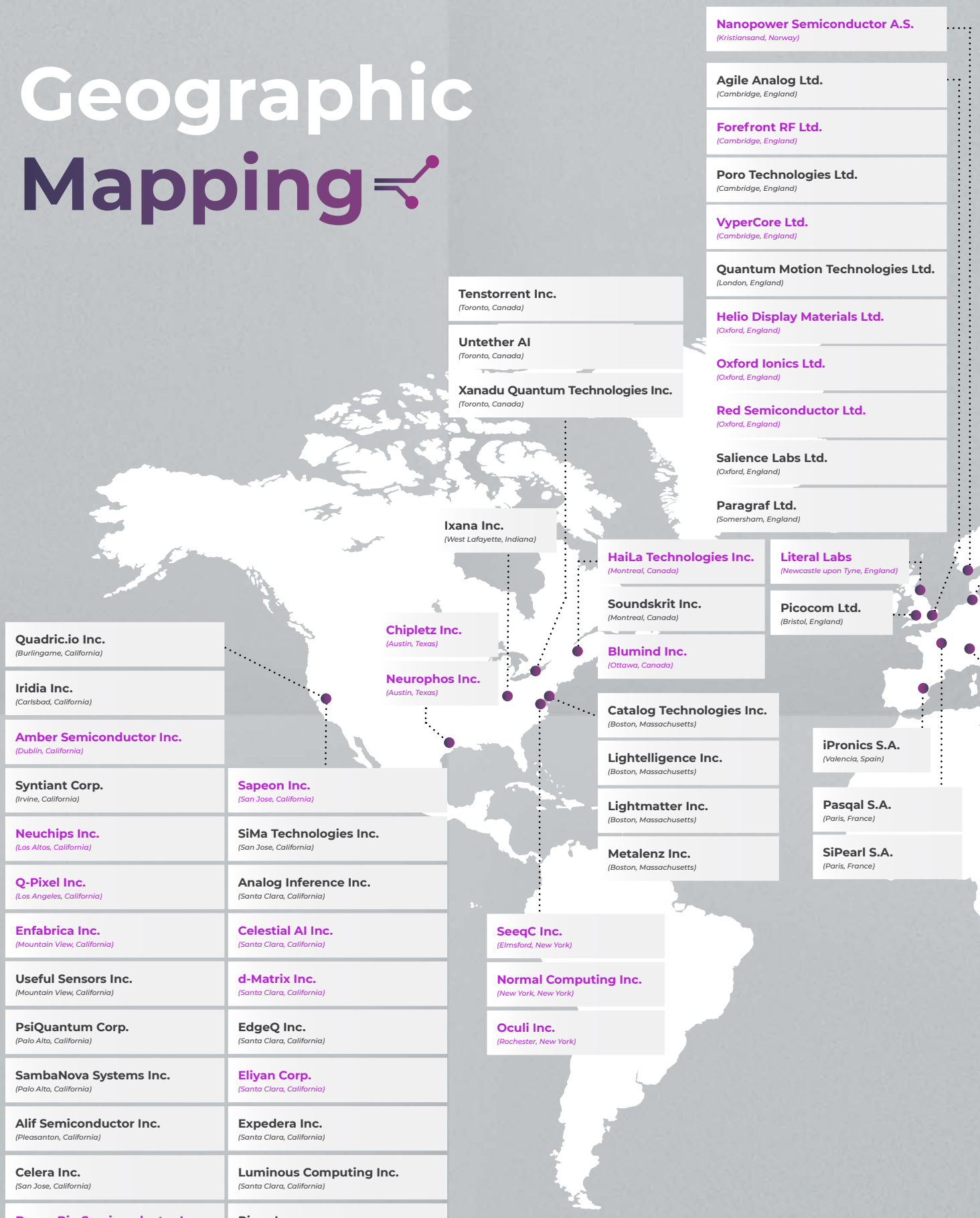
SECURITY

Chain Reaction Ltd.

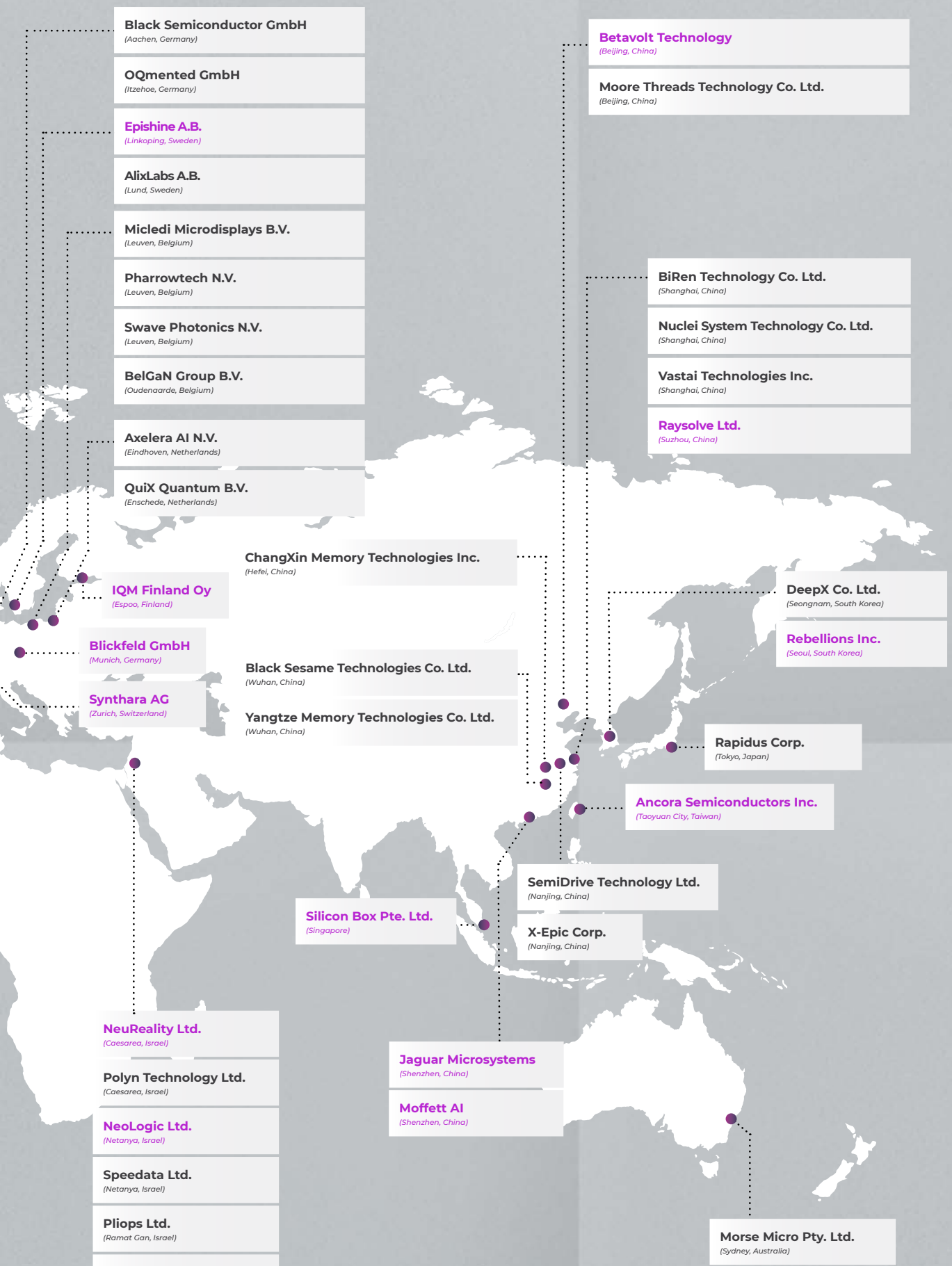
(Note: Categories are listed in approximate order from least abstract and most fundamental to the most complex and highest level of abstraction. Although some categories have no entries, we maintain the nomenclature to present a comprehensive view of the startup universe. Silicon 60 or Silicon 100 companies have occupied these categories in the past and may well do so in the future.)

***Companies listed in purple are new additions to this year's Silicon 100 list.**

Geographic Mapping



- Nanopower Semiconductor A.S. (Kristiansand, Norway)
- Agile Analog Ltd. (Cambridge, England)
- Forefront RF Ltd. (Cambridge, England)
- Poro Technologies Ltd. (Cambridge, England)
- VyperCore Ltd. (Cambridge, England)
- Quantum Motion Technologies Ltd. (London, England)
- Helio Display Materials Ltd. (Oxford, England)
- Oxford Ionics Ltd. (Oxford, England)
- Red Semiconductor Ltd. (Oxford, England)
- Salience Labs Ltd. (Oxford, England)
- Paragraf Ltd. (Somersham, England)
- Tenstorrent Inc. (Toronto, Canada)
- Untether AI (Toronto, Canada)
- Xanadu Quantum Technologies Inc. (Toronto, Canada)
- Ixana Inc. (West Lafayette, Indiana)
- HaiLa Technologies Inc. (Montreal, Canada)
- Literal Labs (Newcastle upon Tyne, England)
- Soundskrit Inc. (Montreal, Canada)
- Picocom Ltd. (Bristol, England)
- Chipletz Inc. (Austin, Texas)
- Blumind Inc. (Ottawa, Canada)
- Neurophos Inc. (Austin, Texas)
- Catalog Technologies Inc. (Boston, Massachusetts)
- Lightelligence Inc. (Boston, Massachusetts)
- iPronics S.A. (Valencia, Spain)
- Lightmatter Inc. (Boston, Massachusetts)
- Pasqal S.A. (Paris, France)
- Metalenz Inc. (Boston, Massachusetts)
- SiPearl S.A. (Paris, France)
- SeeqC Inc. (Elmsford, New York)
- Normal Computing Inc. (New York, New York)
- Oculi Inc. (Rochester, New York)
- Quadric.io Inc. (Burlingame, California)
- Iridia Inc. (Carlsbad, California)
- Amber Semiconductor Inc. (Dublin, California)
- Syntiant Corp. (Irvine, California)
- Neuchips Inc. (Los Altos, California)
- Q-Pixel Inc. (Los Angeles, California)
- Enfabrica Inc. (Mountain View, California)
- Useful Sensors Inc. (Mountain View, California)
- PsiQuantum Corp. (Palo Alto, California)
- SambaNova Systems Inc. (Palo Alto, California)
- Alif Semiconductor Inc. (Pleasanton, California)
- Celera Inc. (San Jose, California)
- DreamBig Semiconductor Inc. (San Jose, California)
- Frore Systems Inc. (San Jose, California)
- Perceive Corp. (San Jose, California)
- Sapeon Inc. (San Jose, California)
- SiMa Technologies Inc. (San Jose, California)
- Analog Inference Inc. (Santa Clara, California)
- Celestial AI Inc. (Santa Clara, California)
- d-Matrix Inc. (Santa Clara, California)
- EdgeQ Inc. (Santa Clara, California)
- Eliyan Corp. (Santa Clara, California)
- Expedera Inc. (Santa Clara, California)
- Luminous Computing Inc. (Santa Clara, California)
- Rivos Inc. (Santa Clara, California)
- xMEMS Labs Inc. (Santa Clara, California)
- Blue Cheetah Analog Design Inc. (Sunnyvale, California)
- Cerebras Systems Inc. (Sunnyvale, California)


Black Semiconductor GmbH
(Aachen, Germany)
OQmented GmbH
(Itzehoe, Germany)
Epishine A.B.
(Linkoping, Sweden)
AlixLabs A.B.
(Lund, Sweden)
Micledi Microdisplays B.V.
(Leuven, Belgium)
Pharrowtech N.V.
(Leuven, Belgium)
Swave Photonics N.V.
(Leuven, Belgium)
BelGaN Group B.V.
(Oudenaarde, Belgium)
Axelera AI N.V.
(Eindhoven, Netherlands)
QuiX Quantum B.V.
(Enschede, Netherlands)
IQM Finland Oy
(Espoo, Finland)
Blickfeld GmbH
(Munich, Germany)
Synthara AG
(Zurich, Switzerland)
Betavolt Technology
(Beijing, China)
Moore Threads Technology Co. Ltd.
(Beijing, China)
BiRen Technology Co. Ltd.
(Shanghai, China)
Nuclei System Technology Co. Ltd.
(Shanghai, China)
Vastai Technologies Inc.
(Shanghai, China)
Raysolve Ltd.
(Suzhou, China)
ChangXin Memory Technologies Inc.
(Hefei, China)
Black Sesame Technologies Co. Ltd.
(Wuhan, China)
Yangtze Memory Technologies Co. Ltd.
(Wuhan, China)
DeepX Co. Ltd.
(Seongnam, South Korea)
Rebellions Inc.
(Seoul, South Korea)
Rapidus Corp.
(Tokyo, Japan)
Ancora Semiconductors Inc.
(Taoyuan City, Taiwan)
SemiDrive Technology Ltd.
(Nanjing, China)
X-Epic Corp.
(Nanjing, China)
Silicon Box Pte. Ltd.
(Singapore)
NeuReality Ltd.
(Caesarea, Israel)
Polyn Technology Ltd.
(Caesarea, Israel)
NeoLogic Ltd.
(Netanya, Israel)
Speedata Ltd.
(Netanya, Israel)
Pliops Ltd.
(Ramat Gan, Israel)
Chain Reaction Ltd.
(Tel Aviv, Israel)
Hailo Technologies Ltd.
(Tel Aviv, Israel)
Quantum Machines Ltd.
(Tel Aviv, Israel)
Jaguar Microsystems
(Shenzhen, China)
Moffett AI
(Shenzhen, China)
Morse Micro Pty. Ltd.
(Sydney, Australia)

EE Times Lists 100 Emerging Companies to Watch in 2024

By Peter Clarke

EE Times has retained 61 of the companies from its v23 list of startup companies that we feel are worth keeping an eye on and has selected 39 startups to join them in the Silicon 100 v24. That said, it is notable that the pace of startup formation seems to have increased markedly in the past few years.

EE Times has been publishing and updating its list of emerging startups since April 2004, reflecting corporate, commercial, technology and market conditions. The latest batch of newcomers includes companies that collectively are active across a broad technology front. Their areas of focus include electrical supply control; gallium nitride (GaN) and nuclear battery power; indoor photovoltaics; LiDAR and smart sensors; photonic interconnects and chiplets; display materials and microLED displays; tunable, backscatter and high-frequency RF; subthreshold-voltage circuits; and logic processors of many sorts, from analog up to quantum, for the data center and to the edge.

The entire Silicon 100 lineup covers many areas of interest, including semiconductor manufacturing, EDA and design services, analog and mixed-signal circuits, artificial intelligence, neural networks, processors and intellectual property, quantum computing, security, memory, processing-in-memory, optical communications, optical processing, MEMS, sensors, displays, LiDAR, radar, RF, IoT, energy harvesting, wireless charging, power semiconductors and power management.

The selection of companies to the Silicon 100 is based on the consideration of a mix of criteria, including technology, intended market, financial position and investment profile, maturity and executive leadership. Selection for the Silicon 100 does not mean these companies are tips for financial success. It means they are of interest—and this may be for a variety of reasons.

The names of the companies brought onto the list at this iteration are highlighted in purple in the listing that follows.

Readers are welcome to nominate their own emerging companies for inclusion in a future iteration of the Silicon 100 list. Nominations should be supported by a short citation providing details about the company and explaining why the company is suitable for inclusion on the list.

Barry Paterson, CEO

Agile Analog Ltd.

Cambridge, England

Founded in August 2017, Agile Analog claims it can design analog circuits faster, to a higher quality and on multiple silicon processes. The company has developed the Composa platform for generating IP variants based on standard platforms in functional domains, such as signal conditioning, data conversion, power regulation and sensing. Agile Analog has recently joined the Intel Foundry Services Accelerator IP Alliance Program and the TSMC IP Alliance Program.

www.agileanalog.com

Alif Semiconductor Inc.

Pleasanton, California

Alif Semiconductor was founded in 2019 and has entered the Arm-based microcontroller market with enhanced support for machine learning. The company launched its Ensemble and Crescendo families of MCUs and fusion processors in 2021 and its Balletto family of Bluetooth Low Energy 32-bit MCUs for AI/ML workloads in April 2024. Alif is led by CEO and co-founder Syed Ali, who co-founded Cavium Networks and was that company's CEO and chairman.

www.alifsemi.com

Syed Ali, CEO and co-founder

Jonas Sundqvist, co-founder and CEO

AlixLabs A.B.

Lund, Sweden

AlixLabs is a 2019 startup formed to exploit developments in atomic layer etching (ALE) at dimensions below 20 nm. The company's method uses inclined surfaces—readily fabricated by dry etching or epitaxial growth—to provide masking for the ALE process, which can produce small structures in a precise and efficient way, the company claims. In September 2023, AlixLabs secured SEK40 million ($3.8 million) in funding to accelerate the development of its ALE pitch-splitting technology.

www.alixlabs.com

✸ = New

Thar Casey, CEO and founder

✸ Amber Semiconductor Inc.

Dublin, California

Amber Semiconductor (AmberSemi), founded in May 2016, is developing technologies for the digital control of electricity. AmberSemi is producing silicon chips to transform electrical product architecture and build out smarter infrastructure, including whole-building smart systems that will function as sensor- and feature-rich ecosystems for energy and environmental awareness, control and automation.

www.ambersi.com

Analog Inference Inc.

Santa Clara, California

Analog Inference is a 2018 startup founded by analog and memory circuit designer Vishal Sarin to develop edge AI analog in-memory inference accelerators. Target markets for its products range from edge servers to mobile devices. The company is backed by Khosla Ventures. Investors and advisers also include Andy Bechtolsheim, co-founder of Sun Microsystems; Pradeep Sindhu, co-founder of Juniper Networks; and Atiq Raza, CEO of Raza Microelectronics.

www.analog-inference.com

Vishal Sarin, president and CEO

✸ Ancora Semiconductors Inc.

Taoyuan City, Taiwan

Ancora Semiconductors was incubated within Delta Electronics before being formally founded in 2022. The Ancora product line includes GaN discrete components, as well as system-in-package (SiP) and system-on-chip (SoC) implementations.

www.ancora-semi.com

Fabrizio Del Maffeo, CEO and co-founder

Axelera AI N.V.

Eindhoven, Netherlands

Axelera AI was incubated by Dutch blockchain unicorn Bitfury in 2019, began working with research institute imec in early 2020 and was launched as an independent company in 2021. It has produced edge AI processors with a custom dataflow architecture and multi-core in-memory computing. Axelera AI raised $68 million in a Series B funding round in June 2024.

www.axelera.ai

B

BelGaN Group B.V.

Oudenaarde, Belgium

BelGaN Group was formed in 2022 to acquire an onsemi silicon wafer fab in Oudenaarde and convert it to GaN production for automotive and other power applications. The company, led by CEO Alan Zhou, is a joint venture between Rockley Management (HK) Ltd. and Wuxi Group Ltd., both of Hong Kong. In March 2024, BelGaN qualified its BEL1 first-generation 650-V eGaN platform for volume production.

www.belgan.com

Alan Zhou, CEO

Zhang Wei, chairman and CEO

✸ Betavolt Technology

Beijing, China

Betavolt Technology, the trading name of Beijing Betavolt New Energy Technology Co. Ltd., was established in April 2021. The company's main products include atomic-energy batteries based on nickel-63, supercapacitors, diamond semiconductors and materials like carbon nanotubes. The company claims that its first nuclear battery can deliver 100 μW and 3 V and that the battery can run for 50 years without requiring a recharge or maintenance.

www.betavolt.tech

Zhang Wen, co-founder, chairman and CEO

BiRen Technology Co. Ltd.

Shanghai, China

BiRen Technology, aka Shanghai BiRen Intelligent Technology Co. Ltd., was co-founded in 2019 by Lingjie Xu and Zhang Wen. It developed its first GPU/AI chip to compete in China with chips from Nvidia, claiming its chiplet-based component offered 3× the performance of products sold by others. However, access to TSMC's 7-nm manufacturing process was prevented by U.S. export controls that became effective in October 2022, forcing modifications. BiRen received an investment of ¥2 billion (about $280 million) in December 2023, but reportedly Lingjie Xu resigned in late 2023 or early 2024.

www.birentech.com

Black Semiconductor GmbH

Aachen, Germany

Founded in 2019, Black Semiconductor is developing a back-end-of-line graphene-based photonics manufacturing process that supports on-chip optical signal routing and fiber-to-chip interfaces for chip-to-chip connections. The technology supports bidirectional electro-optic conversion with data transmission rates of up to 10 petabits/second, the company claims. At the same time, the technology is compatible with CMOS front-end-of-line manufacturing.

www.blacksemicon.de

Daniel Schall, CEO, and **Sebastian Schall**, CFO

Johnson Shan, CEO

Black Sesame Technologies Co. Ltd.

Wuhan, China

Founded in 2016, Black Sesame Technologies is an automotive-grade AI digital imaging technology company. Black Sesame says it is innovating at every level of the stack, from chips to new algorithms and network architectures at the cutting edge of ML research. Its IP cores navigate tradeoffs among performance, power and area, as well as integration with flexibility and programmability.

www.bst.ai

Mathias Müller, CEO

Blickfeld GmbH

Munich, Germany

Blickfeld was founded in 2017 to build high-performance LiDAR sensors. It operates subsidiaries in the U.S. (Blickfeld North America) and China (Blickfeld Optoelectronics Technology Shanghai Co. Ltd.). Its sensors are combined with perception software to enable mobility, smart city, industrial and security applications. The Qb2 is an industrial 3D LiDAR sensor that features integrated perception software in its compact design. In December 2023, Blickfeld raised €7.5 million in initial growth financing.

www.blickfeld.com

Blue Cheetah Analog Design Inc.

Sunnyvale, California

Founded in May 2018 by graduates and academics from the University of California, Blue Cheetah Analog Design develops parameterized generators that can produce customized design IP, which is being applied to die-to-die chiplet interconnects. The chiplet interconnect IP is configurable for packaging type, data rate, I/O configuration, process and more. AI chip designer Tenstorrent has licensed Blue Cheetah's customizable die-to-die interconnect IP for its AI and RISC-V chiplet designs.

www.bcanalog.com

Elad Alon, co-founder and CEO

Roger Levinson, CEO

Blumind Inc.

Ottawa, Canada

Blumind has developed an analog architecture for neural network inferencing at the edge. The company claims its all-analog AI neural network architecture delivers deterministic and precise inferencing performance at ultra-low power—up to 1,000× lower power than traditional digital methods. Blumind was founded in 2020 by CTO John Gosson and COO Niraj Mathur. Roger Levinson soon joined as CEO.

www.blumind.ai

Hyunjun Park, CEO

Catalog Technologies Inc.

Boston, Massachusetts

Founded in 2016, Catalog Technologies is developing DNA-based platforms for massive data storage and computation through the manipulation of synthetic DNA. Before founding Catalog Technologies, Hyunjun Park, now CEO, was a postdoctoral associate in synthetic biology at MIT.

www.catalogdna.com

Celera Inc.

San Jose, California

Founded in 2018, Celera is developing and deploying an automated AI software-based platform that delivers custom IC designs faster than legacy teams and flows can. The company claims a 100× speedup. It focuses on analog/mixed-signal applications, which historically have been resistant to automation. In October 2023, Celera hired analog IC veteran Pat Brockett as its new CEO.

www.celeratechnologies.com

Patrick Brockett, CEO

Dave Lazovsky, CEO

✸ Celestial AI Inc.

Santa Clara, California

Celestial AI, founded in 2020, has developed a proprietary photonic material that uses light for data movement between chips. The company describes its Photonic Fabric as an optical connectivity solution that enables the disaggregation of compute and memory to accelerate AI infrastructure. In March 2024, Celestial AI raised $175 million in a Series C financing round, bringing the total to $339 million since the company's inception.

www.celestial.ai

Andrew Feldman, CEO

Cerebras Systems Inc.

Sunnyvale, California

Cerebras Systems is a computer systems company dedicated to accelerating deep learning on wafer-scale chips. The company's third-generation, 5-nm Wafer Scale Engine (WSE-3) has 4 trillion transistors and powers the CS-3 AI supercomputer, delivering 125 petaFLOPS of peak AI performance through 900,000 AI-optimized compute cores. The company was founded in 2016 and is headed up by Andrew Feldman, who sold micro-server chip company SeaMicro to AMD in 2012 for $334 million.

www.cerebras.net

✸ Chain Reaction Ltd.

Tel Aviv, Israel

Chain Reaction develops custom ASICs in partnership with cloud computing providers and data centers to run privacy routines and technologies at high performance and low power. Its 3PU (Privacy Preserving Processing Unit) is used to accelerate privacy-enhancing technologies on encrypted data in real time. Chain Reaction was co-founded in 2019 by CEO Alon Webman, who was a co-founder of Mellanox and worked at that company for 19 years until shortly before its sale to Nvidia in April 2020.

www.chain-reaction.io

Alon Webman, co-founder and CEO

Yiming Zhu, CEO

ChangXin Memory Technologies Inc.

Hefei, China

ChangXin Memory Technologies (CXMT) was founded with Chinese state support in May 2016. The privately owned company is the largest DRAM integrated device manufacturer (IDM) in mainland China and operates a 300-mm wafer fab for DRAM chips. In 2019 and 2020, CXMT signed long-term licensing agreements securing access to DRAM patent portfolios, including that of now-defunct company Qimonda AG.

www.cxmt.com

Bryan Black, CEO

Chipletz Inc.

Austin, Texas

Chipletz is a fabless substrate startup created to enable chiplet-based packaging. The company started out in 2016 as an activity within AMD and was spun off in 2021. It is developing a technology called Smart Substrate. By accommodating die-to-die interconnect, I/O and multiple voltage domains within the substrate, Chipletz plans to support the integration of almost any die from any manufacturer. In September 2023, SKC, a South Korean materials company and a subsidiary of SK Group, reportedly acquired a 12% stake in Chipletz.

www.chipletz.com

D

DeepX Co. Ltd.

Seongnam, South Korea

DeepX is a developer of neural processing units (NPUs) for edge computing through the efficient support of convolutional neural networks. The company has introduced four chips covering a range of AI processing capabilities for applications ranging from sensors with minimal data processing requirements to AI-intensive applications such as robotics, computer vision and autonomous vehicles. DeepX was founded in 2018 and is led by CEO Lokwon Kim, who helped design the A11 Bionic process for the iPhone X at Apple.

www.deepx.ai

Lokwon Kim, CEO

Sid Sheth, founder and CEO

d-Matrix Inc.

Santa Clara, California

D-Matrix is developing processors for data center AI inferencing using in-memory computing techniques with chiplet-level interconnects. Founded in 2019 by CEO Sid Sheth, d-Matrix uses circuit techniques, machine-learning tools, software and algorithms to address memory-compute integration problems. In September 2023, d-Matrix raised $110 million in a Series B funding round to begin the commercialization of its Corsair in-memory compute platform.

www.d-matrix.ai

Sehat Sutardja, CEO

DreamBig Semiconductor Inc.

San Jose, California

DreamBig Semiconductor is a chiplet platform startup founded in 2019 by semiconductor industry veterans Sehat Sutardja, Weili Dai and Sohail Syed. The company is focused on providing low-cost, low-latency and high-throughput solutions for AI, data centers, 5G and automotive markets. DreamBig Semiconductor has offices in the U.S., Mexico, Vietnam, Pakistan and Canada for R&D cost optimization.

www.dreambigsemi.com

E

EdgeQ Inc.

Santa Clara, California

EdgeQ is a 2018 startup that aims to put 4G and 5G base stations and AI on the same SoC. Led by executives from Qualcomm, Intel and Broadcom, EdgeQ is pioneering a converged connectivity and AI platform that is software-customizable and programmable. Former Qualcomm CEO Paul Jacobs and former Qualcomm CTO Matt Grob are advisers at EdgeQ, with Vinay Ravuri at the helm as CEO.

www.edgeq.io

Vinay Ravuri, CEO

Ramin Farjadrad, CEO

Eliyan Corp.

Santa Clara, California

Eliyan was founded in 2021. Serial entrepreneur Ramin Farjadrad, formerly CTO of Aquantia, is the company's CEO. Eliyan is designing chiplet connectivity technologies. In addition to die-to-die interconnects in chiplet-based designs, Eliyan addresses memory capacity and bandwidth in AI chips with the provision of its Universal Memory Interface.

www.eliyan.com

Rochan Sankar, CEO

Enfabrica Inc.

Mountain View, California

Enfabrica was founded in 2019 by managers and engineers from companies including Broadcom, Google, Cisco, Amazon Web Services and Intel to develop data center networking silicon and software to support AI computing workloads. The company announced a new class of chips, called Accelerated Compute Fabric devices, in March 2023. The company gained investment from Nvidia in a $125 million Series B round in September 2023.

www.enfabrica.net

Epishine A.B.

Linkoping, Sweden

Founded in 2016, Epishine makes printed organic solar cells for use indoors and can help make electronics self-powered, reducing the use of power cables and disposable batteries. Epishine has formed partnerships with several companies in the energy-harvesting sector. Anders Kottenauer is its CEO.

www.epishine.com

Anders Kottenauer, CEO

Da Chuang, CEO

Expedera Inc.

Santa Clara, California

Expedera provides neural engine semiconductor IP with a pipelined architecture that runs neural network models natively. The company was founded in 2018 by executives who previously worked at Memoir Systems and at Cisco. Expedera claims its IP has scalable performance that can range from edge nodes and smartphones to automotive and data centers, and it says it is shipping millions of devices worldwide. In May 2024, Expedera raised $20 million in a Series B round to advance its NPU products for license. This investment brings the company's total funding to more than $47 million.

www.expedera.com

Ronald Wilting, CEO

✸ Forefront RF Ltd.

Cambridge, England

Forefront RF was founded in January 2020 to apply adaptive passive cancellation of RF signals to the replacement of BAW and SAW filters and switch banks in mobile phones and wearables across 3G to 6G. Its approach replaces fixed-frequency filters with tunable alternatives to reduce space, weight and cost. The company was founded by Leo Loughlin, who has academic expertise in this area. Co-founder and COO Julian Hildersley gained management and marketing experience at TTPcom, Motorola and Nujira. Ronald Wilting was hired as CEO in 2022 to help Forefront RF accelerate its transition from startup to fabless semiconductor manufacturer.

www.forefrontrf.com

Frore Systems Inc.

San Jose, California

Founded in 2018 by two former Qualcomm executives, Frore Systems has developed a technology for the active cooling of chips. The company claims that putting its MEMS devices, called AirJets, on top of microprocessors can increase the amount of time the devices can operate in turbo mode without overheating, effectively doubling performance. Seshu Madhavapeddy is CEO of the company, which has raised $116 million in total from such sources as Mayfield, Addition, Clear Ventures and Qualcomm Ventures.

www.froresystems.com

Seshu Madhavapeddy, CEO

Derek Kuhn, president and CEO

✸ HaiLa Technologies Inc.

Montreal, Canada

HaiLa Technologies, founded as Wavelite in 2019, is developing a low-power back-scattering Wi-Fi data communications platform for IoT applications that piggybacks data signaling on ambient Wi-Fi carriers. The fabless semiconductor and software company, led by CEO Derek Kuhn, is focused on power-efficient wireless-communication SoC solutions.

www.haila.io

Orr Danon, co-founder and CEO

Hailo Technologies Ltd.

Tel Aviv, Israel

Hailo Technologies was founded in 2017. Its Hailo-8 is an edge AI processor capable of handling high-resolution video in real time or multiple video streams and neural network models simultaneously. The company followed up the Hailo-8 with the Hailo-15 AI vision processors, which combine AI inferencing with computer vision engines, and the Hailo-10, for performing generative AI at the edge. In April 2024, Hailo raised an additional $120 million in an extension of its Series C funding, bringing the total raised to $344 million.

www.hailo.ai

✸ Helio Display Materials Ltd.

Oxford, England

Helio Display Materials was founded in 2016 as Heliochrome Ltd. by Professor Henry Snaith of the University of Oxford Department of Physics and Professor Sir Richard Friend of the University of Cambridge. The company is developing metal-halide perovskite materials as alternatives to quantum-dot and direct-bandgap materials for displays in a bid to create brighter displays that consume less power. The company claims that only a thin layer is needed to produce superior colors and enhanced power efficiency thanks to the high optical absorption of perovskites.

www.heliodisplaymaterials.com

Bernard Wenger, CTO

Mark Halfman, CEO

iPronics S.A.

Valencia, Spain

Founded in 2019 as a spinoff of Universitat Politècnica de València, iPronics has developed a programmable photonic IC architecture that is inspired by the electronic FPGA. The company's photonic array is a hexagonal mesh of 2D photonic waveguides that incorporate programmable Mach-Zehnder interferometers. According to the company, a large variety of functions can be performed on the seven-cell hexagonal array, enabling the same hardware to be applied to multiple commercial applications, including 5G communication, data centers, AI, autonomous driving, quantum computing and IoT.

www.ipronics.com

Jan Goetz and **Mikko Välimäki**, co-CEOs

IQM Finland Oy

Espoo, Finland

IQM Finland, which trades as IQM Quantum Computers, was founded as a spinoff from Finland's VTT Technical Research Centre in 2018. The company's approach to quantum computing is based on superconducting quantum devices. IQM has more than 300 employees and has raised more than €200 million ($217 million) in venture capital to date, with its most recent funding round bringing in €128 million in 2022. The company has established subsidiaries in Palo Alto, California; Warsaw, Poland; Munich; Madrid; Paris; and Singapore.

www.meetiqm.com

Iridia Inc.

Carlsbad, California

Iridia combines proprietary enzymology, semiconductor manufacturing and blockchain technology for data storage and data security using DNA. Iridia was founded in 2016 and has developed techniques for writing, storing and reading data held in single molecules of DNA.

www.iridia.com

Murali Prahalad, CEO

Angik Sarkar, CEO

Ixana Inc.

West Lafayette, Indiana

Ixana has developed a non-radiative body-area network wireless technology, called Wi-R, that it says is 100× more energy-efficient than traditional wireless. Wi-R enables links between personal and wearable devices with communication at lower energy than is possible with Wi-Fi, Bluetooth and UWB. Ixana, founded in 2020, offers the 4-Mbit/s-capable Y22 Wi-R chip, the Wi-R module and a wireless headset demonstrator.

www.ixana.ai

Sunny (Kai-Yeung) Siu, founder and CEO

Jaguar Microsystems

Shenzhen, China

Jaguar Microsystems develops data processing unit chips for next-generation data centers. The company was founded in 2020 by CEO Sunny Siu, former general manager of Broadcom's preprocessor and wireless infrastructure business unit in Greater China. In 2002, Siu co-founded Raza Microelectronics, which was acquired in 2009 by NetLogic, itself acquired by Broadcom in 2011.

www.jaguarmicro.com

Lightelligence Inc.

Boston, Massachusetts

Lightelligence was spun out of MIT in 2017 to commercialize optical processing. In 2021, the company announced a 64 × 64 optical matrix multiplier in an integrated silicon photonic chip and a CMOS microelectronic chip, flip-chip-packaged together. In 2023, Lightelligence demonstrated its Hummingbird Optical Network-on-Chip (oNOC) processor, designed for domain-specific AI workloads.

www.lightelligence.ai

Yichen Shen, CEO

Nick Harris, CEO

Lightmatter Inc.

Boston, Massachusetts

Lightmatter is a 2017 MIT spinoff that was founded to commercialize optical processing through waveguides on silicon. The company's fundamental hardware comprises its photonic AI accelerator product line, Envise, and its programmable photonic interconnect product, Passage. These are complemented by Idiom, a development environment that interfaces with standard deep-learning frameworks and model exchange formats while providing the transformations and tools required by deep-learning model builders and deployers.

www.lightmatter.co

Noel Hurley, CEO

Literal Labs

Newcastle upon Tyne, England

Literal Labs, previously known as Mignon Technologies Ltd., was founded in March 2023 by University of Newcastle professors Alex Yakovlev, who serves as chief scientific officer, and Rishad Shafik, who serves as chief technology officer. Both have been active in research on Tsetlin machines at the university. Literal Labs claims that Tsetlin machines can provide an approach to AI that is up to 10,000× more energy-efficient than artificial neural networks. In February, the company recruited Noel Hurley, a former vice president at Arm, as its CEO.

www.literal-labs.ai

Luminous Computing Inc.

Santa Clara, California

Luminous Computing aims to build a scalable AI supercomputer based on an AI training and inference chip that uses proprietary silicon photonics technology to eliminate data movement bottlenecks. Founded in 2018, the company is backed by Bill Gates and other Silicon Valley investors.

www.luminous.com

Marcus Gomez, CEO

Rob Devlin, CEO

Metalenz Inc.

Boston, Massachusetts

Metalenz was spun out of Harvard University in 2016 to develop meta-surface optics that use sub-wavelength structures to manipulate light in a manner not possible with traditional refractive lenses. The company holds an exclusive license to the portfolio of foundational intellectual property developed in the Capasso Lab at Harvard University. In October 2023, Metalenz launched Polar-ID, its subsystem for secure face-recognition-based unlocking on smartphones.

www.metalenz.com

Sean Lord, CEO

Micledi Microdisplays B.V.

Leuven, Belgium

Micledi Microdisplays was founded in 2019 by researchers from imec with expertise in thin films and display R&D. The company is developing microLED displays in a 300-mm CMOS manufacturing platform, said to be key to achieving augmented-reality (AR) smart glasses that are small and lightweight, with long battery life and reasonable cost. In March, Micledi Microdisplays raised $25 million in a Series A funding round to commercialize microLED displays for AR applications.

www.micledi.com

✸ Moffett AI

Shenzhen, China

Moffett AI, formally Moxin Artificial Intelligence Technology (Shenzhen) Co. Ltd., was founded in Silicon Valley in 2018 before setting up its headquarters in Shenzhen. The company aims to support the development of a sparse neural network architecture by optimizing computing models, as well as provide a universal AI computing platform. Wang Wei, the founder and CEO of the company, worked for Intel on its processors from the fifth to 10th generations.

www.moffettai.com

Wang Wei, founder and CEO

Jams Zhang Jianzhong, CEO

Moore Threads Technology Co. Ltd.

Beijing, China

Graphics and AI startup Moore Threads Technology raised hundreds of millions of dollars in a seed funding round only 100 days after its formation in October 2020. The company's mission is to build a computing platform to accelerate AI, graphics and metaverse computing.

www.mthreads.com

Michael De Nil, co-founder and CEO

Morse Micro Pty. Ltd.

Sydney, Australia

Morse Micro is a fabless semiconductor startup developing Wi-Fi HaLow chips for the IoT market. The technology can reach 10× the range of conventional Wi-Fi technology—a 3-km record connection distance has been achieved—and last many years on a single battery. The company was founded in 2016 by Andrew Terry and Michael De Nil, who had both previously worked on Wi-Fi for Broadcom. Morse Micro offers the MM6108 Wi-Fi HaLow SoC, encompassing radio, PHY and MAC and adhering to the IEEE 802.11ah standard, with data rates up to 43.3 Mbps.

www.morsemicro.com

N

✸ Nanopower Semiconductor A.S.

Kristiansand, Norway

Nanopower Semiconductor has developed a peripherals and sensor management IC that operates using subthreshold voltage operation, offering low-power performance for battery-powered systems. The fabless semiconductor company, founded in 2017, claims its nPZero technology can achieve power consumption savings of up to 90% in certain operating modes and can be combined with any wireless and sensor technology.

www.nanopowersemi.com

Tore Irgens Kuhnle, CEO

Avi Messica, CEO, and **Ziv Leshem**, CTO, co-founders

✸ NeoLogic Ltd.

Netanya, Israel

NeoLogic was founded in 2021 to develop a high fab-in form of logic called Quasi-CMOS that uses up to a third fewer transistors per function than conventional CMOS. This has potential performance-power-area advantages for classical and AI processors. NeoLogic was founded by CEO Avi Messica and CTO Ziv Leshem; both have extensive experience in the R&D and management of microprocessor design and fabrication. The company has raised $8 million in a seed round of funding.

www.neologicvlsi.com

Ken Lau, CEO

Neuchips Inc.

Los Altos, California

Neuchips is an AI ASIC provider founded by a team of veteran IC design experts in 2019. The company is developing purpose-built hardware for deep-learning recommendation models and for large language models. It lists its headquarters as Los Altos but has two engineering sites in Taiwan. Neuchips CEO Ken Lau previously was general manager of Intel Taiwan.

www.neuchips.ai

NeuReality Ltd.

Caesarea, Israel

NeuReality is a startup focused on scalable AI for the data center. The company was founded in 2019 by a team with experience in data center architectures. In 2023, NeuReality launched its NR1 AI Inference chip, delivered to market in the form of the NR1-M AI inference module for legacy data centers or the NR1-S AI inference appliance for newer, CPU-free data centers. In March, NeuReality secured $20 million to accelerate the deployment of its NR1 AI inference solution to more regions and market segments.

www.neureality.ai

Moshe Tanach, CEO and co-founder

Patrick T. Bowen, CEO

Neurophos Inc.

Austin, Texas

Neurophos, a 2020 spinout from Duke University and metamaterials incubator Metacept, is looking to improve the energy efficiency of AI inference by more than 100× through the use of optical metasurfaces and silicon photonics that can be manufactured using mature CMOS manufacturing process technology. Neurophos is developing a proprietary metasurface that serves as a compute-in-memory tensor core processor. The company has raised $7.2 million in seed capital to develop its metamaterials-based optical AI acceleration chip, and it has joined the Silicon Catalyst incubation program.

www.neurophos.com

Faris Sbahi, CEO

Normal Computing Inc.

New York, New York

Founded in 2022, Normal Computing has raised $8.5 million in seed funding to build a full-stack probabilistic compute infrastructure enabling AI for critical and complex applications. At the heart of the approach is AI hardware based on thermodynamic processes. Normal Computing was founded by former Google Brain team members and Alphabet X engineers who built generative AI production systems for Alphabet.

www.normalcomputing.ai

Nuclei System Technology Co. Ltd.

Shanghai, China

Nuclei System Technology was created in 2018 as a RISC-V core provider. Founder Bob Hu is the creator of China's first open-source RISC-V core, the Hummingbird E203, and is the author of the first RISC-V book in Chinese. Nuclei System Technology is focused on developing RISC-V core IP and on growing the RISC-V market and ecosystem in China. The company's RISC-V roadmap runs from the N100 and NS100, with a two-stage pipeline, to the 64-bit UX1000 Linux processor, with a 12-stage pipeline and out-of-order instruction execution. The NA900 and NA300 cores are optimized for automotive applications and for compliance with ISO 26262.

www.nucleisys.com

Charbel Rizk, founder and CEO

Oculi Inc.

Rochester, New York

Founded in 2019, Oculi produces the Sensing and Processing Unit (SPU), an integrated image sensor plus processing system to address visual processing at the edge. The SPU targets traffic monitoring, analytics and tolling. Oculi's technology is deployed on a U.S. public highway, and Oculi is partnering with companies to deliver products to market.

www.oculi.ai

Ulrich Hofmann, founder and CEO

OQmented GmbH

Itzehoe, Germany

Founded in 2018, OQmented is developing MEMS mirror and laser scanning technologies. The company claims its MEMS bubble technology provides a steerable chip that optimizes performance in terms of field of view, device size, durability, energy consumption, sensing and resolution. The technology is applicable to automotive, consumer AR, robotics and 3D camera applications. OQmented's UltraLITE XR laser beam scanning-based light engine is designed for high-volume production and is scheduled to enter the market at the end of 2025.

www.oqmented.com

✸ Oxford Ionics Ltd.

Oxford, England

Oxford Ionics is a quantum computing startup founded in 2019 by Chris Ballance and Tom Harty, who had been working together for almost a decade at Oxford University's Department of Physics. In 2023, Oxford Ionics raised £30 million (about $38 million) in a Series A round of financing to develop its electronic qubit control technology, which is claimed to support the scaling of trapped-ion quantum computing to hundreds of qubits.

Chris Ballance, co-founder and CEO

www.oxionics.com

Simon Thomas, CEO

Paragraf Ltd.

Somersham, England

Paragraf was spun out from the University of Cambridge in 2018 and has raised $85 million over three rounds of fundraising. The company has developed a process for producing single-atomic-layer materials, including graphene, directly on crystalline substrates such as silicon, silicon carbide, sapphire and gallium nitride. Paragraf has developed Hall-effect sensors for use in magnetic and battery applications. In 2023, it announced the acquisition of graphene biosensor pioneer Cardea Bio Inc. (San Diego).

www.paragraf.com

Georges-Olivier Reymond, co-founder and CEO

Pasqal S.A.

Paris, France

Rather than use ion traps that need to be cryogenically cooled, Pasqal uses neutral atoms as quantum bits that are controlled in 2D and 3D arrays of optical tweezers, using laser light to manipulate quantum registers with up to a few hundred qubits. Pasqal was spun out of the Institut d'Optique in 2019 by CEO Georges-Olivier Reymond; Alain Aspect, 2022 Nobel Prize in Physics; Christophe Jurczak; Antoine Browaeys; and Thierry Lahaye. Pasqal has raised more than €140 million ($150 million) in funding.

www.pasqal.com

Perceive Corp.

San Jose, California

Perceive has developed a machine-learning chip for the edge. The Ergo chip requires custom software programming, performed by Perceive, but achieves 55 TOPS/W, which is higher than the efficiency of many alternatives. The chip is manufactured by GlobalFoundries in its 22-nm FD-SOI manufacturing process and is shipping to consumer equipment makers. Target applications include security cameras, smart appliances, mobile phones, action cameras and wearables. Perceive was incubated by and is a majority-owned subsidiary of Xperi Corp.

www.perceive.io

Steve Teig, founder and co-CEO

Wim Van Thillo, CEO and co-founder

Pharrowtech N.V.

Leuven, Belgium

Pharrowtech, a 2019 spinoff from research institute imec, designs and develops complete solutions for next-generation wireless applications, with products including millimeter-wave RFIC and digital baseband processor semiconductors, phased-array antennas and software solutions.

www.pharrowtech.com

Yingbo Jiang, founder and CEO

Picocom Ltd.

Bristol, England

Picocom designs and markets Open RAN-compliant baseband SoCs and carrier-grade software products for 5G small-cell infrastructure. In 2021, it introduced the PC802, a 4G/5G SoC for disaggregated 5G small-cell platforms. In late 2023, Picocom unveiled its next small-cell SoC, the PC805, a purpose-designed PHY for 5G NR and LTE small-cell O-RU RAN architectures that is fully compliant with Open RAN specifications. Picocom was founded in August 2018 and has R&D engineering sites in Beijing and Bristol.

www.picocom.com

Pliops Ltd.

Ramat Gan, Israel

Pliops was founded in 2017 by flash storage industry veterans from Samsung, M-Systems and XtremIO. Pliops is developing a storage processor-accelerator to help cloud and enterprise data centers access data up to 50× faster with 10% of the computational load and power consumption. Its technology collapses multiple layers into one device based on a patent-pending approach. Ido Bukspan, who served as senior vice president of chip design at Nvidia, joined Pliops as its CEO in 2023.

Ido Bukspan, CEO

www.pliops.com

Alex Timofejevs, CEO and founder

Polyn Technology Ltd.

Caesarea, Israel

Polyn Technology offers neuromorphic analog signal processing of raw sensor data of any type, enabling conversion of trained neural networks into AI silicon chips with ultra-low power consumption, low latency and small size. The company, founded in 2019, has introduced dedicated voice and vibration front-end processors.

www.polyn.ai

Tongtong Zhu, CEO and founder

Poro Technologies Ltd.

Cambridge, England

Poro Technologies, which trades as Porotech, was founded by Rachel Oliver, Tongtong Zhu and Yingjun Liu in April 2018 as a spinoff from the University of Cambridge. Porotech is commercializing porous GaN in conjunction with its partners and foundry network for production of semiconductor devices for microLEDs, lasers, power electronics, quantum computing and communication.

www.porotech.co.uk

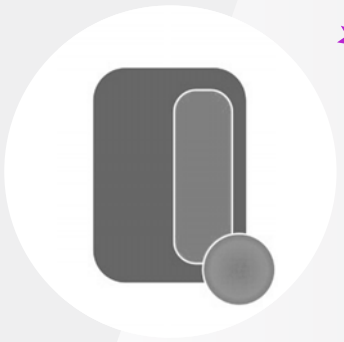
PsiQuantum Corp.

Palo Alto, California

PsiQuantum, founded in 2015, aims to create a photonic quantum computing platform. The company was co-founded by Jeremy O'Brien, formerly a professor of physics and electrical engineering at the University of Bristol and the director for the Centre for Quantum Photonics there, and Terry Rudolph, a professor at Imperial College London. PsiQuantum is using GlobalFoundries' wafer fabs in the U.S. and Germany to make circuits and has said it expects to build a million-qubit photonic quantum computer by 2025. In April, PsiQuantum announced its plans to build a utility-scale quantum computer in Brisbane, Australia, with AUD940 million (about $620 million) of investment from the state of Queensland and from the national Australian government.

Jeremy O'Brien, CEO and co-founder

www.psiquantum.com



Q-Pixel Inc.

Los Angeles, California

Q-Pixel is using a proprietary polychromatic microLED technology to achieve full-color tunability across a single, 1-micron-dimensioned pixel. The approach could replace the single-color LED and address challenges confronting the microdisplay industry, according to the company. Q-Pixel claims its tunable, full-color, single-pixel LED eliminates the need for pick-and-place, a key bottleneck in traditional LED display assembly, while enabling ultra-high pixel density. The company has announced a full-color, microLED display with a pixel density that can reach 10,000 pixels per inch. Founded by Jyh Chia Chen in 2022, Q-Pixel joined the Silicon Catalyst incubator one year later to accelerate tunable polychromatic microLED display developments.

www.quantum-pixel.com

Veerbhan Kheterpal, co-founder and CEO

Quadric.io Inc.

Burlingame, California

Founded in 2016, Quadric is developing machine-learning software and platforms for autonomous vehicles and robots. Its Chimera GPNPU is a licensable processor IP core that scales from 1 to 16 TOPS in a single core and intermixes scalar, vector and matrix code. In a multicore configuration, Chimera scales to hundreds of TOPS.

www.quadric.io

Quantum Machines Ltd.

Tel Aviv, Israel

Founded in 2018, Quantum Machines is a developer of a hardware-software stack for the control and operation of quantum computers. The company's Quantum Orchestration Platform supports multi-qubit calibrations and quantum-error correction and scales up to many hundreds of qubits. In March 2023, Quantum Machines partnered with Nvidia to debut the DGX Quantum, a system that coupled GPUs and quantum computing using the CUDA quantum software platform.

Itamar Sivan, co-founder and CEO

www.quantum-machines.co

Alberto Sangiovanni-Vincentelli, chairman

Quantum Motion Technologies Ltd.

London, England

Quantum Motion Technologies is developing a scalable array of qubits fabricated on silicon using a CMOS-compatible process. The company is currently building a silicon spin qubit quantum processor testbed for the U.K.'s National Quantum Computing Centre. Quantum Motion Technologies was founded in 2017 by John Morton, professor of nanoelectronics at University College London, and Simon Benjamin, professor of quantum technologies at Oxford University. Its chairman is Alberto Sangiovanni-Vincentelli, professor of EECS at University of California Berkeley and co-founder of Cadence Design Systems and Synopsys.

www.quantummotion.tech

Stefan Hengesbach, CEO

QuiX Quantum B.V.

Enschede, Netherlands

QuiX Quantum was founded in 2019 to develop an optical processor for quantum computing capable of room-temperature operation. The company is a spinoff from the University of Twente (Enschede) and uses silicon-nitride waveguides on silicon or glass substrates.

www.quixquantum.com

R

Rapidus Corp.

Tokyo, Japan

Rapidus was established in August 2022 with consortium support from eight Japanese companies looking to get Japan back into advanced chip manufacturing at 2 nm. The company has linked up with IBM, which claims to have a 2-nm manufacturing process. Rapidus plans to build a wafer fab in Chitose City, on the northern island of Hokkaido, and start production of 2-nm chips by 2027. The project could cost as much as ¥5 trillion (about $33 billion). In April, Japan's Ministry of Economy, Trade and Industry approved an additional ¥590 billion ($3.9 billion) subsidy for Rapidus.

www.rapidus.inc

Atsuyoshi Koike, founder and CEO

Eddie Wing Cheung Chong, founder and CEO

✸ Raysolve Ltd.

Suzhou, China

Founded in 2019, Raysolve performs R&D for the development of monolithic full-color microLED display technology. The company has demonstrated 0.11- and 0.22-inch single-chip, full-color microLED microdisplays for use in AR and mixed-reality applications. The core team came from Hong Kong University of Science and Technology.

www.raysolve.com

Park Sung-hyun, CEO

Rebellions Inc.

Seoul, South Korea

Founded in 2020, Rebellions raised $124 million this year in a Series B round of funding led by KT Corp., South Korea's leading data center business. Rebellions is looking to take on Nvidia in the AI data center and is part of a South Korean fabless AI wave, supported by Samsung as a foundry chipmaker. Thus far, Rebellions has produced the Ion and Atom processors in a 5-nm process and is looking to introduce the 4-nm Rebel chiplet in 2025.

www.rebellions.ai

Red Semiconductor Ltd.

Oxford, England

Red Semiconductor was founded in 2021 to develop a microprocessor IP core called Versatile Intrinsic Structured Computing (VISC). Compatible with the standard RISC-V instruction set architecture, VISC uses compression and sequencing technology to facilitate algorithmic routines being optimized for efficient parallel execution of programs aimed at edge AI, autonomy and cryptography.

www.redsemiconductor.com

James Lewis, CEO

Puneet Kumar, CEO

Rivos Inc.

Santa Clara, California

Rivos is a high-performance RISC-V processor developer founded in May 2021 by CEO Puneet Kumar and chief scientific officer Mark Hayter, two executives whose processor startups were sold to Apple and Google. Rivos is developing a full stack encompassing silicon, platform and software based on the idea of workload-defined hardware. The hardware will support large language models and data analytics through the combination of RISC-V CPUs and a data parallel accelerator.

www.rivosinc.com

Vaysh Kewada, CEO and co-founder

Salience Labs Ltd.

Oxford, England

Spun off from Imperial College London in November 2020, Salience is developing a hybrid photonic-electronic IC for AI processing. The photonic tensor processing unit can be modulated at 100 GHz and allows for parallelization via multiplexing. The unit is being designed into an SoC to address AI inference. The technology is based on research collaboration between Oxford University and the University of Münster, Germany.

www.saliencelabs.ai

SambaNova Systems Inc.

Palo Alto, California

SambaNova Systems was founded in November 2017 to develop a machine-learning computing platform. The technology is based on research conducted in Stanford University's hardware and software labs. SambaNova has built and pre-trained a trillion-parameter AI model it calls Samba-1, designed for enterprises to customize and fine-tune with their own data. The company raised $676 million in a Series D round of financing in 2021, which lifted the total raised by the startup to $1.13 billion. The company is offering Dataflow-as-a-Service (DaaS), a subscription-based, extensible AI services platform.

www.sambanova.ai

Rodrigo Liang, co-founder and CEO

Sue Ryu, CEO

✸ Sapeon Inc.

San Jose, California

Sapeon was founded in 2022 as a spinout of SK Telecom, SK Hynix and SK Square in South Korea with plans to provide full-stack AI capabilities, ranging from semiconductor hardware to algorithms, software and AI-based services. Sapeon has introduced the X220 chip, implemented in a 28-nm silicon manufacturing process, and the X330 chip, in TSMC's 7-nm manufacturing process. A third-generation chip, the X430, with high-speed HBM3 memory, is planned for 2025.

www.sapeon.com

John Levy, co-founder and CEO

SeeqC Inc.

Elmsford, New York

SeeqC, founded in 2018, applies classical and quantum technology through digital readout and control technology and through a chip-scale architecture. The company is a spinout of Hypres, a developer of superconductor electronics. In September 2023, SeeqC announced a partnership with Nvidia to accelerate quantum supercomputing.

www.seeqc.com

SemiDrive Technology Ltd.

Nanjing, China

SemiDrive Technology, aka Nanjing SemiDrive Technology Ltd. or Nanjing Xinchi Semiconductor Technology Co. Ltd., was founded in June 2018. The fabless chip company focuses on automotive SoCs and MCUs used in ADAS, e-cockpit and other autonomous-driving and intelligent-vehicle applications. The company was co-founded by Maggie Qiu, who was previously general manager at the Freescale Qiangxin IC design organization as well as R&D director for the i.MX product line at Freescale. In 2023, SemiDrive appointed Cheng Taiyi, former CEO of GigaDevice Semiconductor, as its CEO.

www.semidrive.com

Cheng Taiyi, CEO

Byung Joon (B.J.) Han, CEO

Silicon Box Pte. Ltd.

Singapore

Silicon Box was created in 2021 by the founders of chip company Marvell and an experienced chip packaging executive. The company has opened a $2 billion factory in Singapore to address chiplet design and chiplet-based component assembly. In March 2024, the company confirmed plans to collaborate with the Italian government and invest up to €3.2 billion (about $3.5 billion) for a chiplet assembly and test factory in northern Italy.

www.silicon-box.com

Krishna Rangasayee, founder and CEO

SiMa Technologies Inc.

San Jose, California

SiMa Technologies has been shipping a 16-nm machine-learning SoC (MLSoC) that has been in development since the company's founding in 2018. The company states that the chip addresses computer vision for such applications as robotics, smart vision, security, autonomous vehicles, drones and healthcare. In April 2024, SiMa raised an additional $70 million in funding to accelerate the delivery of its second-generation MLSoC for release in the first quarter of 2025. The device will be manufactured on TSMC's 6-nm manufacturing process.

www.sima.ai

SiPearl S.A.

Paris, France

SiPearl was founded in 2019 to implement the European Processor Initiative (EPI) and support the deployment of a European exascale supercomputer. The fabless company is collaborating with partners in the EPI to develop a high-performance microprocessor designed to work with any third-party accelerator (GPU, artificial intelligence, quantum). SiPearl has received funding support from the European Union to enable European sovereignty in supercomputing for solving scientific, industrial and societal challenges.

www.sipearl.com

Philippe Notton, CEO and founder

Bruce Diamond, CEO

Soundskrit Inc.

Montreal, Canada

Founded in 2019, Soundskrit has developed a MEMS microphone technology that it claims is inherently directional and therefore does away with the need for microphone arrays to achieve directionality. The company offers the SKR0600 and SKR0400 product series and has formed a partnership with AAC Technologies (Shenzhen, China) to bring the directional microphone to market.

www.soundskrit.ca

Jonathan Friedmann, CEO and co-founder

Speedata Ltd.

Netanya, Israel

Speedata is working on a dedicated processor for optimizing cloud-based database and analytic workloads. The analytics processor unit addresses three bottlenecks in analytics—I/O, compute and memory—while being compatible with legacy software and requiring no changes to an enterprise's code or existing framework. Speedata emerged from stealth mode in 2021 with $55 million in Series A funding.

www.speedata.io

Swave Photonics N.V.

Leuven, Belgium

Fabless semiconductor company Swave Photonics is a 2022 spinoff from imec that designs and markets holographic chips based on proprietary diffractive photonics. The technology uses sub-half-wavelength pixels to reconstruct a 3D optical wavefront from a 2D hologram. In May, Swave Photonics demonstrated the prototype of what it claims is the first true color 3D holographic display technology using phase-change materials.

www.swave.io

Mike Noonen, CEO

Manu V. Nair, CEO and co-founder

✸ Synthara AG

Zurich, Switzerland

Synthara works on machine-learning chips for the edge. The startup has developed a method of inserting in-memory computation into preexisting hardware-software platforms and supporting legacy applications. The ComputeRAM technology can also be used to develop hardware-software platforms from scratch. Synthara was spun off in 2019 from the UZH-ETH Institute of Neuroinformatics in Zurich and raised $11 million in funding in June 2024 to help bring its ComputeRAM solution to market.

www.synthara.ai

Kurt Busch, CEO

Syntiant Corp.

Irvine, California

Syntiant offers neural decision processors (NDPs) that operate in "always on" gatekeeper mode. In April 2024, Syntiant launched its NDP250 chip, which it claims delivers 5× the tensor throughput of its previous generation of deep-learning hardware. The company addresses edge AI applications across a range of consumer and industrial use cases, from earbuds to automobiles. Syntiant has raised more than $100 million in funding since its formation in 2017.

www.syntiant.com

T

Tenstorrent Inc.

Toronto, Canada

Founded in 2016, Tenstorrent is creating high-performance processor ASICs engineered for deep learning. Tenstorrent's software-programmable processor is designed to excel at both training and inference, and the architecture scales from battery-powered IoT devices to large cloud servers. The company team comprises alumni from hardware companies such as Nvidia and AMD. Under former CTO Jim Keller (now CEO), Tenstorrent closed a $100 million round of financing led by Hyundai Motor Group and Samsung Catalyst Fund in 2023.

Jim Keller, CEO

www.tenstorrent.com

U

Chris Walker, CEO

Untether AI

Toronto, Canada

Untether AI was founded in February 2018 and provides AI chips that embody a neural network inference engine, based on near-memory computing and enabled by software capable of pre-placing data. The architecture is said to be scalable from mobile devices to data centers. The technology is available today as the runAI200 and speedAI240 chips and the tsunAImi tns800 and tsunAImi tns200 PCIe form-factor accelerator cards. In April, Untether AI announced its collaboration with Arm to enable Untether's AI inference accelerators to work with the latest generation of Arm automotive enhanced technology for autonomous vehicles and advanced driver-assistance systems.

www.untether.ai

Pete Warden, CEO

Useful Sensors Inc.

Mountain View, California

Useful Sensors was founded in March 2022 by Pete Warden and Manjunath Kudlur, who were both founding members of Google's TensorFlow open-source machine-learning framework. The company makes sensor and hardware-software stacks with built-in machine learning to enable capabilities including anomaly and presence detection, hand-gesture recognition and voice interfacing.

www.usefulsensors.com

V

Vastai Technologies Inc.

Shanghai, China

Vastai Technologies is a computer vision and AI chip vendor. The company was founded in December 2018 by former AMD luminaries John Qian, today Vastai's CEO, and Louis Zhang, the startup's CTO. In July 2023, Vastai introduced its second-generation GPU, the 7-nm SG100, integrating rendering, AI and video. Vastai also launched the VG1600 GPU, VG1800 GPU and VG14 GPU, as well as the VA1L AI accelerator for large language models and the VA12 high-performance accelerator chip for generative AI.

www.vastaitech.com

John Qian, founder and CEO

Russell Haggar, co-founder, CEO and chair

✸ VyperCore Ltd.

Cambridge, England

VyperCore, founded in July 2022, claims its processor architecture can speed some applications written in modern programming languages by a factor of 10. VyperCore's first processor, called Akurra, is a clean-sheet design that takes a standard RISC-V architecture and instruction set and amends the instructions to support its proprietary memory-allocation technology.

www.vypercore.com

Christian Weedbrook, CEO

Xanadu Quantum Technologies Inc.

Toronto, Canada

Founded in 2016, Xanadu Quantum Technologies designs and integrates quantum silicon photonic chips into existing hardware to create full-stack quantum computing. Enterprises and researchers can begin using Xanadu's photonic quantum computers through the Xanadu Quantum Cloud (XQC) service and Strawberry Fields application library. The company is also advancing the field of quantum machine learning through the development of PennyLane, an open-source software library.

www.xanadu.ai

X-Epic Corp.

Nanjing, China

X-Epic is focused on developing China's industrial base for EDA software technology. The company offers hardware emulation, FPGA-based prototyping, formal verification, logic simulation, system debug and cloud-based verification. X-Epic was established in March 2020 and reportedly secured six rounds of funding worth a total of several hundred million yuan in less than two years.

芯华章 X-EPIC

www.x-epic.com

Joseph Jiang, CEO

xMEMS Labs Inc.

Santa Clara, California

A team of MEMS veterans and audio industry engineers with experience gained at Apple, InvenSense, Knowles and UltraChip founded xMEMS Labs in January 2018. The company implements both actuation and diaphragm in silicon. It has developed a series of MEMS speakers for near-field audio in sealed earbuds and closed headphones that can also operate as tweeters in unsealed headphones. xMEMS Labs has over 100 granted patents worldwide for its technology.

www.xmems.com

Chen Nanxiana, chairman

Yangtze Memory Technologies Co. Ltd.

Wuhan, China

Yangtze Memory Technologies Co. (YMTC) was formed by the take-over of Wuhan Xinxin Semiconductor Manufacturing Corp. (XMC), a volume producer of NOR flash and image sensors, by Tsinghua Unigroup in July 2016. YMTC is an IDM of components ranging from 3D NAND flash memory wafers and chips to embedded memory solutions and consumer and enterprise SSDs. Its products are used in mobile devices, consumer electronics, computers, servers and data centers.

www.ymtc.com

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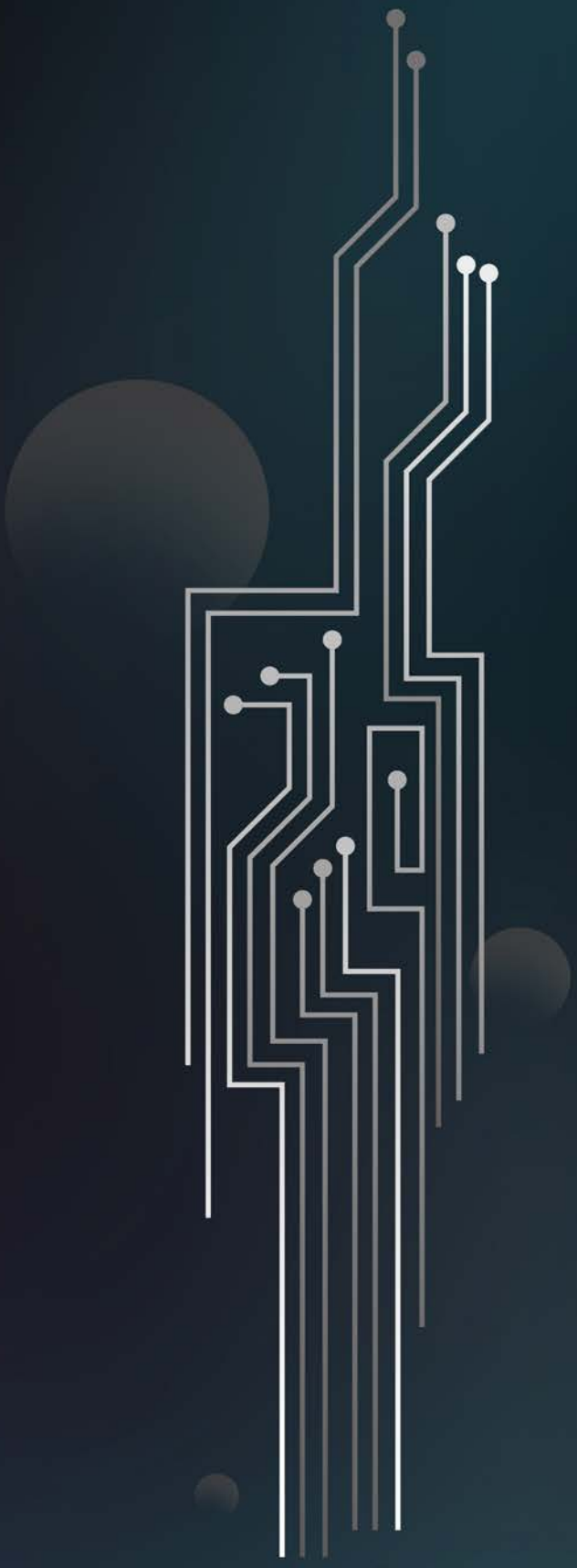

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CAMBRIDGE, MA
1-408-330-7575
silicon100@aspencore.com