intel
startup program

Powering Innovation to Scale

4th Edition

intel
startup program

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Deep-tech Industry Trends

An unprecedented confluence of 100X[1] faster data networks, ubiquitous digital connectivity and distributed digital processing infrastructure is on the rise

- ✔ Semiconductor devices and systems being optimized for AI
- ✔ Dedicated private 5G networks & decentralized Cloud networks
- ✔ Ultra-low latency edge computing

Unleashing boundless possibilities for the advancement and mass adoption of deep tech solutions across all the industries, till the last mile.

- ✔ 3X[2] faster time to market and 30% higher adoption for deep tech solutions through open innovation
- ✔ Immersive engagements through virtual reality, augmented reality and 4K live streaming
- ✔ India taking Big leap in the digital transformations - Autonomous vehicles, industry 4.0, IoT, digital twins

While being shaped by regulations and global commitments for making deep tech socially responsible, safe and trustworthy for everyone

- ✔ More than 90%[3] of deep tech ventures contribute to at least one significant goal of the sustainable development
- ✔ 10-15 legislations[4], pacts and directives being put in place across the globe to bring accountability, transparency and ethical fairness in the use of advanced technologies
- ✔ Growing emphasis on sustainability, addressing environmental challenges by aligning with ESG (Environmental, Social, Governance) principles.

10,000+ [5] deeptech startups as of May 2023

New emerging sectors that are adopting deeptech solutions

ClimateTech | Defense | Maritime | Aviation | SpaceTech

First public listing[6] in the deep technology space happened in 2023

Deeptech startups raised **$496** Mn in 2023, almost **25%** higher as compared to 2022[7]

More than **50%** of the startups are leveraging DeepTech for achieving higher operational efficiency

High-value exits for Deep tech startups are happening earlier as compared to conventional tech startups[8]
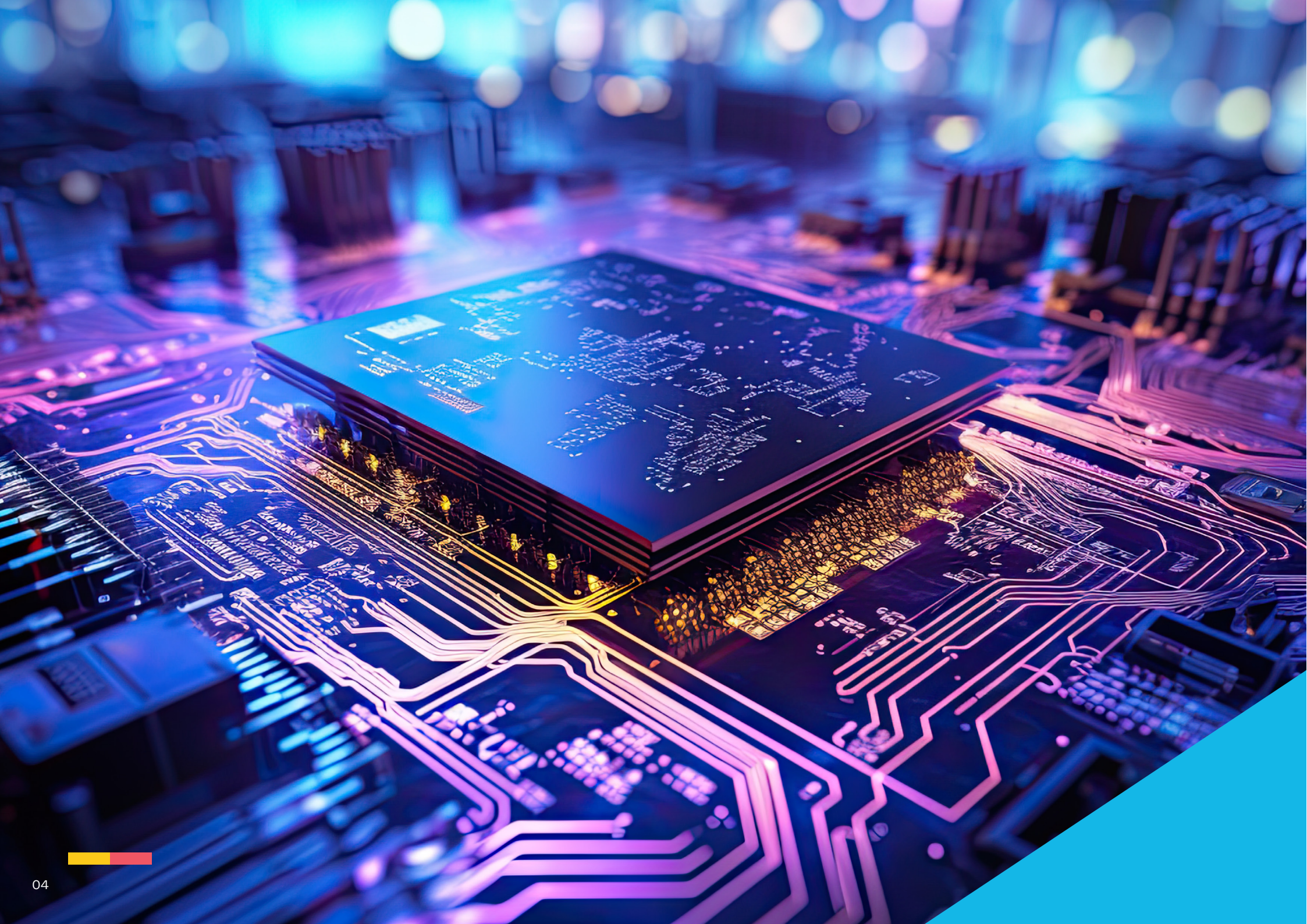
Foreword

Neel Bhatia
Senior Director
Technology Incubation Group, Intel India

Deep tech solutions have significantly evolved for mass adoption over the last few years and now the pace with which world around us is assimilating the digital reflections of life is accelerating faster than ever. We believe the next 5 years will be India's golden era of digital revolution and Intel Startup Program continues to reinforce our commitments with more power for empowering India's new growth story with the deep-tech innovations at its core.

In our journey of relentless pursuit of innovations Intel Startup Program has worked with several startups and seen them grow, worked with the industry to establish the one of its kind Plugin Alliance, built some high impact stories and most importantly built human relationships across the ecosystem.

As we look forward, the year 2024 may just turn out to be very pivotal with AI as a technology taking center stage and becoming pervasive across all verticals and solutions.

AI Everywhere is going to be principle of most solutions being explored and deployed. The ecosystem will be thinking of AI across everything more than ever before. We at Intel Startup Program truly believe in

collaborate to Innovate and in that spirit, we will work very closely with our ecosystem collaborators on our journey to realize the AI Everywhere vision.

I'm really excited to present the next edition of our coffee table book as a clear testimony of world-class innovations being seeded and nurtured in India.

This book is a small glimpse into the story of India's unrelenting spirit to conquer the problems of daunting scale and I promise that it will animate your curious mind.

I urge you to thoughtfully flip the pages of this book and let it take you on a journey of rendezvous with an eclectic mix of 10 pathbreaking startups.

Preface

Emerging technologies will play an increasingly critical role in solving many complex challenges faced by our world today. As a global enterprise that has actively shaped the future of the technology for last 50 years and thereby influenced some of the most radical innovations in the history, we have firmly expanded our commitment to play a responsible role in the development of disruptive solutions for problems that matter for the future of our world. This commitment reflects in the quality of the impact being generated by 80+ Deep Tech startups across a wide spectrum of industries nurtured by Intel Startup Program.

Core of the Intel Startup Program always has been the value acceleration collaboration designed for startups to transform their technological breakthroughs into high-value industry-ready solutions. Based on multiple startup trajectories touched year on year since the inception of this program, we have continuously developed new insights and realigned our startup interventions. This year, the program is taking a significant leap in terms of the efficiency and scale of the value acceleration for the startups. One of the most pivotal enablers of this leap is the autonomous ecosystem of diverse industry collaborators serving as the linchpin for mainstream adoption of the disruptive, albeit untested solutions emerging from the startup community. With 50+ large industry partners and 15 venture capital funds onboard currently, our industry ecosystem has built a cohesive rhythm for working together to engage with the startups in the most seamless and meaningful manner.

Another crucial element of our value acceleration leap is our enhanced ability to support diverse range of the Deep Tech startups, each with unique intervention needs. Intel Startup Program empowers the complete life cycle of innovation - nurturing the development of ground-breaking intellectual properties, amplifying the value of existing solutions, and facilitating the value realization of the solutions in the real-world scenarios of the industry.

Intel Startup Program has undergone a notable shift, moving away from a cohort-based acceleration model to a continuous and ongoing engagement approach. This strategic shift has allowed us to establish a more contextualized, focused and progression-based startup acceleration framework which is further underpinned by multiple initiatives run by Intel, either directly or in collaboration with industry and academia.

Intel Direct Program for Startups

Intel Startup Program has identified 6 disruptive technologies – Artificial Intelligence, Silicon Design & Manufacturing, 5G & Edge, ADAS & Mobility, Client & Cloud Computing and Security, that are collectively changing the world. Intel Direct program is meant for growth startups that have mature, proven solutions backed by strong technology IP in the above 6 identified focus areas with a potential to positively impact the lives of every person on this planet. For such startups, the program opens up its entire global business ecosystem as well as an exclusive community of technology mentors for the startups to rapidly propel growth.

With 99% survival rate of its portfolio startups, this industry-agnostic program provides a level-playing market opportunity to these startups, serving as a potent catalyst for accelerating the upcoming waves of technological revolutions across the industry domains.

From the value performance perspective, It is indeed encouraging for us to note that 60% of the portfolio startups have raised funding after joining the program with the total cumulative valuation of the portfolio over $ 1 billion.

Intel Direct Program for Startups also features Growth Tunes – an interactive series of advanced knowledge sessions designed for hand-picked growth-stage startups that is hosted by reputed industry experts around the globe. This initiative provides startup founders with the opportunity to delve deeply into the intricacies of scaling their businesses-from the initial startup phase to becoming a small enterprise and ultimately evolving their vision into a large multinational enterprise.

Plugin Alliance

Plugin Alliance is an autonomous industry ecosystem comprising of leading members from the industry, academia, government, investors and startups. This Plugin Alliance is one of its own kind focused on scaling up disruptive technological innovations in selective strategic verticals to fuel India's growth opportunities.

Plugin Alliance is a collaborative effort for discovering and curating a diverse portfolio of industry 4.0 innovations that can significantly contribute to the intelligent transformation of industries. Another important agenda of the Plugin Alliance is to instil confidence for accelerated adoption of new technological choices by increasing the awareness of such emerging innovations among industry community.
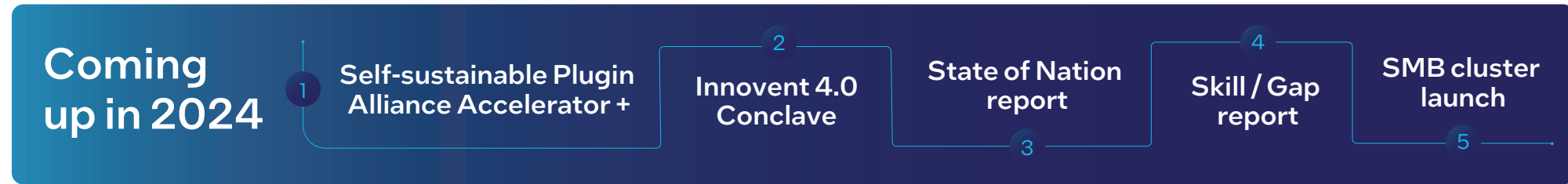
AI Open Innovation Day

AI Open Innovation Day is yet another pioneering initiative envisioned by Intel Startup Program in the beginning of this year to bring together community of Gen AI deep-tech innovators, industry thought leaders, investors and leading enterprises to spark inspiring dialogues around AI adoption in Retail, Healthcare, Supply Chain, and Edge AI. Its unique in itself for the leaders from diverse industry ecosystems to converge on a single platform dedicated to shaping the future of the industry through exploration of possibilities presented by AI applications.

Digital Discovery Arena

Intel Startup Program has also setup a , a first-of-its-kind advanced platform – Digital Discovery Arena that allows startups to amplify their virtual presence by enabling experiential showcase of their products & technology innovations. This platform will broaden access to a larger pool of potential customers, facilitating additional sales without constraints imposed by the physical presence of the startup team, customers, or product installations.

Plugin Alliance is now 136 members strong and growing fast

PLUGIN Alliance

- **48** Enterprises
- **47** Industry 4.0 startups / 160 solutions
- **15** Government & industry bodies
- **20** Investors

Coming up in 2024

1. Self-sustainable Plugin Alliance Accelerator +
2. Innovent 4.0 Conclave
3. State of Nation report
4. Skill / Gap report
5. SMB cluster launch

- The foundational Governance Body established
- A comprehensive solution matrix for industry 4.0 released
- ISB brought on board as an Academic Partner and Founding Member

Noteworthy milestones of 2023

- Frost and Sullivan State of Nation Report for 2023 published
- 3.5 Special Interest Groups launched
  a. Robotics across industry sectors
  b. Evaluation and assessment of Industry 4.0 startups
  c. Evaluating business models and capital requirements for startups
  d. Sustainability in Industry 4.0
  e. Connectivity & 5G
- MoU with STPI signed for the first Plugin Alliance chapter focused on Mining in Odisha

Industry 4.0 is the new blueprint for intelligent industries of the future. Despite the transformational potential, uptake of the Industry 4.0 technologies remained sluggish for a very long period of time primarily due to lack of discoverability and reliability of the solutions. As the interest in exploring digital transformation options intensified, a larger cluster of enterprises unmistakably became more competitive through the adoption of advanced technologies. Recognizing this shift, Industry community felt a pressing need to have a market place for Industry 4.0 solutions and a reliable ecosystem for industry-led evolution and validation of these deep-tech solutions. This marked the genesis of the Plugin Alliance program.

From its inception, Plugin Alliance has consciously evolved to collaborate autonomously which has made it a truly inclusive community-led initiative across the intersections of emerging technologies and high-potential application areas.

With the rapid growth of the Plugin Alliance spread over the multitudes of stakeholders, technologies and industries, a robust governance framework has been implemented to support the program's overall direction and trajectory. The governance body's foundational layer also has been constituted, featuring the Executive Council comprised of industry thought leaders and influencers. The Executive Council will be working on six different focus area verticals, each being led by a Member of the Council.

In 2024, Plugin Alliance is poised to take a big leap with the most awaited launch of Plugin Alliance Accelerator +, the one-of-its-kind industry-led techno-commercial accelerator focused on elevating India's industry 4.0 landscape. This initiative will propel the adoption of Deep tech innovations within enterprises by streamlining the discovery, validation and onboarding of advanced technology solutions. With Plugin Alliance Accelerator + set into motion, we envision 500+ deep tech industry-ready solutions made accessible on a unified digital platform by 2025, empowering the digital transformation of more than 100 enterprises.

To know more about the Plugin Alliance, visit www.plugin.org.in
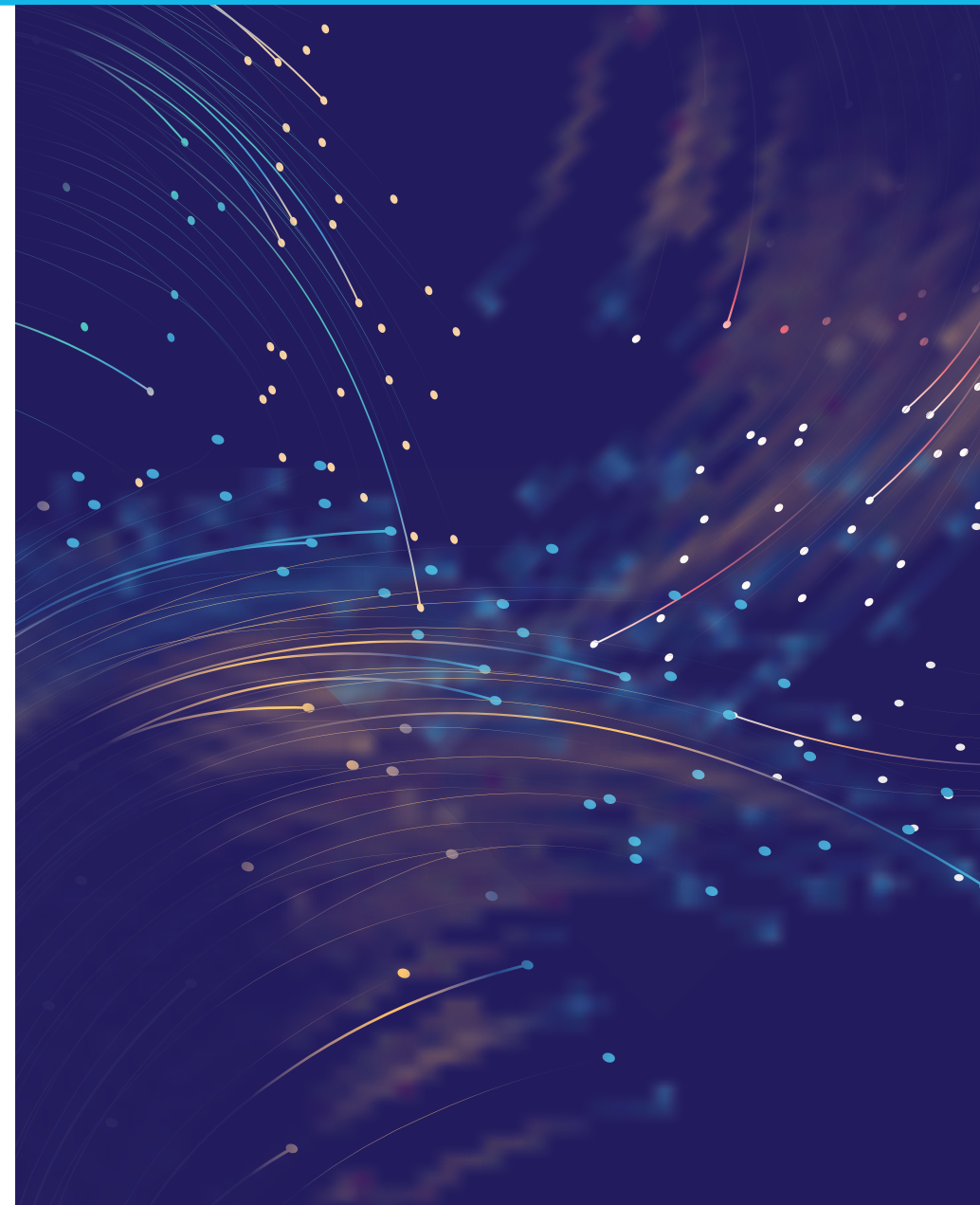
Mentor Ecosystem

Powerhouse of The Future Technologies

Intel Startup Program has built one of the most comprehensive pools of dedicated mentors that are well networked across different business units within Intel and within the startup ecosystem.

Most of these mentors are expert industry veterans with 15+ years of experience in the area of deep-tech, business management and IP-centric product development, with a self-ignited passion of bringing disruptive ideas to life.

Mentors and Startups are paired together with a common goal of achieving product-market fit and converting pieces of innovative technology breakthroughs into a fully industry/scale ready product. Our mentors invest significant time in startup engagements and often develop long-term relationships with the teams they mentor.

50+
Dedicated
Senior Mentors

6-8
Mentoring
hours per month

1-to-1
Mentor-Startup
pairing

- Product-Market Fit Guidance and Deep-dives
- Expert Technology Advices
- Strategic Go-to-Market Acceleration

The Bigger Picture

Mentors are nurturing the startups as part of their individual engagements but collectively on the larger canvas of the Intel Startup Program, they are nurturing the technologies of the future to make it more valuable, sustainable and accessible to every human being on the planet. They are true change makers working in silence.

★ ★ ★ ★ ★

Game Changing Conversations

Most startups that join Intel Startup Program usually have basic nuts and bolts to make technology innovation work. There are so many unknowns at this stage on all critical fronts of the startup, tackling these unknowns with more definitive understanding from the experts significantly cuts short the lead time for technology to product life-cycle.
-Deepak Tanna, Principal Engineer, Intel India

Working with startups has widened our niche expertise horizon into a multitude of technology adjacencies. It is really exciting to mentor deep tech startups to help them connect the dots to build disruptive, holistic industry solutions. It is a win-win collaboration.
- Mahesh K Kumashikar, Senior Principal Engineer, Intel India

Working with Intel Startup Program gives a good exposure to the startup ecosystem in India and it is beyond just startup and touches VC Ecosystem and other Industrial/Government/Academic bodies working on this. Mentoring gives an unique opportunity to address the compelling technical challenges the start up wants to solve as part of their product building. Mentors get the additional advantage of getting to know the problem at the lowest level and also able to explore solutions with the startup team. It is an overall win-win situation and helps the mentors as well as a startup mutually for their professional growth.
**- B.Sivakumar, Principal Engineer, Intel India**

Mentors play a pivotal role in transforming the raw technological breakthroughs into professionally refined products. If startups take center stage in our narrative, mentors emerge as the vital lifeline of the ecosystem. Mentors are the real game changers for the Intel Startup Program.
-Amit Chatterjee, Startup Programs and Strategic Business Initiatives, Intel India

Startup Testimonials
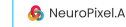
> For an early-stage startup like us, it is not easy to get access to industry veterans with such deep level of expertise. Having Intel experts with us in our journey at this crucial stage has multiplied our confidence to bring a disruptive technology into the market.
> **- Arvind Venugopal, CEO & Cofounder Neuropixel.ai**

★ ★ ★ ★ ★

> Our conviction to talk to investors has grown because of our association with Intel Startup Program. There have been many occasions where investors have spoken directly to Intel to validate our technology and gain confidence. For us that is a very positive outcome of this program.
> **– Ranjani Narayan, Founder and CTO Morphing Machines**

★ ★ ★ ★ ★

> One of the most valuable contributions from Mentors has been to help in discovering the real high-value use-cases of our technological innovation and keeping our focus laser sharp in terms of the prioritization and differentiating value propositions for the target market
> **-Srinivas Shekar, CEO and Founder Pantherun**

★ ★ ★ ★ ★

> Intel Startup Program has enabled frequent deep-dive discussions leading us to realize the full-potential of High-Performance Computing through vectorization, which has ultimately translated to a 2x speed-up of simulations for our customers
> **– Dipanjan Gope, Founder & CEO, SimYog Technology**

★ ★ ★ ★ ★

Multiplying the odds to win

- Discovering assumptions that may not stand the test of time
- Realizing practical challenges of real-life industry deployability
- Avoid getting lost in 'boiling the ocean'
- Identify technology design limitations and inefficiency early in the life-cycle
- Tweak the solution design to make it scalable
- Identify constraints and discover superior technological alternatives

Startup Showcase

Autonomous & distributed 5G Core Network software

A5G Networks has pioneered an edge-centric mobile packet core (ANoNCore) that seamlessly enables autonomous distributed network of networks over 4G, 5G and Wi-fi connectivity for a variety of use-cases such as smart cities, industrial IoT and connected cars.

Company Name	:	A5G Networks, Inc
Founders	:	Rajesh Mishra, Kaitki Agarwal, Kartik Raval, Ravi Nathwani
Year of Establishment	:	2021
HQ	:	Nashua, NH, USA
Key Technologies	:	AI/ML, cloud native, 4G, 5G, WiFi
Industry sectors	:	Telecom and IT
Funding Stage	:	Venture fund backed

"

As AI, 5G and edge computing continue to shape up the next level of digital experiences, there is a pressing need for data network architecture to become edge-centric, open, distributed and lot more programmable.

We are really excited to have Intel's unwavering support for unlocking the true potential of mobile edge deployments.

★ ★ ★ ★ ★

Kaitki Agarwal
Founder

A5G Networks aspires to become the ubiquitous network integration fabric across the globe by 2030 assuring secure and disruption-free data transmission across every kind of public or private network.

One of the tier-1 operators in APAC region required a 4G/5G converged and cloud-native packet core solution suitable for deployment in their current multi-vendor and shared infrastructure. Conventional solutions required significant capital expenses for new servers.

A5G Networks seamlessly implemented a containerized carrier-grade solution on the customer's existing servers which not only reduced customer's additional expenses by up to 60% of the total hardware budget but also cut down the the additional energy requirements by 30%.

Intel NIC's Data Plane Development Kit (DPDK) and Single Root I/O Virtualization (SR-IOV) capabilities have empowered the A5G Networks core to efficiently handle the escalating number of subscribers and tremendous surge in 4G/5G data transmission by optimizing the packet processing speed and reducing latency within the telecommunications infrastructure.

In addition, Intel's Traffic Analytics Development Kit (TADK) has strengthened the core capability of analysing complex network flows that mostly carry encrypted data packets.

Number of private networks owned by mobile operators, government and private enterprises is expected to grow exponentially in next few years due to accelerated demand of edge-centric 5G networks, connected mobility, smart cities and digital transformations.

Existing network services lack the design for seamless connectivity across expansive distributed networks flow. telecom operators are missing out on revenue gains from the surge in data flow.

A5G Networks has created an intelligent fabric of edge-native 5G mobile packet core that autonomously manages private and public networks across 4G, 5G and Wi-fi connectivity for completely secure and seamless content distribution.

A5G's software is solving the network interconnection problem as well as simplifying the deployments and distributed nature of the network by brining autonomous behavior.

One-stop high-bandwidth satellite communication solution

Space-tech startup Astrogate is the only end-to-end service provider for all satellite laser communications needs - from user terminals to ground stations which enables secure download of high-resolution earth observation data from satellites at 100x higher speed.

Company Name	:	Astrogate Labs
Founders	:	Nitish Kumar Singh
Year of Establishment	:	2017
HQ	:	Bengaluru, India
Key Technologies	:	Laser communication, Photonics, Optical tracking
Industry sectors	:	Space technology, Satellite communications
Funding Stage	:	Seed funding

"

With the deep experiential insights from Intel mentor completely tailored for our laser communication technology, we significantly advanced the software maturity levels of our solution to be on par with our mature laser communication systems.

It was really beneficial to get high-quality support from the program.

★ ★ ★ ★ ★

Nitish Kumar Singh
Founder

Astrogate's moon-shot vision is to become strategic partner for all satellite operation centers across the globe by 2035 to provide end-to-end communication infrastructure for all smallsat constellations.

SatSure, a global leader in earth observation (EO) space data analytics is leveraging Astrogate's laser communications system Astro-Link to exponentially increase the satellite-to-ground transmission of their fleet of optical microsatellites to an unparalleled speed of 1 Gbps.

This upgrade of upstream communication link has allowed SatSure to offer services across the entire EO data value chain while drastically improving the downstream utilization of the EO data generated from their microsatellites.

Astrogate Labs worked closely with Intel team for advancing the FPGA design using complex optimization techniques and architectural best practices. As a result, Astrogate Labs team was able to fast-track core hardware and firmware modules by over 2X in term of lead time.

These valuable improvements have not just accelerated their offerings for the defense sector but also strengthened their application development across satellite earth observation systems and optical inter-satellite links.

⚠ Earth observation constellations capture over 100GB/day/satellite from 1000+ satellites but maximum 25% of this data is utilized due to data bandwidth limitations of the RF downlink technology and prohibitively expensive data transmission costs.

With over 25,000 small satellites expected in orbit by 2030, there is an urgent need to build 10x data transmission capacity in the existing communication downlinks.

Astrogate Labs has developed specialized tracking algorithms and compact precision beam steering mechanisms that ensure stable gigabit laser links for the smallsat data transmission.

These links offer up to 125 GB per day data download capacity per satellite at an affordable cost while Astrogate's super compact laser terminals make it quite simple to integrate with large number of power-constrained small sized satellites.

Posit-enabled hardware accelerator for HPC/AI computations

Calligo Technologies has built world's first-ever Posit-enabled Octacore RISC-V hardware accelerator, when scaled up will significantly improve the performance of mission critical HPC & AI applications.

Company Name	:	Calligo Technologies Private Limited
Founders	:	Anantha P Kinnal, Rajaraman Subramanian, Vinay N Hebballi
Year of Establishment	:	2012
HQ	:	Bengaluru, India
Key Technologies	:	Silicon Engineering, High Performance Computation, Artificial Intelligence, LibOCCA
Industry sectors	:	Oil & Gas, Life sciences, Healthcare, Automotive & Aerospace
Funding Stage	:	Seed funding

"

Calligo's disruptive innovation has reached an important inflection point in its journey where transformative power of the technology has to stand the test of the industrial benchmarks. Thanks to Intel's capable facilitation for putting our technology on the silicon chip, we are busy creating greater value for our clients.

*- Vinay N Hebballi,
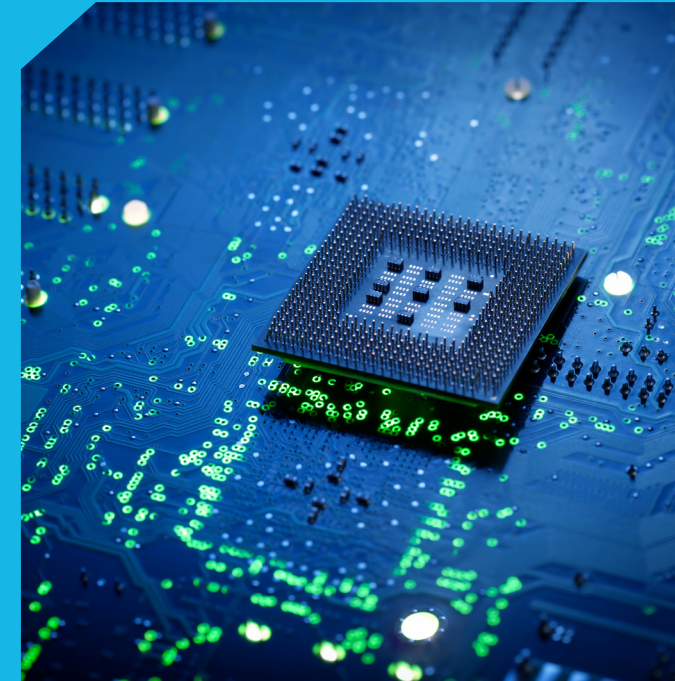COO & Cofounder*

Anantha P Kinnal
Co-Founder

Rajaraman Subramanian
Co-Founder

Vinay N Hebballi
Co-Founder

Calligo's moon-shot vision is to make posit-enabled processor available in all computing platforms – mobile, Laptop, Desktop and Servers by 2035 and become an integral part of all mission critical HPC/AI systems.

A leading tele-radiology company was struggling to manage the storage and transmission of digital scans. Such centers typically transport 5-10 GB scan data per day only due to network bandwidth limitations and that severely limits their ability to service more remote diagnostic cases daily.

With Calligo's Posit-enabled accelerator, client is able to compress and achieve up to 84% reduction in the DICOM image size that directly translated to 4X capacity for taking additional remote MRI diagnostic cases and saving up to 40 Lakh INR annually on digital infrastructure.

True value of Calligo's innovative solution could be only realized by porting the Posit computation system onto a silicon chip.

Intel committed some of its best silicon engineers to work with Calligo to efficiently navigate the complexity of designing and managing the tape out of the Tunga1.0, the flagship concept demonstration chip, in the shortest possible turn-around time.

Majority of computers today are based on X86 architecture that use IEEE-754 float for mathematical computations.

A significant loss of precision has been observed in the IEEE-754 based computing for high-performance mission critical systems that can lead to mission failures.

Calligo has built world's first custom hardware accelerator based, a technology demonstrator, on a superior alternative called Posit to reliably deliver loss-less computation at 100x faster speed, when scaled up, for a wide range of mission critical HPC/AI applications.

TUNGA1.0 (Technology for Unum-based Next Generation Arithmetic) is their flagship Octa-core CPU chip containing RISC-V processor and Posit Numeric Unit co-processor has been designed to demonstrate the power of Posits.
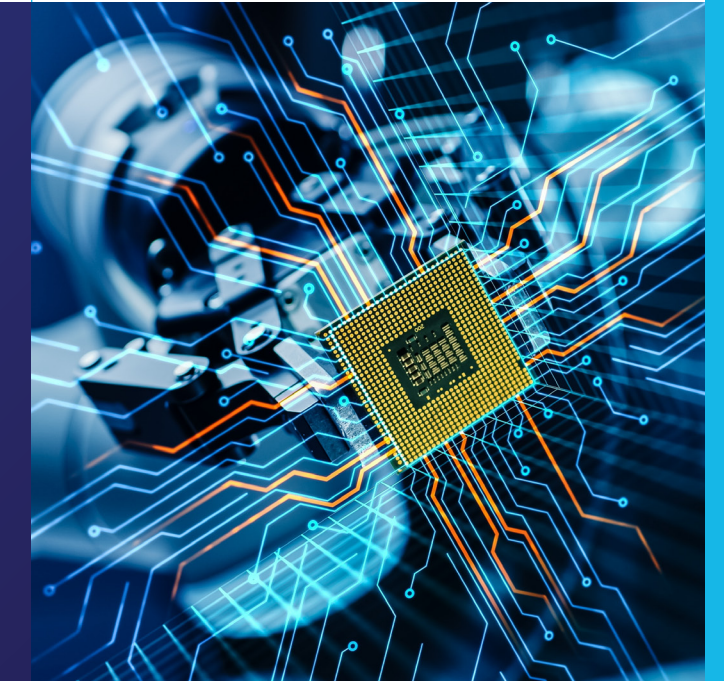
Hardware-only high-grade data security solutions

Chipspirit provides unique hardware-only semiconductor solutions designed for highest-grade data security which promises complete freedom from computer viruses and backdoors

Company Name	:	Chipspirit Technologies Pvt. Ltd.
Founders	:	Mohan Kumar Jindal
Year of Establishment	:	2018
HQ	:	Bengaluru, India
Key Technologies	:	VLSI, Semiconductors, Chip Design
Industry sectors	:	Defense, cybersecurity and Communications
Funding Stage	:	Bootstrapped

> "
> As a technology innovation company, we may have become overly engrossed in our engineering challenges.
>
> However, through discussions with the Intel team, we have successfully expanded our market perspective and enhanced our product positioning significantly.
>
> ★ ★ ★ ★ ★

Mohan Kumar Jindal
Founder and CEO

Chipspirit's moon-shot is to get the government mandate for their products to be part of the nation-wide cyber infrastructure by 2035 for all of the Government of India's high-security data exchanges.

Even though the Chipspirit solutions are in prototype evaluation stage currently, early validations have already demonstrated 15% improvement in the data transfer speed on USB 3.0 system while making it fully immune to all software-based malware and viruses.

Intel is working very closely with the startup to facilitate technology validation exercises with the Indian defence wing,

Intel is helping the startup in the development of Intel-FPGA devices to benchmark the performance and security coverage of the solution.

Currently the Encryption/Decryption is done using the software, which leaves a lot of room for the Plain text being transacted across the memories to be exploited by Operating-system or Memory-based attacks or Mirroring of the sensitive data.

Even the most widely used cryptography solutions are prone to errors and carry the risk of compromised software keys.

To fortify enterprise systems against both present and future software vulnerabilities, Chipspirit has devised novel physical hardware-based security solutions devoid of any software interventions. ABHED-1 is a dedicated secure hardware-based offline and online encryption device.

The other product is Data Diode, which is again a fully hardware-based device that enables unidirectional data transfer. These two solutions from Chipspirit are highly secure, customizable and capable of faster data transfer speeds close to line rate.

MinionLabs

Simplest plug & play solution for monitoring energy consumption within a building

MinionLabs is one of the most successful energy management technology startups that helps enterprises save up to 30% in their energy expenses by intelligently plugging the energy leaks across all equipment / appliances.

Company Name	:	MinionLabs India Private Limited
Founders	:	Gokul Shrinivas, Jeyakumar N
Year of Establishment	:	2017
HQ	:	Bengaluru, India
Key Technologies	:	IoT, Artificial Intelligence, Machine Learning, 5G & Edge
Industry sectors	:	Enterprise Energy Management, Clean Tech
Funding Stage	:	Pre-series A

> " Intel's laser-sharp guidance and professionally meticulous support significantly advanced our energy management solutions by pushing the product engineering excellence, cost-effectiveness, and solution scalability couple of notches higher.

★ ★ ★ ★ ★

Gokul Shrinivas
Co-Founder

Minion Labs envisions 2.5 million Minions installed across the globe, 50 billion kilowatt-hours electricity saved, 100 million metric ton CO2 emission reduced by 2035.

⚠ Most industrial facilities today have 20-30% overhead operational costs directly attributed to poor energy management.

While lack of equipment level energy consumption data in most facilities makes it harder to diagnose the energy leakages, even the traditional energy monitoring options with equipment level sensors suffer from highly intrusive footprint and prohibitively high initial capex.

Fortis Hospital, a prominent healthcare institution, was grappling with high electricity costs due to the energy-intensive nature of its operations.

After deploying Minion Energy Management Solution, their annual electricity expenses came down from INR 1.5 Crores to INR 1.3 Crores - gross annual energy cost savings of INR 18 Lakhs INR with fastest payback ROI delivered within 3 months. This success story served as a compelling example for healthcare facilities seeking to optimize their energy usage.

💬 MinionLabs has overcome these issues with its innovative energy signature technology, which enables equipment-level energy performance monitoring in real-time without using costly sensors or meters.

Such proactive insights empower businesses to optimize the energy consumption and eliminate the energy wastages.

Intel experts played a crucial role in refining MinionLabs solution to achieve efficient edge processing capabilities. As a result, MinionLabs is able to assure best-in-class edge processing capability for enabling real-time data analysis and low-latency insights directly at the source. MinionLabs uses Intel's FPGA technology to optimize its energy management solution. FPGA component is an instrumental part of MinionLabs solution for making it highly scalable, programmable and responsive to address the needs of a wide spectrum of equipment and devices across multiple industries.

World's first massively parallel, runtime reconfigurable many-core processor

Morphing Machines is a fabless semiconductor technology company that has created world's first run-time configurable many-core processor that allows dynamic instantiation of domain specific architectures (DSAs) co-existing on the same silicon to handle a wide range of application profiles without needing multiple hardware accelerators.
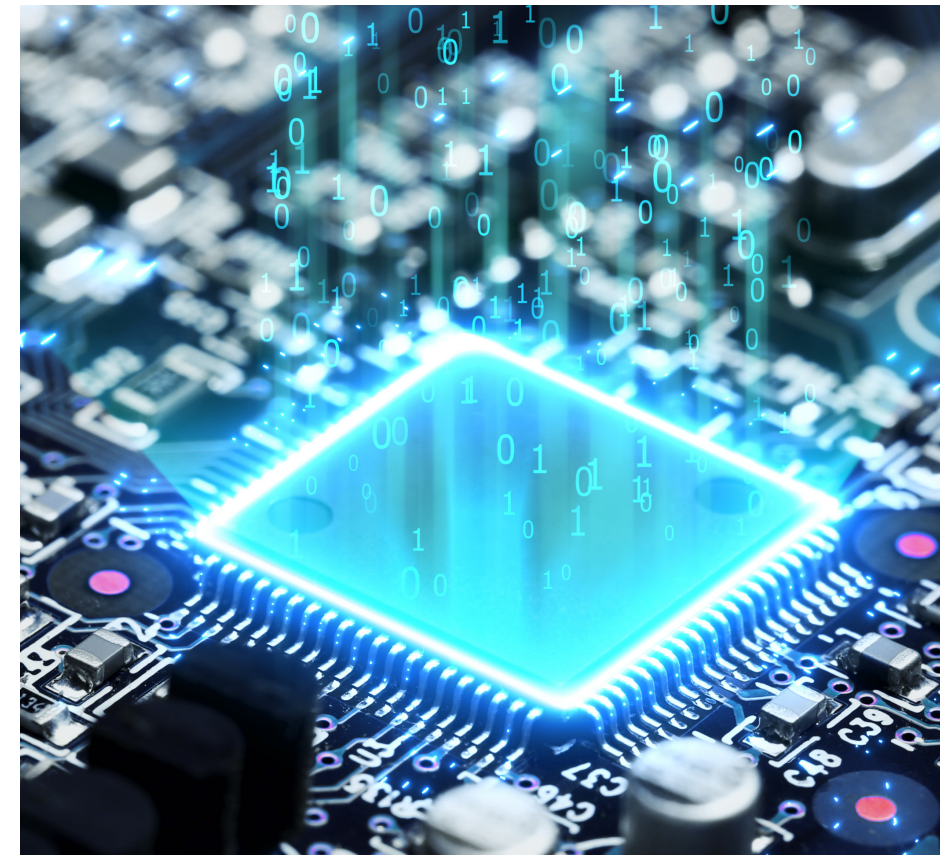
Company Name	:	Morphing Machines Private Limited
Founders	:	Dr. Ranjani Narayan, Dr. Nandy Soumitra, Deepak Shapeti
Year of Establishment	:	2005
HQ	:	Bengaluru, India
Key Technologies	:	5G/6G, AI/ML, High performance computing, MLIR compiler, hardware accelerator
Industry sectors	:	Life Sciences, automotive, avionics, telecom
Funding Stage	:	Seed funding

"
Due to the direct expert interventions from Intel, we were able to scrutinize and mature our technical implementation in a deeper and much more comprehensive manner which has allowed us to unequivocally demonstrate the superior performance of our many-core REDEFINE™ processor in comparison with other reference designs.
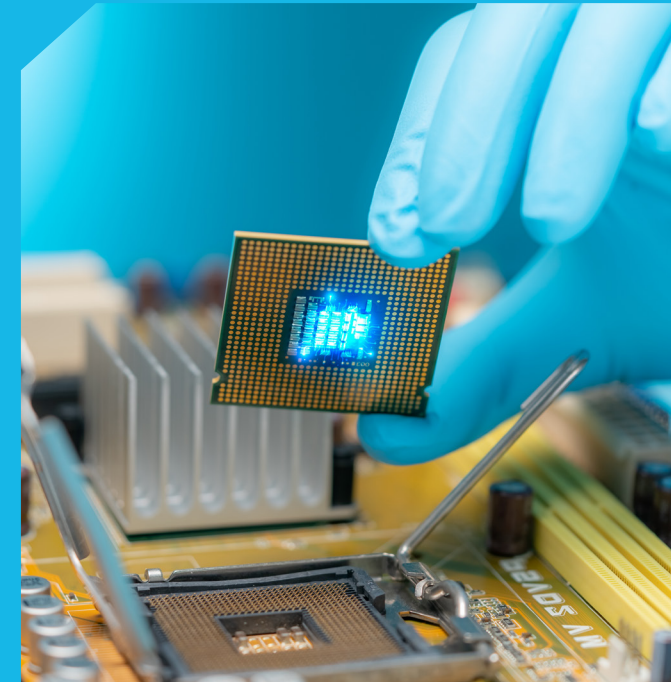
★ ★ ★ ★ ★

Dr. Ranjani Narayan
Founder and CEO

Deepak Shapeti
Co-Founder and CEO

🚀 Morphing Machine's moon-shot vision to have REDEFINE™ technology inside every high-performance application server running on this planet, by 2035.

⚠️ Existing high performance computing architecture heavily relies on a combination of need specific hardware such as CPUs, GPUs, FPGAs and other dedicated chipsets.
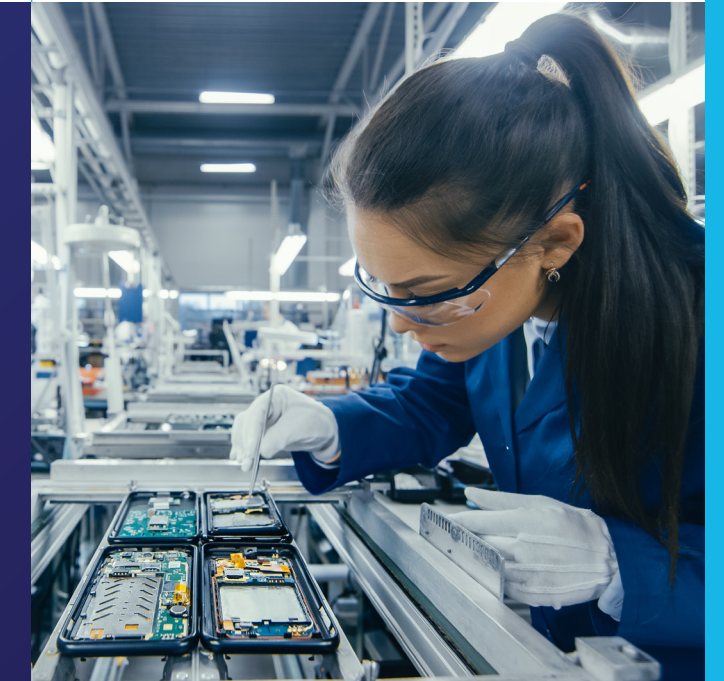
Such OS controlled architecture inherently suffers from power inefficiency with multiple system overheads and hence cannot easily scale.

While custom domain specific parallel computing is the only alternative today that could scale up the compute capacity, it is a rigid, complex and costly solution.

REDEFINE™ platform is currently in pre-deployment stage but validations performed so far has demonstrated an order of magnitude (10x) improvement in power-performance of existing processors (when coupled) and an ability to reduce the cost & timeline for new ASIC development process by 80%.

💬 In order to solve this problem, Morphing Machines has created a unique many-core platform called REDEFINE™ that innovatively uses programming abstractions to run multiple domain specific architecture (DSAs) within a single processor.

This amazing processor is capable of seamlessly scaling from 16-cores to 4K-cores without any software change.

REDEFINE™ platform is working towards integration of the Universal Chiplet Interconnect (UCIe) to extend the REDEFINE processor to a chiplet, unlocking enormous flexibility for creating custom fabric sizes (32 cores to 1024 cores) for diverse use cases, without sacrificing performance, yield, and cost.

Simplified high-performance multi-site private 5G network & Edge Cloud

Niral Networks offers a comprehensive suite of industry specific solutions designed for business enterprises to seamlessly deploy high-performance private 5G networks and harness the full potential of the digital technologies for maximizing the operational effectiveness of the enterprises.

Company Name	:	Niral Networks Private Limited
Founders	:	Abhijit Chaudhary, Dr. Inder Gopal
Year of Establishment	:	2019
HQ	:	Bengaluru, India
Key Technologies	:	Private 5G, Edge Computing, Software Defined Networking, Cloud-Native, Enterprise Connectivity
Industry sectors	:	Mining, Manufacturing, Ports, Oil & Gas, Aviation, Logistics & Warehouse and Use case Labs
Funding Stage	:	Bootstrapped & DoT DCIS Grants

"
Our mission is to simplify the private 5G deployments at scale which turned out to be a far more complex undertaking than we imagined. We genuinely appreciate Intel's support for providing us with the specialized tools, expert insights and access to the global 5G ecosystem which significantly accelerated our go-to-market with a true enterprise-class platform.

Abhijit Chaudhary
Founder and CEO

Dr. Inder Gopal
Chairman and Co-founder

★ ★ ★ ★ ★

By 2035, NiralOS™ envisions to become a de facto building block for implementing reliable, resilient and true real-time data networks in 5 industrial domains – Mining, Oil & Gas, Manufacturing, Ports and Aviation.

A large mining site located in one of the remotest parts in India had been facing major challenges of low operational efficiency, high operations cost and hazardous working conditions rooted in highly constrained data networking infrastructure.

NiralOS™ Private 5G & Edge solution provided the seamless data connectivity inside the mine site which enabled multiple critical digital advancements such as fleet management, real-time video surveillance and health, safety & environment monitoring. Post deployment of NiralOS™, the mining customer achieved approximately 11% improvement in productivity and 15% reduction in the workplace fatalities.

NiralOS™5G Core was rigorously tested and refined in the Intel Lab on the Intel Xeon 8470N Processor with DPDK, VPP, SR-IOV features enabled.

As a result, there was almost 5x gain in UPF performance of the NiralOS™5G Core, allowing it to effortlessly handle a typical profile of Private 5G deployment containing 10,000 active subscribers with an aggregated throughput of 40 Gbps.

In addition, NiralOS™ 5G Core was integrated with Intel partner's Policy Control Function to make the 5G Policy administration flexible and scalable.

⚠️ 5G technology is revolutionizing the digital connectivity landscape by delivering secure high-speed data communication with ultra-low latency.

However, creating an enterprise specific private deployment and operating it across multiple sites with 5G radios, backhaul, packet core and 3rd party edge applications is really hard.

💬 Niral networks created a modular operating system NiralOS™ based on the software-defined networking capabilities to simplify the provisioning of multi-site multi-application network.

It can operate efficiently on commodity hardware while seamlessly integrating with the third-party radio systems, backhaul systems and edge applications.

Affordable, privacy-assured, radiation-free breast cancer detection

NIRAMAI is a deep-tech healthcare company that offers an innovative artificial intelligence-based breast cancer screening test for women in an affordable, radiation-free and no-touch manner to accurately detect the breast cancer at a much earlier stage than traditional screening methods.

Company Name	:	Niramai Health Analytix Pvt Ltd
Founders	:	Geetha Manjunath
Year of Establishment	:	2016
HQ	:	Bengaluru, India
Key Technologies	:	Medical Imaging, Artificial Intelligence, Machine Learning, Cloud Services
Industry sectors	:	Healthcare, Healthtech
Funding Stage	:	Series A

> " Niramai is a startup fighting a big battle against breast cancer to save millions of lives. We truly appreciate Intel's contribution not only for simplifying our product with an all-in-a-box solution with right security and privacy features that helps Niramai to address important engagements with the government offices where security policies and data confidentiality restrictions are important to navigate.

★ ★ ★ ★ ★

Geetha Manjunath
Founder, CEO and CTO

NIRMAI's moon-shot is to have its breast screening test reached 80% of the ladies on earth in next 10 years and thus be known across the globe as "the Indian Startup" which invented a novel affordable & automated whole-body-scanning test for early-detection of abnormalities in a zero-touch zero-radiation manner.

Till date, NIRAMAI has conducted more than 150,000 screenings in 150+ hospitals/diagnostic facilities. These screenings were found to be 4x more effective in catching the breast cancer cases as compare to the conventional methods.

For example, NIRAMAI Thermalytix test saved 22 lives in Punjab State recently with just two deployments within 10 months period.

NIRAMAI's Thermalytix solution collaborated with Intel on their NUC system for All-in-a-Box product and machine learning SDK for optimized thermal imaging analysis.

Several deep dive reviews and expert sessions were conducted by the Intel technology team to help enhance the Thermalytix product architecture in terms of security and scalability.

⚠ Number of breast cancer cases in women are increasing every year and in a country like India mortality rate among the women detected with the breast cancer is almost 50%.

The single biggest reason for the high mortality rate is the late detection of the disease due to lack of affordable procedures for regular screening.

To address such a critical gap, NIRAMAI developed Thermalytix – a novel solution based on low-cost radiation-free thermal sensing device that records 4 lakh temperature points and then analyzes the temperature scan using patented machine learning algorithms to detect early-stage breast cancer in a completely privacy-aware manner.

NIRAMAI is the first Indian company to receive an US FDA clearance for a medical device used for women health

Enabling high performance AES encryption in Edge devices

Pantherun is an Indian cyber security innovator that has made it possible to implement SSL/IPSec compatible AES encryption in edge devices in real-time, bringing high performance encryption for the first time to such devices and eliminating data-breach vulnerabilities.

Company Name	:	Pantherun Technologies Pvt Ltd
Founders	:	Srinivas Shekar, Tiffany Chan, D S Sreedhara Murthy
Year of Establishment	:	2019
HQ	:	Bengaluru, India
Key Technologies	:	Proprietary AES encryption software, RTL.
Industry sectors	:	Cybersecurity, Communication networks and IOT
Funding Stage	:	Pre-series A

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We are sure that our game-changing innovation will be able to safeguard 40 billion connected edge devices across the globe, however we owe it to Intel for helping us make our solution scale-ready and soft-landing it into the mainstream market.

★ ★ ★ ★ ★

Srinivas Shekar
Founder and CEO

Pantherun's moon-shot is to make encryption technology an Integral part of every Edge device being manufactured by 2035.

Indian Railways has taken an enormous initiative to install CCTV cameras in all passenger train coach so that real-time video feed can be sent to a monitoring station where it will be recorded. Conventional data security solutions need data storage in each carriage which results in significantly high project cost, 40% higher transmission latency and other major issues such as loss of video performance.

Pantherun's AI powered chip-based communication solution was able to deliver strong end-to-end encryption on the fly as video feed from camera Is transmitted to the storage server in real-time, without any compromise on the video feed quality.

By porting the solution on Intel's FPGAs like Cyclone V and Arria 10, Pantherun is able to achieve much greater flexibility in deploying the solution across multiple devices and upgrading / reprogramming the encryption code post deployment with Intel's FPGAs allowing for field updates on the fly.

Intel's expert mentors were instrumental in making the Pantherun solution fully interoperable and seamlessly functional with the existing encryption approaches such as SSL and IPSec.

Enterprises are still struggling to implement data encryption on connected edge devices, such as routers, switches, sensors, IOT and smart cameras.

As a result, more than 40 billion IoT connected devices today are easy doorways for hackers to execute data-security breaches that then impact the entire network.

Pantherun's innovative cyber security solution reduce the resource requirement for the edge devices by completely eliminating the need to exchange encryption keys.

It has enabled AES encryption to be easily implemented on even the most resource constrained of edge devices.

* * * * * * *

Cyber security solution to stop kernel mode root-kit exploits in Linux based systems

SecurWeave provides an OS independent security platform for blocking the most dangerous cyber security attacks facilitated through 'kernel mode rootkit exploits' which conventional solutions have not been able to combat effectively so far.

Company Name	:	SecurWeave Research Labs Pvt Ltd
Founders	:	Dr. Prem Chand, Gopakumar Thekkedath, Dinakar Medavaram
Year of Establishment	:	2021
HQ	:	Hyderabad, India
Key Technologies	:	Secure hypervisor, embedded systems
Industry sectors	:	Cyber Security, Defense
Funding Stage	:	Seed funding

"

Being an early-stage technological breakthrough startup, it was critical for us to have early adopters for seeding the trust.

Being part of Intel's startup cohort has given us lot of credibility that clearly reflects in the pedigree of pilot opportunities we have been able to execute with the industry leading enterprises.

★ ★ ★ ★ ★

Dr. Prem Chand
Co-Founder

Gopakumar Thekkedath
Co-Founder

Dinakar Medavaram
Co-Founder

SecurWeave's moon-shot vision is to be one of the top firms known worldwide by 2035 for offering reliable solutions to mitigate advance malware attacks across various hardware platforms.

One of the agencies responsible for national security required a reliable solution to detect and mitigate kernel mode rootkit malware in Linux systems.

SecurWeave's CHESS-P solution successfully detected and mitigated all the rootkit malware samples without any performance drop in the host systems.

SecurWeave's secure hypervisor is powered by Intel's virtualization technology (VT-x) for making it work on multiple operating system across diverse hardware platforms.

With VT-x enabled hypervisor, SecurWeave is able to implement the security policies without incurring any significant drops in the system performance.

⚠ Advanced malware attacks that leverage kernel mode exploits are one of the most dangerous and difficult-to-detect threats.

Such advanced malware cannot be stopped by the conventional cyber security solutions and these are increasingly becoming available in darkweb and open repositories.

To protect against the kernel mode exploitation, SecurWeave has created its own secure hypervisor-based platform "CHESS" with patented mechanisms that can run independent of the operating system.

CHESS security shield can provide security fabric across wide spectrum of digital assets.

Note of Thanks

Ashok Chandavarkar
Director - Strategic Initiatives, Technology Incubation Group, **Intel India**

I hope this book kept its promise, I sincerely do. Let me take a moment to thank you with a deep sense of gratitude for joining us in this small yet significant showcase gallery that celebrates the long and demanding journeys of startup change makers.

These emerging startups wield significant influence in shaping the digitally transformed future, and the Intel Startup Program takes pride in collaborating with them as a valuable catalyst, facilitating the transformation of their ambitious visions into reality.

I would like to sincerely acknowledge and thank all the portfolio startup founders and their team members for giving their unconditional support that made it possible to put together this book. As I always say, they are the real shining start of the show.

Intel Startup Program rests on the shoulders of Intel Mentors and External Industry Plugin Alliance Mentors who brought immense value from their experiential knowledge to change the value trajectory of these startups. I would like to take this opportunity to thank them for providing insightful observations that make the stories of these startups worth knowing.

Lastly, the overarching force – my Intel Startup Program team, this is where all dots are connected and blueprint of the program's success comes alive. It's their passionate commitment and indomitable spirit that truly matches the fire within the startup founders.

A big thank you to the Intel Startup Program team for thoughtfully assimilating their Startup engagements into this lovely book.

At Intel, our pursuit to transform technological breakthroughs into the instruments of positive change will continue to next leap.

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