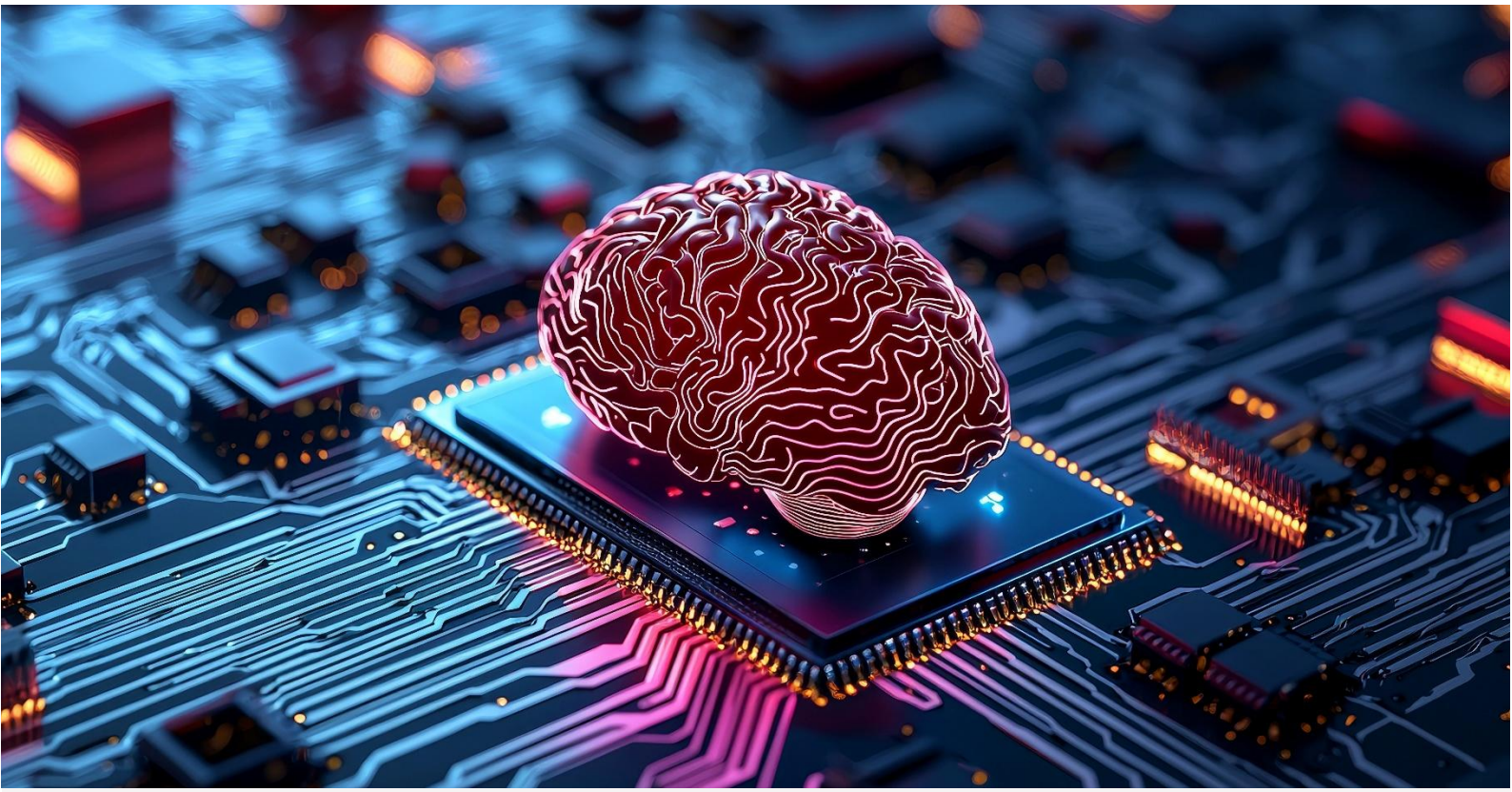
NeuroWare
THE UK INNOVATION & KNOWLEDGE CENTRE
IN NEUROMORPHIC COMPUTING HARDWARE

UCL
Policy Impact Unit



A UK Roadmap for Neuromorphic Computing: 2050 Vision

Executive Summary

September 2026

Introduction

Purpose of the roadmap

In September 2026, NeuroWare, the Innovation & Knowledge Centre for neuromorphic computing hardware, launched ''*A UK Neuromorphic Computing Roadmap: 2050 Vision'*, the UK's first long-term strategic vision for neuromorphic computing. Developed through an extensive community-led process involving more than 100 stakeholders from academia, industry, government and the wider innovation ecosystem, it sets out the actions needed across research, commercialisation, skills, infrastructure and policy to achieve the UK's vision of becoming a global leader in safe, sustainable and accessible neuromorphic computing by 2050. It is intended as a living document that provides strategic direction rather than a fixed implementation plan, recognising that technologies, markets, and policy priorities will continue to evolve over time.

Why neuromorphic computing matters

Neuromorphic computing (also known as brain-inspired computing) is an emerging technology that draws inspiration from the best existing computing system – **the human brain**. Unlike conventional computers, the brain can perform complex tasks such as recognising faces, understanding speech and making decisions while using only around 20 watts of power, roughly the same as a household light bulb. Neuromorphic computing seeks to capture some of these principles to create computing systems that are faster, more energy-efficient and better suited to processing AI and complex data in real time.

Neuromorphic computing may not be a common term, but its impact could be felt in everyday life in profound ways. Every business investing in AI today faces the same constraints: rising compute costs, growing energy bills, data privacy risk, and latency that limits what's possible at the edge. Neuromorphic computing addresses all four simultaneously, not by replacing existing systems, but by adding a layer of brain-inspired intelligence that processes faster, uses less power, and keeps sensitive data on-device.

The current state of play: strengths, gaps, and opportunities

The UK's position varies significantly across the neuromorphic computing ecosystem. Research is a genuine strength, underpinned by world-leading universities and a strong base in neuroscience and materials discovery. However, capability weakens from hardware development and scale-up onwards, where access to manufacturing infrastructure and commercialisation funding becomes more limited. Software tooling, testing, deployment, skills, standards, and investment infrastructure are all still developing, and supply chain resilience remains a significant gap, reflecting the UK's reliance on overseas manufacturing and semiconductor supply chains.

No single nation is likely to lead across the entire neuromorphic value chain, and the UK should not try to. Instead, the roadmap's central strategic premise is that the UK should aim to be the producer and shaper of neuromorphic computing by becoming world-leading in a small number of critical elements that other countries depend on – translating research excellence into real-world impact through application development, systems integration, standards leadership, and targeted industrial capability.

Global outlook

The global neuromorphic computing market is forecast to grow from $5.3 billion in 2023 to $20 billion by 2030[1]. The United States and China remain the dominant players, backed by major federal programmes and coordinated state investment respectively. Europe is accelerating too with the Netherlands having launched a €30 million national neuromorphic initiative[2], while Germany, France, and Switzerland are integrating neuromorphic computing into their wider AI and energy-efficiency strategies. The UK's research strength gives it a genuine head start, but that advantage is not guaranteed to last. Without coordinated investment in scale-up, manufacturing, and skills, the UK risks being overtaken by countries moving faster to convert research into industrial capability.

Key messages

The UK has a genuine, but narrowing, window to lead. World-leading research gives the UK a headstart in neuromorphic computing, but without coordinated investment in scale-up and manufacturing, that advantage won't hold as the US, China, and a fast-moving Europe convert research into industrial capability.

This is an upgrade, not a disruption, for UK businesses already investing in AI. Neuromorphic computing cuts compute costs, energy use, latency, and data-privacy risk by adding intelligence at the edge, not replacing what's already built.

The UK should aim to shape the value chain, not dominate all of it. Rather than competing everywhere, the roadmap sets out where the UK can become the go-to supplier – in specific hardware, applications, and standards that other nations will depend on.

Twenty-six aims, one ask: act now. Government, industry, and academia each have a concrete near-term role – from funding open-access testbeds to embedding neuromorphic computing in STEM curricula.

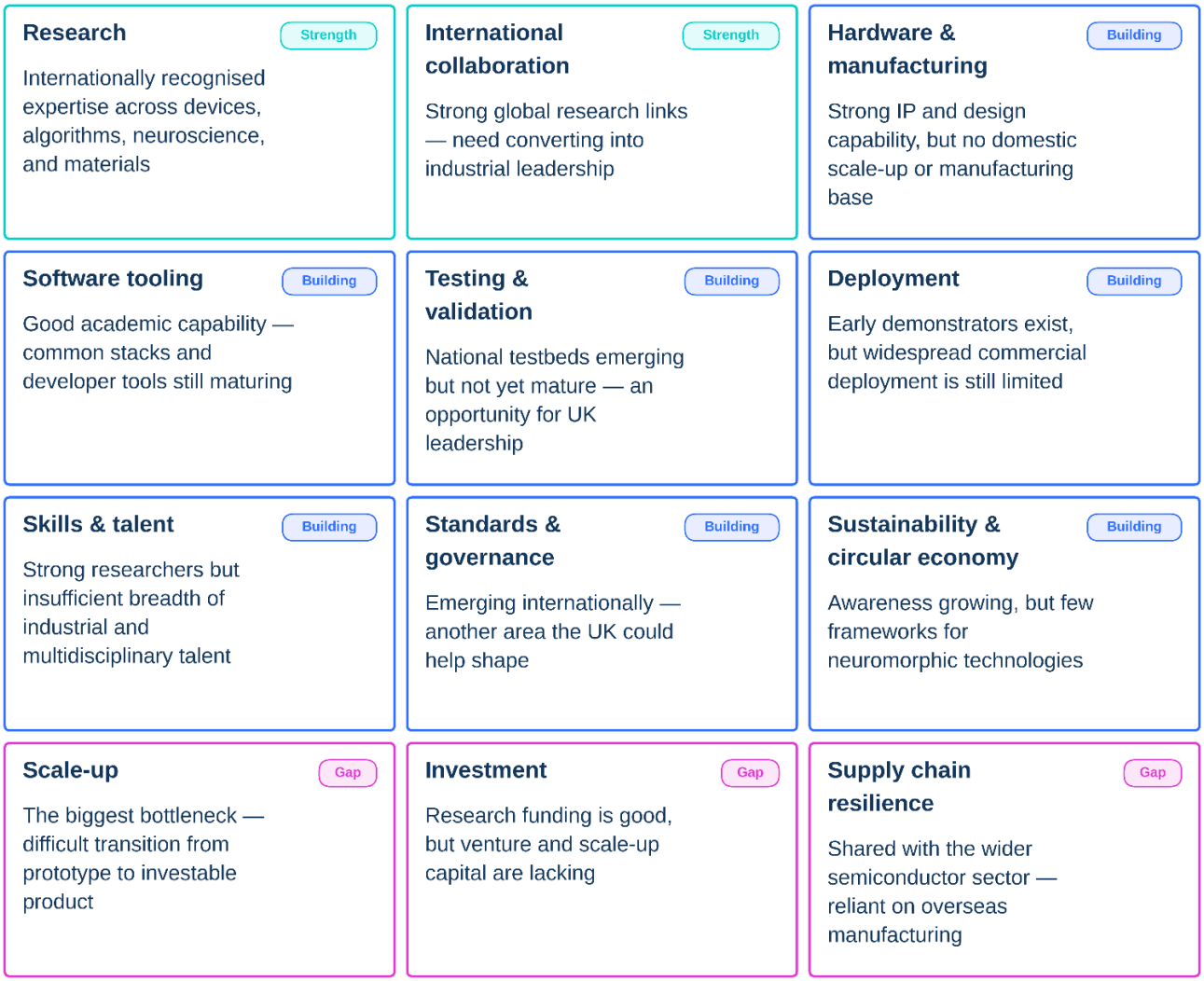
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[1]Grand View Research. (n.d.). Neuromorphic Computing Market (2024-2030). Retrieved 26 August 2026. https://www.grandviewresearch.com/industry-analysis/neuromorphic-computing-market

[2]University of Groningen (2026). €30M NWO grant positions the Netherlands to lead next-generation brain-inspired computing

The UK's position is mapped across 12 areas of the ecosystem, from fundamental research through to deployment, coding each as a Strength, a developing capability ('Building'), or a Gap. It matters because it's the single clearest visual answer to 'where does the UK actually stand' – the pattern it shows (strong at the research end, weaker from scale-up onwards), is the evidence base for the roadmap's core argument that the UK should shape specific parts of the value chain rather than compete across all of it.

Figure 1: UK Neuromorphic Computing Ecosystem – Summary



Source: A UK Roadmap for Neuromorphic Computing: 2050 Vision[3]

[3] (2026). A UK Roadmap for Neuromorphic Computing: 2050 Vision

Five themes at a glance

The roadmap is organised around five strategic themes covering 26 aims in total, each setting out milestones for 2030, 2040 and 2050 alongside an ‘Act Now’ framework for government, industry, academia, and other stakeholders. Each theme is followed by the roadmap’s core rationale and its most consistently repeated near-term actions.

Theme 1: Industrial Applications & Leadership

The UK has world-class research but faces a real risk of losing its commercial value to other countries, such as the US. Closing that gap means building an ecosystem for industry adoption, sovereign capability, and public trust – one that draws on genuine regional strengths, including the M4 corridor semiconductor cluster, Manchester’s neuromorphic computing heritage, and emerging clusters in Scotland and Northern Ireland.

Key actions:

- Fund open-access design, prototyping and testbed infrastructure so researchers, SMEs and manufacturers can access shared facilities.
- Support financial incentives and industry-led partnerships to help UK neuromorphic companies scale, and retain domestic talent, IP and investment before international acquisition.
- Establish a National Council for Neuromorphic Technology and identify sovereignty specialisms that protect UK security and industrial independence.
- Build national testbeds, validation infrastructure and certification frameworks so industry has the confidence to adopt neuromorphic technologies at scale.

Theme 2: Technological Innovation

Neuromorphic computing can redefine how intelligent computing is designed, built, and deployed – delivering step-change improvements in energy efficiency, speed, adaptability, and real-time intelligence. Realising that requires breakthroughs across the whole innovation stack including algorithms, hardware, manufacturing, software and system integration.

Key actions:

- Prioritise sustained investment in neuromorphic capabilities and embed them within UK computing and semiconductor strategies alongside conventional, photonic and quantum computing.
- Fund research into data-efficient learning that reduces reliance on large-scale training datasets.
- Identify high-value use cases, including robotics, healthcare, 6G infrastructure, where latency and power consumption are decisive, and invest in the materials and manufacturing needed to scale reliable, low-power hardware.
- Establish shared benchmarks, standards and a national coordination mechanism so hardware and algorithm design develop together rather than in parallel.

Theme 3: Sustainability

The power demands of the world's computing are unsustainable – the UK data centre alone is forecast to represent 8.8% of total UK electricity demand by 2030. Neuromorphic computing offers a fundamentally lower-power path: hardware that processes information the way the brain does, capable of operating at the edge without relying on energy-hungry data centres.

Key actions:

- Align neuromorphic computing initiatives with the UK's Net Zero strategy and broaden sustainability metrics beyond AI energy use to cover sensing, edge intelligence, materials and latency.
- Provide targeted funding for low-power computing and sustainable semiconductor manufacturing, including designing out PFAS ('forever chemicals') from manufacturing processes.
- Support hybrid computing architectures, combining digital, neuromorphic, photonic and quantum approaches, that automatically select the most energy- and cost-efficient option for each workload.
- Develop lifecycle sustainability metrics and design-for-circularity standards, working towards neuromorphic hardware manufacturing as a net circular system by 2050.

Theme 4: Education & Skills

Expertise in neuromorphic computing sits at the intersection of disciplines that have traditionally developed separately – digital and analogue circuit design, semiconductor engineering, neuroscience, and computer science. Few existing training pathways bring these together, which makes building genuine expertise in the field unusually demanding.

Key actions:

- Build a clear public engagement strategy and narrative on the value and career opportunities of neuromorphic computing, including addressing the gender imbalance in the talent pipeline.
- Strengthen international education partnerships, including through Erasmus+, to develop and retain world-leading talent.
- Carry out a national skills-gap assessment and ensure equitable access to training and facilities across all UK regions, not just the established hubs.
- Embed neuromorphic computing into STEM curricula and expand Centres for Doctoral Training from undergraduate through to PhD level.

Theme 5: Resilience

Neuromorphic technologies must be resilient to geopolitical disruption, supply chain vulnerability, rapid technological change, and infrastructure risk. This theme covers how neuromorphic computing integrates within UK infrastructure, how the UK can secure its position in global supply chains, and how the lessons from building this ecosystem prepare the UK to respond faster to future technological change.

Key actions:

- Integrate neuromorphic computing into the UK's future digital and physical infrastructure agenda, assessing where it can enhance critical national infrastructure, including across energy, transport, communications, healthcare and security.
- Map supply chain dependencies and critical mineral risks and establish sourcing agreements that reduce reliance on any single nation.
- Recognise neuromorphic technology as a strategic sovereign capability and publish a National Neuromorphic Strategy to secure the UK's position in global supply chains.
- Establish a knowledge-capture framework so lessons from building the neuromorphic ecosystem strengthen the UK's capacity to respond to future emerging technologies.

These five themes do not operate in isolation. A set of cross-cutting principles applies across all of them, shaping how the roadmap's 26 aims should be delivered in practice: from cross-sector collaboration and hardware-software co-design, through to responsible innovation, international collaboration, shared standards, and long-term investment.

Figure 2: Cross-cutting principles throughout the roadmap



Source: A UK Roadmap for Neuromorphic Computing: 2050 Vision

The roadmap sets out a clear, coordinated path for the UK to build on its research strength and become a genuine shaper of the global neuromorphic value chain. Delivering it will take sustained action from government, industry and academia alike, **starting now** – that will be the difference between a UK that leads in safe, sustainable, brain-inspired computing by 2050, and one that watches the opportunity pass by to faster-moving competitors.

Get in touch

The NeuroWare Innovation and Knowledge Centre (IKC) is a UK wide initiative led by UCL in partnership with a consortium of leading UK institutions, bringing together researchers, industry partners, investors and policymakers. NeuroWare accelerates the development, commercialisation and adoption of neuromorphic hardware, translating world class research into scalable technologies, competitive UK companies, and real-world impact, while supporting a more efficient and secure UK AI ecosystem.

This executive summary was produced by Dr Aysha Riaz, Research Fellow at NeuroWare, and Latisha Gordon, Policy Advisor at the UCL Policy Impact Unit.

The full interactive roadmap is available at: neuroware-ikc.com.