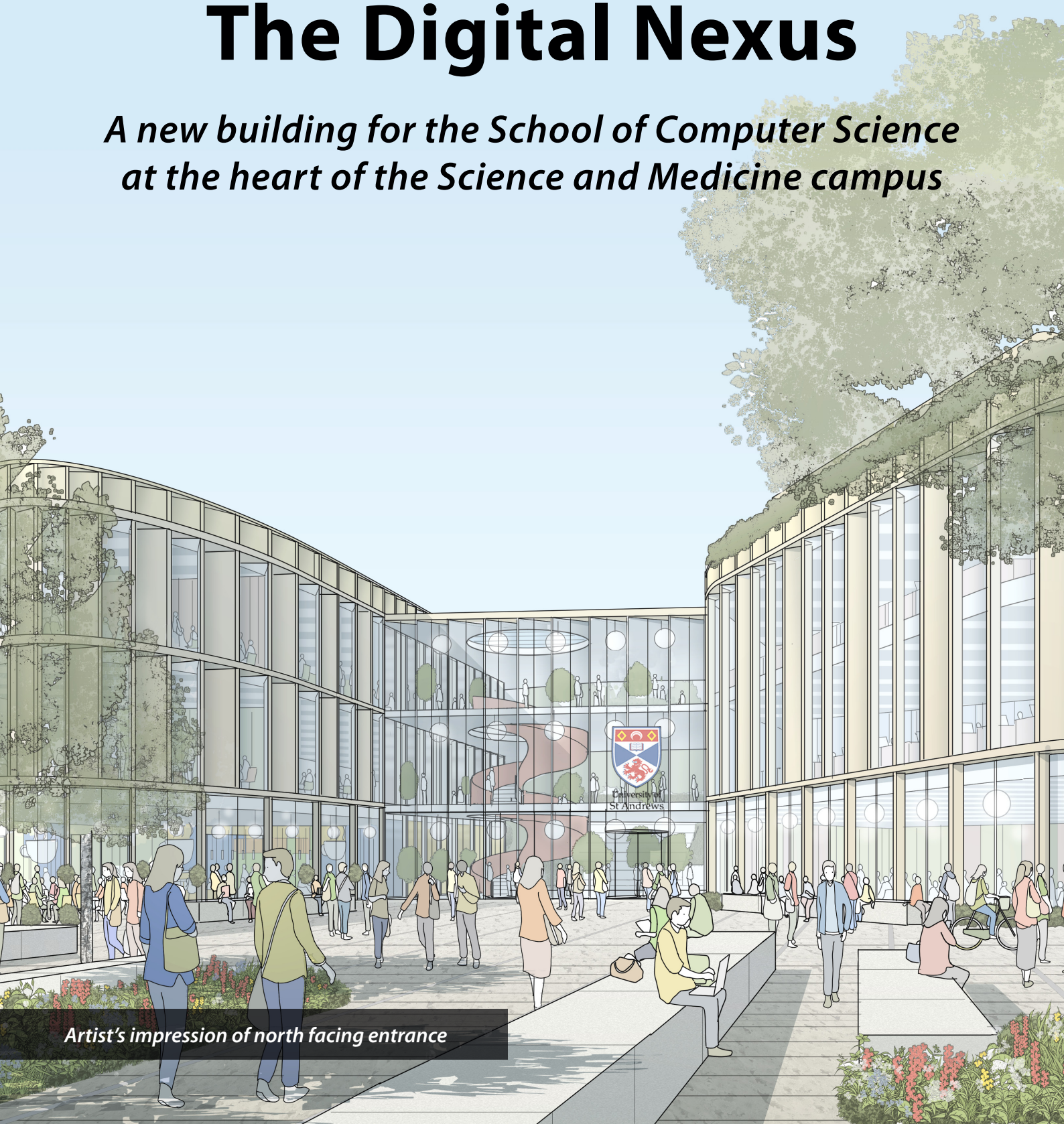
University of St Andrews | FOUNDED 1413

# The Digital Nexus

## *A new building for the School of Computer Science at the heart of the Science and Medicine campus*



*Artist's impression of north facing entrance*

# EXECUTIVE SUMMARY

Data and machine learning are rapidly transforming modern society, and in the dynamic landscape of St Andrews, where ancient tradition blends harmoniously with modern innovation, we are at the forefront of bringing history and our future to life. Collaborations between the science and humanities have enabled us to create accurate digital reconstructions of the Laconia Acropolis, St Andrews Cathedral (in ruins since the 16th century), and the city of Glasgow in one hundred years time with predicted sea level rises. We are helping companies to harness the power of multicore and edge computing technology. Our cutting-edge data-driven solutions around fertility prediction have given hope and empowerment to couples navigating the complexities of fertility, and are shaping personalised medicine for the treatment of cancer. Our trans-disciplinary research is helping to protect endangered species all over the world.

Significant institutional investment in computer science and interdisciplinary research technologies reflects our commitment to preparing our students to succeed in a rapidly-evolving digital world. The £50 million Digital Nexus will form a state-of-the-art building for the School of Computer Science, designed to meet the insatiable demand for well-trained experts in one of the fastest-moving fields imaginable and to nurture the profoundly international and interdisciplinary nature of the field. The Digital Nexus will enable our world-renowned computer scientists and students to collaborate with scholars across the sciences, and medicine, facilitating a rich exchange of ideas and fostering innovations that transcend traditional academic boundaries.

# OUR DIGITAL NEXUS WILL:

*Be the first new building of the masterplan for developing our Science and Medicine campus*

- Create an integrated powerhouse of teaching learning, and inquiry centred around state-of-the-art facilities.
- Be an architectural centrepiece befitting one of the most prestigious, diverse, and highly-ranked Schools of Computer Science in the UK.
- Provide a world-class facility with the lowest environmental impact, in line with making St Andrews carbon neutral by 2035 and contributing to the wider goals embodied in the United Nations Agenda 2030 and its Sustainable Development Goals.

*Attract more and more exceptional minds*

- Deliver our mission to attract and nurture the brightest minds to create and inspire the next generation of researchers, practitioners, and scholars through endowed chairs and postgraduate scholarships.
- Maintain and grow the already world-leading gender balance in our student cohort.
- Drive an expansion of student numbers, from undergraduate to doctoral under both traditional and online modes of study, to help satisfy the global need for computing talent.
- Continue to grow and diversify our outreach, including our dedicated Gateway to Science and summer programmes, to make participation in higher education a reality amongst groups not traditionally represented at top universities, and to encourage and enable people to teach computer science at primary and secondary level.

*Create an environment for success*

- Deliver welcoming, accessible, and flexible spaces including state-of-the-art lecture theatres,tutorial spaces, laboratories, social and independent learning spaces.
- Drive engagement across disciplines in collaboration with our partners across the University, using data to improve early diagnosis of disease; to model, understand, and minimise the effects of human activity on animal populations; and to pursue foundational understanding of the most challenging core problems in mathematics and computer science.

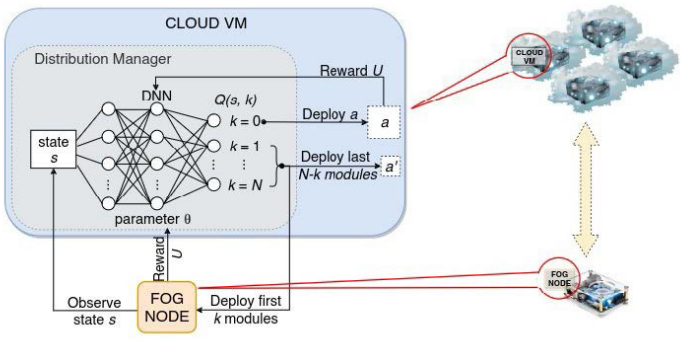
# THE POWER OF COMPUTER SCIENCE AT ST ANDREWS

## Sustainable distributed AI

By 2030 it is predicted that over 80 billion devices will be connected to the internet. With that volume comes the challenge of sending the data produced by those devices for cloud processing. Growth at the expected rate will create issues around latency, bandwidth and privacy.

Many new applications use deep learning – a method of artificial intelligence (AI) – inspired by human and animal cognition. Such systems demand significant computing power which, from a sustainability perspective, is unsustainable in terms of water and electricity usage.

As AI becomes more widespread and personalised, researchers at the University of St Andrews are exploring algorithms that learn from limited data, can evolve their knowledge over time and can explain their decision-making. Through the University's EPSRC-supported Edge Computing Hub, we're working on fitting those models into smaller processors, enabling smart applications to be deployed anywhere.




## Protecting fertility

Researchers at the School of Computer Science have developed a Fertility Calculator designed to help couples who are navigating a fertility journey that involves assisted conception. It is especially targeted at maintaining fertility after cancer and other treatments.

The calculator simplifies complex data and offers precise predictions of the likelihood of conception across cycles of IVF and ICSI, which it then relates to the probability of natural conception.

By combining data with predictions, our researchers can identify those who respond poorly to treatments, allowing personalised interventions and maximising a couple's chance of conceiving a baby.

## Shaping the future of multicore computing

Our computers, mobile phones and other devices use multicore technology, which is where multiple computer units work together for enhanced performance. However, getting multicore technology right isn't easy.

At St Andrews, we are combining hardware and programming language technology to help companies to make the most of multicore systems. Techniques developed in the School of Computer Science have improved compilers, which are used in the latest RISC-V chips by tech

giants including IBM and NVIDIA. These advancements are streamlining processes, cutting costs and increasing system accuracy and security.

Technologies developed at St Andrews are having a fundamental impact across the tech landscape.

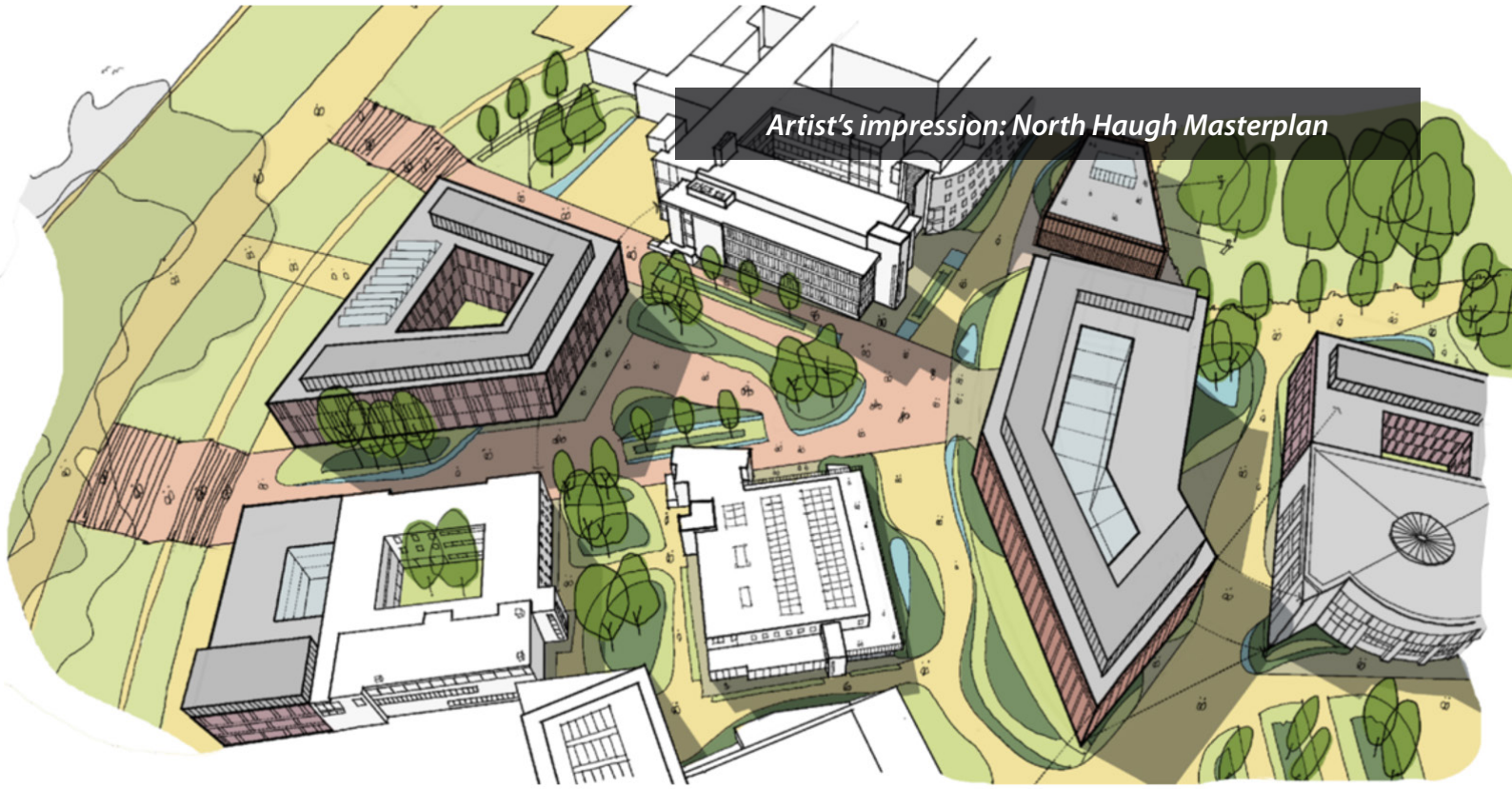
## Shedding light on visual impairment

Cerebral Visual Impairment (CVI) is a hidden disability that affects how people process visual information. It's often overlooked compared to other visual impairments, despite being relatively common: research suggests that one child in every mainstream classroom may be affected, with many cases going undiagnosed.


At St Andrews, we're developing innovative solutions as part of a global effort to address CVI. Researchers in the School of Computer Science have created virtual reality programs and educational videos to help people understand how CVI impacts vision. Our free resources have already reached over two hundred countries and territories.

By working with teachers, museum experts, parents and educators, we've tested simulations in various environments, helping stakeholders design better spaces for those with CVI.

*Artist's impression: North Haugh Masterplan*



*Artist's impression: North Haugh Masterplan*

# INVESTMENT OPPORTUNITIES

The capital redevelopment will cost £50M, with significant naming opportunities available, including naming the building.

In addition to the capital development, we have a strategic goal to endow postgraduate scholarships and prestigious academic Chairs to continue to attract the finest experts and future thought-leaders in strategically important fields.

Join us as we embark on the first phase of the masterplan for the whole Science and Medicine campus, with the Digital Nexus at its heart.With your support, we have an extraordinary opportunity to create a new home for the School of Computer Science, fuel research breakthroughs, empower curious minds, drive scientific progress, and establish a new building which will be a sustainable beacon of excellence.

# FURTHER INFORMATION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