



Public summary

The Leiden Institute of Advanced Computer Science (LIACS) is a rapidly expanding research institute in the Faculty of Science of Leiden University. The mission of LIACS is *to further fundamental knowledge of computer science, AI and its applications*. To realize this mission, LIACS maintains a strong body of knowledge and skills in core computer science, including theoretical computer science, computer systems, natural computing and evolutionary optimization, vision and imaging, media technology, and algorithms, always with a keen eye on applications. In parallel, based on this strong foundation, LIACS has significantly expanded its focus on data driven AI, automated machine learning, quantum machine learning, robotics, tomography and deep learning, security and programming education over the past six years.

The strategy of LIACS can be summarized in four key aspects:

1. *Build a strong core of computer science research.* By maintaining a strong fundamental core, LIACS provides continuity through the generation of new knowledge and skills for future innovations. Within this core, LIACS aims to cover a broad range of subfields. The institute is proud of its research output in the form of papers, software, installations, and data sets in the past years. It has a number of unique specializations and its researchers hold leadership positions in several key areas of computer science and AI. The institute has been successful in attracting talented new researchers.
2. *Collaborate with other research fields, with society and industry.* LIACS has a long tradition of building relations with other fields and domains, with the aim of generating impact. The institute has a broad network of researchers in other disciplines, as well as in society and industry. These include networks across faculties within Leiden University (SAILS), national networks (Quantum Software Consortium, NLAIC, Sports Data Valley) and European networks (CLAIRE). In addition, there are many collaborations with societal and industrial partners, including medical centers, industry and governments.
3. *Nurture a stimulating research atmosphere for researchers to excel.* LIACS strongly believes that its researchers prosper when they are in a safe, supportive and inclusive environment. Researchers are given freedom to explore their research interests and expand their network, and are provided with the perspective of a promising academic career. LIACS actively supports and facilitates initiatives for new collaborations whenever they arise. This dynamic management culture makes the institute flexible and agile, which is noted and very much appreciated by its staff.

4. *Educate a new generation of talented computer scientists.* Research and education are strongly interrelated at LIACS. The institute aims to provide excellent supervision of students and PhD candidates, to raise a new generation of talented researchers.

For the coming years, LIACS has identified the following strategic priorities:

- > *Core computer science and AI, and its applications.* The ambition to focus and pursue further collaboration is essential. This mandates a prominent place for fundamental, long-term research, maintenance of the strength of LIACS in AI and the support of unique niches in which LIACS excels.
- > *Consolidating the funding situation.* To be able to maintain the current size of the institute, warranting the sources of funding is necessary. There are many opportunities for funding and grants which could be more structurally pursued.
- > *Maintaining a high-quality research staff.* It will get increasingly harder to hire and retain talented research staff talent. LIACS aims to be an attractive employer, with an open, inclusive and welcoming environment, with excellent coaching, supervision and career options, and a manageable workload.
- > *Professionalizing the management culture.* Clearly, the management style should match the scale of a growing institute. At the same time, LIACS should not entirely lose its agile culture, which is an important strength of the institute.

Throughout this report, six Case Studies showcase the achievements of LIACS in the past six years. These examples have been chosen to reflect high-quality and impactful research that aligns very well with the strategic goals:

- > Hardware Security (p. 3)
- > SAILS (p. 8)
- > CLAIRE (p. 13)
- > Evolutionary Computing with Industry (p. 21)
- > Programming Education (p. 26)
- > Quantum AI (p. 31)

