Universität Stuttgart

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University of Stuttgart successful with cluster draft proposals

DFG announces first decisions in Excellence Strategy

The German Research Foundation (DFG) has announced the first pivotal decisions for the "Clusters of Excellence" funding line as part of the Excellence Strategy of the German federal and state governments. The University of Stuttgart has been given the green light for two new cluster initiatives. This means that it can submit a full application for the „Bionic Intelligence for Health“ and „Chem4Quant“ draft proposals. The final decision on the new clusters of excellence and the continuation of existing clusters will be made in May 2025.

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"The decision of the panel of experts offers us the opportunity to sharpen and further expand our excellent profile as an interdisciplinary university with great strength in research. We will seize this opportunity and use our cutting-edge research to make an even greater contribution to solving major global challenges," explains Prof. Wolfram Ressel, Rector of the University of Stuttgart. Ressel was delighted with the success of the cluster outlines, congratulated the scientists at the University of Stuttgart and their cooperation partners, and thanked everyone involved for their commitment.

Initiatives for the clusters of excellence „Bionic Intelligence for Health“ and „Chem4Quant“ are eligible to apply.

Bionic Intelligence for Health: New approaches to the therapy and diagnosis of neuronal diseases

“The Bionic Intelligence for Health cluster project is searching for fundamentally new approaches to integrate technology and medicine in

order to better diagnose and treat neuronal diseases. It thus addresses one of the greatest challenges facing our healthcare system and our society as a whole," says Wolfram Ressel.

In the Bionic Intelligence for Health cluster project, an interdisciplinary research team is combining the neuronal and physical intelligence of the human body with a fundamentally new approach to intelligent technology. The aim is to better recognize neuronal diseases, treat them adaptively, and thereby improve the quality of life of those affected in their everday lives. To this end, innovative technical systems are to be intelligently integrated with the body. The cluster project is an initiative of the University of Stuttgart in cooperation with the University of Tübingen. The Max Planck Institute for Intelligent Systems in Stuttgart and Tübingen as well as the Max Planck Institute for Biological Cybernetics in Tübingen are involved as cooperation partners. The project builds on the complementary expertise of outstanding scientists from the fields of neuroscience, materials science, biomechanics and systems theory, among others. It benefits from the excellent Stuttgart-Tübingen ecosystem and has the potential to significantly reduce the social challenges posed by neuronal diseases.

Chem4Quant: Chemical platform for high-precision quantum architectures

"Quantum technology has the potential to revolutionize numerous applications, such as making communication secure or exponentially accelerating computing power. Our cluster initiative Chem4Quant researches novel quantum materials and structures and thus makes a fundamentally new contribution to achieving this goal," says Wolfram Ressel.

Researchers from the Karlsruhe Institute of Technology (KIT), the University of Ulm and the University of Stuttgart want to purposefully develop material structures for future quantum technologies in the joint Chem4Quant initiative. Despite the breakthroughs already achieved in quantum technologies, many of the platforms currently in use are limited in terms of scalability, adjustability, positionability, and error correction.

Chem4Quant is therefore proposing a fundamentally new approach with a chemistry-based platform: Chemically, precisely-definable quantum architectures can be used to plan atomically accurate material structures and their quantum properties in a targeted manner. For example, qubits can be positioned in electrical or photonic components with a precision below the nanometer range. The initiative aims to develop novel qubit materials and create the first components for the future quantum internet. Chem4Quant can draw on globally unique expertise in the field of molecular quantum systems as well as established collaborations.

Successful Clusters of Excellence apply for further funding period

"Our already very successful Clusters of Excellence Integrative Computational Design and Construction for Architecture (IntCDC) and Data-integrated Simulation Science (SimTech) also stand for cutting-edge interdisciplinary research that uses fundamentally new investigative approaches and methods to advance solutions for social challenges," emphasizes Ressel. For example, IntCDC is paving the way towards greater sustainability in the construction industry, and thus making a decisive contribution to the development of a climate- and environmentally-friendly society. With its innovative data-based simulation models, SimTech enables significant progress in the research, testing, and application of new technologies.

The clusters in detail:

IntCDC: Research for more sustainability in the construction industry

Launched in 2019, the Integrative Computational Design and Construction for Architecture (IntCDC) cluster uses digital technologies to rethink planning and construction in an integrative and interdisciplinary approach, and thus enable greater sustainability in the construction industry. To this end, the University of Stuttgart and the Max Planck Institute for Intelligent Systems (MPI-IS) merge their internationally recognized research expertise. More than 150 scientists from the fields of architecture, computer science and robotics, engineering, production and systems technology as well as the humanities and social sciences are currently working together to modernize the construction sector. They are focusing on the co-design of integrative computer-based planning and

construction methods, on cyber-physical manufacturing and construction processes, as well as on next-generation sustainable material and construction systems. In the second funding phase, the cluster aims to take up new initiatives and scientific challenges in order to lay the methodological foundations for sustainable architecture.

SimTech: New simulation models for science and innovation

Without simulations, advances in science and technological innovations for the benefit of society are not possible. Since 2019, researchers at the Cluster of Excellence Data-integrated Simulation Science (SimTech) have been working on new data-driven methods that go beyond improving the applicability and accuracy of simulation models. The systematic integration of data into simulation science is also changing the way science and technology are conducted. Developments include data-based representations of physical phenomena, new methods for designing and optimizing micro-materials, and data-based models for optimizing control processes and algorithms. Although we have already come a long way in data-integrated simulation science, there is still a great deal of untapped potential in dealing with knowledge and understanding. This untapped potential will be the focus of research in the next funding phase and will be systematically integrated into models, methods, and algorithms in the future in order to further promote our insights.

Further information:

Further information on the Excellence Strategy can be found on the DFG website:
https://www.dfg.de/en/research-funding/funding-initiative/excellence-strategy

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Pictures:

Bionic Intelligence: Integrating technology and medicine: Bionic Intelligence for Health seeks to improve diagnoses and therapies for neuronal illnesses
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Chem4Quant: New materials and structures: Chem4Quant aims to help quantum technologies achieve a breakthrough
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