

# Pushing the boundaries for AI and life science research

The University of Tübingen is already **recognized as one of Europe's finest**. As of 2019, it is now also home to three Clusters of Excellence for research into tumours, infections and machine learning.

## Research, Relevance, Responsibility

— these three words epitomize the guiding principles of the University of Tübingen. In an age increasingly dominated by scientific and technological change, we never underestimate our responsibility to the global future. By combining such foresight with outstanding research, we have become one of Germany's — and indeed Europe's — finest universities.

Tübingen is respected worldwide for research into neuroscience and artificial intelligence. Beyond these fields, we have strong life sciences research in cancer, infection medicine, microbiology and plant molecular biology. Other core areas include geoscience and environmental science; archaeology and anthropology; language and cognition; and education and the media. Overall, more than 4,800 scientists and academics work at the University of Tübingen.

We are not the only research-focused organization in Tübingen. The city is also home to four Max Planck institutions, four German health research centers, as part of the

Helmholtz Association, and two Leibniz Association institutes. Not only do we collaborate with these independent institutions, but we have gone even further to jointly establish the Tübingen Research Campus. We all want to attract the finest minds from around the world to Tübingen, so the Campus offers a one-stop service to highly qualified, international, early career researchers who are relocating to the city.

## CLUSTERS OF EXCELLENCE

The University of Tübingen has recently been awarded three Clusters of Excellence as part of the German government's Excellence Strategy. Tübingen began hosting the new outstanding research networks centered around tumour biology, control of microorganisms and machine learning in January 2019. This means that Tübingen has passed another key test in the Excellence funding programme. "The decision to sponsor three clusters in Tübingen underscores just how important these research fields are at the University," said Tübingen President Bernd Engler. He expressed confidence that the Clusters of Excellence



An inspiring place for the best researchers from around the world: The University of Tübingen.

and the entire university would benefit from world-class research in Tübingen.

## TUMOUR THERAPIES

The Image-Guided and Functionally Instructed Tumour Therapies (iFIT) Cluster of Excellence aims to build a comprehensive understanding of the biological processes in tumours in order to develop innovative and sustainable cancer treatments. iFIT researchers will start by comprehensively mapping the biological processes in tumours using functional genetic analysis and to identify potential weak points for new targeted treatments. In

particular, researchers will focus on those biological processes that allow tumours to survive under stress. Using

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state-of-the-art imaging techniques, researchers can visualize the stressed state of tumours and apply



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CHRISTOPH JÄCKLE

individually tailored cancer treatments. Additionally, iFIT researchers will seek to activate the patient's own immune system using innovative immunotherapies, to support and complement the targeted drug therapy.

### CONTROL OF MICROORGANISMS

The surfaces of the human body host colonies of microorganisms, known as microbiomes. Microbiomes contain both bacteria that have a positive effect on human health and potentially life-threatening pathogens. In the past, broad-spectrum antibiotics have often been

used to tackle the disease-causing bacteria. Nowadays it is known that these drugs not only promote resistance to antibiotics, but also, in many cases, they damage the microbiome as a whole. Researchers in the Control of Microorganisms to Fight Infection (CMFI) Cluster of Excellence aim to develop a new strategy to control infections. Their goal is to find targeted agents that will have a positive effect on the microbiome overall. We know that useful bacteria help to keep down the harmful ones. In order to understand and exploit the underlying mechanisms, the CMFI Cluster of Excellence

will bring together researchers from the fields of molecular, bioinformatics and clinical disciplines.

### MACHINE LEARNING

New technologies using artificial intelligence are set to make tangible changes to our world in the coming decades, made possible by recent breakthroughs in machine learning. The new cluster "Machine Learning: New Perspectives for Science" will analyze developments that promise to fundamentally change not only the technology but also the whole process of scientific investigation. The researchers aim to explore

the full potential of machine learning and how it can be harnessed for science and academia. At the center of their research are algorithms that recognize complex structures and causal links in data sets; methods that allow uncertainties to be quantified in data-driven scientific models; and techniques that enable researchers to better understand, interpret and control the phases of machine learning. ■

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