Festrede zur

Gründung des

Munich Data Science Institute (MDSI)

15. September 2023

Prof. Dr. Thomas F. Hofmann
Präsident der TU München

Es gilt das gesprochene Wort

Welcome to the Official Opening and General Assembly of the Munich Data Science Institute (MDSI).

Dear State Minister Blume, Members of the MDSI Board of Directors – Executive Director Prof. Günnemann. Dear students, scientists, colleagues and partners from academia and industry.

We are venturing into a new world – characterized by volatility and uncertainty, and – at the same time – by new opportunities that have never been greater.

We are venturing into a new world, which we are able to build as we go – if we grasp those opportunities with a courageous “can-do-culture”, an entrepreneurial mindset and by pushing leapfrog innovations. Today, we do not need to ask ourselves, whether or not some recent innovations will revolutionize the way we communicate, move from A-to-B, work and live.

We know that engineering biology and the possibilities of reprogramming nature's genetic computer through e.g. CRISPR/Cas open new doors for biomedical innovations. Our answer to this is the Munich Institute of Biomedical Engineering, supported through the Center for Protein Assemblies, the TranslaTUM und the new Center for Organoid Systems, which we will open next year.

We know that miniaturization has helped electronics to penetrate society more widely and deeply than ever before. There are worlds between the Zuse Z3, the first functioning digital computer from 1941, and modern microprocessors – both in terms of speed and size. And emerging molecular electronics may be on the verge of another age. Our response is the ZeitLab in the new electrical engineering building.

We foresee a maximization of performance in sensing, communication, and computing through quantum technologies. Through the Excellence Cluster MCQST and the Munich Quantum Valley we want to become a catalyst for these developments.

And for each and every of these developments, digitalization and modern data science function as leap-frogging levers: Major advancements in artificial intelligence, natural language processing, and computer vision have reached society – not least through ChatGPT. The scope, scale and impact of those technologies are most likely more profound than any other transformation in human history.

ML and AI can help make science more productive, can help diagnosis and medicine to become more effective, can help companies to run even faster and more agile. They can also help make our lives more comfortable. We can only imagine the effect of AI on education.

These opportunities materialize at the interfaces of disciplines. Grasping them requires interlacing modern mathematics, data science, software and AI with microelectronics, hardware and quantum engineering.

Hence, our decision to combine the most important scientific, methodological and technological core competencies for digitization under the roof of our new TUM School of Computation, Information, and Technology (CIT) – as part of our organizational transformation from faculties to schools.

But grasping the opportunities of digitalization requires more! We need to integrate modern data science and AI into domain-specific contexts and industrial applications. Furthermore, we need to bring data and AI literacy to domain scientists and professionals.

Taking advantage of the Age of AI requires also to verge into a New Age of Collaboration – across disciplines and institutions! More than ever, data science is becoming a team sport. It is no longer about building a model; it is about what you do with the model once you have it.

That is why we founded the Munich Institute for Robotics and Machine Intelligence (MIRMI) in 2017 – with Sami Haddadin as executive director. More than 50 professors across schools are driven by the joint vision to shape the future of health, work, and mobility through embodied AI, robotics and machine intelligence.

Today, the Munich Data Science Institute officially complements this effort as another cornerstone of our TUM AGENDA 2030. MDSI is built on a foundation of intellectual excellence:

- A team of currently 64 professors across TUM Schools, of which 14 were appointed in the last three years, thanks to the HighTech Agenda Bavaria!
- Three Leibniz awardees, two Alexander von Humboldt professorships, and 16 ERC grantees
- Ranked by Times Higher Education (THE) among the top ten in computer science and sixth place in AI (TUM is the only German university among the ten most influential institutions in AI).

Inspired by human intelligence, the MDSI is designed to give modern data science a completely new momentum in four dimensions:

1. Advancing disciplinary foundations
2. Facilitating collaborative data science and domain-specific integration
3. Generating real-world impact by a strategic convergence of competences
4. Enabling data literacy – trans-generational and across domains

Within the first dimension, we want to advance foundations of modern data science, with special focus on reliable machine learning and the development of methods based on neural networks.

Within the second dimension, we want to advance our capabilities and leverage innovation potentials through collaborative integration of data science, ML and AI in

specific application fields: from life sciences and personalized medicine, to materials and construction research to quantum-, astro- and climate research all the way to the dynamics of social, political and economic systems.

The fundamental truth for each of these applications is that ML/AI systems serve the needs and expectations of humanity. The North Star for our development is that it is truly humans – and not the machine – who are in the driver seat. It is in our hands, whether or not AI and machines will become trusted companions for humans, or outpacing competitors.

It is our obligation to design AI systems in a way that allows for interaction with humans in a nuanced and multi-dimensional way. They need to be trustworthy, privacy preserving and be able to bridge the gap between data utilization and data protection. Here, the MDSI can take advantage of the competences of our new TUM School of Social Sciences and Technology.

The goal of the third dimension of MDSI activities is to increase real-world impact by a strategic convergence of competences in core areas within TUM and beyond.

Growing just quantitatively through more and more disconnected activities and programs does not create enough impact to play in the global league of champions. That is why we put all strategic data-enabled activities under the organizational roof of the MDSI. By doing so, we want to minimize redundancies across TUM and advance synergy creation between the fields.

A prominent example is the Munich Center for Machine Learning (MCML, founded 2018) jointly led by TUM and LMU, funded by the BMBF and the HighTech Agenda Bavaria as one of the National AI Competence Centers. The TUM branch of the MCML is interlaced in the MDSI infrastructure and led by Daniel Cremers, one of our MDSI directors.

In a similar way, jointly with Helmholtz Munich, the MDSI hosts the TUM branch of the ELLIS Unit Munich. This makes the Bavarian capital a visible partner in the European Laboratory for Learning and Intelligent Systems (ELLIS) – a highly prestigious alliance comprising the best ML research facilities in Europe.

An example for a domain-specific MDSI activity is the TUM Georg Nemetschek Institute for Artificial Intelligence for the Built World. This institute was founded under the roof of the MDSI with the support of a €50M donation of the Nemetschek Innovation Foundation in 2020. Here, we bundle forces in research on AI and ML applications throughout the entire lifecycle of building structures – from planning, construction, to the sustainable management. Welcome, Director Ian Smith!

The MDSI also hosts the AI Future Lab: AI for Earth Observation (2020) funded by the BMBF and led by Xiaoxiang Zhu, one of the five MDSI directors. Here, we combine our strengths in geodesy and earth observation, satellite technology, mathematics, AI and ethics to create reliable models of global urbanization, food

supply and the management of natural disasters. This is a great success of connecting competences of the new Department for Aerospace and Geodesy, founded by the HighTech Agenda Bavaria, and other TUM departments.

Moreover, the MDSI will inject core competences in informatics into our medical campus through the Center for Digital Health – a §91 building, funded (€44M) by the federal government as well as the Free State of Bavaria. Under the leadership of the MDSI director Daniel Rückert, it focuses on the development of data-driven approaches and AI methodologies in medicine from early detection and diagnosis of diseases, to the identification of biomarkers to individualized/ personalized treatments all the way up to ethics, security and privacy protection in the use of patient data.

In the near future, the MDSI will grow also here on the Campus Garching. Together with the CIT, the MDSI will receive a new building financed by the Dieter Schwarz Foundation (8,000 m²) as the bridgehead to the TUM Heilbronn Data Science Center and the IPAI – Innovation Park Artificial Intelligence. Together with our Industry on Campus Partners SAP and Siemens, and our TUM Venture Lab initiative, this will make the Campus Garching a leading European hub for digital impact technologies.

The fourth dimension stands for promoting data literacy across-domains and generations!

The MDSI developed a cutting-edge education portfolio reaching out to Master and doctoral students, researchers, professionals and executives – because it is our mission to prepare them to learn, invent, build, and scale reliable ML and AI technologies – with purpose and a human-centered approach.

On the Master-level, the MDSI offers students to work in project teams and explore new data-driven approaches to interdisciplinary challenges in collaboration with companies. This educational research experience is offered by the TUM Data Innovation Lab, led by its founder Massimo Fornasier, one of the five MDSI directors.

Another example is the DAAD-funded Konrad Zuse School of Excellence in Reliable AI (2022) – jointly coordinated by TUM and LMU. The MDSI hosts the TUM branch of the Konrad Zuse School and it is led by the MDSI Executive Director Stephan Günnemann. M.Sc. and PhD candidates are trained in the development of reliable AI technologies – including scientific knowledge, business expertise, and industrial exposure. They perform cutting-edge research to make AI ready for deployment in domains of public interest, including all of its implications when it comes to reliability, safety, security, and privacy-preservation.

Excellent M.Sc. and PhD candidates are encouraged by our Linde/MDSI Master and Doctoral Fellowships. We have started to strengthen interdisciplinary research addressing data science challenges.

Moreover, the MDSI supports our domain scientists across TUM with data-related services and advice on qualitative research data management – increasingly important for internationally competitive research!

Likewise, standardized processes for research data management are a key success factor in collaborative research programs. The MDSI is fulfilling this demand. The institute created the TUM Research Data Hub, which is operated in collaboration with the TUM University Library. This is a one-stop shop for researchers regarding sustainable data management, new methods/tools in data analysis, and data-related project communication. TUM researchers can request a data steward as a trained expert and apply to integrate the data steward in their respective collaborative research project. Today, all four Clusters of Excellence, seven Collaborative Research Centers, and eight Transregios are attached to the MDSI – from microbiome to energy research, from quantum science to neutrino and dark matter research, from biomedical research to additive manufacturing.

Going beyond TUM core competences, the MDSI has been co-creating continuous education programs together with the TUM Institute for LifeLong Learning to promote data literacy of professionals and executives. We do this because without competences in modern data science, professionals will most likely not be able to stay competitive during their careers – regardless of their professional domain.

Likewise, we need to speed up the lengthy process of bringing AI literacy to high schools. We need to be even more active in developing classroom-ready AI resources for high school teachers – across subject areas. The MDSI, the Department of Educational Sciences and the new TUM Center for Educational Technologies creates a strong force field to deliver on this goal. I thank Prof. Enkelejda Kasneci for taking leadership in this role!

Dear colleagues, partners and friends, I am confident that the MDSI is on the right development track. We have the opportunity to make this institute a global brand institution standing for data science excellence, talent, and domain-specific impact. I want to invite all of you working at the MDSI to help make the MDSI globally visible, e.g. by naming it in your publications, grant proposals etc.

Today, I would like to express my gratitude to all who have contributed to this historic moment: the visionaries who conceived the institute, the researchers who are keen to enter the terra incognita. The students who are at the root of our efforts, and all partners/supporters – in particular our “Innovation” Minister Blume and his support by way of the HighTech Agenda Bavaria. You all helped the MDSI come to life!

Now, let us further shape the MDSI together in order for it to become a global brand institution known for its thoughtful leadership and its farsighted, data-enabled and collaborative impact.Thank you!