Munich Center for Machine Learning

ANNUAL REPORT 2024

Highlights, Achievements, Vision

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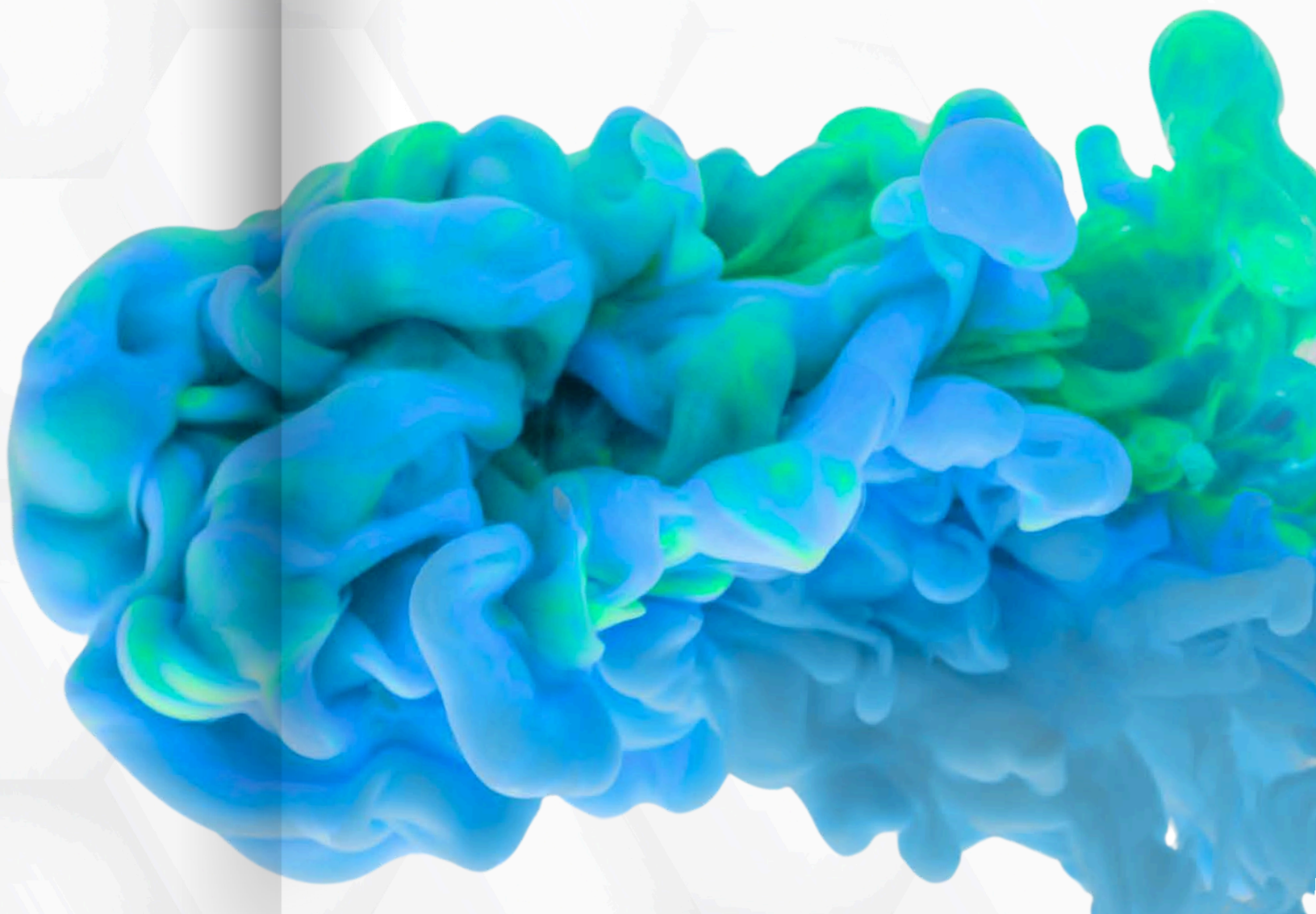


Dear Supporters and Members of the MCML,

The Munich Center for Machine Learning (MCML), as a joint initiative of the two Universities of Excellence, Ludwig-Maximilians-Universität München (LMU) and Technical University of Munich (TUM) was launched in 2018. After a project phase, the MCML has been reinforced as one of six institutionally funded AI competence centers — next to BIFOLD, DFKI, LAMARR, ScaDS.AI, and TUE.AI Center.

From the very beginning the MCML was a key player in the AI research landscape - starting small it has now grown to almost 400 members. With more than 400 publications at top conferences and journals throughout 2024, the MCML boosts the international visibility of Germany's AI research. Our goal is to continue strengthen a supportive environment for research and innovation.

With this report we want to give you an overview on MCML and some of the achievements of 2024 — awards, events, and the outstanding research successes. We have been collecting the outcomes throughout the year and are impressed by the amount. Aside the scientific results we had a high number of outreach activities that we are highlighting in this summary.

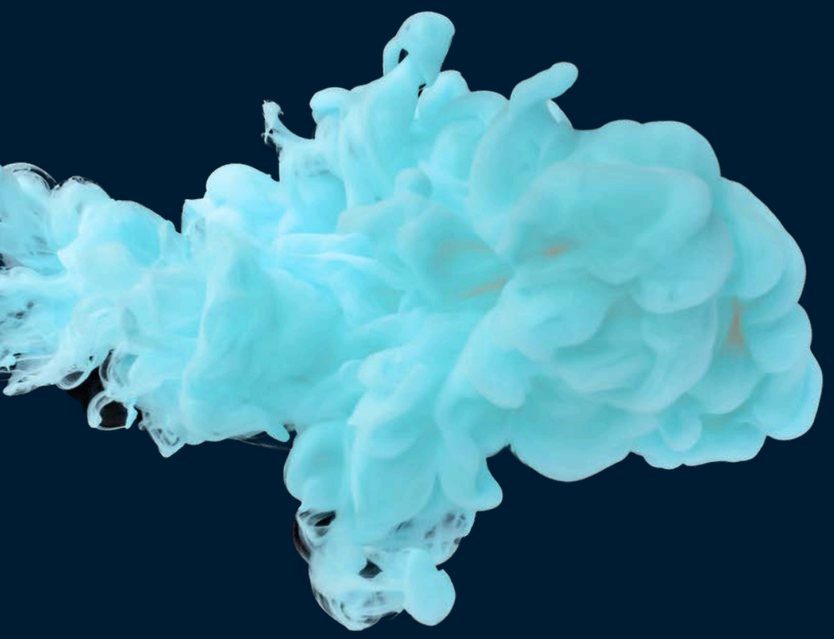
Thanks to all who contribute to the success of MCML.

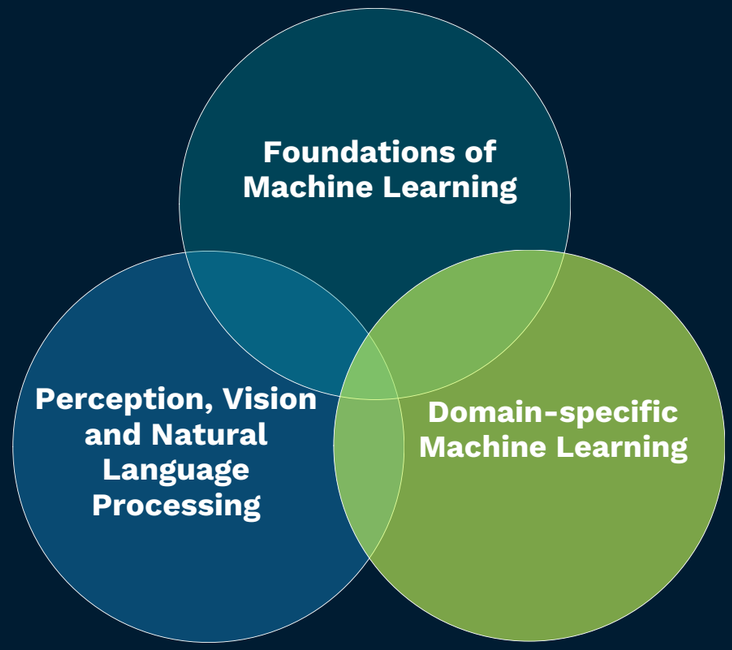
Sincerely,
Thomas Seidl, Daniel Cremers,
Bernd Bischl, Daniel Rückert,
and the whole Management-Team

INSTITUTIONAL OVERVIEW

The MCML unites top researchers from LMU and TUM to advance AI and ML through research, collaborations, and talent development, supported by an annual funding by the Federal Ministry of Education and Research as well as by the Ministry of Science and the Arts in Bavaria.

Our center encompasses eleven research areas in the fields of application-oriented machine learning and foundational research. More than 70 principal investigators — many involved in AI professorships funded by the Hightech Agenda Bavaria — and Associates, along with over 340 Junior Members conduct scientific research in these fields.





THREE RESEARCH AREAS

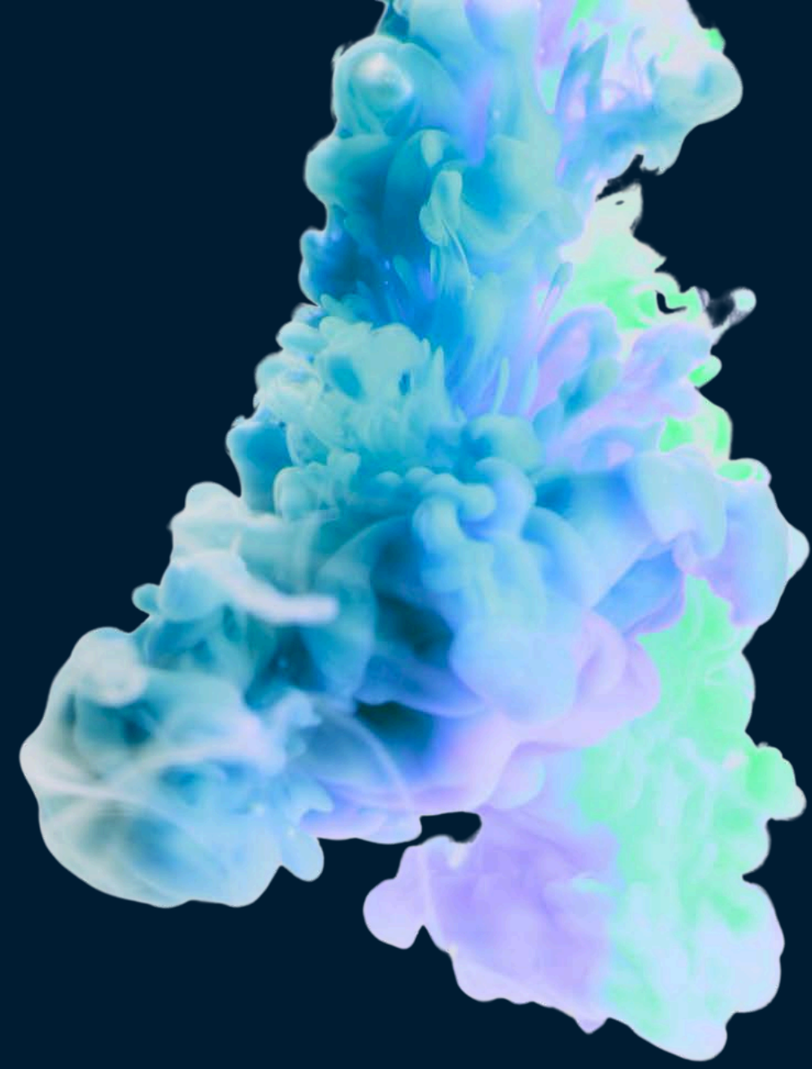
The research areas at MCML form the basis for methodological advances in machine learning, bridging computer science and cognitive science, and focuses on developing ML methods for application-oriented fields such as medicine, biology, and ethics.

At the heart of MCML's mission lies a dedication to excellence in foundational research while fostering regional, national, and international collaborations. Its efforts aim to translate cutting-edge AI potential into meaningful applications for science and industry.

OUTSTANDING RESEARCH

Around 200 papers at top conferences and more than 60 papers in highly ranked journals in 2024.

Discover our research featured in prestigious A and A* conferences and leading journals, showcasing innovation and impact across disciplines.



IEEE Xplore®

SPRINGER NATURE

EUROPEAN JOURNAL OF RADIOLOGY

BMC

JAIR Journal of Artificial Intelligence Research

Journal of Statistical Software

PLOS

Earth System Science Data
The data publishing journal

Radiotherapy &Oncology

NEURAL INFORMATION PROCESSING SYSTEMS

CVPR JUNE 17-21, 2024 SEATTLE, WA

ICML International Conference On Machine Learning

EMNLP 2023

uai2024

ECML PKDD 2024

AISTATS

CHI 2024

May 7-10 2024 PAKDD

AAAI

JAN 4-8 WACV 2024 WAIKOLOA HAWAII

ICLR

ACL 2024

PRIZES & AWARDS

MCML researcher received several awards and prizes in the last year. In this section, we are highlighting some of them.

LEIBNIZ PRIZE FOR DANIEL RÜCKERT

MCML Director Daniel Rückert received the Gottfried Wilhelm Leibniz Prize 2025. He is being honored for his research on AI-assisted medical imaging. The most important German research prize is endowed with 2.5 million euros by the German Research Foundation (DFG).

In addition, Daniel Rückert has been honored with the prestigious MICCAI Society's 2024 Enduring Impact Award, which recognizes Individuals who have made significant and lasting contributions to the fields of medical image computing and computer-assisted interventions. This award celebrates his exceptional achievements and influence in advancing medical imaging technologies, shaping the field, and fostering innovation over the years.

ISMAR CAREER IMPACT AWARD

Our principal investigator Nassir Navab has been honored with the ISMAR Career Impact Award. This prestigious recognition celebrates his exceptional contributions to the field of mixed and augmented reality, acknowledging his research, innovations, and lasting impact on this interdisciplinary domain.

TWO HUMBOLDT PROFESSORSHIPS

The Alexander von Humboldt Professorship is Germany's most prestigious international research award. The winners are selected through a highly competitive process. Qualifiers must play a pivotal and internationally visible role in shaping their field of research.

Recipients of the Humboldt Professorship take up a chair at the university that nominated them. Our two PIs Stefanie Jegelka, foundations of deep neural networks and Suvrit Sra, resource aware machine learning have been honored with this prestigious professorship.

SUCCESS FOR BJÖRN OMMER

In 2024, Björn Ommer received several awards: He was nominated for Deutscher Zukunftspreis, had the Opening Keynote at Neurips 24 in New Orleans, became co-chairman of the Bavarian AI Council, and received the "KI Innovationspreis" from Welt as well as the Eduard-Rhein-Foundation Technology Prize.

EVEN MORE AWARDS & PRIZES

Our members won outstanding prizes and grants in 2024. Here is an overview of some of them.

Our principal investigator Matthias Nießner has been awarded the prestigious ERC Consolidator Grant for his research in computer vision and machine learning. His work focuses on developing advanced methods for 3D reconstruction, visual computing, and AI-driven content creation, with applications ranging from virtual environments to realistic simulations.

Furthermore, our PI Alena Buyx, an expert in ethics and public health, was awarded the prestigious Order of Merit during the 2024 German Unity Day celebrations. The award, presented by Federal President Frank-Walter Steinmeier, recognizes her significant impact on societal issues.

Alexander Fraser is spearheading an important EU-funded project aimed at enhancing Large Language Models (LLMs). His research project focuses on improving the integration of lesser-spoken languages into LLMs, the AI-driven technology behind ChatGPT and similar chatbot platforms. This initiative will not only advance the technology but also explore its societal implications, ensuring that these advancements benefit the community.

The BMBF is funding two new joint projects with several MCML researchers involved. One teaches AI models causal relationships, including MCML PIs Stefan Feuerriegel (spokesperson of the project), Stefan Bauer, and Niki Kilbertus. The other refines the tactile abilities of robots, including MCML PIs Gitta Kutyniok and Björn Ommer.

In addition, the 'Capital' Magazine selected Zeynep Akata as one of its 'Top 40 Under 40'.

Our PI Julia Schnabel was awarded the Alfred-Breit-Prize of the German Radiological Society (Deutsche Röntgengesellschaft) for her work in the field of radiological imaging.

Moreover, Niki Kilbertus was awarded the Leopoldina Prize for Young Scientists for his research and teaching achievements.

MCML Junior Member Maria Matveev has been awarded the 2024 Engagement Award by the German National Academic Foundation (Studienstiftung des deutschen Volkes) for co-founding the online platform www.lern-fair.de. The educational platform Lern-Fair aims to address the disadvantages faced by socially weaker groups in our education system.

And MCML associate Steffen Schneider is young scientist of the year. Steffen and his team are developing machine learning algorithms to statistically model dynamic processes in biological systems.

This is just a glimpse of awards and prizes for our researchers in 2024.

MCML DISSERTATIONS

Congratulations to our PhD-students who successfully graduated in 2024.

Alexandra Chronopoulou.
Efficient multilingual and domain adaptation of language models under resource constraints.
Dissertation 2024. DOI
MCML PI: Alex Fraser

Konstantin Riedl.
Mathematical Foundations of Interacting Multi-Particle Systems for Optimization.
Dissertation 2024. URL
MCML PI: Massimo Fornasier

Christian Alexander Scholbeck.
Bridging gaps in interpretable machine learning: sensitivity analysis, marginal effects, and cluster explanations.
Dissertation 2024. DOI
MCML PI: Bernd Bischl

Azade Farshad.
Learning to Learn Neural Representations with Limited Data and Supervision.
Dissertation 2024. URL
MCML PI: Nassir Navab

Luke Haliburton.
Designing behavior change technologies for workplace wellbeing.
Dissertation 2024. DOI
MCML PI: Albrecht Schmidt

Hanna Krasowski.
Guaranteeing Complex Safety Specifications for Autonomous Vehicles via Reinforcement Learning with Formal Methods.
Dissertation 2024. URL
MCML PI: Matthias Althoff

Collin Leiber.
Clustering in transformed feature spaces by analyzing distinct modes.
Dissertation 2024. DOI
MCML PI: Thomas Seidl / Christian Böhm*
*former member of MCML

Katharina Röck.
Stochastic processes as surrogate models for dynamical systems in magnetic confinement fusion.
Dissertation 2024. DOI
MCML PI: Bernd Bischl

Victor Steinborn.
Multilingual and multimodal bias probing and mitigation in natural language processing.
Dissertation 2024. DOI
MCML PI: Hinrich Schütze

Philipp Wesp.
Application of machine learning in CT colonography and radiological age assessment: enhancing traditional diagnostics in radiology.
Dissertation 2024. DOI
MCML PI: Michael Ingrisch

Niklas Strauß.
Artificial intelligence for resource allocation tasks.
Dissertation 2024. DOI
MCML PI: Matthias Schubert

Maximilian Bernhard.
Deep learning methods for image recognition in remote sensing.
Dissertation 2024. DOI
MCML PI: Matthias Schubert

FOR MEMBERS:

If you finish your PhD this year and want your dissertation to be listed in our annual report, send the link to your dissertation via E-Mail to the MCML Management-Team and it will be included in the next report.

THE MCML BOARD OF DIRECTORS AND MANAGEMENT TEAM

The Management Team at MCML is responsible for the operational efficiency of the Center. The team collectively ensures MCML remains a well-structured and supportive environment for research and innovation. Get to know the team.

BOARD OF DIRECTORS

The MCML board of directors provide guidance and strategic direction for the center.

BERND BISCHL

DANIEL CREMERS

DANIEL RÜCKERT

THOMAS SEIDL

GENERAL MANAGEMENT

As General Managers, Elke and Alexandra are responsible for the overall administrative coordination of MCML. They oversee daily operations, manage institutional partnerships, and serve as the primary points of contact for researchers.

ELKE ACHTERT (LMU)

ALEXANDRA STANG (TUM)

OFFICE AND EVENT MANAGEMENT

Ellia: Manages administrative and event-related tasks.

ELLIA WAMESE
OFFICE MANAGER

SCIENCE MANAGEMENT

The Science Management team focuses on research communication, collaborations, and PhD program coordination.

- Thomas: Handles research collaborations, and coordinates the PhD program.
- Juliane: Manages our yearly Match-Making Call.
- Verena: Manages MCML's science communication and media activities.
- Daniela: Supports science communication and project management on a part-time basis

THOMAS MEIER
COLLABORATIONS & PHD COORDINATION

VERENA ALBRECHT
COMMUNICATION & MEDIA

JULIANE LAUKS
MATCH-MAKING

DANIELA PIELENHOFER
COMMUNICATION

PIs at MCML

The MCML has been expanding its membership numbers constantly. Here is an overview of all principal investigators (PIs) at our center.


ZEYNEP AKATA


MATTHIAS ALTHOFF


STEFAN BAUER


ULRICH BAUER


BERND BISCHL


ANNE-LAURE BOULESTEIX


ALENA BUYX


DANIEL CREMERS


ANGELA DAI


MATHIAS DRTON


STEFAN FEUERRIEGEL


MATTHIAS FEURER


MASSIMO FORNASIER


ALEXANDER FRASER


JULIEN GAGNEUR


STEPHAN GÜNNEMANN


REINHARD HECKEL


EYKE HÜLLERMEIER


MICHAEL INGRISCH


STEFANIE JEGELKA


GÖRAN KAUERMANN


NIKI KILBERTUS


FELIX KRAHMER


FRAUKE KREUTER


HELMUT KÜCHENHOFF


GITTA KUTYNIOK


STEFAN LAUTENEGGER


CHRISTIAN MÜLLER


THOMAS NAGLER


NASSIR NAVAN


MATTHIAS NIEßNER


SVEN NYHOLM


BJÖRN OMMER


BARBARA PLANK


HOLGER RAUHUT


PATRICK RINKE


DANIEL RÜCKERT


DAVID RÜGAMER


FABIAN SCHEIPL


VOLKER SCHMID

ALBRECHT SCHMIDT

JULIA SCHNABEL

ANGELA P. SCHÖLLIG

MATTHIAS SCHUBERT

BJÖRN SCHULLER

HINRICH SCHÜTZE

THOMAS SEIDL

SUVRIT SRA

FABIAN THEIS

NILS THUEREY

VOLKER TRESP

CHRISTIAN WACHINGER

RÜDIGER WESTERMANN

BENEDIKT WIESTLER

XIAOXIANG ZHU

RALF ZIMMER

Associates at MCML

Associates are scholars who are strongly affiliated with MCML research. These researchers explore key topics in core ML and AI and are making top contributions to advancing methodologies and concepts in these fields.


CHRISTOPH KERN


GEORGIOS KAISSIS


DANIEL GRÜN


THOMAS GABOR


VINCENT FORTUIN


DAVID EGGER


ANDREAS DÖPP


FELIX DIETRICH


TOM STERKENBURG


HELGE STEIN


PETER SCHÜFFLER


MICHAEL SCHOMAKER


STEFFEN SCHNEIDER


MARCUS PARADIES


SVEN MAYER


JOHANNES MALY


CHRISTIAN KÜHN


JOHANNES KINDER

OUR JUNIOR RESEARCH GROUPS

Within our funding formats for early career researchers, we established Junior Research Groups. The group lead will have the opportunity to conduct independent research and to lead and to supervise two PhD students. This format offers a promising opportunity to foster research output. Get to know our current research groups.

ETHICS OF AI

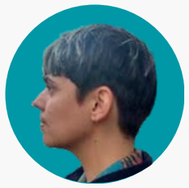
Ben Lange leads the MCML Junior Research Group 'Ethics of Artificial Intelligence' at LMU Munich.

He and his team conduct research into fundamental and application-related ethical issues relating to AI and ML. They deal with fundamental and practical questions of AI ethics from a philosophical-analytical perspective. By organizing conferences, workshops and panel discussions, the group aims to enter into an interdisciplinary exchange with researchers from philosophy and other disciplines. An important focus here is also communication with the wider public about the moral and social aspects of AI. Another important task of the JRG is the transfer of philosophical-ethical findings and results into practice, for example through collaborations and dialogue with industry and society.

JRG ETHICS OF AI

BENJAMIN LANGE

ANNA-MARIA BRANDTNER



JESSE DE JESUS DE PINHO PINHAL

AI IN VISON

Martin Menten leads the MCML Junior Research Group 'AI for Vision' at TU Munich.
He and his research group specialize in machine learning for medical imaging.

DR. MARTIN MENTEN

LUCIE HUANG

Supported by DFG funding, their research focuses on weakly and self-supervised learning to address data scarcity in healthcare and the integration of multimodal clinical data with medical images. In particular, they are interested in the development and application of machine learning and computer vision algorithms in the field of ophthalmology.

MULTI-MODAL LEARNING

Almut Sophia Koepke leads the MCML Junior Research Group 'Multi-Modal Learning' at TU Munich, funded as a BMBF project.
She and her team conduct research into multi-modal learning from vision, sound, and text.

ALMUT SOPHIA KOEPKE

DANIIL ZVEREV

They focus on advancing video understanding, with an emphasis on capturing temporal dynamics and cross-modal relationships. To achieve this, they aim to improve the combination of information from various modalities within learning frameworks. Furthermore, they are exploring how to adapt large pre-trained models for audio-visual understanding tasks.

HUMAN-CENTERED NLP

Michael Hedderich leads the MCML Junior Research Group 'Human-Centered NLP' at LMU Munich.

His team's research covers the intersection of machine learning, natural language processing (NLP) and human-computer interaction. Human factors have a crucial interplay with modern AI and NLP development, from the way data is obtained, e.g. in low-resource scenarios, to the need to understand and control models, e.g. through global explainability methods. AI technology also does not exist in a vacuum but must be validated together with the application experts and stakeholders it should serve.

The group explores these questions from different perspectives, taking the lense of machine learning, natural language processing and human-computer interaction. By embracing these diverse perspectives, the researcher value how each viewpoint enriches the understanding of the same issues and how different skill sets complement one another.

MICHAEL HEDDERICH

FLORIAN EICHIN

RAOYUAN ZHAO

THOMAS BAYES PROFESSORSHIP

Matthias Feurer is a Thomas Bayes Fellow of MCML and Interim Professor at the Chair of Statistical Learning and Data Science at LMU Munich.

His research focuses on simplifying machine learning for domain scientists and experts by developing automated machine learning (AutoML) tools for hyperparameter optimization, meta-learning, and model selection.

MATTHIAS FEURER

JUNIOR REPRESENTATIVES

Our four junior member representatives act as a bridge between the MCML directors/management team and the large cohort of junior members. They are elected by the junior members for a three-year term. One of their tasks is to organize activities and networking opportunities for the MCML junior members, and serve as a point of contact for any junior members seeking support.

AZADA FARSHAD

MARIA MATVEEV

IVICA OBADIC

CLARA SOPHIE VETTER

DIVERSITY, EQUITY AND INCLUSION REPRESENTATIVES AT THE MCML

The diversity representatives work on measures to increase diversity, equity and inclusion among researchers. At this year’s General Assembly, the MCML members voted for our diversity representatives and we are happy to announce that for LMU Jesse de Jesus de Pinho Pinhal as well as Philip Boustani (substitute) and for TUM Anika Spiesberger have been elected.

JESSE DE JESUS DE PINHO PINHAL

PHILIP AMIR BOUSTANI

ANIKA SPIESBERGER

SCIENCE COMMUNICATION

Showcasing MCML research on the MCML website as well as social media and working together with the media is an essential component for making research results visible, and supporting the dialogue between science, politics, and society.

Media

Working together with the media is essential to contribute to a better understanding of the role of AI in the world and help shape its development responsibly.

Several MCML researchers have been present in the media. Topics included new possibilities of AI and what dangers it might bring, the rise of fake news or an assessment of Deepseek.

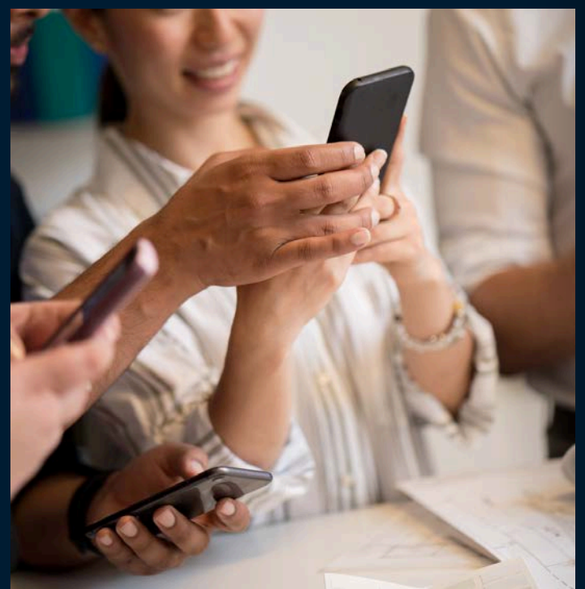
MCML Blogsection

On the newly established MCML blog, we highlight research papers and showcase short interviews with our MCML junior members.

FOR MEMBERS:

WANT TO WORK WITH THE MEDIA OR SHOWCASE YOUR WORK ON OUR CHANNELS?

Get in contact with our Science Communication Team. It helps to communicate your work in an understandable way and provides support in cooperating with the media.



WORKSHOP ON EPISTEMIC FOUNDATIONS AND LIMITATIONS OF STATISTICS AND SCIENCE

THE REPLICATION CRISIS - LISA WIMMER, MORITZ HERRMANN, PATRICK SCHENK

The Open Science Initiative in Statistics - which is part of the Open Science Center at LMU - and the MCML hosted a workshop about epistemic foundations and limitations of statistics and science. The event brought together researchers from diverse fields to discuss one of science's most pressing challenges: The replication crisis. While the crisis is often attributed to systemic issues like "publish or perish" incentives, the discussions highlighted an overlooked culprit: a lack of understanding and acknowledgment of the epistemic foundations of statistics.

After the workshop, our MCML members Lisa Wimmer, Moritz Herrmann and Patrick Schenk wrote a blog post with their thoughts on the topic.

Statistics suffers from a replication crisis

The fact that Statistics, as a field, is undergoing a replication crisis might seem puzzling at first. More applied disciplines like Psychology have been known for producing results that don't replicate (i.e. prompt the same scientific conclusions). Much of this has been attributed to researchers' misconception about complex statistical entities, such as the notorious p-value, but surely this can't be a problem for statisticians themselves? Unfortunately, our field suffers from many of the same issues that have tripped others. For one, the pressure to publish enforces a tendency to emphasize positive results–in the sense of successful methods–while negative results, which are still valuable to the community, remain in the file drawer.

A more worrying aspect is that good scientific practice has proven hard to adhere to even with the best of intentions. As the famous physicist Richard Feynmann put it: “The first principle is that you must not fool yourself — and you are the easiest person to fool.” We argue that fields like Statistics and machine learning need to revisit epistemic foundations and limitations, educating ourselves and others about the principles of empirical sciences.

Neither big data nor large models are going to solve the crisis

The foundations for today’s powerful statistical models were laid in the latter half of the past century. New mathematical insights and a leap in available computing power have brought into existence AI agents that people increasingly look to as their companions. Their dazzling capabilities, however, mask the brittleness of their theoretical underpinnings.

«New mathematical insights and a leap in available computing power have brought into existence AI agents that people increasingly look to as their companions.»

Anecdotes of, e.g., ChatGPT hallucinating to give dreadfully wrong answers, or AI turning racist, are abundant. Such undesirable effects occur due to faulty development processes: models overfitting to toy datasets, black-box algorithms picking up spurious patterns and producing surprising outcomes, or an omission to incorporate all relevant sources of uncertainty that inevitably enters the data way before they are used to build models. These examples already hint at the complexity of the endeavor – it is simply very easy to miss relevant aspects and make mistakes at some point along the way.

In this conundrum, some turn to Big Data as the savior of us all. Can’t we create an appropriate representation of the world if we just feed our models enough data? Sadly, the answer is no for two reasons at least. First, a well-established result of learning theory states that there can be no learning without inductive biases, i.e., some assumptions we are willing to make about the nature of the data-generating process (otherwise, we could build one model to rule them all and abolish the field of Statistics altogether). Second, it can be shown that data pooled from multiple sources–as is the case in many instances of Big Data–rarely give rise to a well-defined joint probability distribution. In other words, data cobbled together from different corners of the internet don’t tell a coherent story. This may be exacerbated in the future by the incestuous evolution of training data that is to be expected from addressing the perennial data shortage with AI-generated imitations.

With so many unresolved issues, society risks being carried away on an enthusiastic wave of adopting technological progress when the foundations of this progress remain shaky. All this means that our field must continue to strive for excellence in scientific principles – sometimes this includes taking a step back and thinking about whether we too have been swept into the wrong direction. Science is a cumulative endeavor in which researchers ought to be able to rely on previous results. We can only achieve this by holding ourselves to the highest-possible standards. Otherwise, we’re building a house of cards.

We need clarity about concepts more urgently than procedures and formalism

Alas, scientists (and perhaps statisticians in particular) are prone to get bogged down in discussions about methodological details. What we actually need is conceptual clarity as discussed by Herrmann et al. (2024). Take the example of reproducibility.

«What we actually need is conceptual clarity.»

Our field broadly seems to consider computational reproducibility, i.e., the guarantee to produce the exact same numerical results when re-running experiment code, necessary and sufficient to tick off replicability. While computational reproducibility is frequently desirable, making it the sole yardstick falls desperately short of good scientific practice. Program code typically stands at the end of a long succession of design choices. Decisions about research questions (which often conflate exploratory and confirmatory endeavors), model classes, datasets, evaluation criteria, etc. heavily influence the scientific conclusions we can draw. Any two studies about the same research questions must be expected to differ due to assumptions in varying degree of violation alone.
It doesn’t help that scientific progress is often judged by one-dimensional metrics. “When a measure becomes a target, it ceases to be a good measure” has become known as Goodhart’s law. If p-values below 5 % or above-baseline values of accuracy signal scientific quality, it’s not surprising that researchers work towards those indicators more than actual knowledge gain. The abstraction provided by quantitative methods is actually a core virtue of Statistics, with numbers as a lingua franca for people from any scientific (or social, geographical, temporal) background.
We need to make sure,
however, that quantification doesn’t lead to oversimplification, decontextualization, and measure hacking.

This is all the more important in our current geopolitical landscape. Contrary to what naive realism or positivism would have us believe, Statistics doesn’t operate in a vacuum devoid of social processes. We have a responsibility to take into account the circumstances under which data have been generated, the personal perspectives shaping our scientific work, and, ultimately, the implications of employing our models in decision-making.
From our discussions we infer a number of opportunities to save our field from the looming replication crisis. Statistics is not isolated from social processes; we must consider data generation contexts, personal biases, and the impact of our models. To address the replication crisis, we should distinguish between exploratory and confirmatory research, improve infrastructure, and promote education to prevent questionable practices. With better incentives and initiatives like our workshop, we hope to drive positive change. So, statisticians, roll up your sleeves, there’s a crisis to be solved (freely adapted from Seibold et al., 2021), or more generally, we really need to rethink how we do empirical research in machine learning, statistics and beyond (Herrmann et al., 2024) to overcome the challenges discussed during the workshop.

RESEARCH INTERVIEW: JESSE GROOTJEN

MCML Junior Member Jesse Grootjen is writing his doctoral thesis at the Chair of Human-Centered Ubiquitous Media at LMU Munich. The group conducts research at the crossroads of human computer interaction, media technology, and ubiquitous computing. The overall research question is: how can we enhance human abilities through digital technologies?

What is your research about?
I'm not sure if you wear contacts or glasses or if you have ever worn them. But if you have, you probably realized at some point that you could no longer read the subtitles of a movie or see what's on the slides during a lecture. At this point you would visit an optician to get your eyes checked and resolve your sight with glasses. You might eventually have found out you have been walking around with progressively worsening eyesight for months or even years. This is because you're good at compensating for the loss of sight. In the case of myopia (nearsightedness; the example of needing glasses for seeing subtitles) you'll end up squinting your eyes to be able to see things in the distance. Now for myopia, this is relatively easy to resolve. But for other visual impairments like cataracts (cloudy area in the lens of your eye), age-related macular degeneration (loss of central vision) or glaucoma (loss of peripheral vision) it is either permanent damage with regular treatment requirements or needs surgery to get back to normal vision. My research focuses on understanding how these compensation strategies look in terms of eye movements and whether machine learning can be used as an early detection tool. This approach could enable earlier treatments for individuals with visual impairments, helping to preserve as much of their vision as possible.

In what ways does machine learning enhance early detection of visual impairments?
The advantage of ML is that we can train models to recognize mitigation strategies we use to compensate for visual impairments really early, and deploy them in everyday devices. An example is that we could leverage the power of a webcam (or front-facing camera on your phone) in the future to recognize these compensations while you're a device user and don't get interrupted. We can analyze your eye movements while you're reading or texting and give you a message if our model detects something is off. These types of early warnings are something that the Apple Watch already does with heart rate.

What challenges do you face in using machine learning to detect subtle changes in eye movements associated with early stages of visual impairment? How accurate are current models in identifying these early signs?
I believe we're still far away from actually deploying these kinds of systems on everyday devices. For our current research, we are using high-quality and high-frequency eye trackers, and we've only been able to work with a couple of patients and visual simulations of visual impairments. Finding individuals at an early stage is difficult as most people are simply unaware at that stage. However, working with visual simulations of macular degeneration and training those without visual impairments to develop a preferred retinal locus (similar to one that could be developed as a mitigation strategy for someone with macular degeneration) has provided us with some interesting first results that highlight the potential. Moving from a lab setting in a highly controlled environment to webcams or front-facing cameras however opens many challenges, like changing lighting conditions, frequency, resolution, and many more.

How adaptable is your machine learning model to different visual impairments, like cataracts, glaucoma, or age-related macular degeneration? Are there unique challenges in creating models that can generalize across these conditions?
Currently, we are developing individual models for the different visual impairments. There are some unique challenges to creating a generalizable model encompassing all visual impairments, which are twofold. The first challenge is that visual impairments might have overlapping ways of manifesting. An example of this is the loss of visual acuity that is associated with cataracts, glaucoma, and myopia. The second challenge is even larger. Glaucoma for example generally consists of loss of visual acuity, loss of contrast, a shift in color, sensitivity to light, and depending on which version of glaucoma one might experience the loss of peripheral vision.

«This approach could enable earlier treatments for individuals with visual impairments, helping to preserve as much of their vision as possible.»

Although we have interviewed many individuals who only mention being affected by a subset of these, where one person with Glaucoma might experience the loss of visual acuity, loss of visual acuity, and sensitivity to light, the next person could have neither but will experience the color shift and has loss of peripheral vision.

What advice would you give to others considering doing their PhD/PostDoc in Munich?
I think there is lots of advice to give, but most importantly, make sure you like the people in the group you're considering to join and you like the topic. In the end you'll end up spending 3-5 years of your life there and spending it on a topic you like makes the whole PhD a lot easier.

FOR MEMBERS:

WANT TO PRESENT YOUR RESEARCH?

Get in touch with our Science Communication Team.

RESEARCH INTERVIEW: ANNA REITHMEIR

MCML Junior Member Anna Reithmeir is writing her doctoral thesis at the Chair of "Computational Imaging and AI in Medicine" at TUM. Her work addresses the complexity of aligning images from different times or modalities, enabling the comparison of anatomical changes such as tumor growth.

Tell us more about the focus of your research, Anna.
For my doctoral research, I am focusing on Computer Vision and Medical Imaging. Specifically, I am working on the registration of medical images, such as MRI or CT scans. Registration is when you align images - that have been taken at different times - to make them comparable. This allows us to observe how the body has changed over time, for example, how a tumor has grown. While this might sound straightforward, it is a quite complex problem. I focus on regularization of the registration process to incorporate additional knowledge, such as physical information about the body, how it moves, how organs move, and which anatomical structures are present. An emerging approach to effectively regularize this optimization problem is to use AI.

Can you specify a little bit: Why is it so complicated to compare two tumor images? And where does your research come into play?
When aligning two images of different modalities such as a CT image to an MR image, some anatomical structures are better visible in the one image than in the other. Also, image registration is an inherently under-defined problem, meaning that often there is not one but multiple optimal solutions. This is why one needs regularization, which incorporates desired deformation properties in the optimization. However, human body motion is very complicated and generally there is no ground truth information available. Here, my research comes into play:

«My research explores how suitable regularization can be learned in an unsupervised manner from a set of training images.»

What is the benefit of additional knowledge about physical information regarding the body? How can this be studied?
Precise registration is essential for clinical downstream tasks. Physical knowledge about anatomical structures, such as their material and deformation properties help the registration in finding an anatomically plausible solution. A simple example is that bones generally move rigidly while soft tissue can deform non-linearly. Naturally, such properties should be reflected in the obtained deformation. This gets even more difficult for the registration of pre- and post-operative images, where regions of the body have been removed, or contrast-enhanced images, where a contrast agent spreads throughout the body. Other challenges are that physical properties are highly patient-specific and not straightforward to model, and the lack of open-source data.
In my research I study this problem in close collaboration with the radiology department of the Klinikum Rechts der Isar. This gives me the opportunity to develop physiologically accurate regularization methods and also to evaluate novel methods on real medical data.

To what extent is AI already being used in practice in medicine?
In my experience, the research on AI in medical image registration and medical imaging in general is growing and advancing quickly. But I have the feeling that the transfer to clinical practice is still in its infancy. For example in terms of registration, radiologists still manually compare two 3d image volumes by scrolling through the images.

What do you like most about your field of research?
In the medical field, it's especially rewarding to have a direct positive impact. You know that the problems you're working on are genuinely beneficial to society. Also, I see a strong need for digitalization and technological innovation in the clinics and I am very happy to contribute to that.

What are your academic and personal goals?
There are two goals. On the research side, I would like to develop novel methods that advance image registration, possibly with the help of AI, though not necessarily. Ideally, I would apply and evaluate these methods in the clinical context. My personal goal is to learn how to make complex research understandable to others, especially to young people or those not (yet) involved in computer science research.

Have you already done something in this regard?
Last semester, I gave a seminar that I completely redesigned from scratch, with a colleague of mine. I really liked this whole process –from structuring the seminar to guiding the students to a successful final poster presentation. Through the MCML, I also organized a workshop for Girl's Day last year. I also participated in a school workshop to give students some insights into research work and AI in general.

When you are not conducting research, how do you spend your free time in Munich?
Munich is a really beautiful city and I am really enjoying it here. When I'm not researching, I'm either spending time at the Isar, climbing, or cycling in the mountains on my road bike. You just have to take advantage of having the Alps right on your doorstep!

RESEARCH INSIGHT BLOG

CHATGPT IN RADIOLOGY: MAKING MEDICAL REPORTS PATIENT-FRIENDLY?

Radiology reports are often too complex for patients to understand. Filled with complex terminology and specialized jargon, these reports are primarily written for medical professionals, often leaving patients struggling to make sense of their diagnoses. Just weeks after ChatGPT's release, our PI Michael Ingrisch's team launched a study on using AI to simplify them. The study has now also been published in European Radiology

The Study: ChatGPT as a Medical Teacher

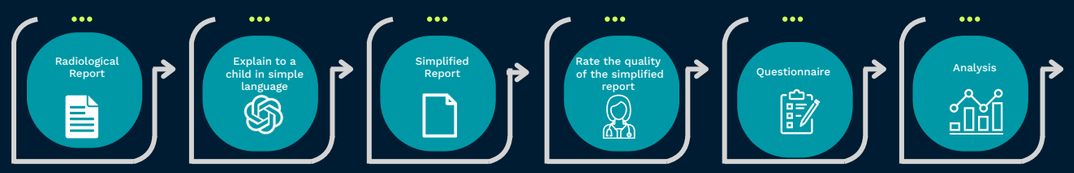
The research team, including MCML Junior members Katharina Jeblick, Balthasar Schachtner, Jakob Dexl, Andreas Mittermeier, Anna Theresa Stüber and Philipp Wesp as well as MCML PI Michael Ingrisch explored whether ChatGPT could effectively simplify radiology reports while preserving factual accuracy. They took three fictitious radiology reports and asked ChatGPT to rewrite them in accessible language, as if explaining them to a child.

Then, 15 radiologists evaluated these simplified reports based on three key factors:

- **Factual correctness** – Did ChatGPT get the medical facts right?
- **Completeness** – Did it include all the relevant medical information?
- **Potential harm** – Could the simplified reports mislead patients or cause unnecessary worry?

«ChatGPT, what does this medical report mean? Can you explain it to me like I'm five?»

The Workflow of the exploratory case study.



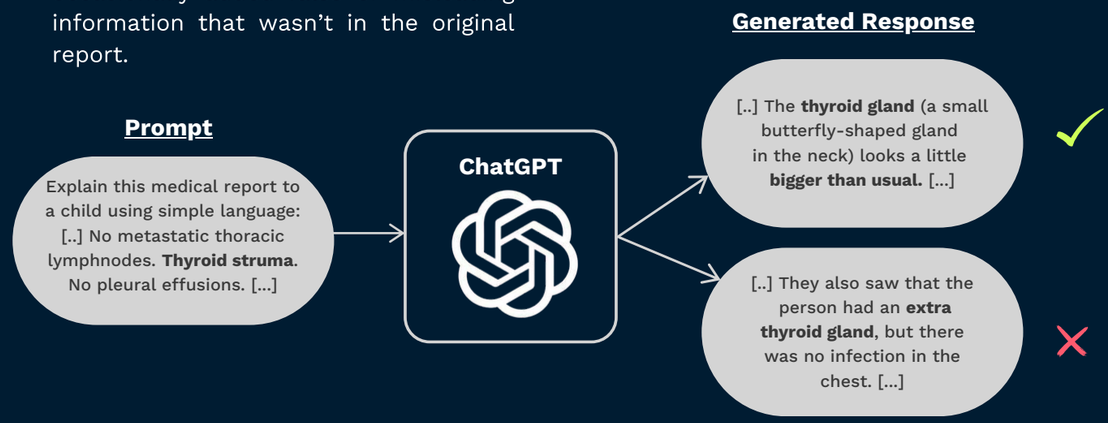
The Results: Promise with a Side of Caution

The radiologists found that, in most cases, ChatGPT-produced reports were factually correct, fairly complete, and unlikely to cause harm. This suggests that AI has the potential to make medical information more accessible. However, there were still notable issues:

- **Misinterpretation of medical terms** – Some simplified reports changed the meaning of critical terms, leading to potential misunderstandings.
- **Missing details** – Important medical findings were sometimes omitted, which could mislead patients.
- **AI "hallucinations"** – ChatGPT occasionally added false or misleading information that wasn't in the original report.

With further improvements and medical oversight, AI-powered text simplification could revolutionize how patients engage with their health information—making medicine easier to "swallow" for everyone.

«While further quantitative studies are needed, the initial insights of this study unveils a tremendous potential in using LLMs like ChatGPT to improve patient-centered care in radiology and other medical domains.»



Example of hallucination: Even when responses sound plausible, the content does not need to be true, shown in the response on the bottom.

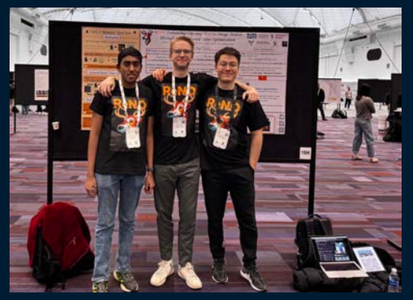
What's Next?

The study highlights a huge opportunity for AI to bridge the gap between complex medical language and patient understanding. However, it also emphasizes the need for expert supervision. AI-generated reports should not replace human interpretation but rather serve as a tool for doctors to enhance patient communication.

K. Jeblick, B. Schachtner, J. Dexl, A. Mittermeier, A. T. Stüber, J. Topalis, T. Weber, P. Wesp, B. O. Sabel, J. Ricke and M. Ingrisch.
ChatGPT makes medicine easy to swallow: an exploratory case study on simplified radiology reports.
European Radiology 34 (May. 2024).

RESEARCH INSIGHT BLOG

ReNO: A Smarter Way to Enhance AI-Generates Images



Despite their capabilities, Text-to-Image (T2I) models often misinterpret detailed prompts, causing errors in object positioning, attributes, and colors. Traditional fixes require costly retraining and may not generalize well. To address this, our Junior Members—Luca Eyring, Shyamgopal Karthik, and Karsten Roth—along with PI Zeynep Akata and collaborator Alexey Dosovitskiy (inceptive), propose Reward-based Noise Optimization (ReNO).

The Challenge: When AI Gets It Wrong

Recent advancements in T2I models have significantly improved AI-generated visuals, yet challenges remain when it comes to complex compositions, fine details, and spatial accuracy. For example, when asked to generate “a blue scooter parked near a curb in front of a green vintage car”, many models might struggle with correct object placement, resulting in overlapping or misplaced elements. Fixing these issues traditionally requires costly retraining for incremental improvements.
Another key issue is reward hacking—a phenomenon where AI models optimize for high reward scores without truly improving image quality. This happens when a reward model favors certain characteristics, leading the AI to exploit shortcuts instead of genuinely following the prompt. This can result in images that score well on automated evaluations but fail to meet human expectations.

To address these challenges, the authors propose ReNO (Reward-based Noise Optimization), a solution that enhances image generation without costly model retraining. ReNO refines the initial noise using signals from one or multiple human preference reward models, improving spatial accuracy and object placement to produce more coherent and visually accurate outputs.

Example Prompt: “A blue scooter parked near a curb in front of a green vintage car”

Generated image with an object positioning error. The green vintage car is far too far away.

ReNO refinement with correct positioning of the green vintage car.

The ReNO Approach: Smarter Noise, Better Results

ReNO enhances image generation at inference time by optimizing the starting noise. Instead of altering the model itself, ReNO fine-tunes the initial noise using reward models—AI systems trained to evaluate image quality and prompt adherence. This iterative optimization process refines compositions, improves object rendering, and enhances overall image coherence while maintaining computational efficiency.

«Within a computational budget of 20-50 s, ReNO-enhanced one-step models consistently surpass the performance of all current open-source T2I models.»

To mitigate reward hacking, ReNO combines multiple reward objectives, preventing the system from over-optimizing for any single metric. This ensures a balanced approach where images are both aesthetically pleasing and faithful to their prompts.

Qualitative Results of two different one-step T2I models with and without using ReNO over the prompt:
“A curious, orange fox and a fluffy, white rabbit, playing together in a lush, green meadow filled with yellow dandelions”

@L.Eyring et al.

PixArt-a DMD

@L.Eyring et al.

PixArt-a DMD + ReNO

@L.Eyring et al.

SD-Turbo

@L.Eyring et al.

SD-Turbo + ReNO

Key Benefits of ReNO

- Improved Prompt Adherence – Ensures better alignment between text descriptions and generated images.
- Efficient Performance – Works within a 20-50 second processing window, making it practical for real-world use.
- Competitive Results – ReNO-enhanced images outperform major open-source models

The Future of AI-Driven Creativity

ReNO demonstrates that enhancing AI-generated images doesn’t require extensive model retraining. By focusing on noise optimization, it provides a practical, efficient, and scalable solution for improving T2I performance. This innovation could lead to more accessible, high-quality AI art tools.

L. Eyring, S. Karthik, K. Roth, A. Dosovitskiy and Z. Akata.
ReNO: Enhancing One-step Text-to-Image Models through Reward-based Noise Optimization.
NeurIPS 2024 - 38th Conference on Neural Information Processing Systems. Vancouver, Canada, Dec 10-15, 2024.

BE PART OF AI X-CHANGE

Our newly established AI X-Change program aims to support PhD-students at MCML to collaborate internationally with high-impact research institutions in the field of machine learning.

The MCML offers its junior members valuable initiatives to promote their professional and academic development, as well as to enhance research and collaboration within the community.

HOW TO APPLY

PhD-students who plan a research exchange at a well-acknowledged institution in their field of research are invited to apply for funding. Each year, the MCML supports up to twelve research projects abroad.
The aims of the research visit should be a joint paper or the development of research projects that result in joint funding applications.

FOR MEMBERS:

Start Application: March 2025

- **12 spots** per year for PhD students.
- **2 application** deadlines
- **Objectives**: joint paper, development of research projects that result in joint funding applications.

REPORT OF MAOLIN'S EXPERIENCE WITH AI X-CHANGE

Research Collaboration Between MCML and Stanford University: MCML Junior Member Maolin Gao exchange visit was a pilot for the MCML AI X-Change program. During his three-months stay in Stanford, Maolin represented TUM's Computer Vision Group while collaborating with Stanford's Geometric Computing Group on geometry and machine learning. After, he wrote an article about his research stay and the project he worked on.

MOALIN GAO'S EXPERIENCE AT STANFORD

In summer 2024, I represented TUM's Computer Vision Group (Prof. Daniel Cremers) in a research collaboration with Stanford's Geometric Computing Group (Prof. Leonidas Guibas). Over three months, we explored geometry and machine learning, launching projects to push the state of the art. Our findings will be submitted to top computer vision and graphics venues. This collaboration is supported by MCML AI X-change and BaCaTeC.

ADVANCING NON-RIGID SHAPE MATCHING WITH EQUIVARIANT NETWORKS

Non-rigid shape matching is crucial in vision and graphics, with applications in archaeology, medical analysis, and robotics. Traditional methods rely on either pre-alignment (prone to errors) or intrinsic handcrafted features (losing geometric details).
We introduce an equivariant learning approach inspired by vector neurons (Deng et al.), using SO(3)-equivariant networks to learn orientation-aware feature fields. This method eliminates pre-alignment, handles shape symmetries, and enables learning from large 3D datasets.

WHY IT MATTERS

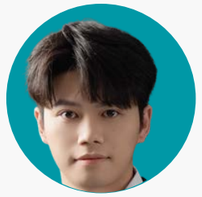
Our approach bridges intrinsic and extrinsic shape features, unlocking:

- Robust shape matching without pre-alignment
- Applications in deformation analysis, classification, and design

This work paves the way for new advancements in shape understanding across diverse fields.

MCML JUNIOR MEMBERS AT CONFERENCES

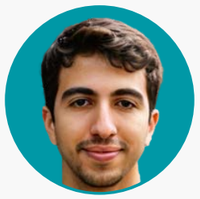
In 2024, our Junior Members went on several conferences around the world to connect with researchers nationally and internationally. We were able to fund the travel expenses. Here are some quotes after their successful stays.



«During the conference I was also able to attend numerous presentations and NLP research and make contacts with NLP researchers from all over the world.
This enriching experience broadened my horizons and encouraged me to enjoy the world of research to the full.»
(Bolei Ma - EACL 2024)

«Attending LREC–COLING and the associated workshops was a great opportunity for meeting natural language processing (NLP) researchers working on similar topics as me (processing low-resource and/or dialectal language varieties), as well as for exploring related work for my upcoming projects on speech processing.»
(Verena Blaschke - LREC–COLING 2024)

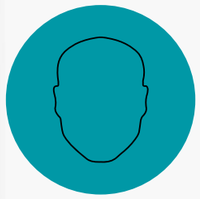
«I gave a presentation that I really enjoyed (both the preparation and the presentation itself). Especially as the project was still very much in its infancy at the time, the preparation really helped me to familiarise myself with the topic and work out a suitable structure.»
(Milena Wünsch - Biometrisches Kolloquium Lübeck)



«Overall, the LREC conference was a great success for me. It allowed us to share our findings and connect with other researchers, an achievement made possible by the support and funding from MCML.»
(Amirhossein Kargaran - LREC–COLING 2024)

«I would like to take this opportunity to express my gratitude to MCML for enabling my participation in ACL, and I am excited to continue contributing to the success of our MCML research community.»
(Ercong Nie - ACL 2024)

«Overall, the trip has been a rewarding experience. The conference allowed me to connect to some other researchers in my research field and I learned a lot from works presented by others at the conference.»
(Haotian Ye - NAACL 2024)



«I believe my participation in ECML PKDD 24 was beneficial for both me and my research. Overall, the trip was highly successful. It brought me several new research ideas as well as contacts that may lead to future collaborations. I am very grateful for the support and opportunity provided by MCML.»
(Philipp Jahn - ECML PKDD 2024)

«The MICCAI 2024 Conference was an enriching experience, providing valuable feedback on my work and exposure to advancements in the field. The insights and connections gained will benefit my future research.»
(Stefan Fischer - MICCAI 2024)

FOR MEMBERS:

MCML provides travel funding for all members presenting papers with an MCML affiliation at conferences. You can find more info on how to apply for this on the MCML Collab site.

OUR PHD PROGRAM

A major goal of MCML is to foster PhD talent. To achieve this, we have an annual call in the fall for fully funded PhD positions. Our aim is to attract the best talent to our center to enable excellent research. Besides this, we offer several activities for young researchers to participate.

OUR MATCH-MAKING CALL

PhD positions at the MCML are open to highly qualified candidates interested in a career in machine learning research. Positions include full stipend support and the opportunity to work in a dynamic and international research environment. This year we had 1190 applications for the Match-Making Call.

Next to our fully funded PhD-students we offer young researchers from our PIs to affiliate with the MCML. All doctoral candidates can profit from travel expenses support, networking and extracurricular activities equally.

COMMUNITY ENGAGEMENT

Further, we organize regular internal Pitchtalk meetups with the aim of connecting our members, we offer an onboarding event for our new PhD students at the beginning of each semester.
Once our PhDs complete their studies, we provide a specialized and individually tailored MCML PhD certificate, where each PhD student's extracurricular activities for MCML are mentioned.

EXTRACURRICULAR TRAININGS

For our PhD students, we offer a wide range of extracurricular activities. MCML has a regular "Stammtisch", fostering the community building and research collaborations, we visit Industry Partners on a regular basis, in our series "MCML Pitchtalks with Industry".

In addition, we collaborate closely with the LMU Graduate Center and TUM Graduate School, where our PhDs are affiliated and can take extra workshops and trainings for their career development.

MCML GENERAL ASSEMBLY

In Fall 2024, MCML researchers celebrated collaboration with talks, Junior Flash Talks, and networking opportunities at the General Assembly.

A SHORT RECAP

On November 4, 2024, members of the MCML gathered at the Bavarian Academy of Sciences and Humanities (BAdW) for the annual General Assembly. This event provided a platform to exchange ideas, showcase major initiatives, and strengthen connections within the community.

The assembly began with an address by the MCML directors, who highlighted the center's achievements over the past year. In addition, the members voted for new diversity representatives.

FOR YOUNG RESEARCHERS

During the Flash Talks session by MCML's junior members, the young researchers shared their projects, offering insights into their ideas and practical applications of machine learning.

The event concluded with a relaxed coffee break and networking session, creating an opportunity for informal conversations.

FOR MEMBERS: NEXT GENERAL ASSEMBLY IS IN FALL 2025

PITCHTALKS 2024

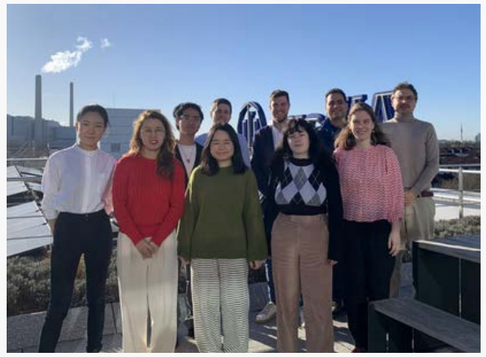
As part of its collaboration formats with industry, the MCML organizes Pitchtalk meetups with selected companies on a regular basis.

SE3 Labs, Allianz Technology & MunichRe

With our series pitchtalks with industry, we aim to provide our junior members a platform where they can connect with selected companies and gain insights into the professional world they will eventually enter as AI experts.
Second, through carefully curated meetups, we lay the groundwork for larger collaboration formats between MCML and the industry. Third, this helps nurture and expand the MCML ecosystem.

SE3 Labs

With the company se3labs, we started our new event series „MCML Pitchtalks with Industry“ on November 13th. We had an insightful exchange of ideas on research that’s happening at the MCML. se3labs shared open questions in the field of computer vision and 3D reconstruction of complex environments, that se3 is currently working on. Our members Michael A. Hedderich, Yunpu Ma and Maximilian Bernhard shared their research on connecting questions - from Natural Language Processing, AI Agents, to Computer Vision.



Allianz

We visited the Allianz Technology Campus in Unterföhring on November 25th, to have our second event in our series „MCML Pitchtalks with Industry“. Connecting dots between collaboration ideas and joint research interests on Generative AI and other hot topics was really fun and revelatory. After a presentation by Allianz on their AI research and topics, Shanshan Bai presented her work on Gen.AI and Earth Observation, Leonor Veloso on Gender Bias and NLP, and Anna Steinberg on how to analyze Greenwashing effects with AI.

SE3 Labs, Allianz Technology & MunichRe

Munich RE

On Decmber 11th, we visited Munich Re for another event in our series „MCML Pitchtalks with Industry“ - this time, our focus was on generative AI, and how it transforms the reinsurance business.
After a presentation from MunichRe on open problems in generative AI, we heard exciting pitchtalks from some of our junior members: Leonardo Galli talked about Optimization. Silvia Casola presented her work in natural language processing. Zijian Ma and Yunpu Ma presented their work on AI Agents. And Zhicong Xian showed advancements in process mining. Exchange of ideas was vivid and informative - we are looking forward to visiting more companies within our community.

Fostering Entrepreneurship

Together with the LMU Innovation and Entrepreneurship Center, we will keep on organizing our AI meets Entrepreneurship Series, where we connect students with industry and startups.

FOR MEMBERS: UPCOMING PITCHTALKS IN 2025

We will amplify our format and organize regular Pitchtalk Meetups with plenty of our industry partners. On April 2nd, we will invite appliedAI to the MCML to talk about AI Agents. On April 10th, we will visit Bain & Company for a Pitchtalk event about Generative AI. On July 16th, SAP invites us to their new building at the TUM Campus Garching, where we will talk about AI Agents.

MUNICH AI DAY 2024

The first Munich AI Day on July 4, 2024, organized by the MCML, was dedicated to the latest developments and research in the field of Artificial Intelligence (AI), at the House of Communication in Munich.

KEYNOTES BY LEADING SCIENTISTS IN THE FIELD

HINRICH SCHÜTZE
(MCML PI)

STEFANIE JEGELKA
(MCML PI)

DISCUSSING THE FUTURE OF AI

Along with leading researchers, the AI Day brought together decision-makers from politics, business and the media.

How can we make advances in the foundations of AI? How can we utilize AI in applications relevant to society's needs, from medicine to autonomous driving?

And in doing so, how can we ensure that AI systems are safe and reliable? These were questions our keynote speakers and panelists addressed.
The event highlighted the broad spectrum of research conducted at the MCML in the international and application-driven context and inspired conversations between researchers and industry representatives.

COMPANIES AND MCML JUNIOR MEMBERS

Since one of the core missions of the MCML is to strengthen relations between academia and industry, we also had invited companies.
Booths by DeepScenario, HP, and SE3 Labs as well as from the baiosphere, the Bavarian AI network, attracted great interest.

Moreover, Federico Tombari from Google gave a keynote on 3D representations. In addition to the talks, posters by junior members of the MCML highlighted the broad range of research at the MCML and gave an insight into the current research and future developments.

Attendees had the opportunity to engage directly with the junior researchers, discuss their methodologies, and explore potential collaborations.

MICHAL IRANI (WEIZMANN INSTITUTE)

The MCML has established itself as one of the largest and most prominent AI research centers in the European ecosystem and, over the past year, has succeeded in forging ties to prominent researchers from Germany and abroad.

IMPRESSIONS

Markus Blume, Bavarian Minister of Science and Arts stated:
« With the Munich AI Day, the Munich Centre for machine learning offers an important platform for artificial intelligence. One thing is clear: the biggest risk with AI is not being there. We have decided: We want to shape the key technology of the future ourselves according to our values. This is the only way to achieve technological and economic sovereignty in the future. [...] The MCML is our Bavarian think tank for AI - thank you very much for your important work! «

FEDERICO TOMBARI (GOOGLE)

MUNICH AI DAY 2025
July 2, 2025
Motorworld Munich

FUNDING FOR MCML WORKSHOPS

MCML regularly provides funding for workshops for its members. Here are two successful examples from 2024.

ETHICS CONFERENCE

On September 12 and 13, 2024, the conference “The Ethics of Conversational Agents & Generative AI” was held at LMU.

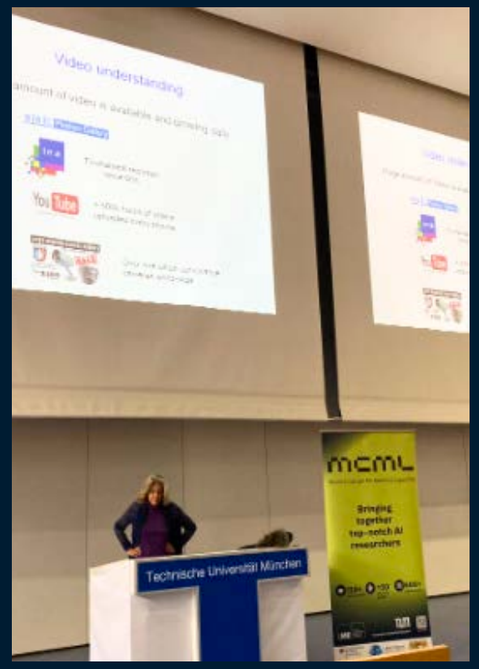
Organized with the support of the MCML, the event brought together academic researchers and AI ethics practitioners to discuss the ethical challenges posed by conversational agents and generative artificial intelligence (genAI).

The conference explored the ethics of generative AI broadly, as well as specific issues arising from its application in industrial contexts. Key themes included accountability, trust, and the societal implications of deploying these technologies. Attendees heard from speakers such as Alena Buyx (Technische Universität München), Herman Cappelen (The University of Hong Kong), Geoff Keeling (Google), and Dr. Bettina Laugwitz (SAP), among others.

The sessions were designed to encourage meaningful dialogue, with each presentation followed by a moderated discussion. Approximately 80 participants engaged in debates, raising questions about the ethical design, deployment, and governance of conversational and generative AI systems. This in-person event provided a platform for interdisciplinary exchange, emphasizing the need for collaboration between academia and industry to address the ethical complexities of this rapidly evolving technology.

The conference concluded with a call for continued research and dialogue, highlighting the importance of ethical foresight in shaping the future of AI. Its success demonstrated the value of such events in addressing the challenges posed by emerging technologies.

GERMAN CONFERENCE ON PATTERN RECOGNITION



The German Conference on Pattern Recognition (GCPR) is the annual symposium of the German Association for Pattern Recognition (DAGM).

It is the national venue for recent advances in image processing, pattern recognition, and computer vision and it follows the long tradition of the DAGM conference series, which has been renamed to GCPR in 2013 to reflect its increasing internationalization.

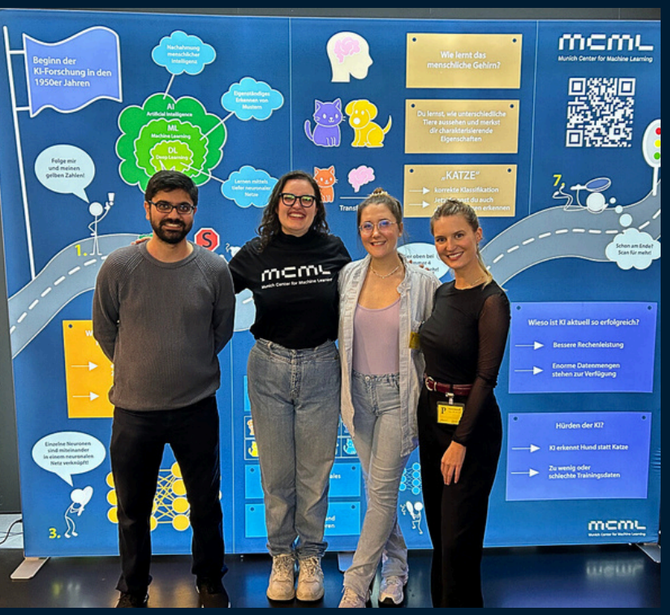
In 2024 in Munich, the conference series celebrated its 46th anniversary at TUM.

FOR MEMBERS:

We are always happy to receive pictures from MCML workshops and events you organize.

OUTREACH: MUSEUM

At the Long Night of Munich Museums in October, MCML researchers gave a glimpse of their work in the Science Communication Lab.



MCML RESEARCHERS ON THE SPOT

More than 1.000 visitors passed by the Science Communication Lab in the Museum during the Long Night of Munich Musuems. Our MCML researchers Mariia Gladkova, Tarun Yenamandra, Mateo de Mayo, Mia Brandtner and Qadeer Khan were on site providing insights on their research and answered all the questions related to AI.

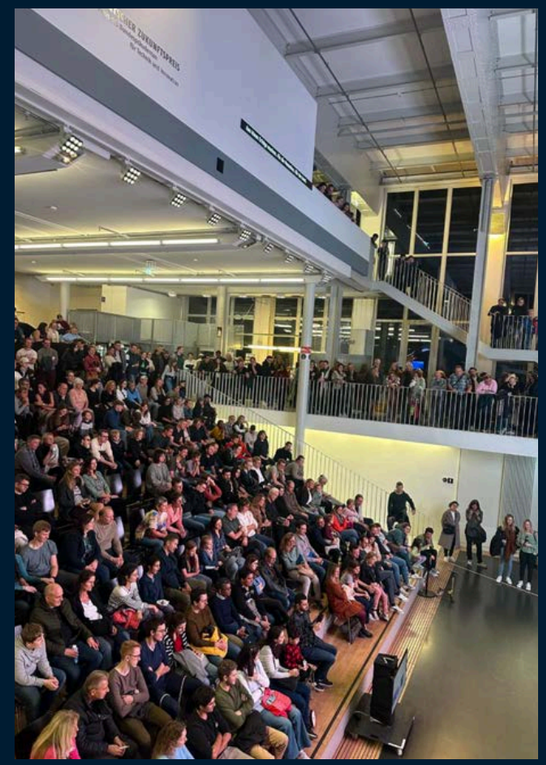
With the AMELIE exhibit, the MCML invited visitors to learn about the basics of machine learning in a playful and interactive way. On a big, illustrated canvas we showed how AI works and explained the difference between AI and machine learning. The Canvas was designed by Laura Ekes.

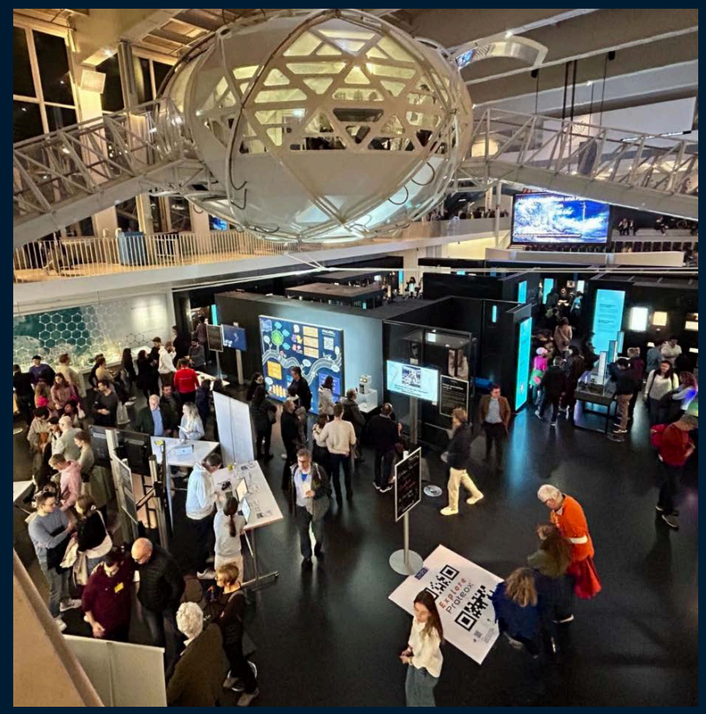
DM-VIO IN SECOND DEMO

In a second demo, we showed how it is possible to simultaneously localize and map the environment using a camera and a connected IMU sensor. The method is called DM-VIO and can be used in self-driving cars, for example.

INSIGHT AND EXPLANATION OF STABLE DIFFUSION

We also provided an insight into Stable Diffusion, a deep learning model by the Vision and Learning Group at LMU that generates images from text descriptions. We explained how Stable Diffusion learns the connection between image and text through a latent diffusion model process and invited the visitors to try out Stable Diffusion for themselves.





OUTREACH: SCHOOLS

Throughout the year, MCML researchers have offered workshops and lectures for school classes and participated in public events to talk about machine learning and artificial intelligence.

SCHOOL WORKSHOPS ON AI

What is AI? What is the difference between AI and machine learning? Can AI learn to see? How do algorithms work, and how can AI be used for the early detection of diseases? Questions like these were addressed in workshops for school classes.

The aim of the workshops was to bring theory closer to the lives of young people, to show the impact of research and who is behind it.

The participants of these school workshops learned, for example, how machine learning algorithms can be used to predict whether a breast tumor is benign or malignant based on certain characteristics of the tumor. They actively worked with a real data set in Python software and learned how to train an algorithm to make predictions on new data and how to assess the quality of the algorithm's predictions.

PROJECT KI TRANS

To not only reach single school classes but the teachers, the MCML with its expertise in machine learning and AI supports the project KI Trans - How artificial intelligence can contribute to the transformation of the education system led by Junge Tüftler and the Chair of Primary School Pedagogy and Didactics at LMU. The project focuses on cross-institutional cooperation in the design of a hybrid further education and training program for teachers.
To constantly improve our outreach offers, the MCML provides its junior members with the opportunity to educate themselves further in didactics. During a pedagogy workshop conducted by the Computing Education Research Group at TUM, the participants received valuable tools for the preparation of workshops for both adults and children regarding the question of how to turn complex research into engaging, educational sessions.

FOR MEMBERS: WANT TO PARTICIPATE IN A SCHOOL WORKSHOP?

We offer a variety of outreach programs to make AI-research more accessible. If you want to participate please contact our management team.

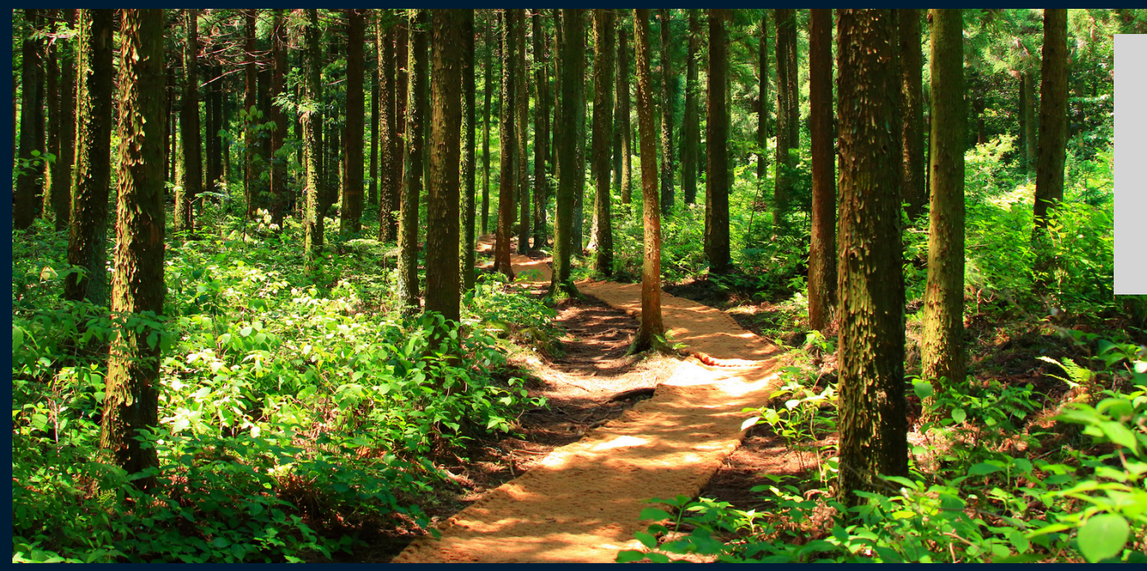
OUTREACH: DSSGX MUNICH

For two months, the DSSGxMunich-Team supported two projects before they presented their results in September at the Bavarian Academy of Sciences and Humanities.

Data Science for Social Good (DSSG), is an initiative founded at the University of Chicago in 2013. Its mission is to create and sustain programs, solutions and communities that enhance the use of data science and AI for social good. From the very beginning, the flagship project of DSSG has been its annual fellowship program, where aspiring data scientists can sharpen their skills in ML and Data Science while working on real problems for the social good.
Through the collaboration between the Department of Statistics at LMU Munich and the MCML, an own annual version of the DSSG Fellowship Program was launched in Munich. In the following, the two projects of this year's DSSGxMunich will be introduced.

GLOBAL DATA INSTITUTE

Foreseeing the effects of events on migration factors and cross-border movements is essential for evaluating the potential shifts and obstacles that IOM operations may encounter. One of the teams – consisting of Masabah Bint E Islam, María Belén Arvili, Derya Durmush, Jorge Roa and the project partner Valerie Gastner - worked to deeper understand migration trends and patterns which is critical for protecting lives and developing effective policy solutions for legal migration routes. The results of the team now help to optimize the data-driven distribution of IOM's resources. With more strategic resource allocation, IOM and its UN partners can now offer improved support to migrants and internally displaced individuals.



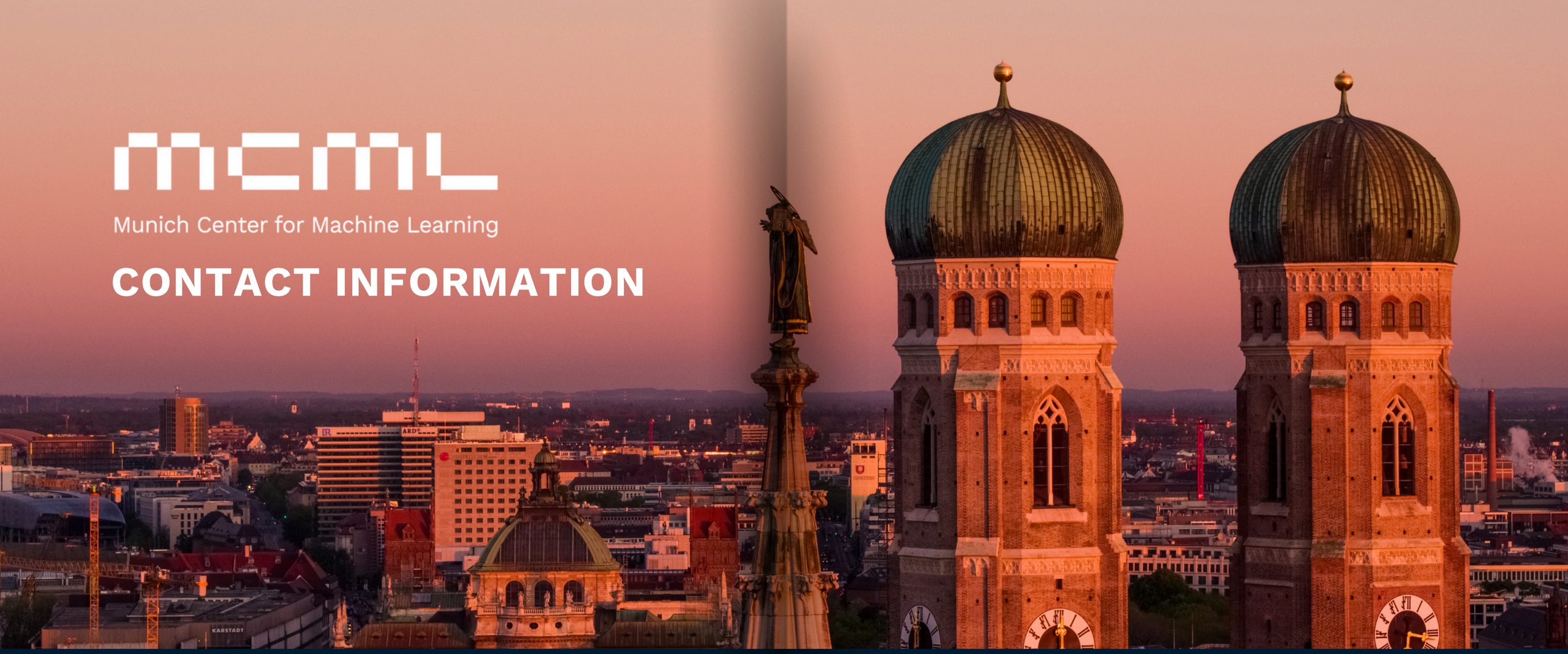
NATIONALPARK BAYERISCHER WALD

The Bavarian Forest National Park, Germany's oldest national park, attracts over 1.4 million visitors annually. However, this popularity also brings logistical challenges. Effective forecasting, management, and control of tourist flows are crucial for ensuring sustainable tourism and responsible use of natural resources. While substantial data on tourist flows is collected in and around the Bavarian Forest, this information is often inconsistent and stored in various formats. There was a need for further automation in processing and integrating these diverse data sources to facilitate a smooth flow of information. This is where the second DSSG-Team worked on for two months.

With their results, the team – including Ayesha Younas, Manpa Barman, Anthony Garove, Patricio Ferreira as well as the project partner Max Mangold - improved the flow of information to various stakeholders, which will contribute to sustainable resource management. This includes efforts to decrease pollution and lower CO_2 emissions in and around the Bavarian forest.

Munich Center for Machine Learning

CONTACT INFORMATION



GET IN TOUCH WITH US AND LET'S CONNECT ON SOCIAL MEDIA!

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