

## - Help us developing the Third Wave of AI (3AI) -

Within the 3AI Cluster Project funded by the Hessian Ministry of Science and the Arts in preparation for the upcoming Excellence Strategy of the German Government up to

### 10 Research Assistants/PhD positions

are available, starting as soon as possible. The employment contracts will be fixed-term until March 2024. An extension of the contract is generally possible. It is the goal of the employment to acquire a PhD level in one of the research themes in the cluster.

Within 3AI, we aim at developing the next generation of AI systems. Pushing the limits of hybrid and neuro-symbolic AI, these AI systems will acquire human-like communication and thinking abilities, recognize and classify new situations, and adapt to them autonomously.

Through 3AI, the systemic and algorithmic foundations of what we call “Systems AI” will be developed. Akin to Systems Biology, interactions of different AI building blocks will be mathematically and algorithmically correctly captured, understood, and used, and new methods of system design, e.g., software engineering or data management for Systems AI, will be explored.

#### Possible research questions include:

- *How to bring together separated AI regimes such as low-level perception & high-level reasoning?*
- *How to represent and interface the what & how of AI computations?*
- *How to deal with uncertainty & incompleteness, when modelling and within the models?*
- *How to achieve a large & diverse coverage of (novel) AI algorithms?*
- *How to rapidly/automatically combine, deploy, and maintain existing AI algorithms and representation?*
- *How to rethink software & systems design for complex AI systems?*

#### They are clustered into three research missions:

- *Foundations of Systems AI Design: probabilistic and differentiable programming and learning, hybrid AI, software engineering for AI, etc.*
- *Foundations of 3AI Methods: tackling challenging AI/ML tasks within NLP, robotics, and computer vision using Systems AI*
- *Life Science Tasks of 3AI: using and challenging the Systems AI paradigm developed in the other missions within the life-sciences applications*

The research program is embedded in a strong, interdisciplinary, and highly dynamic AI environment for performing cutting-edge research. TU Darmstadt is one of Germany’s leading universities in the domain of computer science. 3AI combines top AI research at TU Darmstadt with research at Johann Wolfgang Goethe University Frankfurt, University Hospital Frankfurt and Johannes Gutenberg University Mainz. The cutting-edge research program of 3AI is tightly incorporated into the Hessian Center for Artificial Intelligence – hessian.AI (<https://hessian.ai/>). Over the next four years, 20 new AI professorships will be established within hessian.AI, building on the expertise of the 22 Hessian scientists that are founding members of the center.

TU Darmstadt is firmly established in European AI research according to common rankings (e.g., <http://csrankings.org/>), based on publications in the top AI and 3AI related venues, and is part of the European Networks CLAIRE and ELLIS. This is due to a strong and unique ML and AI ecosystem at TU Darmstadt, which covers AI research and innovation — from databases and software engineering, over NLP, robotics, computer vision, ML, and AI to computational cognitive science — as well as qualifying and educating the future generation of AI experts.

3AI complements other public funded AI excellence projects at TU Darmstadt such as “The Adaptive Mind” and “WhiteBox” with in total more than 25 new PhD positions. All PhD students will be able to access the AI compute infrastructure (>10 DGX) of hessian.AI that is currently being built up.

#### Requirements for all positions:

- University degree (M.Sc.) with strong performance in Computer Science, Machine Learning, Artificial Intelligence, and Cognitive Science or related fields
- Strong programming experience, e.g., with deep (probabilistic) learning, compilers, and/or robotsSpecific technical knowledge that enables participation in the core research questions
- High proficiency in English (spoken and in writing)
- Ability to co-operate in a dynamic and interdisciplinary research environment
- Ability to work independently as well as in a team, and a high level of motivation and initiative

Interested candidates apply to one of the 3AI Research Missions, rather than a specific PhD project, and will be selected by the 3AI principal investigators (PI) of the corresponding mission. While the PhD-students should discuss their research interests and identify potential supervisors in the first year, their thesis topics will be determined latest by the beginning of their second year. The PhD students will be co-supervised each by two 3AI principal investigators:

#### Available PI/Supervisors:

- *Prof. Dr. Kristian Kersting: Artificial Intelligence and Machine Learning Lab ([kersting@cs.tu-darmstadt.de](mailto:kersting@cs.tu-darmstadt.de))*
- *Prof. Dr. h.c. Mira Mezini: Software Technology Group ([mezini@st.informatik.tu-darmstadt.de](mailto:mezini@st.informatik.tu-darmstadt.de))*
- *Prof. Jan Peters, Ph.D.: Intelligent Autonomous Systems - Machine Learning for Intelligent Autonomous Robots ([jan.peters@tu-darmstadt.de](mailto:jan.peters@tu-darmstadt.de))*
- *Prof. Stefan Roth, Ph.D.: Visual Inference Lab ([stefan.roth@visinf.tu-darmstadt.de](mailto:stefan.roth@visinf.tu-darmstadt.de))*
- *Prof. Dr. Iryna Gurevych: Ubiquitous Knowledge Processing Lab ([gurevych@ukp.informatik.tu-darmstadt.de](mailto:gurevych@ukp.informatik.tu-darmstadt.de))*
- *Prof. Dr. Carsten Binnig: Data Management ([carsten.binnig@cs.tu-darmstadt.de](mailto:carsten.binnig@cs.tu-darmstadt.de))*
- *Prof. Constantin A. Rothkopf, Ph.D.: Psychology of Information Processing ([rothkopf@psychologie.tu-darmstadt.de](mailto:rothkopf@psychologie.tu-darmstadt.de))*
- *Prof. Dr. Frank Jäkel: Models of Higher Cognition ([frank.jaekel@cogsci.tu-darmstadt.de](mailto:frank.jaekel@cogsci.tu-darmstadt.de))*
- *Prof. Dr. techn. Heinz Koeppl: Bioinspired Communication Systems ([heinz.koeppl@bcs.tu-darmstadt.de](mailto:heinz.koeppl@bcs.tu-darmstadt.de))*

Additional co-supervision within 3AI via hessian.AI is also possible by

- *Prof. Dr. Peter Wild (University Hospital Frankfurt): Computational Pathology*
- *Prof. Dr. Jochen Triesch (FIAS and Goethe University Frankfurt): Neuro-inspired AI*
- *Prof. Dr. Stefan Kramer (University of Mainz): Machine Learning in Medicine*

For specific questions concerning potential research projects in 3AI, please contact the respective supervisors.

Opportunity for further qualification (doctoral dissertation) is given. The fulfillment of the duties likewise enables the scientific qualifications of the candidate.

The Technische Universität Darmstadt intends to increase the number of female employees and encourages female candidates to apply. In case of equal qualifications applicants with a degree of disability of at least 50 or equal will be given preference. Wages and salaries are according to the collective agreements on salary scales, which apply to the Technische Universität Darmstadt (TV-TU Darmstadt).

**Application Process:**

Please apply online via <https://hai1.ulb.tu-darmstadt.de>

By submitting your application, you consent to your data being stored and processed for the purpose of the recruitment process. You can find our privacy policy here: <https://www.tu-darmstadt.de/datenschutzerklaerung.en.jsp>

Please note that your application documents will be distributed among all potential supervisors. If your application seems more suitable for another supervisor, we reserve the right to pass on your documents there. If you do not agree to this procedure, please indicate this in your cover letter. Of course, this will be of no disadvantage for you.

**Code No. 311**

**Published on:** May 31, 2021

**Application deadline:** June 14, 2021

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