

Jan Stühmer joins HITS as head of new Machine Learning group

Computer scientist and machine learning researcher **Jan Stühmer** joined HITS on 1 September 2022 as head of the new junior group Machine Learning and Artificial Intelligence (MLI). Jan was concurrently appointed as a junior professor at the Karlsruhe Institute of Technology (KIT).

"The new junior group complements and enriches our previous activities in the field of machine learning in an excellent way," said HITS Scientific Director **Frauke Gräter**. "Moreover, we are pleased about the joint appointment, which reflects our close connection with KIT, one of our shareholders."

Jan Stühmer's research has led him to highly reputable academic institutions as well as to industrial research organizations. He received a doctoral fellowship from the TUM Institute for Advanced Study in 2011 and obtained his PhD in

computer science from the Technical University of Munich in 2016 in collaboration with the California Institute of Technology (Caltech). Afterward, Jan was a visiting scientist at the Computer Science and Artificial Intelligence Laboratory (CSAIL) at the Massachusetts Institute of Technology (MIT) before moving to Microsoft Research as a postdoctoral researcher, working first in Cambridge, UK, and then in Zurich, Switzerland. Jan joins HITS from the



Samsung AI Centre Cambridge, UK, where he has been a Senior Researcher since 2020. "I'm very excited to join HITS, which – in partnership with KIT – provides the perfect environment for my research group," said Jan. "I'm looking forward to working in this interdisciplinary research environment and to collaborating with other researchers at HITS and KIT, for example, in computational biochemistry, material science, astronomy, and robotics."

Jan Stühmer develops novel algorithms and models for artificial intelligence and machine learning. In particular, he combines insights from learning theory with methods from convex and non-convex optimization in order to derive algorithms with improved robustness and generalization properties. Jan's further research interests include latent variable models, variational inference, and probabilistic deep learning with applications in healthcare, computer vision, and the life sciences.



Via Data

The HITS blog can be found on the "Scilogs" portal at <https://scilogs.spektrum.de/via-data/>.

HITS

Computing centers: HITS group leader is new chair



HITS Group Leader **Vincent Heuveline** (DMQ), in his capacity both as CIO of Heidelberg University and as Managing Director of the University Computing Centre, has taken

over the role of Chair of the Working Group of Heads of Scientific Computing Centers in Baden-Württemberg (ALWR). The ALWR works on behalf of the Landesrektorenkonferenz (a body of university presidents) and in close cooperation with the Ministry of Science, Research and the Arts of the State

of Baden-Württemberg. The working group is composed of members from the ministry and directors of the Scientific Computing Centers.

Fellowship for COVID-19 researcher

Giulia Paiardi (MCM) has received a postdoctoral fellowship from the Heidelberg–Mannheim Health & Life Science Alliance, a center of excellence in the life sciences at which institutions in the region collaborate with one another. Among other subjects, Giulia



uses computer simulations to study the interactions between heparin compounds and the SARS-CoV2 virus's spike protein.

First prize in the "Student Cluster Competition"

Students from Heidelberg University won 1st prize at the ISC Student Cluster Competition, an annual international event at which participants from all over the world compete to solve problems in high-performance computing. **Aksel Alpay** (DMQ) was one of two team mentors who beat their competitors in the face-to-face event in Hamburg.

New employees and visiting scientists

Group leader: Pre-docs: Visiting scientists:

Jan Stühmer (MLI)
Alexander Zeilmann (DMQ), Andrea Sassoli (MBM), Daniel Sucerquia (MBM, SIMPLAIX)
Marius Puke, University of Hohenheim (CST); Karolina Mitusińska, Silesian University of Technology, Poland (MCM); Marco Rizzo, University of Genua, Italy (MCM)
Sarbani Basu (Yale University, USA)

HITS groups (09/2022): *Astroinformatics (AIN), Computational Carbon Chemistry (CCC), Computational Molecular Evolution (CME), Computational Statistics (CST), Data Mining and Uncertainty Quantification (DMQ), Groups and Geometry (GRG), Machine Learning and Artificial Intelligence (MLI), Molecular Biomechanics (MBM), Molecular and Cellular Modeling (MCM), Natural Language Processing (NLP), Physics of Stellar Objects (PSO), Scientific Databases and Visualization (SDBV), Stellar Evolution Theory (SET), Theory and Observations of Stars (TOS).*

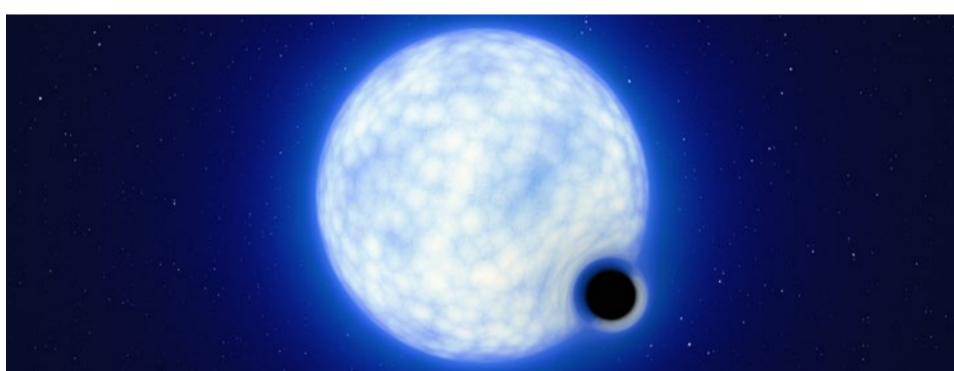
HITSters

The invisible needle in a stellar haystack

A group of astrophysicists from seven countries has identified a so-called "dormant" stellar-mass black hole located in one of our neighboring galaxies, the Large Magellanic Cloud. The team also found that the companion star that gave rise to the black hole disappeared without leaving behind evidence of a strong supernova explosion. The discovery comes after six years of observations with the European Southern Observatory's (ESO) Very Large Telescope (VLT) and has now been published in the journal "Nature Astronomy."

"We have found a 'needle in a haystack,'" said first author Tomar Shenar (University of Amsterdam). "VFTS 243 is the first 'dormant' stellar-mass black hole discovered outside of our galaxy." It has at least nine times the mass of our Sun and orbits a hot, blue star with 25 times the mass of the Sun. To find it, the researchers studied nearly 1,000 massive stars in the Tarantula Nebula of the Large Magellanic Cloud.

Stellar-mass black holes form when massive stars collapse under their own gravity at the end of their lives. If this collapsing star is in



a binary system, the black hole will then orbit a luminous companion star. Such black holes often accrete material from their companion and can emit powerful X-rays, but "dormant" black holes do not. Therefore, it is very difficult to find them. Astronomers suspect that there are many dormant black holes and that a small percent of massive stars may even have such invisible companions.

Also involved in the study was HITS group leader **Fabian Schneider** (Stellar Evolution Theory), an international expert on stellar evolution and binary systems. When massive stars explode in supernovae, their cores collapse and can forge neutron stars – a form of ultracompact matter. "In most cases, these neutron stars receive a kick of several

hundreds of kilometers per second and are shot away from their explosion site into interstellar space," Fabian Schneider explained. "The black hole in VFTS 243 did not receive such a kick, which suggests that its progenitor star directly collapsed into a black hole without signs of a strong supernova explosion." This finding will also help researchers to understand the formation histories of the many black-hole mergers that are nowadays observed via gravitational-wave astronomy.

Publication: Shenar T et al: An X-ray quiet black hole born with a negligible kick in a massive binary of the Large Magellanic Cloud: Nature Astronomy, 18 July 2022. DOI: 10.1038/s41550-022-01730-y <https://www.nature.com/articles/s41550-022-01730-y>

Research

Beyond the limits: HITS' (Re-)Opening Day



After four years, HITS finally reopened its doors to the public on 9 July at its campus on the Schloss-Wolfsbrunnengarten. Under the umbrella of the "Digital Worlds 20.22" theme, the program included science talks in English and German, presentations, and hands-on stations, all of which showcased the Institute's research.



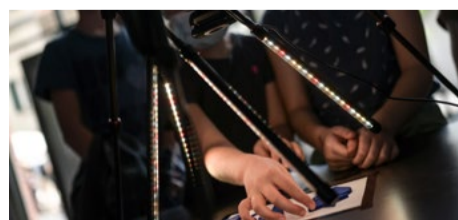
In an effort to also spatially justify its motto ("Think beyond the limits!"), the Institute opened its historic garden to the public for the first time and offered guided tours in both German and English. The tours were a hit and were fully booked in no time.

Equally in demand were the science talks, which were held in the Studio Villa Bosch. **Alexandros Stamatakis** (Computational Molecular Evolution CME) spoke about forecasting football tournaments with bioinformatics software, **Saskia Hekker** (Theory and Observations of Stars TOS) explained the interior of stars and how we know about it, and **Johannes Bracher** (Computational Statistics CST) used the example of the coronavirus hospitalization rate to address the question of why – in addition to a classical forecast – a so-called "nowcast" is also vital.

The research groups also came up with further "highlights": The astroinformaticians (AIN) set up a hands-on station where guests could activate a black hole by moving around on an electronic dance mat – purely virtually, of course. At the Data Mining and Uncertainty Quantification (DMQ) group's



station, visitors could simulate air resistance in a wind tunnel with building blocks in the shape of a guitar or a heart. The measurements were calculated in real time by the computer cluster. The Molecular and Cellular Modeling (MCM) group presented biomolecules in motion, and members of the Molecular Biomechanics (MBM) group unveiled the magic of stability by showing kids how to build thin yet sturdy ropes out of ordinary napkins that can hold a heavy weight.



Imprint | Dr. Peter Saueressig (Vi.S.d.P.), saueressig@h-its.org, Tel. +49 6221 533 245 | Pictures: HITS, Annette Mück, Gülay Keskin, ESO/L. Calçada | www.h-its.org

Beyond the limits



The Charts