Faces of CISE: [Jesse Thaler, Ph.D.](#)

Jesse Thaler, Ph.D., is a theoretical particle physicist and professor in the Center for Theoretical Physics at the Massachusetts Institute of Technology (MIT), who fuses techniques from quantum field theory and artificial intelligence AI to address outstanding questions in fundamental physics. Thaler is an expert in jets, which are collimated sprays of particles that are copiously produced at the Large Hadron Collider (LHC). By developing AI algorithms with built-in physics principles, Thaler aims to illuminate the microscopic realm of particle physics and enhance the search for new phenomena at the LHC.

In 2020, Thaler became Director of the [NSF Institute for Artificial Intelligence and Fundamental Interactions](#) (IAIFI), a collaboration between physicists and computer scientists from MIT, Harvard University, Northeastern University, and Tufts University. IAIFI researchers are developing custom AI tools for scientific discovery that are having an impact across theoretical and experimental physics, including at flagship NSF-funded projects like the LHC and the Laser Interferometer Gravity-wave Observatory. The team uses physics-inspired principles, such as space-time symmetries and phase transitions, to develop a foundational understanding of AI and accelerate progress toward more robust and interpretable AI systems. In this way, Thaler and his IAIFI colleagues are fusing the deep learning revolution with the time-tested strategies of "deep thinking" in physics to better understand our universe and the principles underlying machine intelligence.

AI is transforming the process of scientific discovery, but fully validating AI decisions is a challenging task. Therefore, Thaler emphasizes the importance of teaching AI to "think like a physicist" to ensure that it embraces best practices for scientific rigor. "At the same time, physicists need to learn how to 'think like a machine' to capitalize on recent eye-popping advances in computer science," he said. "Going forward, the most impactful physics results are likely to arise from a dialogue between human intelligence and artificial intelligence."

Thaler is also a co-principal investigator on an [NSF Expanding AI Innovation through Capacity Building and Partnerships award](#), which supports a partnership between the University of Puerto Rico Mayaguez (UPRM) and IAIFI to expand established research and education programs at UPRM. The collaboration focuses on developing AI with societal benefits in mind and nurturing the next generation of AI talent, with research targeting AI breakthroughs for particle physics experiments.

Thaler received his doctoral degree in physics from Harvard University in 2006, where he was supported by an NSF Graduate Research Fellowship. He received his Bachelor of Science degree in mathematics and physics from Brown University in 2002, where he pursued research into the formation of black holes. From 2006 to 2009, he was a fellow at the Miller Institute for Basic Research in Science at the University of California, Berkeley.