Welcome to the First IAIFI Colloquium!

Jesse Thaler, Jim Halverson & Phiala Shanahan

IAIFI Director, IAIFI Colloquium Organizer & IAIFI Research Coordinator for Physics Theory (and today’s speaker!)

February 4, 2021
The NSF AI Institute for Artificial Intelligence and Fundamental Interactions (IAIFI) "eye-phi"

Advance physics knowledge — from the smallest building blocks of nature to the largest structures in the universe — and galvanize AI research innovation

http://iaifi.org
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Boston Area: Critical Mass for Transformative Research at the Intersection of Physics and AI

These Colloquia & Other IAIFI Events: Increase Cross Section for Interdisciplinary Interactions
AI²: Ab Initio Artificial Intelligence

Machine learning that incorporates first principles, best practices, and domain knowledge from fundamental physics

Symmetries, conservation laws, scaling relations, limiting behaviors, locality, causality, unitarity, gauge invariance, entropy, least action, factorization, unit tests, exactness, systematic uncertainties, reproducibility, verifiability, …
IAIFI Research Areas

**AI$^2$ for Theoretical Physics**
- Standard Model of Nuclear & Particle Physics
- String Theory & Physical Mathematics
- Astroparticle Physics
- Automated Discovery of Physics Models

**AI$^2$ for Experimental Physics**
- Particle Physics Experiments
- Gravitational Wave Interferometry
- (Multi-Messenger) Astrophysics

**AI$^2$ for Foundational AI**
- Symmetries & Invariance
- Speeding up Control & Inference
- Physics-Informed Architectures
- Neural Networks Theory
The 2021-2024 IAIFI Fellows!

The “Gluons” of IAIFI: Spark multi-investigator, multi-subfield collaborations

Anna Golubeva
Di Luo
Siddharth Mishra-Sharma
Ge Yang

In the coming months, launching various IAIFI activities in workforce development, digital learning, outreach, broadening participation, and knowledge transfer
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Training, education & outreach at Physics/AI intersection
Cultivate early-career talent (e.g. IAIFI Fellows)
Foster connections to physics facilities and industry
Build strong multidisciplinary collaborations
Advocacy for shared solutions across subfields

We look forward to building collaborations and synergies within Boston and beyond!

http://iaifi.org/