2027 Boulder Summer School for Condensed Matter and Materials Physics

Machine Learning and Condensed Matter

July 5-July 30, 2027

Detailed Schedule *All lectures are in Duane Physics Room G130*

Public lecture: Duane G1B30; posters: G130 common space; catered dinner: JILA 10th floor

Week 1, July 5-9, 2027

Introduction to machine learning theory & methods

Roger Melko	*The learning problem: data, machine and loss*
Yasaman Bahri	*Large-width neural networks, mean-field limits*
Anna Dawid*	*Foundations of ML for the many-body problem*

Week 2, July 12-16, 2027

Data-driven learning in classical and quantum systems

Yi-Zhuang You	*Topic to be announced*
Ehsan Khatami	*Learning and strongly correlated electrons*

Week 3, July 19-23, 2027

Neural quantum states

Christopher Roth	*NQS for interaction fermions*
Annabelle Bohrdt*	*Hubbard models and more*
Liang Fu*	*Transformer wavefunctions for fermions*
Juan Carrasquilla	*Hamiltonian-driven variational learning*

Week 4, July 26-30, 2027

Frontiers in physics and artificial intelligence

Agnes Valenti	*Generalization, double descent*
Zohar Ringel	*RG, neural scaling laws, complexity*
Miles Stoudenmire	*Tensor networks & neural networks*
Andrey Gromov*	*Grokking, emergence and scaling laws*

*To be confirmed