

## Phenomenology 2025 Symposium



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## Synaptic Field Theory

*Monday 19 May 2025 14:45 (15 minutes)*

Theoretical understanding of deep learning remains elusive despite its empirical success. In this study, we propose a novel “synaptic field theory” that describes the training dynamics of synaptic weights and biases in the continuum limit. Unlike previous approaches, our framework treats synaptic weights and biases as fields and interprets their indices as spatial coordinates, with the training data acting as external sources. This perspective offers new insights into the fundamental mechanisms of deep learning and suggests a pathway for leveraging well-established field-theoretic techniques to study neural network training.

### Mini Symposia (Invited Talks Only)

### Plenary (Invited talks only)

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**Session Classification:** Machine Learning

**Track Classification:** Machine Learning and Artificial Intelligence in Particle Physics