38th Marian Smoluchowski Symposium on Statistical Physics

Physics of Natural and Artificial Intelligence

Contribution ID: **21**   Type: **Invited talk**

Networks of neural networks: the more is different

Sunday, 14 September 2025 11:30 (30 minutes)

We consider a K-layer hetero-associative neural-network and we carry out a statistical mechanical analysis. Our findings show that these networks exhibit spontaneous information processing capabilities that go far beyond those of auto-associative counterparts. In particular, they can perform frequency modulation and, when presented with a spurious state (e.g., a symmetric mixture made of K patterns), disentangle and retrieve the individual components. Furthermore, we show that this capacity is enhanced by introducing controlled perturbations—either in the training data or neuronal dynamics.

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