Universidade Federal de Pernambuco
DEPARTAMENTO DE FÍSICA - PÓS-GRADUAÇÃO

Colóquio (WEBINAR)

"Replica Symmetry Breaking in Random Lasers: the experimental test of the Parisi theory"

Claudio Conti

University Sapienza Rome, Italy

Resumo: Vide pagina em anexo.

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"Replica Symmetry Breaking in Random Lasers: the experimental test of the Parisi theory"

We review our work on complex photonic systems and their link with spin glass theory. We show that models that have been the subject of intense research for decades, as the Ising Hamiltonian, have a significant and unexpected role in modern photonics.
This mapping holds to random lasers and nonlinear light propagation. One specific outcome is the existence of phase transitions, named replica symmetry breaking, which we observed in different experiments, and enabled the first direct measurement of the overlap of Parisi (Nobel Prize in Physics 2021).
The link with spin glass theory allows using multimodal optical systems to solve combinatorial optimization. Indeed NP-hard computational problems, such as number partitioning or max-cut, also are described by Ising Hamiltonians. I show that simple optical systems with a single spatial light modulator may enable optical computing and "Ising machines" with millions of spins.

CV of Claudio Conti
CC (Ph.D. 2002) is Director of the Institute for Complex Systems of the National Research Council and Head of the Nonlinear Photonics Laboratory at the Department of Physics at University Sapienza in Rome (IT). He authored more than 200 articles in photonics, nonlinear and complex systems.
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