From Nanolasers to Neuromorphic Networks: The GOLDMINE Vision for Photonic Computing

International Research Network GOLDMINE[1]

[1] *Coordination: Université Côte d'Azur, UMR 7710 CNRS, 17 rue Julien Lauprêtre, 06200, Nice, France.*
Contact Phone: +33489152780
Contact Email: gian-luca.lippi@univ-cotedazur.fr

The International Research Network (IRN) GOLDMINE (AdvancinG TechnOlogy, AppLications anD FundaMentals In Coherent NanosourcEs) unites research groups from eight three major European Research Centers [1] to drive innovation in advanced photonics. This multidisciplinary effort focuses on optical neuromorphic computing, non-Hermitian sources, nanolaser development, and theoretical modelling. In optical neuromorphic computing, GOLDMINE aims to mimic biological neural systems, achieving more efficient computation through nanolaser technologies that combine speed, scalability, and low power consumption. Research into non-Hermitian photonic systems explores the use of exceptional points and non-reciprocal behavior for advanced information processing and sensitive detection schemes. The consortium also targets the development of Fano-resonant nanolasers, utilizing slow light in photonic crystal waveguides to improve performance and device integration. To support these objectives, GOLDMINE leverages a wide array of complementary technological platforms, from nanofabrication to fibre and polymer-based systems. A strong emphasis is placed on improving theoretical models by incorporating quantum effects and addressing the complexity of nanoscale dynamics. Through collaborative research and technology sharing, GOLDMINE seeks to reinforce European leadership in photonics and unlock the transformative potential of light-based technologies.

In this talk, we will present a brief overview of the Consortium's latest advances.

References

[1] Research groups members of the GOLDMINE network stem from the following institutions – Department of Informatics: Aristotle University of Thessaloniki (GR); FEMTO-ST: Université Marie and Louis Pasteur & CNRS (F); INPHYNI: Université Côte d'Azur & CNRS, (F); LP2N: Université de Bordeaux & CNRS (F); NanoPhoton: Technical University of Denmark (DK); Department of Physics: Imperial College London (UK); Institute of Solid State Physics: Technical University of Berlin (D); Department of Physics: University of Strathclyde (UK)