

Eugene Wigner Colloquium

event of SFB 910



Dr. Antonio Hurtado

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“Neuromorphic Photonics: Towards Ultrafast Brain-Inspired Computing Systems”

Photonic approaches emulating the powerful computational capabilities of the brain are receiving increasing research interest as these can provide ultrafast operation speeds. In this talk we will review our work on ultrafast artificial photonic neuronal models based upon Semiconductor Lasers, the same devices used to communicate internet data traffic over optical fiber networks. We will show that a rich variety of neuronal computational features, such as spiking activation/inhibition, bursting, etc., can be reproduced optically using Vertical-Cavity Surface Emitting Lasers (VCSELs). Moreover, these optically reproduced neuronal responses are achieved in a fully controllable and reproducible way at sub-nanosecond speeds (up to 9 orders of magnitude faster than the millisecond timescales in cortical neurons). Furthermore, our results are obtained using commercially-available, inexpensive and compact VCSELs operating at the important telecom wavelengths of 1310 and 1550 nm; hence making our approach fully compatible with existing optical communication technologies. Additionally, we will also present our recent results demonstrating the successful communication of spiking signals at sub-nanosecond rates between interconnected VCSEL-based artificial photonic neurons and the use of such systems for information processing functionalities and to emulate basic neuronal circuits at ultrafast speeds.

Thursday, 12.12.19 · 16:15h · EW 202

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