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Experimental Quantum Reading with Photon Counting

Mr. Giuseppe Ortolano, PhD Candidate, DISAT.

The goal of quantum sensing is to reach an advantage over classical benchmarks using quantum resources. In the protocol of quantum reading this advantage is obtained for the task of information recovery from a classical digital memory. In the work presented we showed, both theoretically and experimentally, how this advantage can be achieved using an entangled two-mode squeezed vacuum source paired with a photon counting measurement and a maximum likelihood decision. This quantum strategy is able to outperform any classical strategy for the same number of input photons. Our experimental results prove how quantum entanglement and simple optics are able to enhance the redout of digital data, paving the way to real application of quantum reading as well as any other model based on the binary discrimination of bosonic loss.

Point cloud denoising with graph convolutional neural networks

Ms. Francesca Pistilli, PhD Candidate, DET.

Point clouds are becoming increasingly popular due to the availability of instruments such as LiDARs and the interest in exploiting geometric representation in many challenging applications such as autonomous driving, medical imaging or virtual reality. However, the acquisition methods are imperfect and insert a non-negligible noise. In general, a point cloud is a set of points in the 3D space to which a specific location is associated, the insertion of the noise changes their position and the collected shape is different from the original one. Therefore, in case of safety-critical applications, it is important to perform denoising of point clouds, to recover the original shape from corrupted data. This talk will be focused on the challenges of dealing with point clouds, the limitations of the existing methods in the context of point cloud denoising and the presentation of a neural network based on graph convolutions as a possible solution.

Impedance-based microfluidic devices for personalized medicine applications

Ms. Susana Fuentes Vélez, PhD Candidate, DET.

There are numerous challenges derived from the personalized health paradigm and novel diagnostic and therapeutic approaches are required. Interest in impedance-based assays is rising due to their remarkable advantages, including label-free, low cost, non-invasive, non-destructive, quantitative and real-time. In this application-oriented talk, first, a custom-made impedance measuring system based on electric cell-substrate impedance sensing (ECIS) will be introduced. Emphasis will be given to its potential in cancer treatment decision and early detection of chemoresistance. Then, jumping from cell analysis to more complex systems such as 3D biological constructs, an overview of a microfluidic device under construction, for impedance-based measurements of biopsies, will be presented.

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