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'Evolutionary optimization of optical antennas'

Abstract:
Optical antennas have a wide range of useful applications, e.g. increase of solar cell absorption, coupling to plasmonic waveguides or enhancement of single emitter-vacuum interaction. Most nano antenna designs in recent research are based upon knowledge from the extensive radio wave antenna technology. More complex structures with enhanced optical properties can be found by evolutionary algorithms. I will present an extension of this concept to geometries feasible for nanofabrication, where structures with rounded edges and feature sizes of 22 nm are described by a binary square matrix containing ’0’ and ’1’. I will show how intelligent design of the evolutionary process can help the development of "fit" solutions. In the end I will presenting the experimental proof via two-photon-photo-emission that the resulting nano-antennas show a two-fold better performance compared to the established linear dipolar two-wire nano-antennas. A short outline for a derived general theory will be given, as a proof that we can learn from artificial intelligence.