Floris Laporte[1], Alessio Lugnan[1], Joni Dambre[2], and **Peter Bienstman**[1]

[1]Photonics Research Group, Ghent University - imec, Belgium
[2]IDLab, Ghent University - imec, Belgium

Novel photonic reservoir computing architectures

We will discuss two alternative reservoir computing architectures.

A first one a new design for a passive photonic reservoir computer on a silicon photonics chip in the context of optical communication applications. The design consists of a photonic crystal cavity with a quarter stadium shape, which is known to foster interesting mixing dynamics. These mixing properties turn out to be very useful for successful time-dependent optical signal processing tasks for telecommunication, such as for example header recognition.

A second architecture relates to a set of scattering pillars in the context of the sorting of biological cells, which can be used to reduce error rates. The computational power required to classify cell holograms is a major limit to the throughput of label-free cell sorting based on digital holographic microscopy. We propose a simple integrated photonic stage comprising a collection of silica pillar scatterers as an effective nonlinear mixing interface between the light scattered by a cell and an image sensor. The light processing operated by the photonic stage allows for the use of a simple linear classifier implemented in the electric domain and applied

on a limited number of pixels. The use of scatterers allows for an error rate reduction up to 50% concerning the classification of cells with 2 different average nucleus sizes.