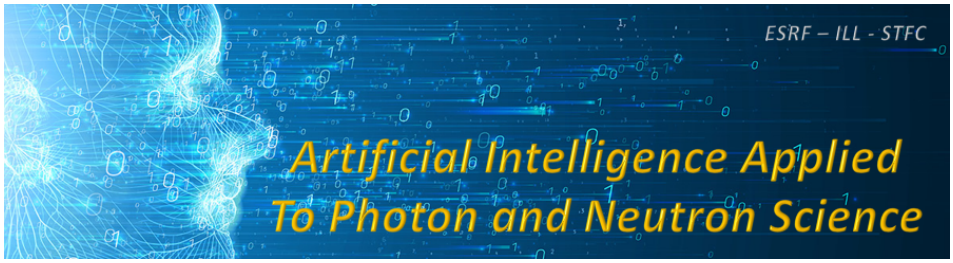

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Biomedical image reconstruction: From the foundations to deep neural networks

Wednesday, 13 November 2019 09:00 (50 minutes)

We present a unified overview of biomedical image reconstruction via direct, variational, and learning-based methods. We start with a review of linear reconstruction methods (first generation) that typically involve some form of back-propagation (CT or PET) and/or the fast Fourier transform (in the case of MRI). We then move on to sparsity-promoting reconstructions algorithms supported by the theory of compressed sensing. These are the most popular representative of the variational methods, which are typically iterative (second generation). Finally, we describe the most recent techniques based on convolutional neural networks (third generation), which constitute the current frontier.
While the second and third generation methods are aimed at reducing the radiation dose (faster imaging), they also have the ability to improve image quality under normal acquisition conditions (full exposure). The third generation methods yield the best performance (SNR), but they are not as robust and well understood as the second generation ones. The first-generation methods (efficient linear solver) retain their importance as a critical module of the second and third generation methods.

Presenter: Prof. UNSER, Michael (EPFL)

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