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**Titre**
Spike-based computing and learning in brains, machines, and visual systems in particular

**Résumé**
Using simulations, we have first shown that, thanks to the physiological learning mechanism referred to as spike timing-dependent plasticity (STDP), neurons can detect and learn repeating spike patterns, in an unsupervised manner, even when those patterns are embedded in noise [1], [2]. Importantly, the spike patterns do not need to repeat exactly: it also works when only a firing probability pattern repeats, providing this profile has narrow (10-20ms) temporal peaks [3]. Brain oscillations may help in getting the required temporal precision [4], in particular when dealing with slowly changing stimuli. All together, these studies show that some envisaged problems associated to spike timing codes, in particular noise-resistance, the need for a reference time, or the decoding issue, might not be as severe as once thought. These generic STDP-based mechanisms are probably at work in particular the visual system, where they can explain how selectivity to visual primitives emerges [5], [6]. Finally, these mechanisms are also appealing for neuromorphic engineering: they can be efficiently implemented in hardware, leading to reactive systems with self-learning abilities [7].

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