

## MINDS CDT **Webinar**



### **Bottom-up and top-down neural processing systems design: Unveiling the road toward neuromorphic intelligence**

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### **Biography**

Charlotte Frenkel received the Ph.D. degree in January 2020 from Université catholique de Louvain (UCLouvain), Belgium, as a Research Fellow of the National Foundation for Scientific Research (FNRS). In February 2020, she joined the Institute of Neuroinformatics, UZH and ETH Zürich, Switzerland, as a postdoctoral researcher. Her current research focuses on low-power high-density online-learning spiking neural network processor design and aims at bridging the bottom-up and top-down design approaches toward neuromorphic intelligence. She serves as an associate editor for the *Frontiers in Neuroscience* journal and as a guest editor for the *IOP Journal on Neuromorphic Computing and Engineering*. She received an IEEE ISCAS 2020 best paper award and was a keynote speaker for the tinyML EMEA 2021 forum and for the Neuro-Inspired Computational Elements (NICE) 2021 workshop.

### **Abstract**

The field of neuromorphic engineering aims at leveraging the computational power and energy efficiency of biological systems into artificial ones. Compared to conventional von-Neumann computing, a paradigm shift is implied for both the data representation and the architecture. However, tackling efficiently this two-fold paradigm shift is still an open challenge and is strongly dependent on the chosen implementation strategy, with design approaches ranging from neuroscience-driven (bottom-up) to application-driven (top-down).

Therefore, it is still unclear which approaches to the design of neuromorphic silicon devices could unveil the most promising roads to neuromorphic intelligence. In order to clarify this question, I will:

- review the different implementation strategies,
- introduce our results following bottom-up [1,2] and top-down [3,4] design approaches,
- outline design guidelines and perspectives toward on-chip neuromorphic intelligence for edge computing.

[1] C. Frenkel et al., *Trans. on BioCAS*, 2019a.

[2] C. Frenkel et al., *Trans. on BioCAS*, 2019b.

[3] C. Frenkel, M. Lefebvre et al., *Front. Neurosci.*, 2021.

[4] C. Frenkel et al., *ISCAS*, 2020.



**Friday 25<sup>th</sup> June 2021 14:00 - 15:00 (UK)**

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