



Monday **January 27, 2020** at 14:00

Politecnico di Torino, DISMA, Aula Buzano (third floor)

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A Single-Stranded Architecture for Infinite Counting

Prof. Giacomo Como introduces the seminar.

Abstract

RNA serves not only as an intermediate medium for synthesizing proteins encoded on DNA but also as a primary medium for computing in vivo. An RNA is synthesized from its DNA template sequence by a molecular Xerox called polymerase nucleotide by nucleotide (A → U, C → G, G → C, T → A) sequentially; this process of RNA synthesis is called transcription and its product is called a transcript. While being thus synthesized, a transcript folds upon itself by having nucleotides form hydrogen bonds. Recent studies revealed that this type of folding called cotranscriptional folding (CF) primarily drives various in-vivo computations. Cotranscriptional folding has turned out to be even programmable through an in-vitro implementation of an RNA transcript (or more precisely, its DNA template) which folds into a target "tile" structure cotranscriptionally (Geary, Rothmund, and Andersen, Science, 2014). This talk aims at demonstrating how to program cotranscriptional folding for computing through our recent implementation of an infinite counter in a novel computational model "oritami." The implementation is an extension of a fixed-bitwidth binary counter, which served as the first proof-of-concept demonstration of the model at its proposal (Geary et al., MFCS 2016).

Biography

Shinnosuke Seki has worked as an assistant professor at the University of Electro-Communications, Tokyo since 2015 and as an invited professor at École Normale Supérieure de Lyon since 2019. He received his Ph.D. in Computer Science from the University of Western Ontario (UWO, London, Canada) in 2010. From 2010 to 2013, he worked as a postdoctoral researcher for UWO, Kyoto University, and Aalto University (Helsinki). Since 2013, he had served as a PI of a 2-year research project in Academy of Finland on DNA pattern self-assembly. He belongs to the Steering Committee of DLT (Developments in Language Theory) and hosted its 2018 edition as well as UCNC2019 (Unconventional Computation and Natural Computation) in Tokyo both as the Organizing and Program Committee Chair. He is a member of the Advisory Board of Springer Natural Computing book-series and an area editor of New Generation Computing.