

SEMINAR ANNOUNCEMENT

Thursday June 12th, 2025

at 10:40 am Room "Sala Seminari" - Abacus Building (U14)

Surjectivity and Reversibility Within a Subclass of Non-Linear Cellular Automata

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Abstract

Cellular automata (CAs) are discrete dynamical systems that evolve in space and time according to local rules. They have been extensively studied both for their theoretical richness and for their applications in areas such as physics, computer science, and cryptography. In this talk, we focus on a specific class of non-linear cellular automata and investigate their dynamical properties, particularly surjectivity and reversibility. We provide a necessary and sufficient condition for such cellular automata to be surjective. In particular, we prove that there is no quadratic cellular automaton, which forms a special subclass of non-linear CAs, that is surjective. Furthermore, we show that these cellular automata are reversible if and only if they are shift-like. These results enable us to better understand how non-linear cellular automata behave.

References:

1. Ben Ramdhane F., Dennunzio A., Margara L., Menara G., Structural Properties of Non-Linear Cellular Automata: Permutivity, Surjectivity and Reversibility, arXiv:2504.15949 (2025)

Short Bio

Firas Ben Ramdhane completed a Research Master's degree in Fundamental Mathematics at the University of Sfax in 2019 and obtained a PhD in Mathematics from Aix-Marseille University and the University of Sfax in 2023.

Following a year as a teaching and research assistant at Aix-Marseille University in 2023/2024, he is now a research assistant at the University of Milano-Bicocca.

His research interests are in the field of symbolic dynamics, cellular automata, and topological dynamical systems.

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