# Practical design and performance of physical reservoir computing using hysteresis

## Authors

Yuhei Yamada

## Publication Information

arXiv:2507.06063v1 [cs.ET] 8 Jul 2025

## Abstract

This paper investigates the design and performance of a physical reservoir computer using hysteresis, focusing on a simple design suitable for experimental implementation. A reservoir composed of independent hysteretic systems modeled by the Preisach model is proposed. The study explores the appropriate design parameters, performance, and limitations of this reservoir, aiming to provide practical guidelines for constructing hysteresis-based reservoirs.

## Key Findings

* \* A reservoir model using multiple hysteretic systems (modeled by the Preisach model) is proposed for physical reservoir computing.
* \* Successful reservoir learning requires the input range to be covered by at least one hysteresis range.
* \* The model effectively imitates the second-order NARMA system, outperforming linear regression.
* \* The model's performance degrades significantly for NARMA-N systems due to the input's delay effect, but improves when this delay is removed.
* \* The study provides practical design guidelines and insights for hysteresis-based reservoir computing, despite the model not achieving the highest accuracy reported in the literature. Further experimental validation is suggested.