Universidade de São Paulo
Instituto de Física de São Carlos

Semana Integrada do Instituto de Física de São Carlos

13ª edição

Livro de Resumos

São Carlos
2023

Ficha catalográfica elaborada pelo Serviço de Informação do IFSC

Semana Integrada do Instituto de Física de São Carlos
(13: 21-25 ago.: 2023: São Carlos, SP.)
Livro de resumos da XIII Semana Integrada do Instituto de Física de São Carlos – Universidade de São Paulo / Organizado por Adonai Hilário da Silva [et al.]. São Carlos: IFSC, 2023.
358p.

Texto em português.
1.Física. I. Silva, Adonai Hilário da, org. II. Título.

ISSN: 2965-7679

PG73

Reservoir computing: using conjugated polymers for constructing physical reservoirs

FARIA, Gregório[1]; TORRES, Bruno Bassi Millan[1]; SOUZA, Rafael Francisco Santiago de[1]

rafael.francisco.sousa@usp.br

[1]Instituto de Física de São Carlos - USP

Reservoir computing is a concept that emerged in the early 2000s which consists of using nonlinear dynamics of physical systems (reservoir) as a neural network. However, unlike a classical neural network, where each element of the network needs to be pre-trained, the elements of the non-classical reservoir functioning in a untrained fashion. The reservoir uses the non-linear dynamics of its elements to propagate information and only the output layer of the reservoir is trained to fit the desired regression/classification. (1) In this work, we evaluated the construction of physical reservoirs based on electropolymerized conducting polymers microfibers based on EDOT, pyrrole and aniline derivatives. We found that EDOT microfibers were easily growth by using a square voltage with amplitudes between 2 and 10 V, and frequencies ranging from 10 to 200Hz. As for the Aniline, o-Anisidine and pyrrole, there is no growth in any of the tested conditions. After sorting the monomers, the physical reservoir was built by placing a monomeric solution in contact with several gold electrodes and applying a sinusoidal voltage so that the polymeric fibers grow and connect to the electrodes. The physical reservoirs obtained with EDOT were characterized for varied dynamical responses and nonlinear transformations. Beyond that, we also aimed to test single fiber EDOT reservoirs to analyze how the single element of a reservoir (a fiber) interacts with signals coming from other sources, with the aim to quantify the electrical resistance variance of the fiber to see the electrical changes in the input signal related to the output signal, analyzing if the single fiber is enough to distinguish between two signals and perform some sort of simple data classification. References [1] Nakajima, Kohei & Hauser, Helmut & Li, Tao & Pfeifer, Rolf. (2015). Information processing via physical soft body. Scientific reports. 5. 10487. 10.1038/srep10487.

Palavras-chave: Reservoir. Computing. Polymer

Agência de fomento: CAPES (88887.495882/2020-00)

Referências:

1 NAKAJIMA, K. *et al.* Information processing via physical soft body. **Scientific reports**, v.5, p.10487-1-10487-11, 2015.