

Universidade de São Paulo Instituto de Física de São Carlos

Semana Integrada do Instituto de Física de São Carlos

13^a 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

PG118

Quantum tomography: unveiling quantum state and processes

DOMINGUES, Artur Venturelli¹; MUNIZ, Sérgio Ricardo¹

artur.domingues@usp.br

¹Instituto de Física de São Carlos - USP

This poster delves into the concepts of quantum state and quantum process tomography, using NV centers as the primary system for demonstration of these concepts. The focus is on applying Bayesian inference and maximum likelihood estimations as data analysis processes within quantum systems. The presentation begins with an introduction to quantum state and quantum process tomography, emphasizing the challenges involved in characterizing and reconstructing quantum states and processes, as well as the importance of accurate measurements and statistical methods. NV centers, which are defects found in diamond crystals, serve as the experimental system for this study. The subsequent part of the presentation explores the practical implementation of Bayesian inference and maximum likelihood estimations for extracting meaningful insights from experimental data obtained through quantum state and quantum process tomography. (1-2) The presentation also investigates the potential application of transformers, known for their success in natural language processing, for data analysis and Hamiltonian estimation in the quantum domain. (3) By understanding these concepts, it is possible to gain insights into the practical applications of Bayesian inference, maximum likelihood estimations, and transformers, contributing to the accurate characterization of quantum systems.

Palavras-chave: Nitrogen-vacancy. Statistical inference. LLM.

Agência de fomento: Sem auxílio

Referências:

- 1 HINCKS, I.; GRANADE, C.; CORY, D. G. Statistical inference with quantum measurements: methodologies for nitrogen vacancy centers in diamond. **New Journal of Physics**, v. 20, n. 1, p. 013022-1-13022-39, Jan. 2018. DOI: 10.1088/1367-2630/aa9c9f.
- 2 VERDEIL, F.; DEVILLE, Y. **Unitary quantum process tomography with unreliable pure input states**. 2023. DOI: 10.48550/arXiv.2306.07867.
- 3 AN, Z. *et al.* **Unified quantum state tomography and hamiltonian learning using transformer models: a language-translation-like approach for quantum systems**. 2023. DOI: 10.48550/arXiv.2304.12010.