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- ★ **~2m NSF Funding**
- ★ **NSF CAREER 2022**
- ★ **REU site@NC State – Algorithms & Theory**
- ★ **Mentor@** EPSCoR Research Infrastructure Improvement (RII) Track-4 award
- ★ **3 PhD graduates** (all assist. profs)

Algorithms & Theory Research

- String Algorithms
- Compressed Data Structures
- Bioinformatics
- …

Proceedings

Proceedings of the 2024 Annual ACM-SIAM Symposium on Discrete Algorithms (SODA)

Near-Optimal Quantum Algorithms for Bounded Edit Distance and Lempel-Ziv Factorization

Authors: Daniel Gibney, Ce Jin, Tomasz Kociumaka, and Sharma V. Thankachan | AUTHORS INFO & AFFILIATIONS

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Abstract

Measuring sequence similarity and compressing texts are among the most fundamental tasks in string algorithms. In this work, we develop near-optimal *quantum* algorithms for the central problems in these two areas: computing the edit distance of two strings [Levenshtein, 1965] and building the Lempel-Ziv factorization of a string [Ziv & Lempel, 1977], respectively.

Classically, the edit distance of two length-n strings can be computed in $\mathcal{O}(n^2)$ time and there is little hope for a significantly faster algorithm: an $\mathcal{O}(n^{2-\varepsilon})$-time procedure would falsify the Strong Exponential Time Hypothesis. Quantum computers might circumvent this lower bound, but even 3-approximation of edit distance is not known to admit an $\mathcal{O}(n^{2-\delta})$-time quantum algorithm. In the *bounded* setting, where