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Privacy-Preserving Techniques in Genomic Applications

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Genomics data is highly useful for a multitude of applications, but often the question of patient privacy is raised. It is important to advance our knowledge in medicine while understanding the limitations and boundaries of the existing privacy-enhancing technology in the healthcare domain. In this project, our goal is to design more efficient privacy-preserving protocols in data outsourcing environments that allow multiple healthcare organizations to securely, accurately, and safely share and query genomic data for biomedical research and evidence-based precision medicine. We are adjusting and developing novel approximation strategies commonly used in the field for generating edit distance, which produces a similarity score between two genetic sequences, in order to improve the efficiency of various biological applications. Our methods include using secure multi-party computation techniques to develop secure and verifiable sequence matching protocols. We experimentally test our methods for accuracy and speed to find the optimal approximation algorithm. This study is still in progress and is currently assessing different multi-party computational techniques.