CRISPR-Cas9 Guide RNA Designer

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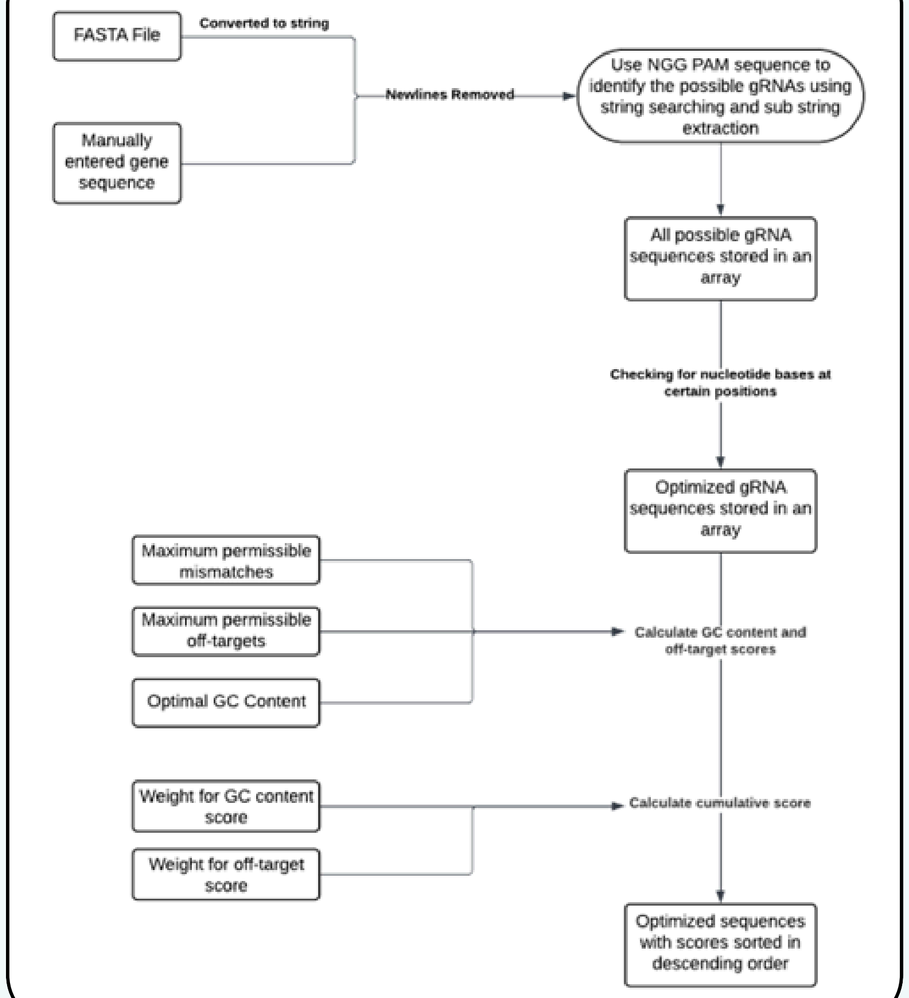
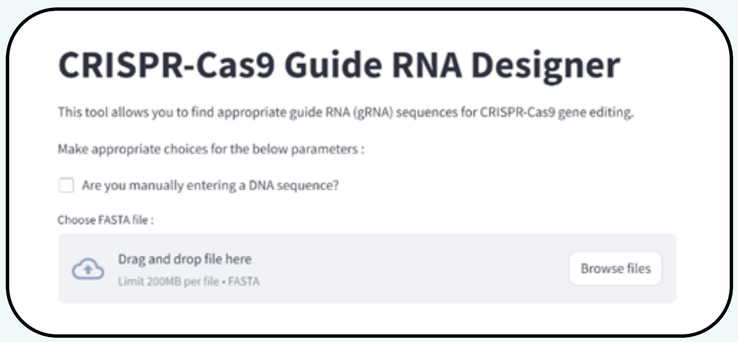
Introduction

The **CRISPR-Cas9 gene editing**, based on a bacterial immune mechanism, offers **precise DNA editing techniques** for gene therapy, disease treatment, and improved agricultural crops. We built a **bioinformatics tool** that combines sequence retrieval, characteristics analysis, and user interaction to create a **systematic framework for building guide RNAs for CRISPR-Cas9 gene editing**. The tool, **built using Python and Streamlit**, allows users to enter in the DNA sequence of choice, and automatically extract guide RNAs that can potentially be used for gene editing. Then, based on user inputs, it then ranks the extracted sequences from least compatible to most compatible for the user's purpose.

Tech Stack

- Python Programming Language
- Streamlit UI Builder





Methodology

- Take in input DNA sequence from the user.
- Use string parsing and analysis to find the required gRNA.
- Use metrics to rank the gRNA sequences based on potential effeciency.

Ranking of gRNAs

- GC Content (Number of guanine and cytosine nucleotides in the sequence)
- Off-target Count, with given maximum number of mismatches
- Presence of adenine, guanine or cytosine in preferred positions within the sequence.