A CS 284A Final Project Proposal: Predicting Off-target activity for Crispr gRNA gene editing

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Motivation

The clustered regularly interspaced short palindromic repeats (CRISPR) technology has revolutionized gene editing and brought new hope for future disease prevention, aging, and even sparked talk of 'designer dna' (the trendy name for potential aesthetic gene editing).

Perhaps the biggest flaw in the Crispr technology is the inability to accurately predict the effects of editing a certain gene using a specific guide Ribonucleic acid(RNA). Many solutions to the problem(predicting off-target activity) have been proposed. Included among these are the Elevation and Crispor algorithms that use machine learning to predict off-target activity for end-to-end gRNA design.

Research Question: Given a DNA target-gRNA pair, can we predict the risk of off-target activity if the Crispr technology were to be deployed for gene editing using that specific pair.

Project Objective

This project will look to apply different artificial neural network models towards predicting off-target activity when using Crispr gRNAs. We will use GUIDE-seq datasets to train and test different models then evaluate their performance against each other and against the Elevation and Crispor algorithms.

References:

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