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Designing Genes that Encode Proteins for Biomedical Applications

Isaiah Traben
Cleveland State University

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Washkewicz College of Engineering

Student Researcher: Isaiah Traben

Faculty Advisor: Nolan B. Holland

Abstract

DNA is a crucial component of all known life. It encodes in genes the structure of the proteins necessary to perform many of the functions in a cell. Proteins are biological polymers consisting of a chain of amino acids. The specific sequence of the amino acids determines the structure and therefore function of the protein. The sequence of the amino acids of a protein is coded in DNA via triplets of the nucleotide bases known as codons, which each can represent only one amino acid. However, an amino acid can be represented by more than one codon, so there are many combinations of DNA that can code for any given protein. The efficiency of expressing a protein from a gene can be affected by the DNA sequence, so to optimize protein production, we want an optimal sequence of DNA. Particularly, we would like to be able to design *ab* initio, optimized genes that code for protein-based materials for biological applications. We are working to develop a computer program to generate DNA code from an amino acid sequence. The ultimate goal is to optimize the sequence by using codons in an efficient way and removing unwanted patterns in the gene.