Challenges in Computer Science
The Low-Autocorrelation Problem

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Introduction

The given problem, the so-called *low-autocorrelation problem of binary sequences*, is subject to actual research and is of big interest for industrial applications, e.g. communications and electrical engineering. Its description follows.
Feasible Solutions: Binary Sequences $\vec{y} \in \{-1, +1\}^n$
Objective Function:

$$f(\vec{y}) = \frac{n^2}{2 \cdot E(\vec{y})} \longrightarrow maximization \tag{1}$$

s.t.

$$E(\vec{y}) = \sum_{k=1}^{n-1} \left(\sum_{i=1}^{n-k} y_i \cdot y_{i+k} \right)^2 \tag{2}$$

i.e., the low autocorrelated binary string problem is defined as finding the string with the maximal objective function.

Best Known Values

The best known values for the low-autocorrelation problem, for various dimensions, are given in the table below.

Your Task

You are required to implement an Evolutionary Algorithm for tackling the low-autocorrelation problem. Given your implementation, run your algorithm on strings of the lengths given in the table, and report your results.

A MATLAB code for the objective function is given to you in the following location:

`http://www.liacs.nl/home/oshir/code/merit.m`

Its documentation:

`http://www.liacs.nl/home/oshir/code/autocorr.pdf`

Table 1: Best Known Values

n	Best Known f
20	7.6923
50	8.1699
100	8.6505
199	7.5835
200	7.4738
201	7.5263
202	7.3787
203	7.5613
219	7.2122
220	7.0145
221	7.2207
222	7.0426