Mathematical Analysis of Genetic Algorithms

- Genetic Algorithms are not appropriate for certain problems where finding the exact global optimum is required.

- Genetic Algorithms are non-deterministic. However, there are theories about how and why they work in idealized settings.

Mathematical Analysis of Genetic Algorithms

The analysis of Genetic Algorithms requires us to understand the following concepts:

- Search Space

- Schema

- Implicit parallelism

The Schema Theorem

The observed best schemas are expected to receive an exponentially increasing number of samples in successive generations.

The building blocks hypothesis

- The genetic algorithm converges on high fitness regions in some low-order schemas.

- The algorithm detects biases on higher order schemas by combining information from low-order schemas through cross-over and mutation

- The algorithm converges on a small region of the search space that has high fitness

Deception

Low-order schemas lead the genetic algorithm away from good higher-order schemas.