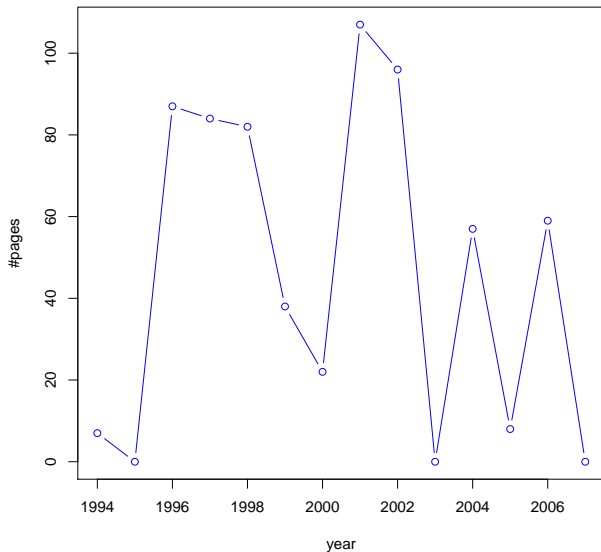# Exploring Neutral Networks for RNA Sequences

Sarah J. Berkemer
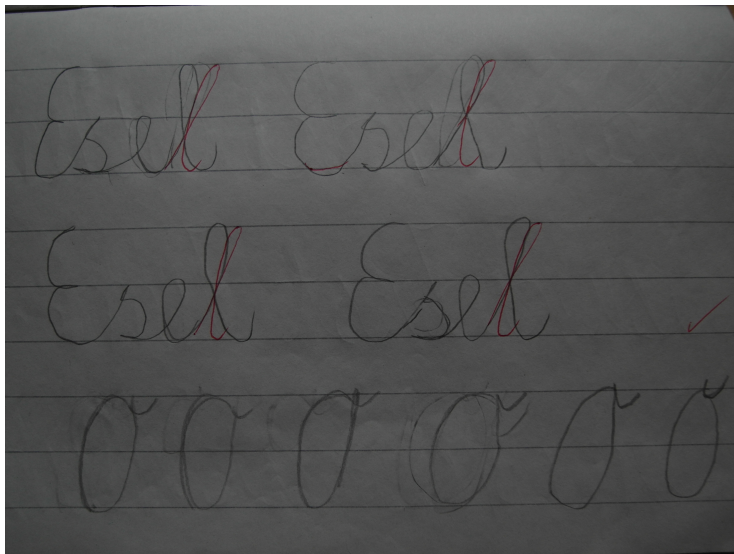
Bioinformatics Leipzig

Winterseminar 2019

Existing Work

Time Frame: 1990ies

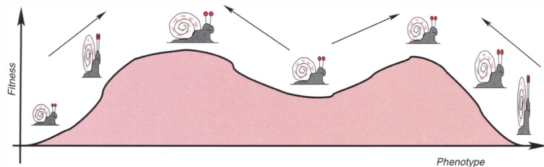# Fitness Landscapes

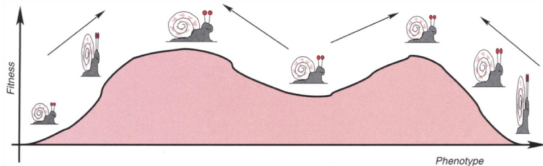Figure: Snail fitness by [Reidys & Stadler, 2002].

Fitness Landscapes

Figure: Snail fitness by [Reidys & Stadler, 2002].

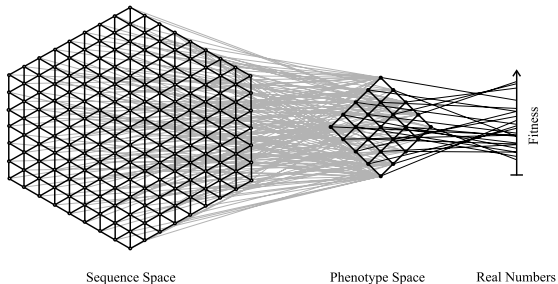Sequence Space   Phenotype Space   Real Numbers

Figure: Genotype space to phenotype space to fitness by [Schuster, 2002].
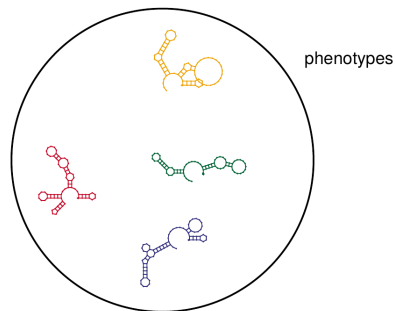
Neutral Networks

Figure: Phenotypes [Fontana, 2002]
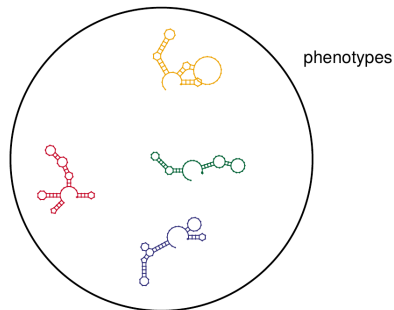
Neutral Networks

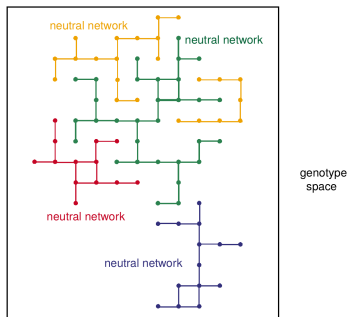Figure: Phenotypes [Fontana, 2002]

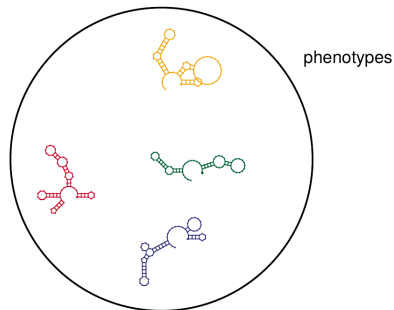Figure: Neutral networks [Fontana, 2002]

Neutral Networks

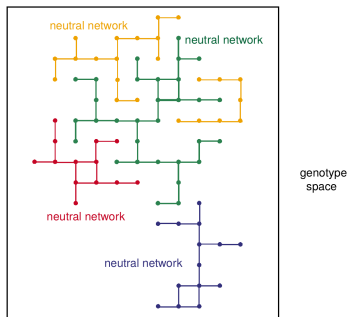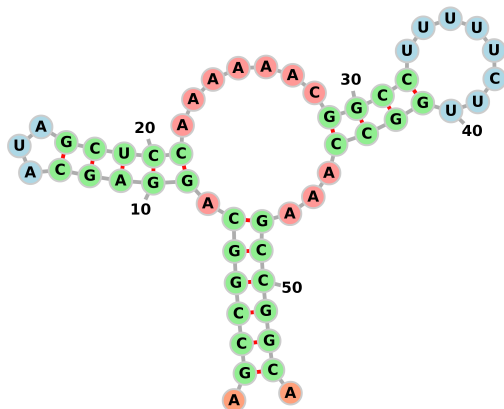
Figure: Phenotypes [Fontana, 2002]

Figure: Neutral networks [Fontana, 2002]
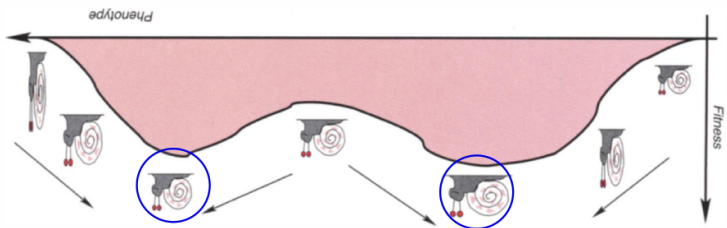
Questions

1. When are two sequences adjacent?
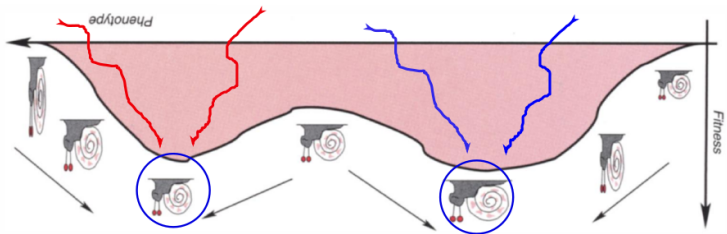2. What is the criterion for neutrality or fitness?

Target Structure

Hammerhead ribozyme type III, length 54nt
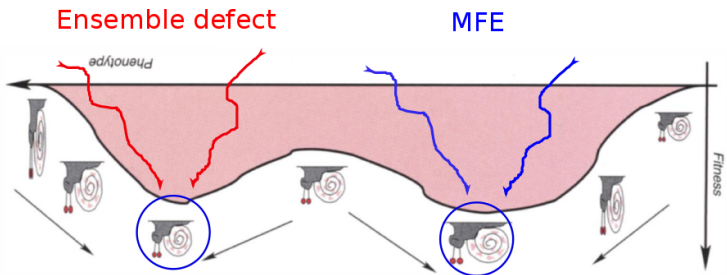.((((((.(((((...))))).......(((((........))))...)))))).

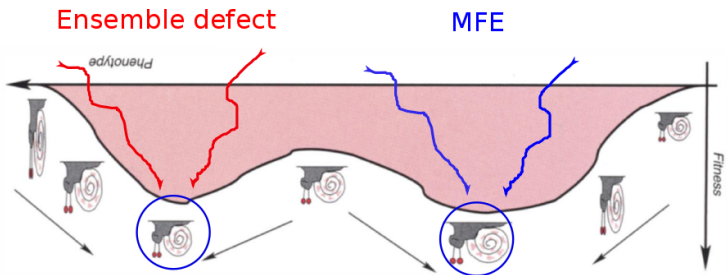# Creation of Neutral Networks aka Sampling

Creation of Neutral Networks aka Sampling
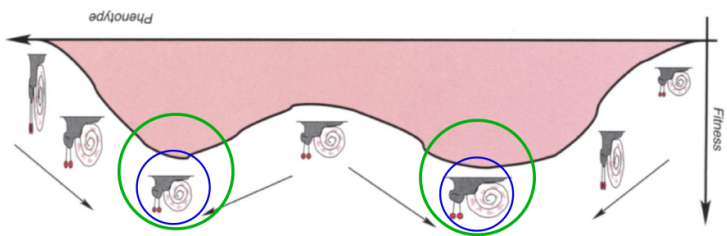
Creation of Neutral Networks aka Sampling

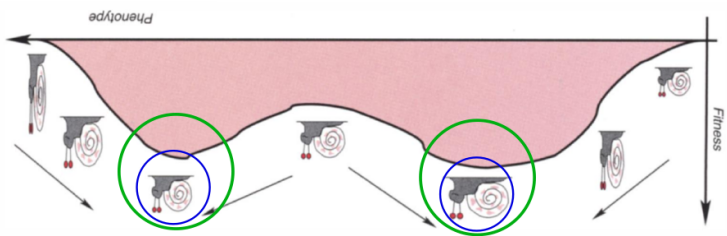# Creation of Neutral Networks aka Sampling

Method

This is done using *RNABluePrint* [Hammer et al., 2017].
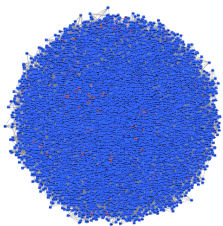
Exploring the Neighborhood
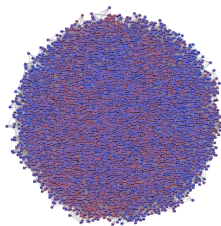
Exploring the Neighborhood

For each of the initial sequences (mfe or ed), we explore the local neighborhood using *RNABluePrint* [Hammer et al., 2017].
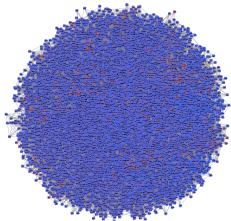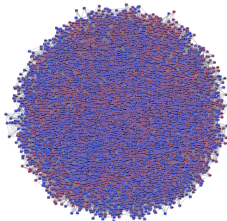
Graph Representation (blue=small)
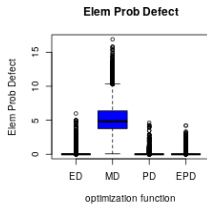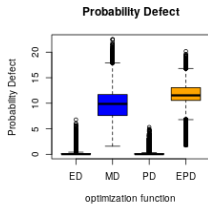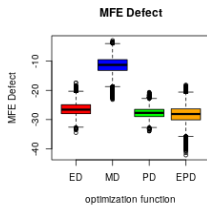

ensemble optimized,
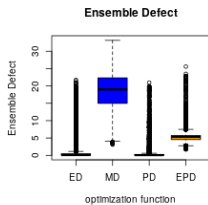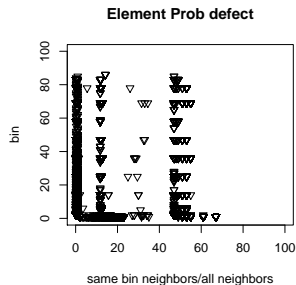ensemble defect colored
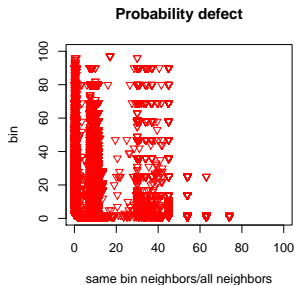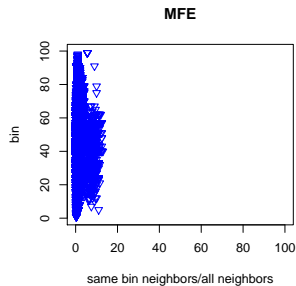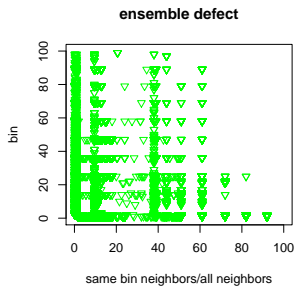

ensemble optimized,
MFE colored

MFE optimized,
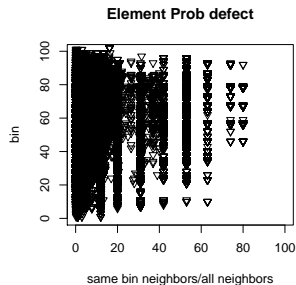ensemble defect colored

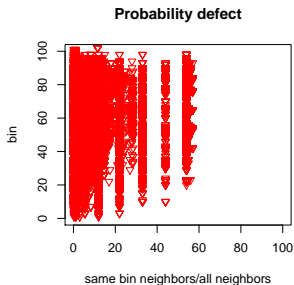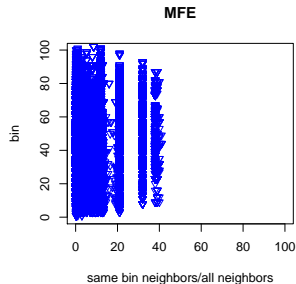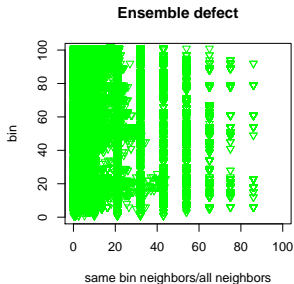

MFE optimized,
MFE colored

Defect Values

Neighborhood - Ensemble Optimized

Neighborhood - MFE Optimized

Thank you for your attention!

Questions?

References

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