Übungen zum Sequenzanalyse-Praktikum

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`http://wiki.techfak.uni-bielefeld.de/gi/Teaching/2013summer/SequaPrak`

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Multiple sequences usually carry more information than each sequence alone. For RNA, compensating base mutations are a strong evidence for putative base pairs: If a putative G-C base pair mutates to an A-U base pair these positions are likely to pair.

Exercise 14.1:

Plan A Use CLUSTALW `http://bibiserv.techfak.uni-bielefeld.de/clustalw/` to align the following two tRNA sequences. Then fold the resulting alignment with RNAALIFOLD `http://rna.tbi.univie.ac.at/cgi-bin/alifold.cgi`. Report consensus Vienna-Dot-Bracket structure and consensus sequence.

```
>Human_tRNA_38.chr6 (Ile, AAT)
GGCTGGTTAGTTCAGTTGGTtAGAGCGTGGTGCTAATAACGCCAAGGtCG
TGGGTTCGATCCCCATATCGGCCA
>Human_tRNA_2.chr7 (Pro,AGG)
GGCTCGTTGGTCTAGGGGTATGATTCTCGCTTAGGGTGCGAGAGGTCCCG
GGTTCAAATCCCGGACGAGCCC
```

Plan B Simultaneously align and fold the two tRNA sequences with FOLDALIGN `http://foldalign.ku.dk/server/index.html`. Report consensus Vienna-Dot-Bracket structure.

Plan C Structurally align the two MFE-structures computed by RNAFOLD `http://rna.tbi.univie.ac.at/cgi-bin/RNAfold.cgi` with RNAFORESTER `http://bibiserv.techfak.uni-bielefeld.de/rnaforester` in multiple mode (you would not get a consensus structure in pairwise mode). Report consensus Vienna-Dot-Bracket structure and consensus sequence. Are there any differences to the alignments from Plan A. and Plan B.?

Plan D Plan D is solely based on stochastic properties like covariance or mutual information. It needs a lot of input data and does not answer the question for *one* optimal secondary structure, but gives a stochastically sound overview about compensatory mutation during evolution. Take the 20 tRNA sequences from `http://tinyurl.com/nhq46em`, extracted from RFAM `http://rfam.sanger.ac.uk/`, in multiple Fasta format. Use MATRIXPLOT `http://www.cbs.dtu.dk/services/MatrixPlot/mutualNucl/index.html` to compute the mutual information. Report the dot-plot. Can you detect the clover leaf in the plot?

Exercise 14.2:
Which plan works best? Which is the fastest one? State your judgements in just a few sentences.