

Program 2011

Day 1: Course introduction

Lectures

- Introduction to course
- Immune system overview
- UNIX crash course 101
- C-programming crash course 101

Exercise

- C programming using pointers and linked lists

Day 2: Weight matrix construction

Lectures

- Weight matrix (PSSM) construction,
- Gibbs sampling, and
- Psi-Blast

Exercise

- Implementation of PSSM construction from pre-aligned sequences including pseudo count correction for low counts and sequence clustering

Day 3: Sequence alignment

Lectures

- Blosum scoring matrices
- Sequence alignment
- Data redundancy reduction algorithms (Hobohm1 and Hobohm2).

Exercise

- Implementation of Smith-Waterman Dynamic programming algorithm
- Implementation of data homology reduction algorithms

Day 4: Hidden Markov Models

Lectures

- Hidden Markov models introduction
- Viterbi decoding
- Forward/Backward algorithm, Posterior decoding, Baum-Welsh learning
- Profile Hidden Markov Models.

Exercise

- Implementation of Viterbi and posterior decoding
- Training of a profile Hidden Markov model using HMMer

Day 5: Artificial neural networks

Lectures

- Background
- Sequence encoding
- Feed forward algorithm
- Back-propagation and neural network training

- Network training - cross-validation

Exercise

- Implementation of sequence encoding feed forward and back-propagation algorithms

Day 6-9: Project work

Day 10: Exam