

Lecture plan 2020

TIF150, Information theory for complex systems

Week 1

Monday 20 January 15:15–17:00

Introductory meeting. Course overview. Basic information-theoretic concepts.

Wednesday 22 January 10:00–11:45

1. We discuss the introductory puzzle in an information theoretic perspective.
2. Information theory: Relative information or Kullback-Leibler divergence, the maximum entropy formalism, Gibbs distributions. (Continuous state space.)

Friday 24 January 13:15–15:00

Examples and exercises — basic concepts. (Susanne)

Week 2

Monday 27 January 15:15–17:00

Information theory: lattice systems, entropies of symbol sequences. Decomposition of information in entropy and redundancy. Decomposition of redundancy into contributions from density information and correlation of different lengths.

Wednesday 29 January 10:00–11:45

Lattice systems, continued. Symbol sequences generated by finite automata.

Friday 31 February 13:15–15:00

Examples and exercises — symbol sequences. (Susanne)

Week 3

Monday 3 February 15:15–17:00

Complexity measures. Two-dimensional systems.

Friday 7 February 13:15–15:00

Introduction to Cellular automata; entropy law.

Week 4

Monday 10 February 15:15–17:00

Cellular Automata.

Wednesday 12 February 10:00–11:45

Examples and exercises — Cellular Automata. (Rasmus)

Friday 14 February 13:15–15:00

Examples and exercises — Cellular Automata. (Susanne)

Week 5

Monday 17 February 15:15–17:00

Information theory and Physics; statistical mechanics.

Wednesday 19 February 10:00–11:45

Information theory and Physics — spin systems.

Friday 21 February 13:15–15:00

Examples and exercises — Spin systems. (Rasmus/Susanne)

Week 6

Wednesday 26 February 10:00–11:45

Chaotic systems.

Friday 28 March 13:15–15:00

Chaotic systems, continued.

Week 7

Wednesday 4 March 10:00–11:45

Examples and exercises — Chaotic systems. (Susanne)

Friday 6 March 13:15–15:00

Geometric information theory, fractals.

Week 8

Wednesday 11 March 10:00–11:45

Self-organizing systems — flows of information.

Friday 13 March 13:15–15:00

Examples from previous exams. (Susanne)