

Lecture plan 2019

TIF150, Information theory for complex systems

Week 1

Monday 21 January 15:15–17:00

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

Wednesday 23 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 25 January 13:15–15:00

Examples and exercises — basic concepts. (Rasmus)

Week 2

Monday 28 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 30 January 10:00–11:45

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

Friday 1 February 13:15–15:00

Examples and exercises — symbol sequences. (Rasmus/Susanne)

Week 3

Monday 4 February 15:15–17:00

Complexity measures. Two-dimensional systems.

Friday 8 February 13:15–15:00

Introduction to Cellular automata; entropy law.

Week 4

Monday 11 February 15:15–17:00

Cellular Automata.

Wednesday 13 February 10:00–11:45

Examples and exercises — Cellular Automata. (Rasmus/Susanne)

Friday 15 February 13:15–15:00

Examples and exercises — Cellular Automata. (Rasmus/Susanne)

Week 5

Monday 18 February 15:15–17:00

Information theory and Physics; statistical mechanics.

Wednesday 20 February 10:00–11:45

Information theory and Physics — spin systems.

Friday 22 February 13:15–15:00

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

Week 6

Wednesday 27 February 10:00–11:45

Chaotic systems.

Friday 1 March 13:15–15:00

Chaotic systems, continued.

Week 7

Wednesday 6 March 10:00–11:45

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

Friday 8 March 13:15–15:00

Geometric information theory, fractals.

Week 8

Monday 11 March 15:15–17:00

Self-organizing systems — flows of information.

Wednesday 13 March 10:00–11:45

Examples from previous exams. (Rasmus/Susanne)