

Lecture plan

TIF150, Information theory for complex systems 2018

Document change log

11 January 2018: Switched sessions between 16 and 19 February.

Week 1

Monday 15 January 15:15–17:00

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

Wednesday 17 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 19 January 13:15–15:00

Examples and exercises — basic concepts. (Rasmus)

Week 2

Monday 22 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 24 January 10:00–11:45

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

Friday 26 January 13:15–15:00

Complexity measures. Two-dimensional systems.

Week 3

Monday 29 January 15:15–17:00

Examples and exercises — symbol sequences. (Rasmus)

Wednesday 31 January 10:00–11:45

Introduction to Cellular automata; entropy law.

Friday 2 February 13:15–15:00

Cellular Automata.

Week 4

Monday 5 February 15:15–17:00

Examples and exercises — Cellular Automata. (Rasmus)

Friday 9 February 13:15–15:00

Examples and exercises — Cellular Automata. (Rasmus)

Week 5

Monday 12 February 15:15–17:00

Information theory and Physics; statistical mechanics.

Wednesday 14 February 10:00–11:45

Information theory and Physics — spin systems.

Friday 16 February 13:15–15:00

Examples and exercises — Spin systems. (Rasmus)

Week 6

Monday 19 February 15:15–17:00

Chaotic systems.

Wednesday 21 February 10:00–11:45

Chaotic systems, continued.

Week 7

Wednesday 28 February 10:00–11:45

Examples and exercises — Chaotic systems. (Rasmus)

Friday 2 March 13:15–15:00

Geometric information theory, fractals.

Week 8

Monday 5 March 15:15–17:00

Self-organizing systems — flows of information.

Wednesday 7 March 10:00–11:45

Examples from previous exams. (Rasmus)