Lecture plan 2021

TIF150, Information theory for complex systems

Week 1

Tuesday 19 January 15:15–17:00

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

Thursday 21 January 15:15–17:00 (Ankit)

1. We discuss the introductory puzzle in an information theoretic perspective.

2. Information theory: Relative information or Kullback-Leibler divergence, the maximumentropy formalism, Gibbs distributions. (Continuous state space.)

Friday 22 January 13:15–15:00

Examples and exercises — basic concepts. (Ankit)

Week 2

Tuesday 26 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.

Thursday 28 January 15:15–17:00

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

Friday 29 January 13:15–15:00

Examples and exercises — symbol sequences. (Ankit)

Week 3

Thursday 4 February 15:15–17:00

Complexity measures. Two-dimensional systems.

Friday 5 February 13:15–15:00

Introduction to Cellular automata; entropy law.

Week 4

Tuesday 9 February 15:15–17:00

Cellular Automata.

Friday 12 February 13:15–15:00

Examples and exercises — Cellular Automata. (Ankit)

Week 5

Tuesday 16 February 15:15–17:00

Examples and exercises — Cellular Automata. (Ankit)

Thursday 18 February 15:15–17:00

Information theory and Physics; statistical mechanics. (Ankit)

Friday 19 February 13:15–15:00

Information theory and Physics — spin systems. (Ankit)

Week 6

Tuesday 23 February 15:15–17:00

Examples and exercises — Spin systems. (Ankit)

Thursday 25 February 15:15–17:00 Chaotic systems.

Week 7

Tuesday 2 March 15:15–17:00 Chaotic
systems, continued.

Thursday 4 March 15:15–17:00

Examples and exercises — Chaotic systems. (Ankit)

Friday 5 March 13:15–15:00

Geometric information theory, fractals.

Week 8

Tuesday 9 March 15:15–17:00

Self-organizing systems — flows of information. (Ankit)

Friday 12 March 15:15–17:00

Examples from previous exams. (Ankit)