

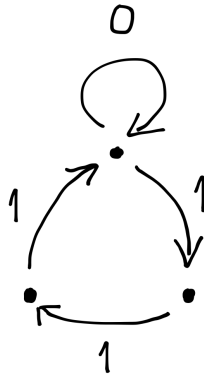
Homework 3

TIF150, Information theory for complex systems 2018

CA information

Consider a one-dimensional cellular automaton given by elementary rule R174, i.e., the neighbourhoods 110, 100, and 000 map to 0, and all others to 1.

Let the initial state ($t = 0$) be characterized by the following finite state automaton (where it is assumed that if two arcs leave the same node they have equal probabilities).



- a) Is this rule reversible, almost reversible, or irreversible?
- b) What is the initial entropy density s (at $t = 0$)?
- c) Derive a finite state automaton describing the CA state after one time step ($t = 1$).
- d) What is the entropy density s at this time ($t = 1$)?
- e) What is the entropy density s after two time steps ($t = 2$)?

Hand in your solutions no later than Friday 16 February at 13:15. Late submissions will normally not be graded. You may hand in on paper in class, or by emailing a PDF named `yourcid.pdf`, e.g. `rasmuse.pdf`, to Rasmus: [rasmus.einarsson\[at\]chalmers.se](mailto:rasmus.einarsson@chalmers.se). Hand-written solutions are fine, but please take care to make them legible.