Logics of Knowledge and Information

guiding themes:

**how to model (access to distributed) information;
reasoning about resulting knowledge phenomena;
support for such tasks in specific logical formalisms**

- analysis of semantic settings and
  expressiveness of suitable logics
  (model-theoretic themes; e.g. bisimulation)
- reasoning principles in various settings:
  axiomatics, proof calculi
  (proof-theoretic themes; e.g. modal correspondence theory)
- methods from classical logic & model theory
  in non-classical settings

modelling information

e.g. at the propositional level: interpret prop. variables $p, q, r, \ldots$

$$\begin{cases} \text{one interpretation at a time:} & \text{perfect information} \\ \text{or several possibilities:} & \text{imperfect information} \end{cases}$$

$\rightsquigarrow$ **possible worlds** and **information states**

- how to deal with (non-trivial) information states:

  "p is/must be true" (easy)

  "$p \vee q$ is/must be true" (not so obvious)

- relationships between information states:
  accessibility between possible worlds ("classical" modal logic)
  accessibility between information states (e.g. inquisitive logic)

- valid reasoning principles in different contexts:
  validity, satisfiability and associated proof calculi

modelling of & reasoning about information

e.g., reading a modal operator $\Box$,
interpretated in terms of relationships between possible worlds,
as one of

factual necessity / **guarantee for the future** / **provability** / ...

are these valid implications?

(?) $\Box\varphi \to \varphi$

(?) $\Box\varphi \to \Box\Box\varphi$

(?) $\Box(\Box\varphi \to \varphi) \to \Box\varphi$

course content: from classical Kripke semantics
and relationship with FO to more recent
developments in finite model theory,
team semantics, relationships with SO, ...