

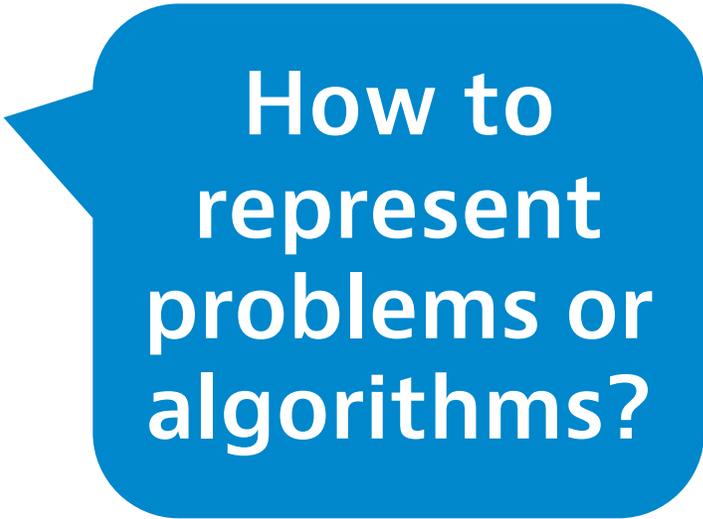
# Distributed Algorithms 2022

9 Round elimination

**Can we  
automate  
our own work?**

# Meta-algorithmics

- **Normal algorithms** — example:
  - input: graph  $G$
  - output: coloring of graph  $G$
- **Meta-algorithms** — example:
  - input: **computational problem**  $P$
  - output: **algorithm** for solving  $P$



How to  
represent  
problems or  
algorithms?

# This week's plan

- **Topic:** *round elimination*
  - function that maps problem  $X$  with complexity  $T$  to problem  $X' = \text{re}(X)$  with complexity  $T - 1$
- **Video:** how to *use* round elimination
  - "re" was a black box
- **Today:** how to *do* round elimination
  - what happens inside the black box and why?

# Round elimination

- Basic idea already used by Linial (1987)
  - *“it is not possible to 3-color cycles in  $o(\log^* n)$  rounds”*
- Until 2015 it was thought this is an ad-hoc trick that only works for graph coloring
- **Lots** of new applications since 2016
- General idea formalized in 2019

# Weak 3-labeling

- **Labels:** 1, 2, 3
- **Active nodes:**
  - degree 3
  - not all labels same
- **Passive nodes:**
  - degree 2
  - both labels same

