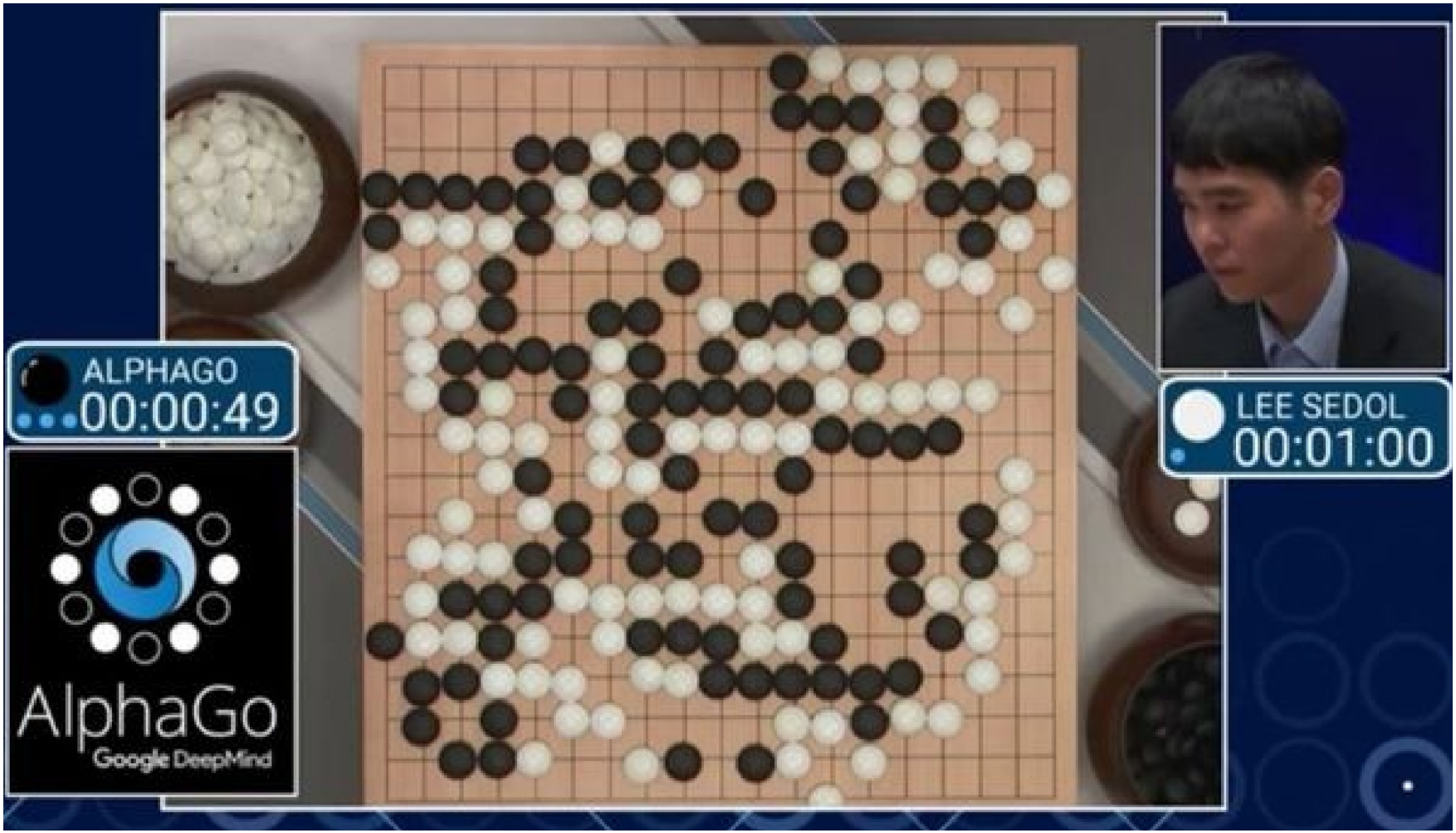
Aalto University
School of Electrical
Engineering

ELEC-E8125 Reinforcement learning
Course arrangements

Joni Pajarinen

6.9.2022



Silver et al., Nature 2016

Mnih et al., Nature 2015

Robot learns to swing a ball into a cup using reinforcement learning

Youtube video:

https://www.youtube.com/watch?v=IjyYCuxcJqs&ab_channel=IntelligentAutonomousSystems

Contents

- Overview of mathematical models and algorithms behind sequential decision making, that is, decision making in time-series systems

- Optimal decisions in known worlds
- Optimal decisions in unknown worlds
- Optimal decisions in partially observable worlds

Learning goals – What's the course about?

- After completing the course, you can explain main concepts and approaches related to decision making and learning in stochastic time series systems
- Read scientific literature to follow the developing field
- Choose approaches for a particular problem
- Implement algorithms such as value iteration and policy gradient

Prerequisities

- Essential
  - Programming (Python)
  - Math (probability, matrix algebra, calculus)
- Useful
  - Machine learning (supervised learning, neural networks)
  - Control engineering (feedback, LQR will be useful)
- Motivation to work hard!

Teaching

- Independent study
  - Readings, videos
- Lectures
  - Discuss concepts, summarize, give new viewpoints
  - Tue 14:15-16
  - 2 hours of lecture / week
- Quizzes
  - Based on lectures and readings, completed electronically
- Assignments/problem sets
  - 7 assignments, TO BE COMPLETED INDIVIDUALLY (1 PERSON)
  - Weekly exercise sessions for going through assignment and getting feedback. Starting 7.9.2022 and going on until project deadline.
- Project
  - Application of learned knowledge (2nd period)
  - 2 person groups
  - Project topic given, optionally own (more challenging, intended for PhD students) topic

Grading and evaluation

- To pass
  - Complete assignments
  - Complete project
  - Get 50%+ of total course points
- Grading
  - Quizzes 20 %
  - Assignments 60 %
  - Project 20 %

Workload estimate

- Lectures 24 h
- Exercise sessions 20 h
- Independent study 59 h
- Project work 27 h
- Total 130 h

Material

- MyCourses
  - Lecture slides
  - Lecture recordings
  - Links to readings and videos
- Sutton & Barto, “Reinforcement learning”, 2018 ed.
- Any other material you can find

Teachers

- Lecturer: Prof. Joni Pajarinen (joni.pajarinen@aalto.fi)
- Teaching assistants (TAs)
  - Yi Zhao
  - Wenshuai Zhao
  - Nikita Kostin
  - Aleksi Ikkala
  - Ali Khoshvishkaie
  - Jifei Deng
  - Mohammadreza Nakhaei

- **Primary contact channel: Slack (see MyCourses)**
  - If you need to contact individual TAs see MyCourses for the responsibilities of TAs

Questions?