Aalto University
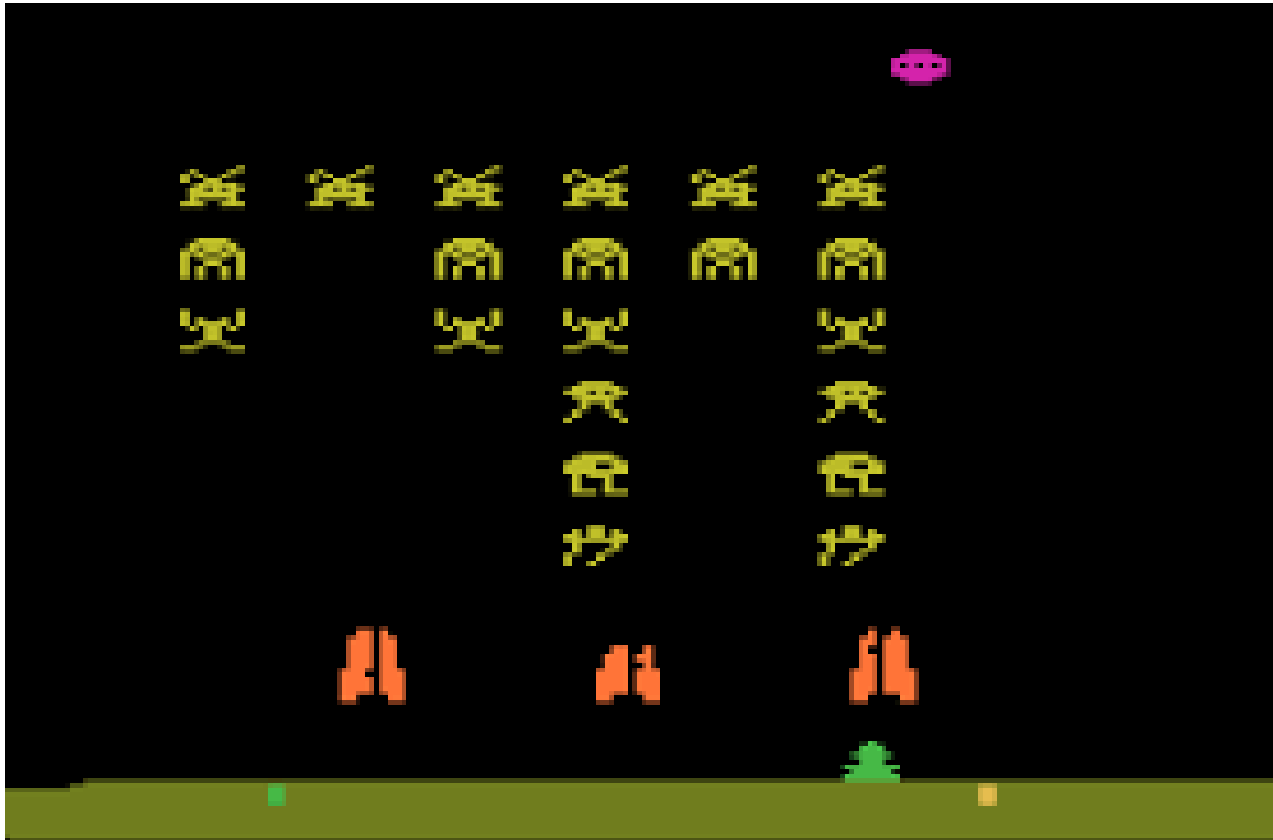**School of Electrical**
Engineering

ELEC-E8125 Reinforcement learning Course arrangements

Ville Kyrki

8.9.2020

Silver et al., Nature 2016

Learning a Complex Skill: Robot Table Tennis
Peters, J.; Kober, J.; Mülling, K.; Motor Skill Learning for Robotics

Mülling et al., IJRR 2013

Contents

- Overview of mathematical models and algorithms behind 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
  - 6 assignments, **to be completed individually**
  - Weekly exercise sessions for going through assignment and getting feedback
- Project
  - Application of learned knowledge (2nd period)
  - 2 person groups
  - Project topic given, optionally own (more challenging) topic

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Grading and evaluation

- To pass
  - Complete assignments
  - Complete project
- Grading
  - Quizzes 20 %
  - Assignments 50 %
  - Project 30 %

Workload estimate

- Lectures 24 h
- Exercise sessions 20 h
- Independent study 44 h
- Project work 40 h
- Total 128 h

Material

- MyCourses
  - Lecture slides
  - Links to readings and videos

- Sutton & Barto, "Reinforcement learning", 2017 ed.

- Any other material you can find

Teachers

- Lecturer
  - Prof. Ville Kyrki (ville.kyrki@aalto.fi)

- Primary TAs (assignments and project)
  - Karol Arndt
  - David Blanco Mulero
  - Oliver Struckmeier
- Secondary TAs (feedback)
  - Aleksi, Alessandro, Luca

Questions?