

Artificial Intelligence

CS-UY-4613-A / CS-GY-6613-I

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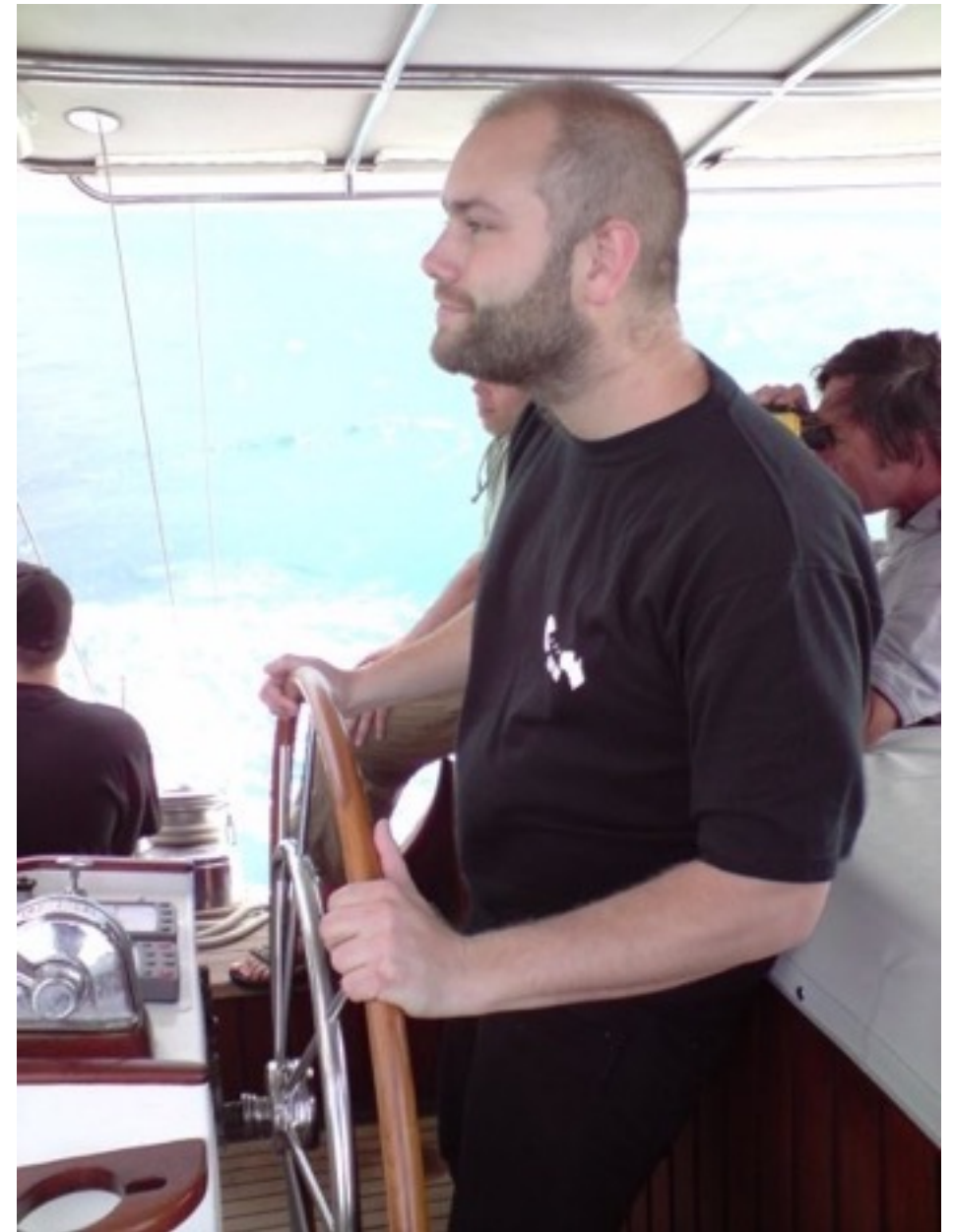
Introductory lecture given by Andy Nealen

Where is the professor?



Who is the professor?

- Wanted to understand the mind, turned to philosophy...
- ...then to artificial intelligence and robotics...
- ...now does AI for games
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This course

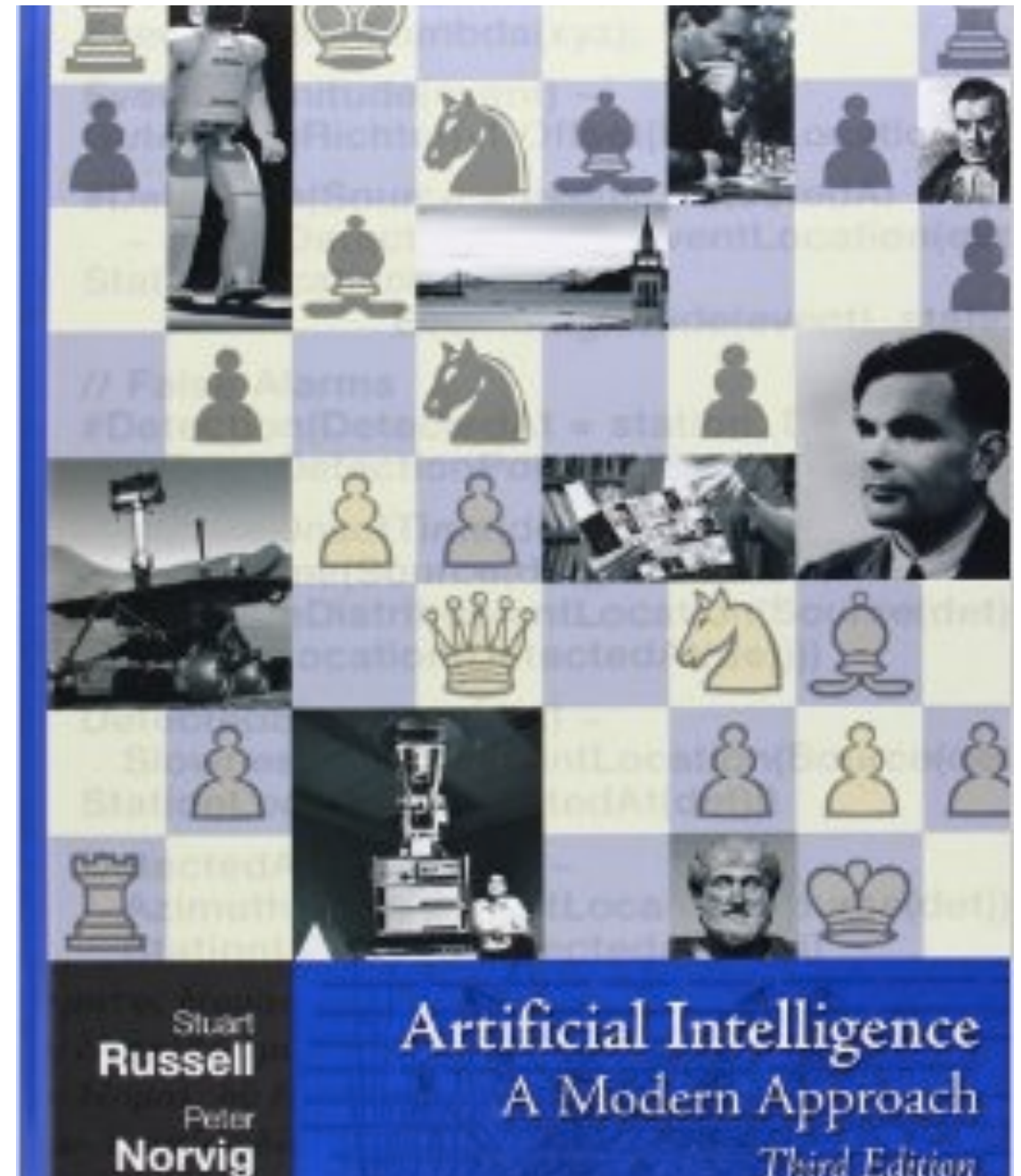
- An introduction to artificial intelligence (AI)
- Prerequisites: intermediate programming skills, an algorithms and data structures course, interest in the topic
- Meant to give you both an overview of the field, knowledge of useful methods and hands-on experience with a group project

AI for Games

- Special topics course given next spring
- Builds on this course, and focuses on the application of AI to games (mostly videogames)
- *If you took AI for Games last spring, that was a different course with large overlaps with the current AI course. If you took that course, it is not recommended that you take this course (AI).*

Course literature

- “Artificial Intelligence: a Modern Approach” by Russell and Norvig
- Classic book, very comprehensive and useful but a bit old-fashioned
- The course will not strictly follow the book, and less than half of it will be covered
- Occasionally additional readings will be given
- See course slides!



What is AI?

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What is AI?

“the study and design of intelligent agents”

“a branch of computer science dealing with the simulation of intelligent behavior in computers”

“the quest to make machines able to perform tasks which normally require human intelligence”

“any kind of computer science method that doesn’t work well yet; when it works, it’s not AI”

What is AI?

A set of powerful algorithmic methods with wide applicability, some of which you will learn in this course.

Don't worry, we'll get to the philosophical parts too.

A huge field where this course will not even scratch all of the surface.

What the course covers

- Some perspectives on AI and its roles
- Uninformed, informed, adversarial and stochastic search.
- Basics of logic and inference.
- Basics of supervised learning and reinforcement learning
- Applications in games and robotics

The course does not cover

- Anything in very much detail
- Knowledge representation
- Uncertainty and probabilistic reasoning
- Natural language processing or generation
- etc.

Course overview

- Sep 9 to Oct 14: Introduction, AI as search, various search strategies.
- Oct 21: Midterm exam
- Oct 28 to Dec 2: Logic, learning, applications, philosophy.
- Dec 9: Final exam
- Dec 14 (preliminary): Final project hand-in.

Grading

- 30% midterm
- 30% final exam
- 40% group project

Exams are meant to test your extensive knowledge of the complete course material. The group project is meant to allow you to indulge in a project that interests you within the general area of the course.

The following detailed
overview is tentative

Sep 9: What is AI?

- Overview and history of the field
- The concepts of intelligent agents and problem solving as search
- Applications of AI, particularly games and robotics
- Info on and discussion about group projects

Sep 16: Uninformed search

- Breadth-first
- Uniform cost
- Depth-first
- Iterative deepening

Sep 23: Informed search and optimization

- A^*
- Heuristics
- Hill-climbing
- Simulated annealing

Sep 30: Evolutionary search

- Evolution strategies
- Genetic algorithms
- Genetic programming
- Crossover, mutation
- Fitness landscapes

Oct 7: Adversarial search

- Minimax
- Alpha-beta pruning
- Evaluation functions
- Chance nodes

Oct 14: Logical agents

- Propositional logic
- Knowledge representation using logic
- Inference

Oct 21: Midterm

Oct 28: First-order logic

- Knowledge representation using predicate logic
- Inference in predicate logic

Nov 4: Supervised learning

- Concept learning
- Linear discriminant functions
- Perceptrons
- Neural networks

Nov 11: Supervised learning

- Decision tree learning

Nov 18: Reinforcement learning

- Policy search
- Temporal difference learning

Nov 25: Robotics

- Types of robot architectures
- Planning and path planning
- Localization and mapping
- Reactive methods
- Learning in robotics

Dec 2: Philosophy & Q/A

- Philosophical foundations of artificial intelligence
- Intelligence versus consciousness
- Superintelligence
- Are you a robot?
- Questions and answers on course content

Dec 9: Final exam