Enabling the Creation of Intelligent Things

European Driving License for Robots and Intelligent Systems
What should be part of an AI syllabus?

- Definition of AI
- Applications and practical examples
- Machine learning
- Vision
- Speech recognition
- Ethics
- Mathematics - Statistics
- Gestures
- Geo-information systems
- Data Analysis
Competencies

• I can describe artificial intelligence
• I can recognize if a given system is based on artificial intelligence
• I can name areas of AI and give specific examples of AI implementations
• I can understand technical, economic, ethical and legal implications of AI
• I am aware of different problem representations
• I can formalize a search problem
• I can explain basic data structures
• I can use algorithms to solve a search problem
• I can assess the basic properties of search algorithms
• I can translate an algorithm into code
• I can implement a simple AI system
• I can assess the correctness of my solution
Course Overview

• Getting to Know Each Other
• Defining Artificial Intelligence
• Natural Language Processing
• Programming 101
• Computer Vision
• Machine Learning
• Problem Solving by Search
• Project Day
Learning Environment
Defining Artificial intelligence
Think – Pair – Share
Defining Artificial Intelligence

AI is the part of computer science concerned with designing intelligent computer systems that exhibit the characteristics we associate with intelligence in human behavior – understanding language, learning, reasoning, solving problems and so on.


We define AI as the study of agents that receive precepts from the environment and perform actions. [. . . ] Ideally, an intelligent agent takes the best possible action in a situation.

Natural Language Processing – Chatbots
Meet the EDLRIS Team

Hello I’m Peter, who are you?

Send
Interviews

• Please describe the experience you just had with the chatbot in a few words.

• What is the relation of chatbots to artificial intelligence?

• In your opinion, how could it be achieved that chatbots reliably pass the Turing Test?

• Did you have other experiences with chatbots or natural language processing systems before?
  
  *If yes:* please describe them (e.g. where were they used, how did you feel interacting with the system?)
  
  *If no:* can you think of some areas where natural language processing might be useful?
The Imitation Game

HOW DO YOU DO: PLEASE TELL ME YOUR PROBLEM.
I miss my mother.
I am lonely.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Context Rule</th>
<th>Response-Template</th>
</tr>
</thead>
</table>
| YOU    | * YOU ARE (?NEG. FEELING) * | • DO YOU THINK COMING HERE WILL HELP
• YOU NOT TO BE @x?
• I AM SORRY TO HEAR YOU ARE @x.
• I’M SURE ITS NOT PLEASANT TO BE @x?
• CAN YOU EXPLAIN WHAT MADE YOU @x? |

<table>
<thead>
<tr>
<th>Replace</th>
<th>with</th>
<th>Word Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>ARE</td>
<td>NEG. FEELING</td>
</tr>
<tr>
<td>YOUR</td>
<td>MY</td>
<td>UNHAPPY DEPRESSED SICK</td>
</tr>
<tr>
<td>I</td>
<td>YOU</td>
<td>FAMILY MOTHER MOM FATHER DAD SISTER</td>
</tr>
<tr>
<td>MY</td>
<td>YOUR</td>
<td></td>
</tr>
</tbody>
</table>

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## Food for Thought

<table>
<thead>
<tr>
<th>Extensional Point of View</th>
<th>Intentional Point of View</th>
</tr>
</thead>
<tbody>
<tr>
<td>If People cannot differ a chatbot from a human, it means that the chatbot must be intelligent.</td>
<td>If People cannot differ a chatbot from a human, it means that these people are just too stupid to know the difference.</td>
</tr>
</tbody>
</table>

**The Chinese Room** (argument mounted by John Searle): A person who speaks only English is given a rule book with instructions written in English, some blank paper and some slips of paper with Chinese inscriptions. Small slips of paper with Chinese inscriptions are then given to the person who follows the rules in the rule book to produce a reply. (Russel, Stuart J. and Peter Norvig (2010). Artificial Intelligence. A Modern Approach. 3rd ed. Pearson.)

| If we ask the person in the room, if he/she speaks Chinese the answer is affirmative in fluent Chinese. This is enough evidence for understanding and speaking Chinese. | Although from the outside, you cannot tell if the person speaks Chinese because the responses are accurate, the person does not understand or speak Chinese, he/she just mindlessly follows a rule book. |
Is it Intelligent? 📁 🌌 📝

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Programming
Introduction

print(“I am an intelligent program”)
I’m a computer program and I’d like to chat with you.”
My friend said “I like you”
Ethics 🤖
Station Work

- Ownership – who does it serve (Changing perspective) 🤝
- Privacy – Continue a conversation with a chatbot 🗝️
- Advertisements – Case studies 🔊
- Abusive Language – How do you react? 🙅‍♂️
- Gender & Diversity – Reflect on your own behavior, impact on society 🏳️‍🌈
- Human Impersonation – Read conversation with Bot 😈
Computer Vision 🕵️‍♂️ 👤
ABC-Graffiti

Watson sees...

<table>
<thead>
<tr>
<th>Classes</th>
<th>Score</th>
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<tbody>
<tr>
<td>forelock hairstyle</td>
<td>0.85</td>
</tr>
<tr>
<td>pageboy hairstyle</td>
<td>0.63</td>
</tr>
<tr>
<td>female child</td>
<td>0.58</td>
</tr>
<tr>
<td>female</td>
<td>0.58</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Faces</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>age 0 - 17</td>
<td>0.81</td>
</tr>
<tr>
<td>female</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Did We Wow You?  Yes  No
Attentive Micro-Lecture
Classification
ABC-Graffiti and Cats & Dogs
Decision Trees

Day?
- Monday - Friday
  - Holiday?
    - Yes
    - Working Day
      - No
    - No
  - No
- Saturday or Sunday
  - No

Health?
- Sick
  - No
- Healthy
  - No

Road Condition?
- Clear
  - No
- Blocked
  - Age?
    - >18
      - No
    - <=18
      - Workplace?
        - Other than School
          - No
        - School
          - Profession?
            - Apprentice
              - No
            - Student
              - Yes
            - School
              - Yes
            - Other than School
              - No
Identifying Vampires
Teach O.K.

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<tr>
<td>Human</td>
<td>?</td>
<td>Yes</td>
<td>Average</td>
<td>None</td>
</tr>
<tr>
<td>Human</td>
<td>Yes</td>
<td>Yes</td>
<td>Ruddy</td>
<td>None</td>
</tr>
<tr>
<td>Vampire</td>
<td>?</td>
<td>No</td>
<td>Ruddy</td>
<td>None</td>
</tr>
<tr>
<td>Vampire</td>
<td>No</td>
<td>No</td>
<td>Pale</td>
<td>Heavy</td>
</tr>
<tr>
<td>Vampire</td>
<td>?</td>
<td>No</td>
<td>Pale</td>
<td>Odd</td>
</tr>
<tr>
<td>Human</td>
<td>Yes</td>
<td>No</td>
<td>Average</td>
<td>Heavy</td>
</tr>
<tr>
<td>Human</td>
<td>Yes</td>
<td>No</td>
<td>Pale</td>
<td>Heavy</td>
</tr>
<tr>
<td>Human</td>
<td>?</td>
<td>Yes</td>
<td>Ruddy</td>
<td>Odd</td>
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## Identify Bloodtypes

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Mother</th>
<th>Father</th>
<th>Anti-A</th>
<th>Anti-B</th>
<th>Anti-AB</th>
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<tbody>
<tr>
<td>A</td>
<td>AB</td>
<td>AB</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>B</td>
<td>AB</td>
<td>B</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>0</td>
<td>B</td>
<td>B</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>AB</td>
<td>A</td>
<td>B</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>A</td>
<td>A</td>
<td>A</td>
<td>Yes</td>
<td>No</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>B</td>
<td>No</td>
<td>No</td>
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<td>0</td>
<td>A</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Ethics 🧐
Station Work

• Ownership – who does it serve (Changing perspective)

• Privacy – Video assisting the elderly

• Advertisements – Imagining the Future

• Inappropriate Content – How do you react?

• Gender & Diversity – How much trust to put into a machine learning algorithm
Problem Solving by Search
Problem Solving by Search 🎈💬
Think – Pair – Share

• How are the previous short activities different and how are they similar?
• What is the goal of each of the problem sets?
• How did you tackle each of the problem sets?
• What is the relation of mazes to artificial intelligence?
• Can you name some real-world examples / applications where a generic way of solving mazes would be helpful?
• What difficulties might a computer have in solving these problems?
Problem Solving by Search
Online Session

Depth First Search

What is the turtle thinking?
I go to pop(4)
Have I reached my Goal? NO
From here I can go push( )
Have I been here before? No

Must remember! I have already been here:
1 6

Stack
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

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Problem Solving by Search Practice