Het begint met een idee

MASTER PROGRAMMES IN ARTIFICIAL INTELLIGENCE
OUTLINE

• Artificial Intelligence at the VU
  – General outline
  – Job perspectives
  – Programs
  – Main focus
  – Courses
  – Example master projects
• Learn how to do independent research into (applications of) Artificial Intelligence

• Example topics to get a feeling:
  – **Structuring information**
    How can you bring structure to the information on the internet? Is it possible to make the internet smarter and more personal?

  – **What turns information into knowledge?**
    Introducing structure, so that the computer can do something with it. But how do you generate the right knowledge? And how do you make sure the computer knows what to do with the information presented?

  – **Learning from data**
    There are millions of hard disks full of information reflecting our world. What can you learn about the real world from that mass of digital information?

  – **Intelligently supporting humans adapting to the user’s state**
    How can you make intelligent support systems (or agents) that are aware of the current functioning of the human and can give dedicated support based upon this state of the human.
• Entry requirements:
  – Bachelor Artificial Intelligence (Lifestyle Informatics)
  – Bachelor Computer Science
  – Bachelor Psychology
  – Other bachelors: possibly pre-master
    (discuss with master coordinator)
CAREER PROSPECTS

- Research
  - Fundamental (universities)
  - Applications (R&D departments Shell, KPN, Oce, TNO, NS, Philips)
DON’T TAKE MY WORD FOR IT…

nrcQ

Ai-ai-ai...

Wie slim is, stapt in de kunstmatige intelligentie
“By 2022, one in five workers engaged in mostly non-routine tasks will rely on AI to do a job” (Gartner, 2017)

“The demand for AI and Machine Learning experts is skyrocketing, there is a predicted 50% - 60% gap between the supply and the demand by 2018.” (The AI Congress, 2017)

AI influences a lot of domains, for example health care: “Data is the new health care currency: Artificial intelligence and real-world evidence are unlocking value in health data” (Deloitte, 2017)
AI PROGRAMMES

• Master AI
  • Focus on *Hybrid Intelligence*, collaboration AI systems and humans.
  • AI techniques and algorithms, and use of AI
  • Research and develop application domains
  • *Multidisciplinary*

• Master AI / Cognitive Science
  In collaboration with Psychology Department
TWO PROGRAMMES

- **AI-master**
  - 90 ects courses (36 ects elective)
  - 30 ects graduation project

- **AI-master Cognitive Science**
  - 90 ects courses (12 ects elective)
  - 30 ects graduation project
## AI PROGRAM – MANDATORY COURSES

### Mandatory Programme AI-core program

<table>
<thead>
<tr>
<th>Year 1</th>
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- **Period 1**: Evolutionary Computing
- **Period 2**: Multi agent systems
- **Period 3**: AI & Society
- **Period 4**: Experimental Design and Data Analysis
- **Period 5**: Data Mining Techniques
- **Period 6**: Machine Learning for Quantifiable Self
- **Year 2**: Master Project / Master Thesis: Research Project Cognitive Science
# AI-CORE PROGRAM – MANDATORY COURSES

## Mandatory Programme Cognitive Science

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| Year 2 |        |        |        | | Master Project / Master Thesis: Research Project Cognitive Science |

**AI-master:** constrained choice 30 ects + 6 ects free

**Cognitive Science:** 18 ects core Cognitive Science constrained choice 6 + 6 ects free
COGNITIVE SCIENCE

• **Main topics of focus:**
  – Cognitive modelling

  – **Two main goals:**
    • **AI → Psychology:** Use AI Techniques to study cognitive processes
    • **Psychology → AI:** Make the computer more human like by using cognitive processes as a source of inspiration

  – Cooperation between Faculty of Psychology and Faculty of Sciences
### Core Cognitive Science (18 ects):
- Seminar Cognitive Neuroscience
- Neural Models of Cognitive Processes
- Brain Imaging

### Electives: 12 ects
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COGNITIVE SCIENCE – EXAMPLE MASTER PROJECTS

• Theme 1: AI → Psychology: Use AI Techniques to study cognitive processes
  – Usual methodology:
    • Start with psychological theory
    • Formalise in the form of a computer model
    • Make predictions using model
    • Compare with empirical data
    • Difference? Improve theory or model
MASTER PROJECT:
SONG LEARNING IN ZEBRA FINCHES
Theme 2: Psychology → AI: Make the computer more human like by using cognitive processes as a source of inspiration

- Usual methodology:
  - Inspiration: psychological model
  - Formalise within computer model (but: less precise)
  - Incorporate model in a system that:
    - Exhibits human like behaviour itself
    - Has knowledge about human behaviour
  - Evaluate system
MASTER PROJECT: REALISTIC TRAINING
# AI PROGRAM – MANDATORY COURSES

## Mandatory Programme Cognitive Science

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**VU University Amsterdam**

Faculty of Sciences
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MASTER AI – ELECTIVE PROGRAMME

Artificial Intelligence Core
MASTER AI – ELECTIVE PROGRAMME

Artificial Intelligence Core

Application Domain:
- Health Sciences
- Human Movement Sciences
- Criminology
- ICT4D

In depth AI
Social Robotics
Natural Language Technology
Cognitive Science
**MASTER AI – ELECTIVE PROGRAMME**

Artificial Intelligence Core

- Application Domain:
  - Health Sciences
  - Human Movement Sciences
  - Criminology
  - ICT4D

- Knowledge representation on the web
- Advanced machine learning
- Planning & reinforcement learning
- Knowledge engineering
- …
MASTER AI – ELECTIVE PROGRAMME

In depth AI

Social Robotics

Natural Language Technology

Cognitive Science

Application Domain:
- Health Sciences
- Human Movement Sciences
- Criminology
- ICT4D

Collaboration with social science faculty

- Social Robotics
- Essentials of Media Psychology
- Robot Brain
- …
MASTER AI – ELECTIVE PROGRAMME

In depth AI

Social Robotics

Natural Language Technology

Cognitive Science

Application Domain:
- Health Sciences
- Human Movement Sciences
- Criminology
- ICT4D

Artificial Intelligence Core

- Machine Learning NLP
- Reading Machines
- Subjectivity Mining
- …
 MASTER AI – ELECTIVE PROGRAMME

Artificial Intelligence Core

- Behaviour Dynamics in Social Networks
- Seminar Cognitive Neuroscience
- Memory and Memory disorders
- Neural Models of Cognitive Processes
- …
EXAMPLE MASTER PROJECT

• Theme: Human centred discipline → AI: Let the computer better understand humans by incorporating models of human functioning
  – Usual methodology:
    • Inspiration: model of human functioning
    • Formalise within computer model
    • Incorporate model in a system that:
      – Exhibits human like behaviour itself
      – Has knowledge about human behaviour to support human in a good way
  • Evaluate system
Using (collective) machine learning to create adaptive, personalised support apps
Data collected from 31 subjects using an Emotive EPOC+ headset.
Subjects playing an adapted coin collector game to provoke frustration.
Machine learning techniques are used to classify frustration using participants’ brainwaves.
Students Marjeta Markovič & Luka Stout are researching the evolution of robot bodies in response to environmental demands.

Morphological evolution “survival of the fattest”
STUDY ENVIRONMENT

- New University building
  > Ready end of 2019

- Intertain Lab → Iconic Lab
THE END

• Questions?
• Contact:
  – m.hoogendoorn@vu.nl (NL Students)
  – annette.ten.teije@vu.nl (Int’l Students)

slides available at: