Interacting with AI
Module 3
Working and living with AI

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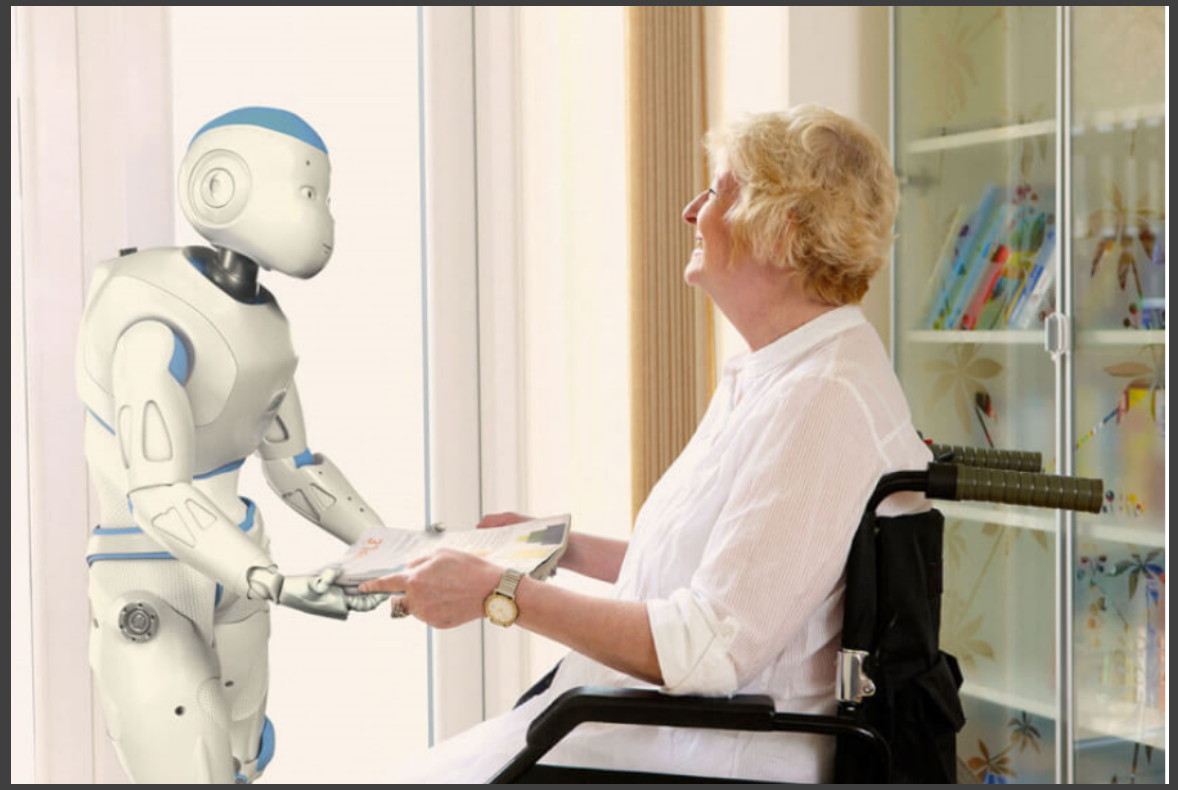
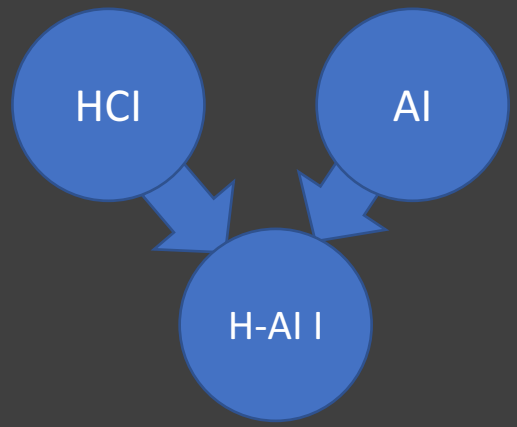
Decision support in ATM
Evaluation methods in HCI
User Experience
User behaviour

Objectives

Understanding of challenges related to use of AI based systems in everyday life and at work

- How to evaluate them?
- How to use them?
- How to integrate them in our life?





Module overview

[3.1 & 3.2] Evaluation of interaction with AI

Overview

Task-oriented evaluation

Ability based evaluation

User Experience, Values and AI

[3.3 & 3.4] Human- AI partnership

Levels of automation

Human-in-the-loop and situation awareness)

Human-robots teams

Task distribution between humans and AI

[3.5 & 3.6] Lessons learned from studies of human – AI interaction

Personality of robots and trust

Empathy with algorithms

Evaluation in the lab and "in the wild"

Evaluation in industry context

[3.7 & 3.8] Writing workshop

Assignments and tasks

Group Assignments and tasks

- Task 1 (lesson 3.1&3.2) – *problems with AI* -> Appendix 3 (a video and a ½ page)
- Task 2 (lesson 3.3&3.4) – *human-machine partnership* -> Appendix 4 (1 page)
- Evaluation approach/plan and reflections on the proposed plan (one page max)

Individual assignment

- Levels of automation (lesson 3.3&3.4, 1/2 – 1 page)

Evaluation of interaction with AI

- When AI goes crazy
- Task-oriented evaluation
- Ability-oriented evaluation
- User Experience, Values and AI

Task 1

Find a video which illustrates well some of the problems that might appear when we interact with AI, an "AI/robot goes crazy" example.

- What was the problem?
- Could it be solved differently?
- Could it be discovered earlier?

Airport passport controll

Your turn - Task 1

Find a video which illustrates well some of the problems that might appear when we interact with AI, an "AI/robot goes crazy" example.

- What was the problem?
- Could it be solved differently?
- Could the problem be discovered earlier?

From task-oriented evaluation to ability based evaluation

Hernández-Orallo (2017)

Artif Intell Rev (2017) 48:397–447
DOI 10.1007/s10462-016-9505-7

Evaluation in artificial intelligence: from task-oriented to ability-oriented measurement

José Hernández-Orallo[1]

Published online: 19 August 2016

Abstract The evaluation of artificial intelligence systems and components is crucial for the progress of the discipline. In this paper we describe and critically assess the different ways AI systems are evaluated, and the role of components and techniques in these systems. We first focus on the traditional task-oriented evaluation approach. We identify three kinds of evaluation: human discrimination, problem benchmarks and peer confrontation. We describe some of the limitations of the many evaluation schemes and competitions in these three categories, and follow the progression of some of these tests. We then focus on a less customary (and challenging) ability-oriented evaluation approach, where a system is characterised by its (cognitive) abilities, rather than by the tasks it is designed to solve. We discuss several possibilities: the adaptation of cognitive tests used for humans and animals, the development of tests derived from algorithmic information theory or more integrated approaches under the perspective of universal psychometrics. We analyse some evaluation tests from AI that are better positioned for an ability-oriented evaluation and discuss how their problems and limitations can possibly be addressed with some of the tools and ideas that appear within the paper. Finally, we enumerate a series of lessons learnt and generic guidelines to be used when an AI evaluation scheme is under consideration.

Keywords AI evaluation · AI competitions · Machine intelligence · Cognitive abilities · Universal psychometrics · Turing test

1 Introduction

The evaluation of any discipline must necessarily be linked to the purpose of the discipline. What is the purpose of artificial intelligence (AI)? McCarthy's pristine definition of AI sets this unambiguously: "[AI is] the science and engineering of making intelligent machines"

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Springer

- Consider evaluation of artificial intelligence systems
- *Task*-oriented evaluation approach
- *Ability*-oriented evaluation approach
- Analyse evaluation tests
- Lessons learnt and guidelines

What and how to evaluate?

- Definitions of AI
- McCarthy (2007) – "AI is the science and engineering of making intelligent machines" –> intelligence test
- Minsky's (1968) - "AI is the science of making machines capable of performing tasks that would require intelligence if done by humans"

  -> task-oriented evaluation
- AI effect (McCorduck 2004) - tasks are not considered AI problems any more once they are solved without full-fledged intelligence

What and how to evaluate?

- *AI systems* - AI agents, cognitive architectures or robots, *self-driving car*
- *AI components* - techniques, algorithms, methods or tools, *camera of the self-driving car*
- Specialized AI systems - task-oriented evaluation
- General-purpose AI - ability-oriented evaluation (artificial pets, assistant…variety of tasks)

What and how to evaluate?

- AI applications: computer vision, speech recognition, music analysis, machine translation, text summarisation, information retrieval, robotic navigation and interaction, automated vehicles, game playing, prediction, estimation, planning, automated deduction, expert systems
- Task-oriented: human discrimination, problem benchmarking, peer confrontation
- Competition - Deep Blue versus Kasparov 1997
- Ability-oriented evaluation – psychometrics (IQ tests and similar)
- Generic guidelines
  - Specify the set of systems to be evaluated, the set of possible tasks, describe the similarities between the tasks

User Exeperience with robots

- Context: factory
- Two types of robots, one within a safety fence
- UX questionnaire (23 respondents)
- Covered aspects: cooperation, perceived safety, perceived stress, perceived usability, general UX
- Conclusion – ting take time

Robots in Time:
How User Experience in Human-Robot Interaction Changes over Time

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Abstract. This paper describes a User Experience (UX) study on industrial robots in the context of a semiconductor factory cleanroom. We accompanied the deployment of a new robotic arm, without a safety fence, over one and a half years. Within our study, we explored if there is a UX difference between robots which have been used for more than 10 years within a safety fence (type A robot) and a newly deployed robot without fence (type B robot). Further, we investigated if the UX ratings change over time. The departments of interest were the oven (type A robots), the etching (type B robot), and the implantation department (type B robot). To observe experience changes over time, a UX questionnaire was developed and distributed to the operators at three defined points in time within these departments. The first survey was conducted one week after the deployment of robot B (n=23), the second survey was deployed six months later (n=21), and the third survey was distributed one and a half years later (n=23). Our results show an increasing positive UX towards the newly deployed robots with progressing time, which partly aligns with the UX ratings of the robots in safety fences. However, this effect seems to fade after one year. We further found that the UX ratings for all scales for the established robots were stable at all three points in time.

Keywords: Industrial Robots, Measurement, Semiconductor Factory, User Experience.

1 Introduction

For effective and highly productive industrial manufacturing, robots have already shown their usefulness in many sectors of production. With that kind of automation, a vast, cheap, and fast production has become reality. However, most of these systems are placed within a safety fence. During production, no human is allowed to enter the working space of the robot and therefore restricting access, any interaction, and/or cooperation with the robot. However, there are claims that more powerful human-robot interaction with the human and the robot working as a team is needed in order to be highly competitive [1]. That means it is necessary to break the general known paradigm of strictly separating

G. Herrmann et al. (Eds.): ICSR 2013, LNAI 8239, pp. 138–147, 2013.

UX Definitions

- "A consequence of a **user**'s internal state, the characteristics of the designed **system** and the **context** within which the interaction occurs" (Hassenzahl&Tractinsky 2006)*
- "All aspects of the **end-user**'s interaction with the company, its services, and its products" (Nielsen Norman Group)
- "The quality of experience a **person** has when interacting with a specific design" (Uxnet, online)

* * Marc Hassenzahl & Noam Tractinsky (2006): User experience - a research agenda, Behaviour &Information Technology, 25:2, 91-97

UX list

satisfying
helpful
fun
enjoyable
motivating
provocative
engaging
challenging
surprising
pleasurable
enhancing sociability
rewarding
exciting
supporting creativity
emotionally fulfilling
entertaining
cognitively stimulating

boring
unpleasant
frustrating
patronizing
making one feel guilty
making one feel stupid
annoying
cutesy
childish
gimmicky

Fra (Rogers, Sharp, Preece; Interaction design; 2011)

Values

- A robot may not injure a human being or, through inaction, allow a human being to come to harm
- A robot must obey the orders given it by human beings except where such orders would conflict with the First Law
- A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws
- A robot may not injure humanity, or, by inaction, allow humanity to come to harm

- What about environment, peace, justice…UN Sustainable Development Goals

Shifting focus

Future AI systems should focus enhancing human cognitive capabilities and channelling human creativity…incorporating trust, ethics, and human values

Global effects of a 'local' optimal solution
Values, ethics, privacy and security as a core design considerations
Embedding ethics and values into AI system

(Lukowicz, Slusallek, 2018)

What to evaluate?

LUDVIG

https://www.youtube.com/watch?v=U9KrEcn4W3Q

Which UX dimensions would you evaluate?
Which values should be adresses by design?