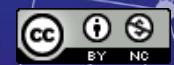


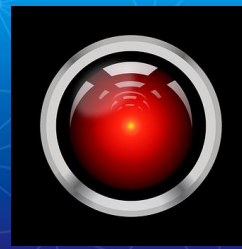
EDLRIS – Training in Robotics and AI

Enabling the Creation of Intelligent Things

Martin Kandhofer
Graz University of Technology,
Institute of Software Technology

eEducation Fachtagung 2018





What we have in mind...



<https://pixabay.com>

What media tells us...

Killerroboter & Co.

23.11.2017, 11:51 Uhr

Wie gefährlich ist Künstliche Intelligenz?

Experten warnen vor Killerrobotern und allmächtigen Algorithmen. Obwohl vieles immer noch Science Fiction ist, berät auch die UN über autonome Waffen. VON OLIVER VOSS UND LAURA WEIGELE



Karriere.DiePresse.com

gsteinbauer abmelden RSS Suche

Ratgeber Unternehmen der Zukunft Lehrlinge

Startseite | Karriere-News

Roboter: Der Wolf im Schafspelz

23.04.2016 | 10:00 | Von Andrea Lehky (Die Presse)

Künstliche Intelligenz. Keine Sorge, beeilt sich die Wissenschaft zu versichern. Roboter vernichten zwar Jobs, sie schaffen aber auch neue.

Bild vergrößern

Drucken Kommentieren (1) Senden

Twittern G+ Empfehlen 1

Bewerbungstipps
Unterlagen
Bewerbung
Orientierung

Frankfurter Allgemeine
Wirtschaft

Frankfurt am Main, 19°

12.592,35 -0,04 % DOWJONES 22.345,59 -0,04 % EUR/USD 1,1948 +0,07 % ALLE KURSE

WIRTSCHAFT

n Jobs fallen weg

VON RAINER HANK UND GEORG MECK - AKTUALISIERT AM 17.01.2016 - 13:14

Kronen Zeitung

Donnerstag, 13. April 2017

WIRTSCHAFT

Seite 9

In zehn bis 15 Jahren Besonders die gering Qualifizierten

Roboter kosten 400.000 Arbeitsplätze

Wien. – Wegen der zunehmenden Digitalisierung, mehr Robotern und automatisierten Tätigkeiten in der Wirtschaft sieht unser Arbeitsmarkt vor dem Umbruch: In zehn bis 15 Jahren könnten bis zu 400.000 Jobs wegfallen, prognostiziert jetzt das Institut für Höhere Studien. Gering Qualifizierte sind am stärksten gefährdet.

Auf dem Rasen des großen Innenhofs des IHS in der Wiener Josefstädter Straße dreht ein Mäherroboter seine Runden. Personal wird für diese Tätigkeit nicht mehr benötigt. Das ist nur ein Beispiel dafür, wie die neue Zukunft fast überall es trifft besonders die gering Qualifizierten. Denn zwei Drittel der Jobs, die gestrichen werden, entfallen auf Personen, die maximal einen Pflichtschulabschluss haben. Viel weniger gefährdet sind hingegen Akademiker und Führungskräfte.

Kocher betont, dass durch die Digitalisierung auch neue Arbeitsplätze entstehen. Doch diese sind meist komplexer und anspruchsvoller. Es gibt Zukunftschancen wie Programmierung oder Maschinenbau. Er fordert deshalb eine rasche

Welche Berufe sind am stärksten gefährdet?

- Hilfsarbeit
- Mont
- Bauingenieur
- Metalldarbeiter / Y
- Bau
- Nahrungsmittelz
- Abfälle
- Bediener stationäre
- Präzisionshandwerker
- Fahrer
- Bediener mobile
- Nahrung
- Holzverarbeitung
- und Text



Erster selbstfahrender Bus in Las Vegas hatte Unfall am ersten Tag

9. November 2017, 15:38

39 POSTINGS

Schuld bei Fahrer eines anderen Lastwagens – keine Verletzten

Las Vegas hat einen ersten selbstfahrenden Shuttle-Bus eingeführt. Die autonomen Fahrzeuge sollen den Straßenverkehr sicherer machen. Der Bus in der Stadt der Casinos hatte jedoch wenig Glück: er wurde schon am ersten Tag seines Betriebs in einen Unfall verwickelt, wie der lokale KSNV News 3 berichtet.

Lastwagenfahrer Schuld

Im Jänner wurde der Bus in einer Pilotphase getestet und soll nun Passagiere kostenlos um das Zentrum von Las



Prognose des ...
ng sei schuld.

WIRTSCHAFT

Roboter vernichten Millionen Jobs

Von Daniel Eckert | Veröffentlicht am 27.08.2016 | Lesedauer: 5 Minuten

Künstliche Intelligenz wird viele arbeitslos machen. Der Ausgleich durch neue Beschäftigung hält sich in Grenzen

0 Kommentare

st technischer Fortschritt ein Jobkiller oder ein Jobmotor? Bei dieser Frage schlagen sich Experten regelmäßig die Köpfe ein. Fest steht, dass es sich eine Exportnation wie Deutschland nicht leisten kann, auf wichtigen Technikfeldern den Anschluss zu verlieren. Doch vor allem die nächste große anstehende Revolution in der Weltwirtschaft, der Einsatz künstlicher Intelligenz

BUNDESTAGSWA
DEUTSCHLAND I
BEDEUTUNG FÜR
FINANZMÄRKTE

JETZT LESEN >

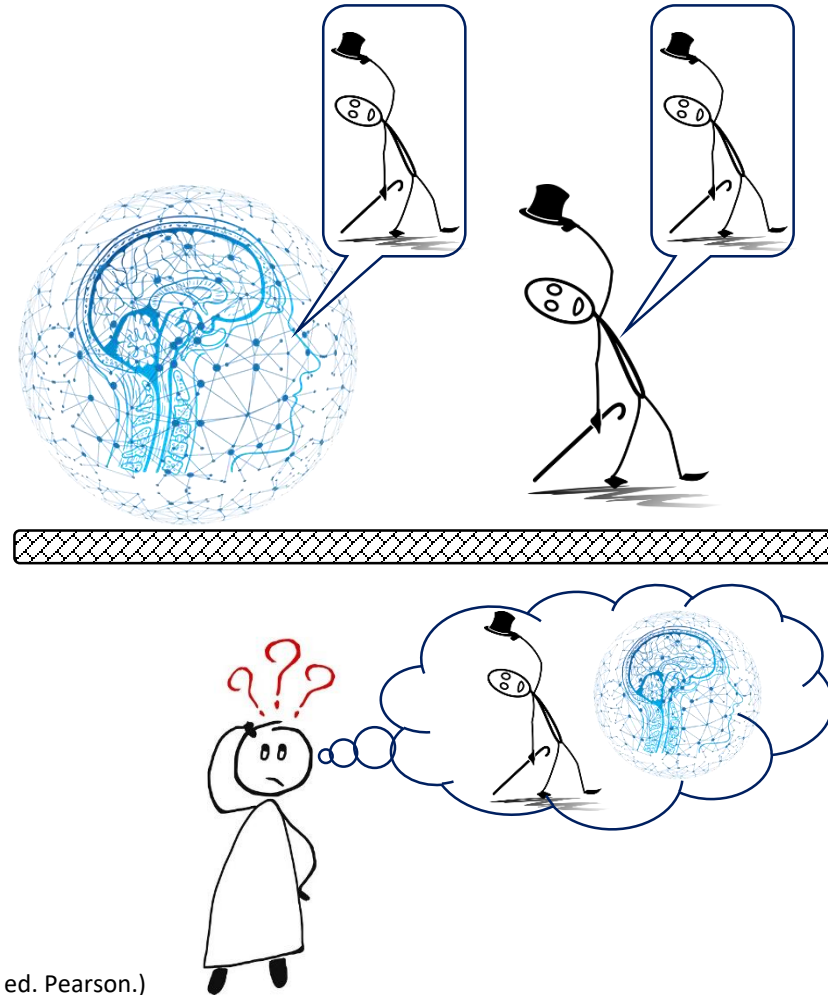
Is it intelligent?



<https://pixabay.com>

Turing Test

- played with one interrogator, a human player and a computer
- the interrogator has to find out, whether the responses to his/her questions come from the human player or the computer
- if the interrogator cannot differentiate between the two players, the computer “wins” the imitation game and passes the Turing Test.



(Russel, Stuart J. and Peter Norvig (2010). Artificial Intelligence. A Modern Approach. 3rd ed. Pearson.)

www.pixabay.com

Lovelace Test

- extension of Turing Test
- including criteria like creativity
- e.g. write a short story given a rough content design
- <http://kryten.mm.rpi.edu/lovelace.pdf>



The Chinese Room



Artificial Intelligence - ?

from: <https://goo.gl/KDPtKT>

	Id.	Category	Definition	Author(s)	Year	Reference	
	AGISI0001	Machine intelligence	"Artificial Intelligence is [...] the study of the computations that make it possible to perceive, reason, and act."	Winston, P. H.	1992	Artificial Intelligence. Third Edition, Addison-Wesley Publishing Company, 1992.	
	AGISI0002	Machine intelligence	"[Intelligence is] the capability of a system to adapt its behavior to meet its goals in a range of environments."	Fogel, D. B.	2006	Defining Artificial Intelligence. In Evolutionary Computation: Toward a New Philosophy of Machine Intelligence. Third Edition. The Institute of Electrical and Electronics Engineers, Inc., IEEE Press, 2006.	
AGISI0020	AGISI0003	Machine intelligence	"Intelligence measures an agent's ability to achieve goals in a wide range of environments."	Legg, S. and Hutter, M.	2007	Universal Intelligence: A Definition of Machine Intelligence. Minds and Machines, 17(4):391-444, Springer, 2007.	
	AGISI0004	Machine intelligence	"Intelligence is the computational part of the ability to achieve goals in the world."	McCarthy, J. and Stanford University Formal Reasoning Group	2007	What Is Artificial Intelligence Basic Questions. Formal Reasoning Group, 2007. Retrieved from https://goo.gl/GM5wwX (Last accessed: April 27, 2018).	
AGISI0021	AGISI0005	Machine intelligence	"The essence of intelligence is the principle of adapting to the environment while working with insufficient knowledge and resources. Accordingly, an intelligent system should rely on finite processing capacity, work in real time, open to unexpected tasks, and learn from experience. This working definition interprets 'intelligence' as a form of 'relative rationality.'"	Wang, P.	2008	What Do You Mean by "AI"? In P. Wang, B. Goertzel, and S. Franklin (eds.), Artificial General Intelligence 2008, Proceedings of the First AGI Conference, Frontiers in Artificial Intelligence and Applications, 171:362-373. IOS Press Amsterdam, The Netherlands, 2008.	
AGISI0022	AGISI0006	Machine intelligence	"The goal is to build computer systems that exhibit the full range of the cognitive capabilities we find in humans. [...] The ability to pursue tasks across a broad range of domains, in complex physical and social environments. [A human-level intelligence] system needs broad competence. It needs to successfully work on a wide variety of problems, using different types of knowledge and learning in different situations, but it does not need to generate optimal behavior."	Laird, J. E., Wray, R. E., Mannier, R. P., and Langley, P.	2009	Claims and Challenges in Evaluating Human-Level Intelligent Systems. In B. Goertzel, P. Hitzler, & M. Hutter (eds.), Proceedings of the Second Conference on Artificial General Intelligence. Atlantis Press, 2009.	stees of Indiana iana.
AGISI0023	AGISI0007	Machine intelligence	"Pragmatic general intelligence measures the capability of an agent to achieve goals in environments, relative to prior distributions over goal and environment space. Efficient pragmatic general intelligences measures this same capability, but normalized by the amount of computational resources utilized in the course of the goal-achievement."	Goertzel, B.	2010	Toward a Formal Characterization of Real-World General Intelligence. In E. B. Baum, M. Hutter, and E. Kitzelmann (eds.), Artificial General Intelligence, Proceedings of the Third Conference on Artificial General Intelligence, AGI 2010, Lugano, Switzerland, March 5-8, 2010, pp. 19-24. Advances in Intelligent Systems Research 10. Amsterdam: Atlantis, 2010.	efinition.mp4 (Last
AGISI0024	AGISI0008	Machine intelligence	"Artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment."	Nilsson, N. J.	2010	The Quest for Artificial Intelligence. A History of Ideas and Achievements. Cambridge University Press, 2010.	of Psychology, 39
AGISI0025	AGISI0009	Machine intelligence	"Intelligence is concerned mainly with rational action. Ideally, an intelligent agent takes the best possible action in a situation."	Russell, S. J. and Norvig, P.	2010	Artificial Intelligence: A Modern Approach, Third Edition. Prentice Hall, 2010.	nces. Nature 10.
AGISI0026	AGISI0010	Machine intelligence	"Intelligence measures an agent's capacity for efficient cross-domain optimization of the world according to the agent's preferences."	Muehlhauser, L. and Salamon, A.	2012	Intelligence Explosion: Evidence and Import. In A. H. Eden, J. H. Moor, J. H. Soraker, and E. Steinhart (eds.), A Scientific and Philosophical Assessment (pp. 15-42). Springer, 2012.	
AGISI0027							
AGISI0028							

Artificial Intelligence - ?

⇒ definitions according to **intelligent behavior observed in humans**

⇒ definitions that focus on the **achievement of goals in a given environment**

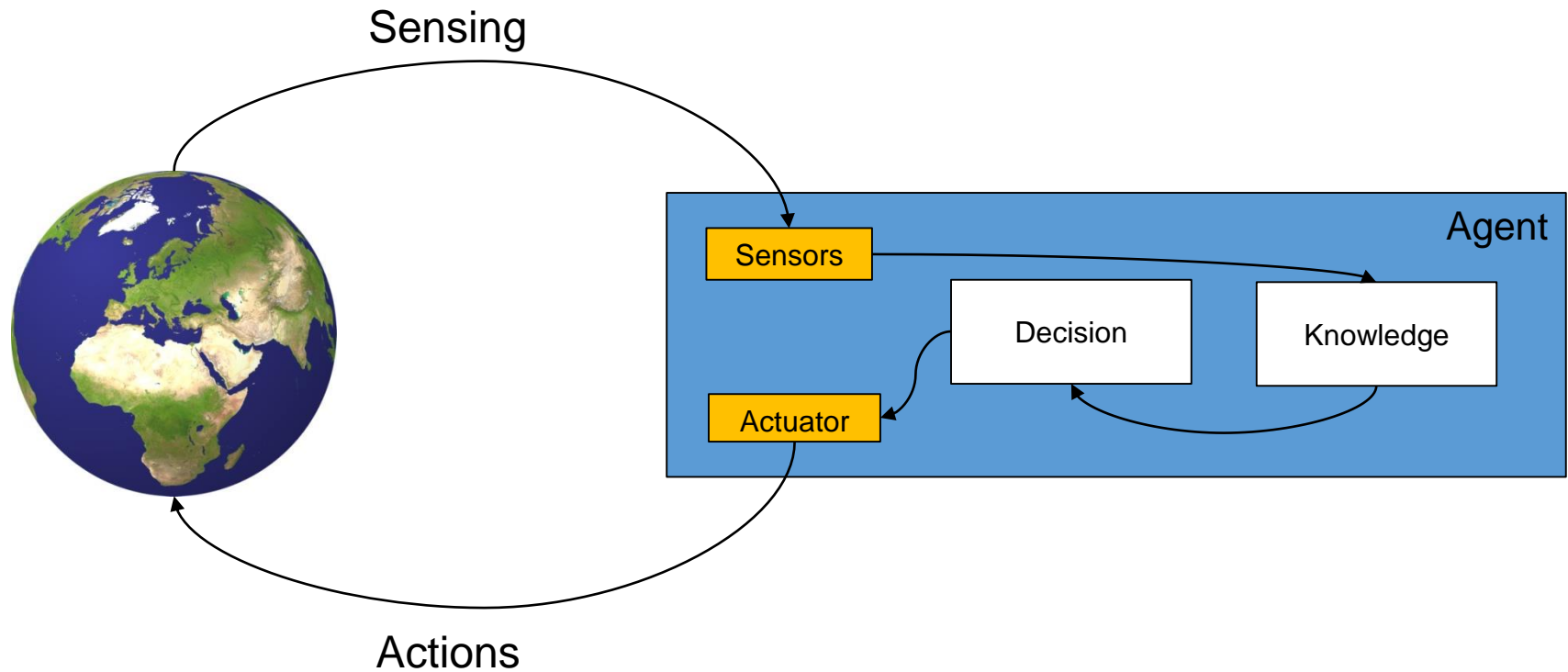
*AI is the part of computer science concerned with designing intelligent computer systems that exhibit the characteristics we associate with **intelligence in human behavior – understanding language, learning, reasoning, solving problems and so on.***

(Barr, Avron and Edward A. Feigenbaum (1981). The Handbook of Artificial Intelligence. HeurisTech Press, William Kaufmann Inc.)

*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.*

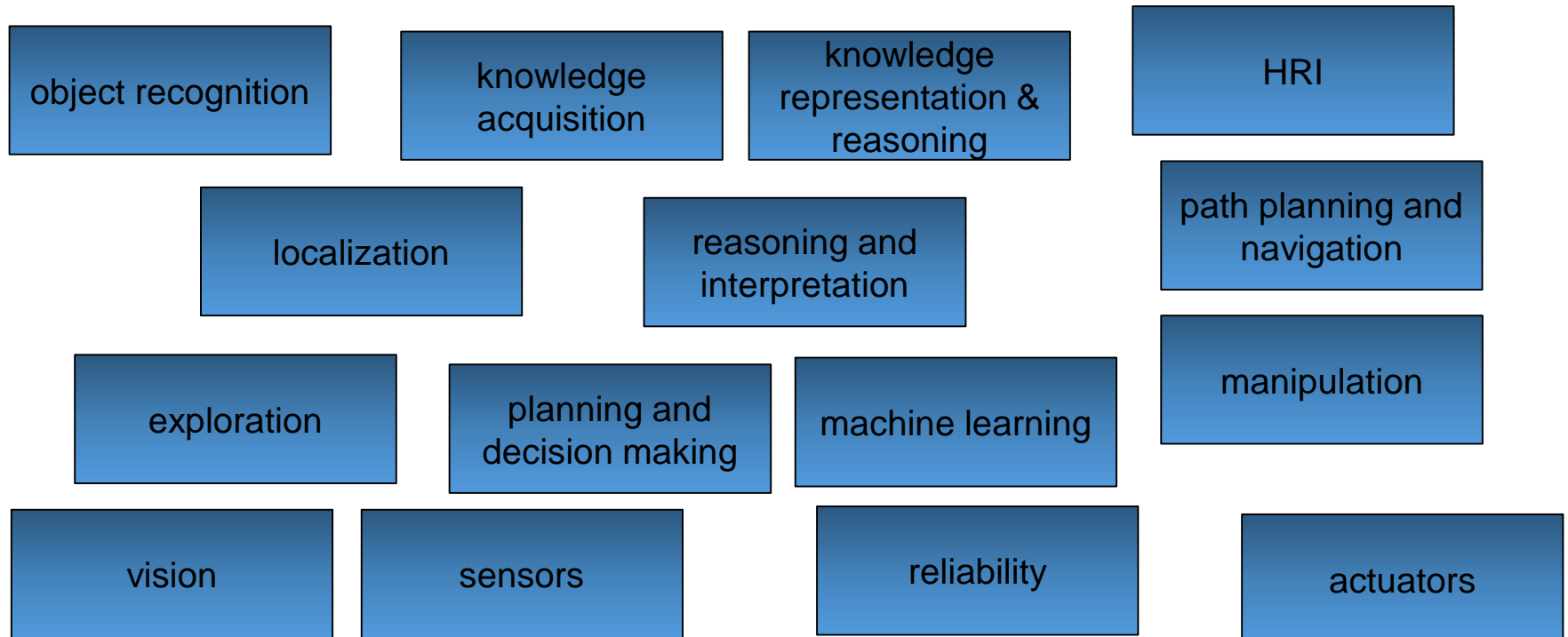
(Russel, Stuart J. and Peter Norvig (2010). Artificial Intelligence. A Modern Approach. 3rd ed. Pearson.)

Agent - ?



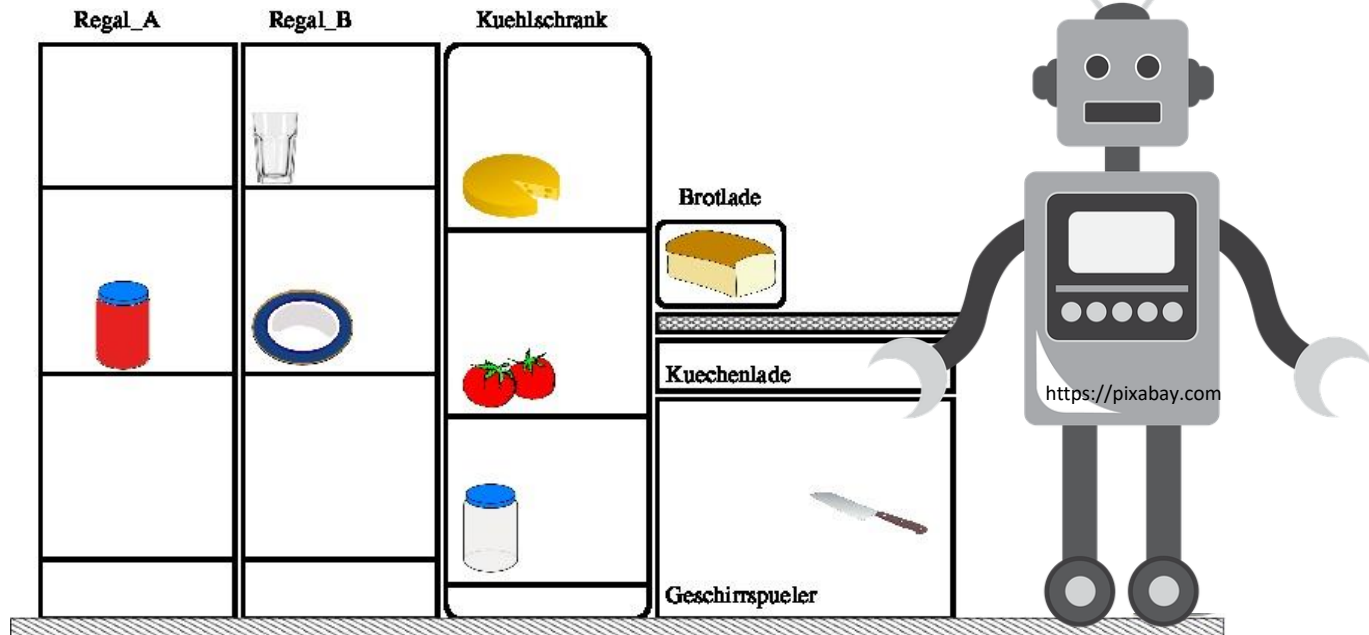
(Russel, Stuart J. and Peter Norvig (2010). Artificial Intelligence. A Modern Approach. 3rd ed. Pearson.)

Robotics & AI

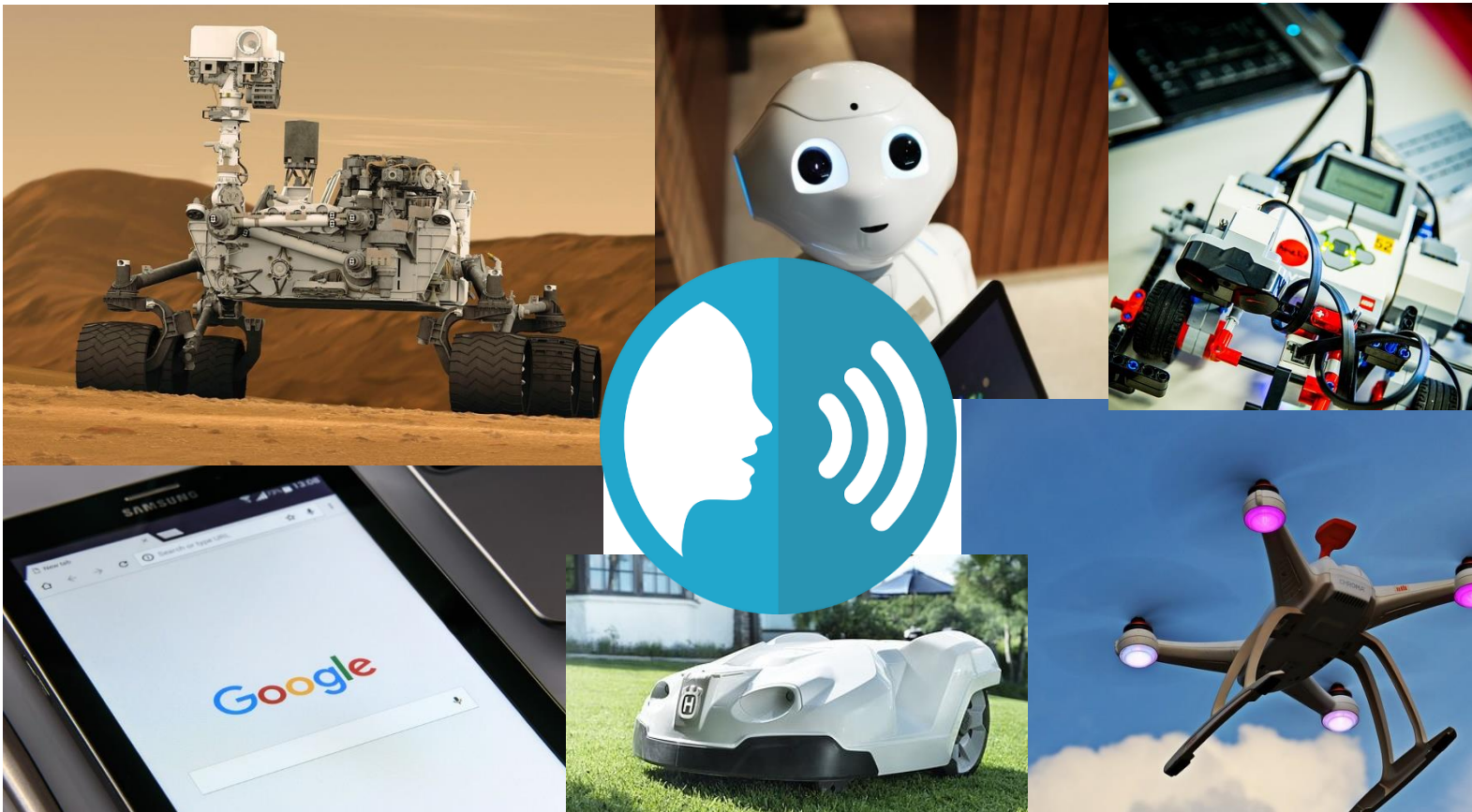


Robotics & AI – an example

... still many challenges

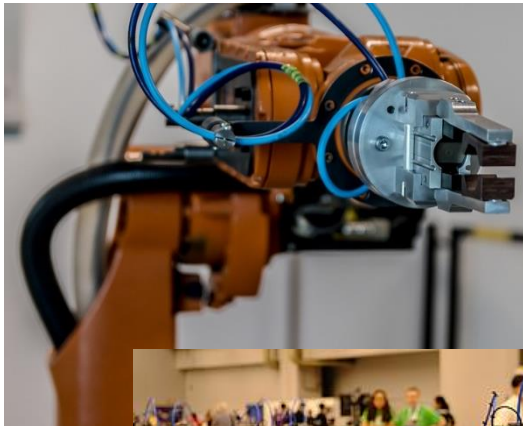


The reality - part of our daily life



<https://pixabay.com>

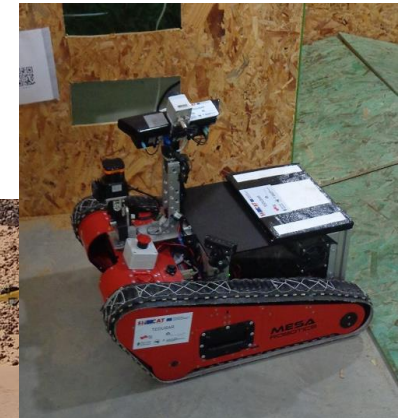
Different areas, future careers and jobs



<https://pixabay.com>



<https://www.tugraz.at>



<https://www.tugraz.at>

And then?

- using -> **understanding**
- principles and **concepts behind**
- **hardly any** systematic teaching exists
- careers, raising awareness – **chances, risks, threats**
- enabling an **economic and social participation**



<https://pixabay.com>

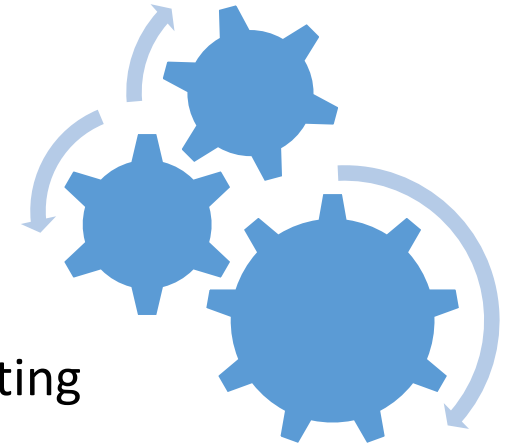
Statements

- AI and Robotics part of our daily life
- Computational Thinking as important as reading/writing

=> **“Literacy in AI / Robotics”**

- development of literacy **in parallel** to personal development, comprising different stages of life
- involving **all groups** of the educational process

=> **holistic approach required**



Holistic approach

- include different age- and educational groups:

Pre-school and Primary	Secondary I	Secondary II	Bachelor	Master/PhD
Children, Pupils Pedagogues, Teachers		Pupils, Teachers	Students, Researchers	

- Robotics / AI as a **learning tool** and main **driver for STEM**
- Robotics / AI allows **project-oriented, motivating** working
- Robotics / AI as an **interdisciplinary** approach



EUROPEAN UNION



EDLRIS

European Driving License
for Robots and Intelligent Systems

Enabling the Creation
of Intelligent Things



European Driving License for Robots and Intelligent Systems



European Driving License for Robots and Intelligent Systems - EDLRIS

- sound knowledge in **Robotics** and **Artificial Intelligence (AI)** as a crucial factor for
 - future careers of young people
 - development of novel, innovative products
 - new jobs demand high level of education
- development of a **training and certification** system inspired by the ECDL
- challenges of teaching and proofing skills
- **3-year project** funded by the EU



Project Partner

- Graz University of Technology; Austria
- OCG Austrian Computer Society; Austria
- University College of Teacher Education Burgenland, Onlinecampus Virtual PH; Austria
- Szechenyi University Győr; Hungary
- John von Neumann Computer Society; Hungary



Overview

- implementing a professional **training- and certification-system** for Robotics and Artificial Intelligence (AI)
 - skills, competencies recognized and accepted by companies, institutions, ...
- target **audience**:



trainers

(teachers, mentors, ...)



trainees

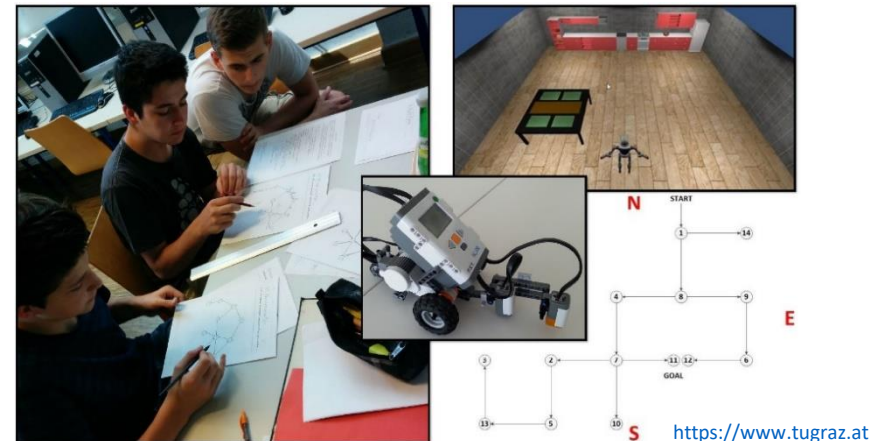
(students, young people, ...)




fotolia.com

Overview


- standardized **training** for trainers and trainees
- standardized **certification** of competences/skills of trainers and trainees
- certification for each module
- well-balanced **class-attendance, practical and online** units
- **high level** regarding content and didactics




EDLRIS modules



**AI
Beginner**




EDLRIS
European Driving License
for Robots and Intelligent Systems




**AI
Advanced**




EDLRIS
European Driving License
for Robots and Intelligent Systems



**Robotics
Beginner**



EDLRIS
European Driving License
for Robots and Intelligent Systems



**Robotics
Advanced**



EDLRIS
European Driving License
for Robots and Intelligent Systems



Artificial Intelligence (AI) Objectives



AI Beginner

No prior theoretical background is required.

Target group:

e.g. interested STEM teachers, secondary school students

- cultural and creative integration of AI concepts
- motivate people and enabling them to *understand and use the technology properly*

<https://pixabay.com>



AI Advanced

Background knowledge in informatics and mathematics is required.

Target group:

e.g. STEM teachers and talented secondary school students with background in the field

- training on a high, elite level
- enabling people to *understand technology and to implement applications*

Robotics Objectives



Robotics Beginner

No prior theoretical background is required.

Target group:

e.g. interested STEM teachers, secondary school students

- **cultural and creative integration of Robotics concepts**
- **motivate people and enabling them to *understand and use the technology properly***

<https://pixabay.com>



Robotics Advanced

Background knowledge in mechanics, electrics, informatics and mathematics is required.

Target group:

e.g. STEM teachers and talented secondary school students with background in the field

- **training on a high, elite level**
- **enabling people to *understand technology and to implement applications***

Approach

1. Training- and Certification- system

- development of an extensive training and certification system
- development of teaching curricula and material
- sound technological and didactic preparation
- modules for AI and robotics (beginner, advanced)

2. Train-the- Trainers

- training and certifying the trainers (e.g. teachers)
- conducted by researchers and educators
- well-balanced class-attendance, practical- and online-units

3. Educating the Trainees

- training and certifying the trainees (e.g. students)
- conducted by certified trainers

Approach

- providing learning **curricula** and **teaching material** for the implementation (ready-to-use, scripts, tutorials, tools, exercises, ...)
- cooperation with **partner schools and educational institutions**
- **advisory board** ensuring broad acceptance (annual meetings, continuous integration and feedback)
- Austria, Hungary → Europe



EDLRIS courses


for each module of Robotics and AI (Beginner, Advanced):

- 40h (5 days) of face-to-face units at partner institutions
- 20h-50h online units
- allocation:

Day 1 F2F	online	Day 2 F2F	Day 3 F2F	online	Day 4 F2F	Day 5 F2F	
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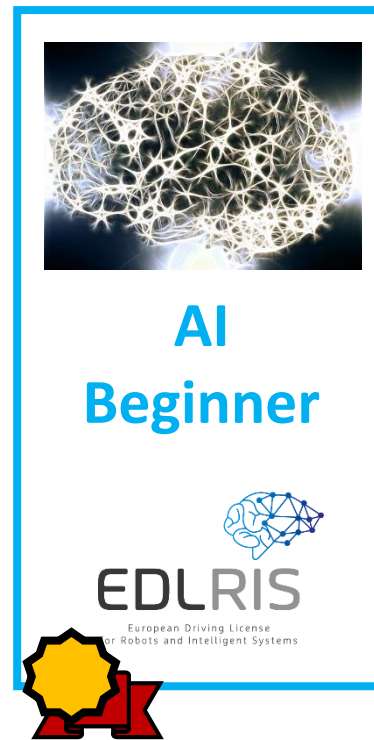
Learning Management System

<http://onlinecampus-server.at/edlris/>



The screenshot shows the Moodle LMS interface for EDLRIS. At the top, there is a navigation bar with the EDLRIS logo and the text "European Driving License for Robots and Intelligent Systems". Below this, the main content area features the Interreg Austria-Hungary logo and the European Union flag. A welcome message reads "Welcome to the EDLRIS Online Training Center!" followed by a brief description of the project. Under the "Courses" section, there are three course cards: "AI Beginner" with a blue brain graphic, "AI Advanced" with a yellow brain graphic, and "AI Certificate" with the EDLRIS logo. Each card has an "Access" button.

Sneak Preview: Module AI Beginner



AI Beginner: Course Overview

Day 1

AI Definitions
Natural Language Processing
Logic

Online Session

Programming

Day 2

Programming
Computer Vision

Day 3

Machine Learning



Online Session

Search

Day 4

Problem Solving by Search

Day 5

Project Day

[Slides](#) Day 1
[Moodle](#)

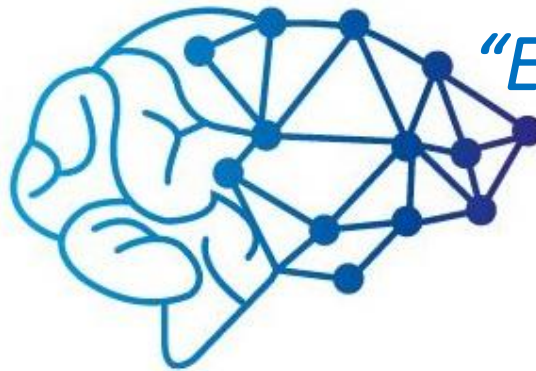
Courses AT 2019 – save the date!

- trainer (teacher) courses start March 2019
- application: <https://www.virtuelle-ph.at/edlris/>
- and via email: edlris@ist.tugraz.at
- **AI Beginner** for Trainer (OCG Vienna, 04.03. – 22.03.2019)
- **AI Advanced** for Trainer (TU Graz, 14.03. – 17.04.2019)
- **Robotics Beginner** for Trainer (PH Burgenland, 18.03. – 05.04.2019)
- **Robotics Advanced** for Trainer (TU Graz, 22.03. – 26.04.2019)

Conclusion

- AI and Robotics part of our daily life
- Computational Thinking / Literacy in AI & Robotics
- prepare for future
- involving all groups of the educational process
- project EDLRIS
 - Robotics and Artificial Intelligence
 - for teachers, students
 - training + certification





*“Enabling the Creation of
Intelligent Things”*

Thank you!

Web: <http://www.interreg-athu.eu/edlris/>

Course application: <https://www.virtuelle-ph.at/edlris/>

Contact, questions: edlris@ist.tugraz.at or kandlhofer@ist.tugraz.at

