



FACILITATE-AI

GUIDELINES FOR FACILITATING THE LEARNING OF ARTIFICIAL INTELLIGENCE
BY SCHOOL STUDENTS OF GRADES 7-12

Project title:

FACILITATE – AI: Guidelines for facilitating the learning of Artificial Intelligence (AI) by School Students of Grades 7-12

Reference Number: 2021-1-CY01-KA220-SCH-000032567

C1 Training course: **Training on Artificial Intelligence (AI) content for adapting to school curricula**

Result 1, A1/T1

Module Number and Area/ Topic: Module 2. BASIC AI / AI Fundamentals

Module owners: BG Univ, RO-univ, CY-univ

Introduction and Broad Description of the Context and Goal of the area/ topic addressed:

This module will provide fundamental concepts, methods and techniques in Artificial Intelligence.

Learning outcomes and learning objectives are described in each of the five following parts of this module:

Part 1- **Knowledge Representation, Processing and Rationing**

Part 2- **Programming in logic. Introduction to Prolog**

Part 3- **Searching, planning and decision making. A*, optimization**

Part 4- **Basics of Python programming and AI projects**

Instruments/ Tools/ Supporting Material/ Resources to be used:

1. Buitrago M., Chiappe A., Representation of knowledge in digital educational environments: A systematic review of literature, Australasian Journal of Educational Technology, 2019, 35(4)
2. Frank Harmelen, Vladimir Lifschitz, Bruce Porter, Handbook of Knowledge Representation, Elsevier, 2008.
3. Max Bramer, Logic programming with Prolog, Springer, 2005
4. Guido van Rossum, Programming in Python 3.7.0, 2018, Python Software Foundation
5. David L. Poole, Alan K. Mackworth, Python code for Artificial Intelligence: Foundations of Computational Agents, 2022, <https://artint.info/AIPython/aipython.pdf>
6. Prolog Resources - <https://academickids.com/encyclopedia/index.php/Prolog>
7. Prolog tutorial: <https://www.youtube.com/watch?v=SykxWpFwMGs>
8. Prateek Joshi, Artificial Intelligence with Python, Packt, 2017.

9. Tuomi, I. (2020), Research for CULT Committee - The use of Artificial Intelligence (AI) in education, European Parliament, Retrieved from [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/629222/IPOL_BRI\(2020\)629222_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/629222/IPOL_BRI(2020)629222_EN.pdf).
10. Stoyanov, S., Glushkova, T., Todorov, J (2019). Artificial Intelligence. Solve problems through search. [Izkustven intelekt. Reshavane na problemi posredstvom tarsene], Sofia: Izkustva, ISBN: 9786197243871.
11. Stoyanov, S., T. Glushkova, R. Papancheva. Artificial Intelligence. Representing knowledge through logic. Logic programming [Izkustven intelekt. Predstavayane na znaniyata chrez logika. Logichesko programirane], Sofia, Izkustva, 126, 2021. ISBN 978-619-7243-87-4.
12. S. J. Russell, P. Norvig, Artificial Intelligence. A Modern Approach, Prentice Hall, 2010.
13. SWI Prolog, <https://www.swi-prolog.org/>
14. Online Python programming environment Trinket, <https://trinket.io/python>
15. Olari, V., Romeike, R. Addressing AI and Data Literacy in Teacher Education: A Review of Existing Educational Frameworks. Retrieved from: https://train-dl.eu/fileadmin/GI/Projekte/Train-DL/Olari_Poster_WiPSCE_2021_fixed.pdf
16. Williams, Randi, Park, Hae Won, Oh, Lauren and Breazeal, Cynthia. 2019. "PopBots: Designing an Artificial Intelligence Curriculum for Early Childhood Education." Proceedings of the AAAI Conference on Artificial Intelligence, 33., <https://dspace.mit.edu/bitstream/handle/1721.1/137136/EAAI-WilliamsR.25.pdf?sequence=2&isAllowed=y>
17. AI4K12, <https://ai4k12.org/>
18. AI4K12, <https://ai4k12.org/resources/list-of-resources/>
19. Elements of AI, <https://www.elementsofai.com/>
20. AI Google, <https://ai.google/tools/>

| Part 1- Knowledge Representation, Processing and Rationing | |
|---|---|
| Learning Objectives | Understand the basic concepts on Knowledge Based Systems |
| Learning Outcomes | Understand knowledge representation, rationing and applications |
| Activities | 1.1 DIKW model. KRPR systems 1.2 Representations methodologies 1.3 Data structures for knowledge representation (lists, trees, graphs etc.) |

| Part 2- Programming in logic. Introduction to Prolog | |
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| Learning Objectives | Understand the basic concepts of Logic programming and Prolog mechanisms |
| Learning Outcomes | Understand the logic model for problem solving |
| Activities | 2.1 Computing with predicates. The Prolog programs structure 2.2 Lists, operators, Arithmetic in Prolog. |

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| | 2.3 Controlling Backtracking and reducing space searching 2.4 Working Examples |
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| Part 3- Searching, planning and decision making. A*, optimization | |
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| Learning Objectives | Understand the basic of searching and optimization strategies |
| Learning Outcomes | Understand A* and solving problems strategies |
| Activities | 3.1 Depth-first strategy 3.2 Breadth-first strategy 3.3 Best-first strategy 3.4 Solving 8-puzzle and scheduling in Prolog |

| Part 4- Basics of Python programming and AI projects | |
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| Learning Objectives | Familiarize with Python programming and object oriented thinking |
| Learning Outcomes | To use Python in coding algorithms |
| Activities | 4.1. Interpreting programs. Basic concepts in Python 4.2. Data structures and statements 4.3. Programs in Python. Create your own code 4.4. AI problem solving in Python |