

# ERASMUS+ ARIS - AI SKILLS FOR ICT PROFESSIONALS

Objectives, activities and outcomes





### **PROJECT OBJECTIVES**

- To design a comprehensive and up-to-date training course in AI technologies and practical applications, to empower ICT professionals with initiative, entrepreneurship & updated digital skills required in the workplace.
- To introduce modern training delivery methods and innovative open-access pedagogical resources, enabling learners to acquire and self-assess AI related skills, including VET providers resources &methods to integrate into their training offerings.
- To facilitate the integration of AI skills requirements into the EU certification and standardization schemes.





### **TARGET GROUPS**

- ICT professionals in need of CVET
- Students in need of IVET
- VET providers and employers
- Sectoral stakeholders
- Policy-makers
- Other European learners







#### **PROJECT DETAILS**

Project acronym:	ARIS
Project name:	Artificial Intelligence Skills For ICT Professionals
Project code:	2019-1-BE01-KA202-050425
Start date:	01-09-2019
End date:	28-02-2022
Budget:	€374,710.00





### **ARIS PROJECT PARTNERS**



• <u>www.exelia.gr</u>





#### MAIN PROJECT OUTCOMES

- Learning outcomes for training provision in the different AI technologies & practical applications for ICT professionals.
- Learning units (curriculum structure), trainers' toolkit, and VET integration guidelines.
- Open Educational Resources for AI technologies and applications.
- **ARIS Vocational Open Online Course** infrastructures & content on AI technology applications for ICT professionals.
- AI Skills Certificate Supplement for the integration of AI skills into certification schemes.
- **Position paper** to support decision-making and promote the incorporation of AI skills requirements into the European e-Competence Framework.
- 5 national information days (one in each partnership country) to promote ARIS project.





### **1<sup>ST</sup> SEMESTER-OUTPUTS & ACTIVITIES**

- Kick-off Meeting in Brussels
- Quality Assurance Plan
- Dissemination & Exploitation Plan
- Project Website & Project Logo
- Social Media Accounts (Facebook, LinkedIn, Twitter, Youtube)
- Printable Materials Templates(poster & brochure)
- Survey on AI Skills Requirements
- Learning Outcomes Report

Start date: 01-09-2019 End date : 29-02-2020





#### **KICK-OFF MEETING IN BRUSSELS**

The first project meeting was held on Wednesday 25 September 2019, at Business Training (LP) premises, in Brussels, Belgium. This meeting marked the official launch of the ARIS project. During the meeting, partners set the project's milestones and strategic objectives, discussed first semester's workplan. They has also opportunity to present their organisations.











#### SURVEY ON AI SKILLS REQUIREMENTS

- The online survey was open for one month and a half, between 01/10/2019 and 31/12/2019.
- 194 individuals with experience in AI technology and computing innovations filled in the online questionnaire.
   Country
   Obtained number
   %

Country	Obtained number	%
Austria	1	0,52
Belgium	33	17,01
Denmark	1	0,52
Germany	1	0,52
Greece	21	10,82
Italy	51	26,29
Lithuania	38	19,59
Portugal	1	0,52
Slovak Republic	1	0,52
Spain	45	23,20
United Kingdom	1	0,52
TOTAL	194	100



# SURVEY ON AI SKILLS REQUIREMENTS (2)

- According to the respondents, the five most needed field knowledge for working on artificial intelligence and related services are, in decreasing order:
  - **Machine Learning Algorithms** (supervised, unsupervised, semi-supervised, reinforcement learning) (18.91 %),
  - **Programming languages for Artificial Intelligence** (e.g. Python, Java, LISP, C++, Prolog) (18 %),
  - Data mining concepts and techniques (15.73 %),
  - **Probability and Statistics** (15.58 %),
  - Ethical, legal and social implications of Artificial Intelligence (10 %)



ARIS

PROJECT

## ARIS PROJECT AI SKILLS FOR ICT PROFESSIONALS

#### SURVEY ON AI SKILLS REQUIREMENTS (3)

- The four most important skills to work as AI professional, according to participants' responses, were in decreasing order:
  - Apply concepts of machine learning in real life problems (17.47 %)
  - Develop machine learning models (15.61 %)
  - Identify patterns in data (11.41 %)
  - Create artificial neural networks (10.36 %)







#### LEARNING OUTCOMES REPORT

- The first set of activities (referred as Intellectual Output) contained defining the specifications the learning outcomes of the ARIS course curriculum.
- The definition of the ARIS learning outcomes was based on the European Qualification Framework (EQF).
- The project ARIS aims to strengthen the key competences of ICT professionals (namely digital, initiative, entrepreneurship and communication skills), rather than focus on the technical and coding skills associated with AI technology.
- To this end, the ARIS curriculum will be made up of the following modules, as drawn from skills needs analysis:
  - Module 1: Foundations of Artificial Intelligence,
  - Module 2: Machine Learning,
  - Module 3: Neural Networks and Deep Learning,
  - **Module 4**: *AI for solving real-life problems*.





### **MODULE 1 : FOUNDATIONS OF AI**

#### This learning outcomes correspond to EQF Level 4.

Defines the essential AI characteristics. Addresses the fundamental features of AI applications			
	Knowledge	Skills	Competence
Know - - -	ns / Aware of: Definitions of Artificial Intelligence Main topics and areas of Artificial Intelligence Methods for problem solving using search algorithms Methods for knowledge representation using logic and probabilistic formalisms Methods for Machine Learning Natural Language Processing Ethical implications of AI	<ul> <li>Able to:</li> <li>Explain the scope of AI differentiating applications from methods and techniques</li> <li>Identify a potential application of AI and critically chose the AI sub-field that may be applied</li> <li>Provide examples of problems that must be addressed with deterministic or probabilistic AI methods</li> <li>Differentiate the knowledge representation, learning and reasoning components in a given AI system.</li> <li>Recognize an AI component in a given system</li> <li>Provide examples of each AI sub-field</li> <li>Examine a suitable real-world problem and abstract its elements to suit one of the AI paradigms</li> <li>Explain the ethical implications of an AI deployment and anticipate the ethical dilemmas that may have to</li> </ul>	<ul> <li>Able to:</li> <li>Give an account of the main methods used in AI solutions and the main areas where AI has been successful</li> <li>Autonomously explain the benefits and risks of AI solutions in terms of performance, accuracy</li> </ul>
		be addressed.	Co-funded by





#### **MODULE 2 : MACHINE LEARNING**

#### This learning outcomes correspond to EQF Level 4.

Defines the foundations for Machine Learning. Teaches how to select the right ML model and to implement it in a given domain

validate its accuracy.

Knowledge	Skills	Competence
<ul> <li>Knows / Aware of:</li> <li>Typology of Machine learning problems (supervised vs unsupervised, classification vs regression)</li> <li>Theoretical principles of Machine Learning</li> <li>Data transformation and visualization</li> <li>Principles and methods of linear ML for classification and regression problems</li> <li>Principles and methods of nonlinear ML for classification and regression problems</li> <li>Principles and methods of unsupervised ML</li> <li>Evaluation of Machine Learning models</li> <li>Languages and resources for ML</li> </ul>	<ul> <li>Able to:</li> <li>Provide examples of the different ML types of problems</li> <li>Identify the ML component in a software system</li> <li>Examine a given problem, identify the component that may be formalize as a ML task and recognize the appropriate typology that is more suitable</li> <li>Critically identify the strengths and weaknesses of a ML solution vs a hard-wired solution, the potential benefits and challenges in different types of scenarios</li> <li>Communicate the potential of ML methods critically telling advantages and disadvantages with respect more traditional approaches</li> <li>For a given problem, formalize requirements of a ML solution, collect the set of methods that may be applied and critically design a plan to test and evaluate the different alternatives</li> <li>Identify languages and other resources for specific ML applications</li> </ul>	<ul> <li>Able to:</li> <li>Evaluate the feasibility of implementing a suitable ML algorithm in a novel domain</li> <li>Provide expertise on a detailed plan to gather the right data, develop the right algorithm taking advantage of existing resources and conducting a suitable validation.</li> </ul>
	<ul> <li>Recognize the relevant data by choosing the right visualizations and the right transformation from raw noisy data.</li> <li>Design a plan for testing a ML solution, evaluate its performance and high train</li> </ul>	Co-funded by Erasmus+ Program of the European U



#### MODULE 3: NEURAL NETWORKS AND DEEP LEARNING

#### This learning outcomes correspond to EQF Level 4.

Defines the foundations for Neural Network (NN) and Deep Learning (DL). Teaches how to implement solutions using NN and DL algorithms in a given domain.

Knows / Aware of:Able to:Able to:- Principles of neural networks- Understand the neural metaphor of NNs and differentiate it from the mathematical abstraction Explain and communicate different types of NN and identify typical domains where each type is more suitable- Explain and communicate different types of NN and identify typical domains where each type is more suitable- Explain and communicate different types of NN and identify typical domains where each type is more suitable- Explain and communicate different types of NN and identify typical domains where each type is more suitable- Explain and communicate different types of NN and identify typical domains where each type is more suitable- Provide expertise on a detailed plan to gather the right data, develop the right algorithm taking advantage of existing resources and conducting a suitable for it Provide examples of the different types of NN and identify the appropriate typology of NN that is more suitable for it Provide examples of the different types of NN on DN solution, collect the set of methods that may be applied and critically design a plan to test and evaluate the different alternatives- Provide examples and other resources for specific NN and DN applications- Co-funded by the Erasmus+ Programmet	Knowledge	Skills	Competence
- Design a plan for testing a NN or DN solution, evaluate its performance	<ul> <li>Knows / Aware of:</li> <li>Principles of neural networks</li> <li>Perceptrons and Multi-Layer Perceptrons</li> <li>Convolutional Neural Networks</li> <li>Recurrent Neural Networks</li> <li>Optimization algorithms for learning in neural networks</li> <li>Deep learning architectures for image processing</li> <li>Deep learning architectures for natural language processing</li> <li>Languages and resources for NN and DL.</li> </ul>	<ul> <li>Able to:</li> <li>Understand the neural metaphor of NNs and differentiate it from the mathematical abstraction.</li> <li>Explain and communicate different types of NN and identify typical domains where each type is more suitable</li> <li>Recognize the analogy between learning in the neural metaphor and optimizing a cost function in the mathematical abstraction.</li> <li>Provide examples of the different types of problems that can be addressed with NN explaining potential benefits and challenges.</li> <li>Identify the NN or DN component in a software system</li> <li>Examine a given problem and identify the appropriate typology of NN that is more suitable for it.</li> <li>For a given problem, formalize requirements of a NN or DN solution, collect the set of methods that may be applied and critically design a plan to test and evaluate the different alternatives</li> <li>Identify languages and other resources for specific NN and DN applications</li> <li>Design a plan for testing a NN or DN solution, evaluate its performance and validate its accurate.</li> </ul>	<ul> <li>Able to:</li> <li>Evaluate the feasibility of implementing a suitable NN architecture and DN algorithm in a novel domain</li> <li>Provide expertise on a detailed plan to gather the right data, develop the right algorithm taking advantage of existing resources and conducting a suitable validation.</li> </ul>



#### MODULE 4: AI FOR SOLVING REAL-LIFE PROBLEMS

#### This learning outcomes correspond to EQF Level 4.

Provides the expertise of the hole software development cycle of an AI solution.

Knowledge	Skills	Competence
Knows / Aware of:	Able to:	Able to:
- Application of AI for object	<ul> <li>provide detailed examples of successful AI industrial applications</li> <li>explain and communicate the design and development of use cases</li> </ul>	- Analyse strengths, weakness,
- Application of AI for image	and proofs of concept at their different phases to potential users and	for specific industry, mainly on those
segmentation	stakeholders	domains where the technology has
<ul> <li>Application of AI for gesture</li> </ul>	- explain, communicate and anticipate advantages and disadvantages	already been tested and resources can
recognition	of AI vs non-AI solutions	be reused.
- Application of AI for classification in	- Critically select existing languages and resources for scenarios	- Provide expertise of the hole software
natural language processing	where AI has already been proved successful.	development cycle of an AI solution

including design, development and validationMonitor the intervention of AI

technology in business models





#### **PRINTABLE MATERIALS**

If you want to learn more about the ARIS project or share information with your network of contacts, please rely on our poster and brochure, which are available to download @ <a href="http://www.aris-project.eu/category/results-outputs/">http://www.aris-project.eu/category/results-outputs/</a>







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