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ARIS PROJECT
AI SKILLS FOR ICT PROFESSIONALS

Erasmus+

ARIS PROJECT

"AI Skills for ICT Professionals"

5TH SEMESTER' OVERVIEW, ACTIVITIES, AND OUTCOMES



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





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Labor market and challenges



Best tech job
of 2020 is

**Artificial
Intelligence
Engineer**



344%
increase in
ads for IT
positions in
the field of
Artificial
Intelligence



Investment in
Artificial
Intelligence
systems is
expected to
increase from
\$ 17.3 billions
in 2021 to \$ 50
billions in 2025



2.3 million
new jobs are
expected to
be created
in the field of
Artificial
Intelligence
in the next 3
years



**More than
765,000 AI-
related jobs
remain
vacant**



Need for the project

- ▶ **Problem:** Lack of professionals who possess the necessary combination of technical and technical skills related to Artificial Intelligence, the momentum in which the search is constantly increasing.
- ▶ **Cause:** The slow and incomplete adaptation of existing curricula to modern technological developments and the underestimated role of vocational training.
- ▶ **Need:** Training for existing and future professionals in the IT industry fulfills the current job market's modern demands and contributes to the full utilization of opportunities.
- ▶ **Solution:** Improve the relevance of education and training systems in the labor market and highlight the importance of continuing vocational education in the ICT sector.



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ARIS project partners



Business
Training

BUSINESS TRAINING

The project
coordinator and
a leading VET
institution in
Belgium



EXELIA EE

EXELIA specializes
in using ICT as an
enabling factor
for innovation and
excellence in
education and
training,
developing
advanced
educational
software and
material.



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DE CATALUNYA
BARCELONATECH

Polytechnic University of Catalonia

is the largest
and most
prestigious
technical
university in
Catalonia,
Spain.



LIETUVOS
KOMPIUTERININKŲ
SĄJUNGA

Lithuanian Computer Society

is the largest
professional
body
representing the
ICT sector in
Lithuania.



Institute for Cognitive Sciences and Technologies

is the most
prominent
research
institution on
cognitive
science in Italy.





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 & techniques 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





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ARIS PROJECT RESULTS





Main results

- ✓ 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.



Labor market research

194 participants from 10 European countries in the field of the research

49 study programs

15 academic publications

75 job postings from consortium countries



Essential technical knowledge

1. Machine Learning Algorithms

2. Programming languages for Artificial Intelligence

3. Data mining concepts and techniques

4. Probability and statistics

5. Ethical, legal and social implications of Artificial Intelligence



Essential technical skills

1. Apply concepts of machine learning in real life problems

2. Develop machine learning models

3. Identify patterns in data

4. Create artificial neural networks



Essential non-technical skills

1. Development of ideas in a functional prototype (proof of concept)

2. Identification of needs/capabilities and development of personalized solutions

3. Change Management

4. Communication and customer service



Features of the curriculum

EQF level: 5

**Course duration:
160 hours**

**40 Learning
Outcomes**

**4 Learning Units
24 Lessons**

**Language of
materials:
English**



Structure of the curriculum

Unit 1. Foundations of Artificial Intelligence

- Scope of AI
- Problem Solving
- Knowledge Representation
- Machine Learning
- Applications
- Ethical Implications

Unit 2. Machine Learning

- Introduction to ML
- Languages and Resources
- Data Transformation and Visualization
- Supervised Linear ML
- Supervised Non-Linear ML
- Unsupervised ML



Structure of the curriculum

Unit 3. Neural Networks and Deep Learning

Brain origin and element of neural networks.

Simple perceptrons and supervised learning.

Multilayer perceptrons and Keras.

Deep learning for image classification: Convolutional neural networks.

Different CNNs for image classification.

Real-time object localization with YOLO models.

Unit 2. Deep Learning for Natural Language Processing and Big Data Analysis

Word Embeddings and Text Classification

Neural networks for NLP and libraries

New approaches, applications, open problems

Big data: problems, core techniques, and introduction to Hadoop

Big data: Hadoop and Spark for data processing

Big data: main analytics, visualization, and applications



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Trainer handbook

The main purpose of this report is to provide guidelines for trainers which will help them achieve the training goals.

This document includes the trainer's guidelines on

- ▶ how to use the training material (slides, videos, case studies and exercises) to
- ▶ maximize the learning outcomes achievement, a short methodology and instructions
- ▶ on how to facilitate the remote training making use of MOOC's supported tools.

Trainer handbook is available here http://www.aris-project.eu/wp-content/uploads/2021/11/2021-03-01_ARIS_O2-T3_Trainers-Handbook.pdf



ARIS PROJECT
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ARIS

Trainer Handbook (O2-T3)

Output type: Intellectual Output

Business Training

February 2021



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ARIS PROJECT
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ARIS online course on Openlearning.com

Artificial Intelligence (AI) skills for ICT professionals



Artificial Intelligence, Machine Learning, Big Data, Robotics,


 Credential type
Certificate of completion

 Start date
Start any time

 Duration
Flexible

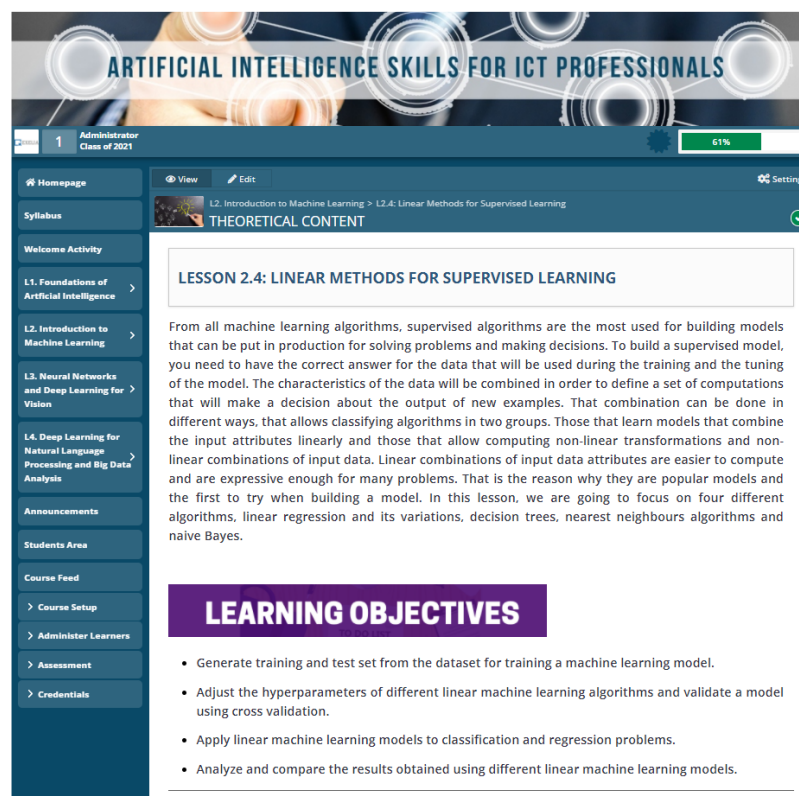
 Cost
Free

[JOIN NOW](#)



Welcome to ARIS VOOC!

Artificial Intelligence (AI) is revolutionizing the way the economy and society function, by automating tasks & business processes, and managing workflows & critical data more effectively. The fastpaced development of AI technologies in diverse economic and social realities is exponentially augmenting the demand for ICT professionals with the right combination of AI technical, non-technical and transversal skills. Recent market surveys show that the demand for AI skills has almost tripled over the past 3 years and the number of relevant job postings is up by 119%. Employers, however, struggle to find candidates with the right skill mix. Further to demand, the gap is amplified by the shortage and inadequacy of relevant skills expected via Vocational Education and Training (VET) provision, given also that AI is currently a subject of ICT specialization mostly offered at the highest level of tertiary education. The **ARIS VOOC** is an up-to-date, self-standing, modular course for ICT professionals, who need to improve their skills, knowledge and competencies in AI technologies and practical applications. ICT professionals who follow this course will acquire and develop AI-related skills - along with problem-solving, managerial and customer-related (transversal) skills - required to respond to modern workplace requirements and succeed in a competitive labour market.

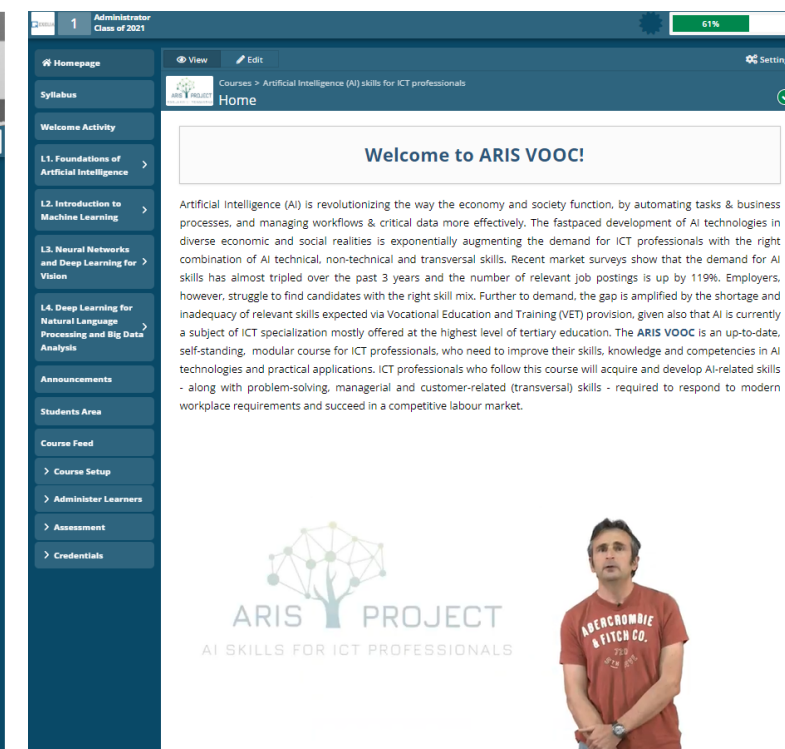


LESSON 2.4: LINEAR METHODS FOR SUPERVISED LEARNING

From all machine learning algorithms, supervised algorithms are the most used for building models that can be put in production for solving problems and making decisions. To build a supervised model, you need to have the correct answer for the data that will be used during the training and the tuning of the model. The characteristics of the data will be combined in order to define a set of computations that will make a decision about the output of new examples. That combination can be done in different ways, that allows classifying algorithms in two groups. Those that learn models that combine the input attributes linearly and those that allow computing non-linear transformations and non-linear combinations of input data. Linear combinations of input data attributes are easier to compute and are expressive enough for many problems. That is the reason why they are popular models and the first to try when building a model. In this lesson, we are going to focus on four different algorithms, linear regression and its variations, decision trees, nearest neighbours algorithms and naive Bayes.

LEARNING OBJECTIVES

- Generate training and test set from the dataset for training a machine learning model.
- Adjust the hyperparameters of different linear machine learning algorithms and validate a model using cross validation.
- Apply linear machine learning models to classification and regression problems.
- Analyze and compare the results obtained using different linear machine learning models.



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To join follow this link www.openlearning.com/courses/artificial-intelligence-ai-skills-for-ict-professionals



Statement of Support and recognition of the project results

96 social and economic actors from all over Europe expressed their support for the project's results. They pledged to contribute to their immediate promotion and adoption to enhance Artificial Intelligence education and the development of modern digital skills.

Actions:

- ▶ Inform the public about the social and economic benefits associated with the further development and adoption of Artificial Intelligence applications.
- ▶ Disseminate training materials and good practices for the development of Artificial Intelligence skills.
- ▶ Promote the integration of prerequisite Artificial Intelligence skills into sectoral skills registers for ICT professionals.



STATEMENT OF SUPPORT

PURPOSE

The purpose of this document is to motivate stakeholders in the Artificial Intelligence (AI) field – AI companies, sector representatives, policy actors, social partners, standardization organisations, national qualification agencies, VET and HE institutions, trainers/mentors, and field experts – to a) directly support the recognition of the validity of the ARIS project's learning outcomes in terms of addressing the skills, knowledge and competences required by ICT professionals to understand, develop and use AI applications, and b) contribute to the advancement of the project's objectives to reinforce education in digital competences, based on the principles of common interest, reciprocity and complementarity.

CONTEXT

The Statement of Support has been created in the context of the [Erasmus+ project ARIS](#), which aims to strengthen the vital digital competencies in VET provision for ICT professionals by offering **an up-to-date curriculum and open educational resources in AI** to address the existing occupational skills needs and mismatches. This objective is in line with the priorities of the Digital Europe EU Program and the Digital Education Action Plan, to support the upskilling of the workforce and update the European Digital Competence Framework with AI related skills requirements.

AI revolutionizes the economy and society function by automating tasks and business processes and managing workflows and critical data more effectively. The fast-paced development of AI technologies in diverse economic and social realities exponentially augment the demand for ICT professionals with the right combination of AI and transversal skills.

AI is currently a subject of ICT specialization mostly offered at the highest level of tertiary education. It makes upgrading initial and continuous VET provision in the field essential so that existing and future ICT professionals can acquire and develop the AI skills and competencies required to respond to modern workplace requirements and succeed in a competitive labor market.



5th main semester tasks

- ▶ Digital presentation for 5th semester
- ▶ 5th direct email campaign
- ▶ Website restructuring based on NA comments
- ▶ Develop the online petition form
- ▶ Development of evaluation form
- ▶ Campaign to circulate the statement of support
- ▶ Drafting of the AI Certificate Supplement
- ▶ Distribution of the AI Certificate Supplement
- ▶ Drafting and distribution of position paper to policy-makers
- ▶ ARIS Information days in Brussels, Barcelona, Greece, Vilnius and Rome

Start date: 01-09-2021

End date: 28-02-2022



AI Skills Certificate of Supplement

- ▶ AI Skills Certificate supplement is a template for VET providers that have integrated some ARIS learning outcomes into their training offerings.
- ▶ The supplement follows the specifications set by Europass and specifies the purpose of the acquisitions professional qualifications, their level and learning results, while providing information on the national educational system.
- ▶ The certificate contributes to the better promotion and recognition of professional qualifications from employers and educators institutions across Europe.



1. Title of the certificate ¹

Example: Τεχνικός Λογισμικού Η/Υ (EL)

2. Translated title of the certificate ²

Example: Software Technical Designer (EN)

3. Profile of skills and competences

Individual Units

- Learning unit 1: Foundations of Artificial Intelligence
 - L1.1.: Scope of Artificial Intelligence
 - L1.2: Problem-solving with search algorithms
 - L1.3: Knowledge representation
 - L1.4: Machine Learning
 - L1.5: Applications of Artificial Intelligence
 - L1.6: Ethical implications of Artificial Intelligence
- Learning unit 2: Machine Learning
 - L2.1: Introduction to ML
 - L2.2: Languages and Resources
 - L2.3: Data Transformation and Visualization
 - L2.4: Linear Methods for Supervised Learning
 - L2.5: Non-Linear Methods for Supervised Learning
 - L2.6: Unsupervised Learning
- Learning unit 3: Neural Networks and Deep Learning
 - L3.1: Brain & Neural Networks
 - L3.2: Simple Perceptrons and Supervised Learning



Position paper

- ▶ **Objective:** to support the integration of artificial intelligence skills in the e-competence framework (e-CF) – the European standard for ICT professionals.
- ▶ **Target group:** bodies and stakeholders active in the ICT sector and participate in policy learning consulting.
- ▶ The position paper also seeks influence policy-making initiatives, seeking to increase the provision of high quality skills and competences & bring closer the VET world with the needs of the labor market.



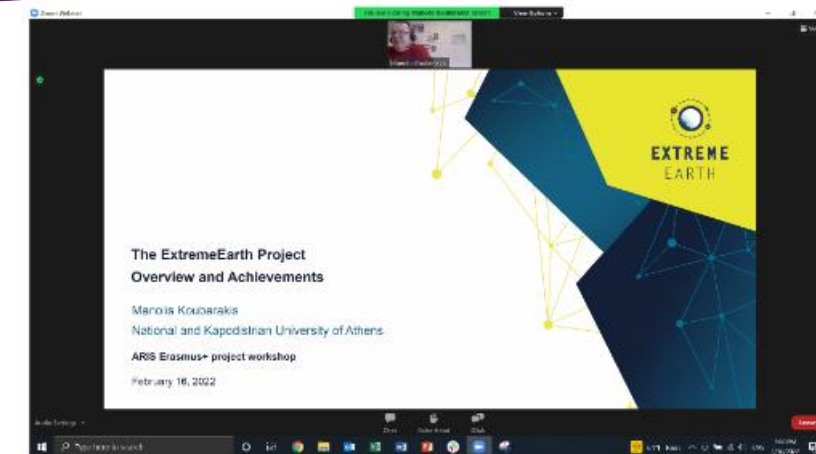
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Information and networking workshop in Greece

- ▶ The national information and networking day of the ARIS project is held by EXELIA on Wednesday 16 February from 12.30 to 15.30, online through the ZOOM platform.
- ▶ The results of the project were presented by Mr. Dionysios Solomos, project coordinator and head of its Erasmus + programs company.
- ▶ The project results were presented by Mr. Dionysios Solomos, project coordinator. During the day, participants had the opportunity to be informed about the results of the project and especially about the curriculum developed by the consortium, while thematic speeches were made by experts in the field of Artificial Intelligence (Dr. Ioannis Refanidis and Dr. Manolis Koumparakis), and representatives of vocational training systems and education (Mr. Dimitrios Kyriakos).
- ▶ More than 50 members of the project target groups participated in the meeting.
- ▶ In the following link you can see the detailed [agenda!](#)





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Information day in Vilnius

- ▶ LIKS has organized the Lithuanian ARIS Information Day in Vilnius on Thursday 17th February 2022.
- ▶ During the event, three speakers introduced to the artificial intelligence course content and its teaching materials, reviewed trends in the artificial intelligence and deep learning, and presented information on the relationship between robot humanoids and artificial intelligence.
- ▶ 51 participants including teachers, lectures and students from various ITC related domains participated in the event.





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Information day in Italy

- ▶ The Info Day in Italy is held by ISTC-CNR on Wednesday 16 February, from 15:00 to 19:00 as a virtual event (registration on Eventbrite)
- ▶ The results of the project are presented by Gianluca Baldassarre, research director at ISTC-CNR, and president of the Advanced School in AI (AS-AI)
- ▶ Representatives from the professional training sector (EULAB Consulting, ITS GALILEI-SANI, MAGISTRA GROUP, ITALIA CAMP), AI companies (INGLOBE TECHNOLOGIES) and sector experts (ISTAT) participated in the networking event.
- ▶ The Info Day included a "hands-on" session centered on the training modules of the ARIS course.
- ▶ 38 participants followed the meeting.
- ▶ At the following [link](#) the detailed agenda.



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NUOVE COMPETENZE DI INTELLIGENZA ARTIFICIALE PER I PROFESSIONISTI ICT

Info Day nazionale
per la presentazione dei risultati
del progetto Erasmus+ ARIS

mercoledì 16 febbraio 2022 | 14.30 - 19:00 |
#ARISProject | virtual event



Consiglio Nazionale delle Ricerche





Information day in Barcelona

- ▶ 17 participants attended online and 38 participants attended in person at the ARIS National Information Day, organized by the Department of Computer Science on February 16th 2022
- ▶ During the Info-day of the ARIS project, Karina Gibert, professor at the EIO department and director of the IDEAI-UPC research centre, presented a general review of the dizzying development of Artificial Intelligence from a perspective ethics
- ▶ Javier Larrosa presented ARIS project MOOC.





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Information day in Brussels

- ▶ Business Training has organized the Belgium ARIS Workshop in Brussels on Thursday 3rd February 2022.
- ▶ During this workshop listener had the opportunity to discover “en avant première” ARIS innovative course and get familiar with this disruptive AI technology.
- ▶ 28 participants attended the workshop.





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Get in touch with us

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