Co-funded by the Erasmus+ Programme of the European Union

Empowering the European Workforce Development through Online/Virtual Skills Training for Digital Transformation towards Mitigating the Impact of Pandemic Situations (SkoPS)

01.03.2022

IN THIS ISSUE

- SkoPs
- Consortium
- Courses
- Industrial Plan
- TPM's

Erasmus+ SkoPS

The project intends to promote up-skilling and re-skilling read lines while involving HEIs in the support of business and society and enhancing competitiveness for engineers, with an emphasis on women in particular.

The ERASMUS PLUS Key Action 2 (capacity building in higher education) has funded the work reported herein; project reference number:2020-1-DE01-KA226-HE-0057722, which is gratefully acknowledged

The project concern asynchronous training modules where the trainees and the trainers will study the notes posted on a special asynchronous training platform and then answer a quiz of graded questions for each module.

MORE INFORMATION VISIT:

Website:

https://www.skops.eu/

twitter:

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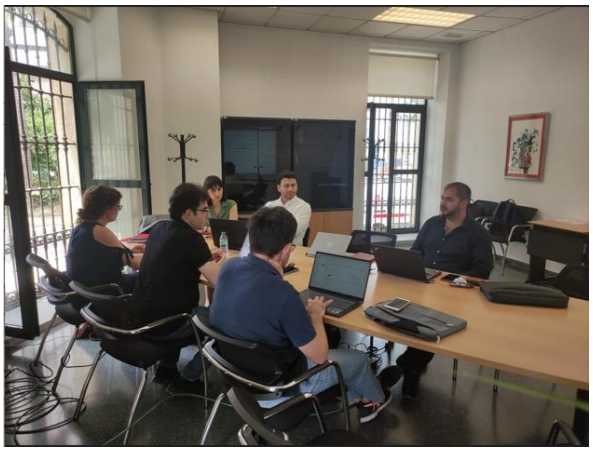


PROJECT INFORMATION

Number:

2020-1-DE01-KA226-HE-0057722

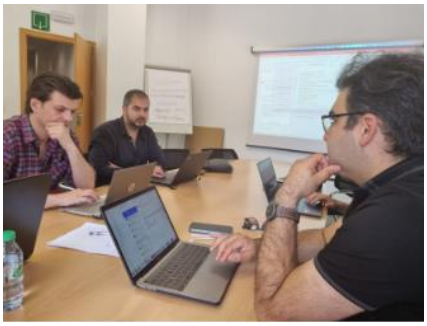
Key Action:
Cooperation for innovation and the exchange of good practices – Capacity Building in the field of Higher Education

Consortium

The consortium includes the leader of the project: the University of Siegen in Germany,

The partners include: European Institute for Local Development, a Non-Governmental–Organization from Greece, Petanux GMBH , a Small and medium-sized enterprises and Universidad De Alicante, a University from Spain.

Courses



The project aims to asynchronous training modules where the trainee trainers will study the notes posted on a special asynchronous training platform and then answer a quiz of graded questions for each module. The courses aim to cover the following areas:

- Fundamental Machine Learning
- Big Data Management
- Engineering, DIgitalization and Applications
- Smart Cities and IoT
- Python Programming for io T Data Science
- Cyberphysiocal Real-Time Systems
- Dependability and Safety
- Wireless Sensor Networks
- Training the Trainers
- Trianing the Trainees

Course 1: Introduction to Machine Learning

This comprehensive course covers essential topics and techniques in Machine Learning, providing a solid foundation for future studies and projects. The course is structured around the following key areas:

Introducing Machine Learning and Supervised Learning: The course begins with an overview of Machine Learning, its applications, and importance. It then focuses on supervised learning, examining regression and classification techniques.

Overcoming ML Obstacles: The course explores common challenges in Machine Learning, such as overfitting, underfitting, and the bias-variance trade. Strategies to address these issues are discussed, including regularization, cross-validation, and ensemble methods.

Neural Networks and Their Learning Methods: Participants will learn about neural networks, their structure, components, and learning methods. Key topics include forward and backward propagation, gradient descent, and optimization techniques.

Kernel Methods: This section introduces kernel methods, techniques that enable working with non-linearly separable data. The basics of kernel functions, support vector machines (SVMs), and kernel-based approaches for regression and classification problems are covered.

Unsupervised Learning and Performance Evaluation: The course concludes with unsupervised learning, exploring algorithms such as clustering, dimensionality reduction, and association rule mining. Challenges in evaluating the performance of unsupervised learning models are also discussed.

Course 2: Big Data Models and Management.

This course discusses its definition, characteristics, and significance in today's data-driven landscape. Participants will explore various Big Data models, such as the 3Vs, and delve into essential components of Big Data management, including data storage, processing, and analytics.Transitioning to data mining, the course investigates the process of discovering patterns and knowledge from large datasets. It also examines mining data streams, a technique for extracting valuable information from continuous, real-time data, and introduces a practical algorithm for hands-on experience in data mining techniques.. Further into the course, two crucial algorithms for handling Big Data are explored overing their underlying concepts, applications, and benefits, as well as their limitations and challenges. This provides valuable insights into key techniques used in Big Data processing and analytics Focusing on Map-Reduce, one of the most widely used processing techniques in Big Data management, the course delves into its fundamental principles and applications in large-scale data processing. Hadoop, a popular open-source framework for distributed storage and processing of Big Data, which employs the Map-Reduce paradigm, is also introduced. Concluding with an in-depth examination of Apache Spark, a widely adopted Big Data management tool, participants will learn about its architecture, components, and features. The course explores how Spark overcomes the limitations of traditional Map-Reduce systems and how to use it for various data processing tasks, such as batch processing, stream processing, machine learning, and graph processing..

Course 3: Engineering, Digitalization, and Applications

This course delves into the intersection of engineering, digital technologies, and their applications in various industries. Key areas covered include the Internet of Things (IoT), Industry 4.0, the Industrial Internet of Things (IIoT), cybersecurity, and various technologies and applications.
Starting with an introduction to IoT and Industry 4.0, the course discusses the interconnection of everyday objects and the current trend of automation and data exchange in manufacturing technologies, leveraging IoT, artificial intelligence, and other digital technologies. Progressing further, the course examines the applications of Industry 4.0 and IIoT, exploring their impact on productivity, efficiency, and competitiveness. A comprehensive overview of Industry 4.0 and IIoT is provided, discussing key principles, components, and technologies, as well as various enablers such as connectivity, data analytics, and automation.Focusing on cybersecurity, the course emphasizes its importance in today's connected world. Various.

types of cyber threats are discussed, along with best practices and strategies for securing IoT and IIoT devices, networks, and systems. The significance of incorporating cybersecurity measures into the design and implementation of digital technologies is also covered.Concluding with an exploration of various technologies and applications related to engineering and digitalization, the course examines robotics, additive manufacturing, and virtual/augmented reality. The role these technologies play in enabling Industry 4.0 and IIoT applications is discussed, as well as the challenges and opportunities associated with their adoption and integration.

Course 4: Smart Cities and IoT

This course explores the concept of smart cities, focusing on the role of the Internet of Things (IoT) in their development and management. Participants will gain an understanding of how IoT technologies can be utilized to create smarter, more efficient, and sustainable urban environments. Delving into IoT for smart cities, the course examines the various applications and benefits of integrating IoT technologies into urban infrastructure, transportation, energy management, and public services. This includes a discussion of innovative solutions for improving the quality of life and optimizing resource consumption. Transitioning to Azure IoT Central, the course introduces this cloud-based platform that simplifies the deployment, management, and scaling of IoT solutions. Participants will learn how Azure IoT Central can be used to develop, monitor, and maintain IoT applications for smart cities Focusing on digital twins, the course explores the concept of creating virtual representations of physical assets, systems, or processes, which can be used to analyze, simulate, and optimize performance in real-time. This includes an examination of how digital twins can be applied to smart cities and IoT. Concluding with Azure Digital Twins, the course delves into this service that enables the creation and management of digital twin models for IoT solutions. Participants will learn how Azure Digital Twins can be used to build comprehensive, scalable, and secure smart city solutions that leverage IoT technologies

Course 5: Python Programming for IoT and Data Science

This course focuses on Python programming for IoT and data science, covering essential skills and concepts for working with data and IoT applications. Key topics include data collection and acquisition, preprocessing, visualization, and implementing data science models.

Beginning with an introduction to Python for IoT and data science, the course explores the foundations necessary to work with data in Python. Data collection and acquisition techniques are discussed, providing an understanding of how to gather and manage data from various sources. Delving into IoT data preprocessing, the course introduces popular Python libraries such as NumPy and Pandas, which are essential for data manipulation and analysis. Participants will learn how to clean, transform, and prepare data for further processing and visualization.Transitioning to IoT data visualization, the course examines various techniques for presenting data, such as box plots, histograms, scatter plots, and principle component analysis (PCA). Python libraries like Matplotlib, Seaborn, and Plotly are introduced for creating visualizations that help gain insights from IoT datasets.

Concluding with an exploration of data science models, the course covers pattern detection, outlier detection, and various algorithms, such as K Nearest Neighbors, logistic regression, and neural networks. Participants will learn how to use Python libraries like Scikit-learn and TensorFlow to implement these models and analyze IoT data effectively.

Course 6: Cyberphysical Real-Time Systems

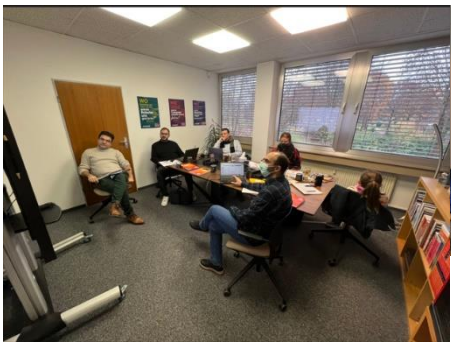
In Real-time systems, sensors collect data in periodic intervals, and the system should respond via actuators. The real-time program should interact with the real-world environment and execute in a system with defined resources. There should be time bounds when the system responses should be delivered in. The ability of the system to respond to timing and computational demands, depends on the system's requirements. For the close-relation events, the system should make a schedule to compute and respond to them in desired time. During system operations and computations, failures are possible to occur and have various consequences. These consequences may be distinguished as minor when the effects are not considerable and otherwise are a catastrophe

This course concentrates on the system aspects of embedded real-time systems. It provides the central requirement and materials, such as introducing, modeling, and designing the embedded control systems represented in 8 weeks. The primary purposes of the course are to explain the application fields of embedded control systems and real-time embedded systems to understand methods to develop embedded control systems such as modeling, design, and analysis. Students will know various paradigms and design principles for real-time embedded systems. In addition, the fundamentals of embedded real-time systems are intended for knowledge gained from new developments (e.g., the Internet of Things(IoT)) to provide the basis for research activities in the field of cyber-physical systems.

Course 7 : Dependability and Safety

Dependability is the ability of a system to deliver the intended service, including fault-tolerance techniques. In Real-time computing, dependability refers to service provision at a particular time. Functional safety is concerned with the safety-critical systems and concentrates on the characteristics of the extra systems added to a system with the

purpose of making its operation safe. The main concept of the dependability theory is the threats, the attributes, and the techniques used to enforce dependability Safety-critical applications require high reliability in computing and electronic systems, which is achieved by designing fault-tolerant systems. This module introduces the design and analysis of reliable computing systems and is represented in 5 weeks. This course presents the fundamentals of fault-tolerant systems and fault-tolerance tools at both hardware and software levels, e.g., redundancy and re-execution. It will give an understanding of how to detect faults, design computing components to tolerate faults, and measure the reliability of systems. This course will help students design and analyze reliable computing systems.



Course 8: Wireless sensor networks

This course explores the fundamentals of wireless sensor networks (WSNs), diving into key concepts, architectures, programming challenges, and practical applications. Participants will gain an understanding of how WSNs can be utilized in various IoT scenarios, as well as how to work with cloud platforms like Azure. Starting with an introduction to WSNs, the course lays the groundwork for understanding the principles and applications of these networks, which enable the collection and transmission of data from distributed sensors. Delving into the architecture of WSNs, the course examines the various components and design principles that govern the organization and functionality of these networks. This includes understanding the roles of sensor nodes, base stations, and communication protocols. Focusing on programming challenges, the course discusses the unique issues faced when developing software for WSNs, such as resource constraints, power management, and network reliability. Participants will learn how to overcome these challenges

and create robust, efficient WSN applications.Transitioning to Azure and IoT, the course explores the integration of

WSNs with cloud-based platforms, such as Azure IoT, which can simplify the deployment, management, and scaling of IoT solutions. Participants will learn how to leverage Azure IoT services to build, monitor, and maintain WSN-based IoT applications. Concluding with a hands-on lab, the course provides practical experience in implementing WSNs for people identification. Participants will apply the concepts and techniques learned throughout the course to develop a real-world WSN application that addresses a specific use case.

Course 9: Training the Trainers

This course is designed to equip trainers with the knowledge and skills necessary to develop and deliver effective training programs. Key topics covered include the purpose of training, training development, training process, virtual classroom management, and assessments and feedback. Beginning with the purpose of training, the course establishes a foundational understanding of the goals and objectives of training programs, as well as the role trainers play in facilitating learning and skill development. Focusing on training development, the course explores the various components of designing and creating comprehensive training programs, including identifying learning objectives, selecting appropriate instructional methods, and organizing content to maximize learning outcomes. Examining the training process, the course delves into the practical aspects of delivering training, such as planning, preparation, presentation, and engaging participants in interactive learning experiences. Transitioning to virtual classroom management, the course addresses the unique challenges and opportunities presented by online training environments. Participants will learn strategies for managing virtual classrooms effectively, including fostering collaboration, maintaining participant engagement, and

leveraging technology to support learning. Concluding with assessments and feedback, the course emphasizes the importance of evaluating training effectiveness and providing constructive feedback to learners. Participants will learn how to design and implement assessments that measure

learning outcomes and facilitate continuous improvement in training programs

Course 10 : Train the Trainees

This course is designed to prepare trainees for success in various learning environments, with a focus on problem-solving, online learning, and the enhancement of online education. Key topics covered include the purpose of training, problem-solving techniques, online learning strategies, enhancing the learning process, and designing and developing course tasks. Beginning with the purpose of training, the course sets the stage for understanding the goals and objectives of training programs, as well as the role trainees play in their own learning and skill development. Focusing on problem-solving, the course introduces trainees to effective techniques for addressing challenges, fostering critical thinking, and enhancing their ability to find innovative solutions in both training and real-world situations. Transitioning to online learning, the course explores strategies for success in digital learning environments, including time management, self-motivation, and effective communication with instructors and peers. Delving into the enhancement of online education's learning process, the course emphasizes the importance of engaging in active learning, leveraging digital resources, and adapting to the unique demands of virtual classrooms. Concluding with the design and development of course tasks, the course equips trainees with the skills necessary to create and complete assignments that align with learning objectives, showcase their understanding of course material, and contribute to their overall academic and professional growth.

Industrial Dissemination Plan

Objectives

- To raise awareness about the initiative.
- To provide the groundwork for successful communication of the project's idea and possible advantages to the target audiences.
- To convey research findings in order to maintain interest in the project's work.
- To lay the groundwork for a successful distribution approach.
- To create the framework for establishing and strengthening a broad network of prospective target groups for positive effect.
- To maximize chances for the European workforce during and after upskilling.

Benefits:

- It supports and raises awareness of your project goals and results within and outside your organization.
- It brings your product or results to the attention of relevant decision-makers.
- It places the focus on project highlights; these might be, e.g. "good practices" or specific innovations.
- It encourages interested parties to use your product or results in their own or similar problematic situations.
- This use by third parties also increases the sustainability of your project.
- Successful exploitation is confirmation of the professionalism and quality standards of your institution.
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DISSEMINATION MEANS

- Posts
  Twitter : @skops_project
- Dissemination Campaign
- Website: https://www.skops.eu/
- Brochure
- Press release
- Poster
- Newsletter
- Emails
- Local/Online Meeting with Stakeholders
- Online meeting
- Local meeting
- Multiplier event
- Communication with network so as to share dissemination material
- Network/Ecosystem meeting

WHO IS OUR TARGET GROUP

- National educational instruments
- Chambers
- Professional associations
- Industry associations
- Trade fairs, conferences
- National umbrella organizations

Planning the integration of, and networking with, your stakeholders

- Stakeholders are persons or institutions who are affected by your project activities.
- Cluster stakeholders together in groups and give them titles, e.g. training and education, policy making, business, etc.
- For each stakeholder, decide how influential he or she is and what his or her attitude is to the project.
- In the project team, decide how you wish to manage the stakeholders during and after the project

WHAT YOU CAN POST

You can post posters, brochures, press release or photos from the context of the project.
You can post relevant articles to the project's topics.

Email marketing tips for industrial stakeholders

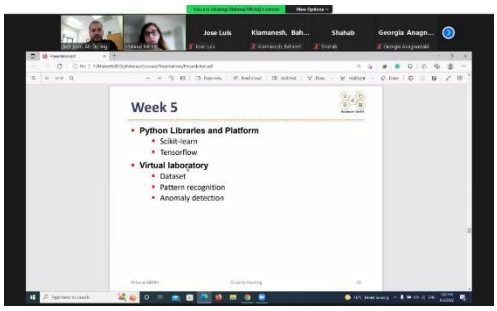
Avoid SPAM at all costs

Before receiving email, the receiver must have provided their consent, have the ability to unsubscribe from receiving future emails, must not mislead the recipient about the content or origin of the email, and utilize approved ways to get the recipient's email address.

Personalize your emails
You should avoid sending generic emails. Your recipients are not all the same, and you should make distinctions between them by segmenting your database. This means sending the same type of email diversified in some key aspects depending on the type of recipient.

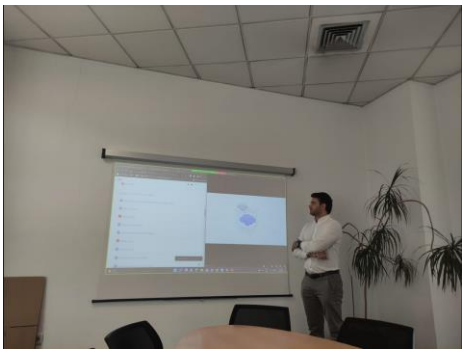
Optimize your subscriber list
Do not rush out and buy an email list to get started with email marketing. You should grow your in-house subscriber list and get to know your contacts and what they need from you

Trasnational Partners Meetings



Online Kick-Off Meeting

In the online Kick-Off Meeting, the consortium addressed key points, assigned action items, and discussed course materials, platform choices, and dissemination strategies. Monthly PMB meetings, a shared Q/E team, questionnaire methodologies, and an OSC were established. The SkoPS project website, "skops.eu," and communication platforms, such as Zoom, SharePoint, and WhatsApp, were agreed upon. EILD will prepare dissemination materials, and partners will contribute to a stakeholder list based on their experiences and countries.



F2F meeting at Spain

The Project Annual Progress Report and Course Development Meeting was held in Alicante, Spain, on 2nd-3rd June 2022. Partners presented course materials and discussed project management. Action items include updating progress tables, preparing slides, finalizing course content, and quality control measures. The consortium agreed on a passing grade of 80% for course participants. EILD is tasked with updating references and preparing dissemination materials. Project progress and timesheets must be reported, and partners should obtain consent for copyrighted materials. Feedback from the project proposal must be addressed, including stakeholder involvement, dissemination planning, and sustainability strategies

F2F meeting at Bonn

On the 5th and 6th of December 2022, a meeting was held with participants from USI, UA, EILD, and PTX. The meeting covered various topics, including updating the agenda, course materials, plagiarism checks, and video creation. The deadlines for these tasks range from 12.12.2022 to 30.05.2023. Additionally, plans for future transnational meetings were discussed, with the Project Dissemination and Exploitation Meeting scheduled for February 2023 in Athens, Greece, and the Project Closure and Final Report Meeting set for May 2023.

F2F meeting at Athens

The Project Dissemination and Exploitation Meeting took place on 22nd and 23rd February 2023 in Greece. The meeting focused on project dissemination plans, course development, and quality assurance. Various action items were assigned to partners with deadlines ranging from 01.03.2023 to 14.07.2023. Some key tasks include uploading meeting files on SharePoint, course review and preparation, adding resources and references to courses, creating a YouTube channel for course videos, and preparing the final project report. Additionally, partners will work on plagiarism checks, keyword generation, event updates, and sustainability plans.

Project Leader

The consortium is led by the University of Siegen in Germany. The University of Siegen has a long running experience of combining embedded systems, as the overarching concept for CPS, knowledge management and intelligent systems, to continuously utilize the intersection for research and teaching throughout the master's degree domains of computer science and electrical engineering. In consideration of the implemented best practices at the University of Siegen, a jointly developed pedagogy is in focus of the MS@CPS master program.

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