Co-funded by
the European Union

UNIVERSITETI
POLIS

BOOK OF PROCEEDINGS

INTERNATIONAL CONFERENCE
SUSTAINABLE MOBILITY

5-6 MARCH
2026

The INTEC International Conference brings together academics, researchers, policymakers and industry experts to discuss innovative approaches and collaborative solutions for a sustainable future in engineering and mobility. The conference will be hosted by POLIS University in Tirana, Albania, and co-organized by partners from across the EU as part of the Erasmus+ CBHE Project 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2.

INTEC International Engineering Competence Centres to push sustainable mobility development in Albania and Montenegro
Project Reference: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

Project Partners:

ISBN 9789928347268

DOI: 10.37199/c41001000

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

Partner Universities

Project Coordinator: FH JOANNEUM Gesellschaft mbH (FHJ), Austria
Frankfurt University of Applied Sciences (FRA-UAS), Germany
University of Split (US), Croatia
POLIS University (POLIS), Albania
Polytechnic University of Tirana (PUT), Albania
University of Vlore "Ismail Qemali" (UV), Albania
University of Montenegro (UOM), Montenegro
Adriatic University Bar (FSKL), Montenegro
University of Donja Gorica (UDG), Montenegro
AVL List GmbH (AVL), Austria
Gama Auto d.o.o. (GA), Montenegro
NVO Alfa Centar (AC), Montenegro

Conference Chair

DI Daniela Wenzl
Dr. Elona Karafili
Dr. Flora Krasniqi

Conference Keynote Speaker

DI Horst Pflügl, AVL List GmbH (AVL), Austria
MSc. Mine Bushi, General Directorate of Road Transport Services in Albania

Scientific Committee

Prof. Emeritus Dr. Nataša Gospić, Adriatic University Bar (FSKL), Montenegro
Prof. Dr. Bhavin Kapadia, FH JOANNEUM Gesellschaft mbH (FHJ), Austria
Assoc. Prof. Dr. Ivan Tolj, University of Split (US), Croatia
Prof. Dr. Kristofor Lapa, University of Vlore "Ismail Qemali" (UV), Albania
Prof. Dr. Damir Sedlar, University of Split (US), Croatia
Prof. Dr. Boško Ilija Matović, University of Montenegro (UOM), Montenegro
MA Adrian Millward-Sadler, FH JOANNEUM Gesellschaft mbH (FHJ), Austria
Dr. Anis Sulejmani, Polytechnic University of Tirana (PUT), Albania
Dr. Enkelejd Mëhilli, University of Vlore "Ismail Qemali" (UV), Albania
Dr. Blenard Xhaferraj, Polytechnic University of Tirana (PUT), Albania
Dr. Elona Karafili, POLIS University (POLIS), Albania
Dr. Flora Krasniqi, POLIS University (POLIS), Albania
Dr. Ivana Ognjanović, University of Donja Gorica (UDG), Montenegro

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

Organizing Committee

DI Daniela Wenzl
Dr. Keti Hoxha
Dr. Flora Krasniqi
Dr. Elona Karafili
MSc. Sadmira Malaj
MSc. Sindi Doce
MSc. Glejdi Fejza

TABLE OF CONTENTS

1. POLITICAL AND REGULATORY FRAMEWORK 9

RENEWABLE ENERGY PROCUREMENT (CPPA) AND TRANSPORT ELECTRIFICATION: EUROPEAN PERSPECTIVES AND ALBANIAN CHALLENGE 10

REVIEW OF THE EVOLUTION OF INTERNATIONAL SHIP ENERGY EFFICIENCY REGULATIONS AND THE ALBANIAN CONTEXT 20

THE EUROPEAN GREEN DEAL AND ITS NATIONAL IMPLEMENTATION: FROM STRATEGY TO PRACTICE 30

THE CURRENT STATUS OF AUTONOMOUS VEHICLE TECHNOLOGY ADOPTION IN THE BALKAN REGION 42

INTEGRATING EVENT DATA RECORDER (EDR) TECHNOLOGY INTO SUSTAINABLE ROAD SAFETY FRAMEWORKS WITHIN THE EUROPEAN GREEN DEAL 56

INFRASTRUCTURE READINESS FOR SUSTAINABLE MOBILITY: EU FRAMEWORKS AND THE CASE OF ALBANIA.. 70

FROM PREDICTION TO REGULATION: EVIDENCE PRODUCTION APPROACHES IN AUTONOMOUS MOBILITY RESEARCH AND THEIR POLICY IMPLICATIONS...................... 82

REVIEWING THE EUROPEAN GREEN DEAL IN ENERGY, MOBILITY AND INDUSTRY 98

2. TECHNOLOGICAL INNOVATIONS 107

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

AUTOMOTIVE COOLING SYSTEMS SUSTAINABILITY: A FOCUS ON THE EXPANSION TANK 108

EMPIRICAL COMPARATIVE STUDY OF STRUCTURAL CFRP SANDWICH STRUCTURE INSERTS FOR OUT-OF-PLANE LOADS 118

LIQUID COOLING SYSTEMS FOR ELECTRIC VEHICLE BATTERIES: IMPROVING SAFETY, PERFORMANCE AND SUSTAINABILITY 132

DESIGN AND DEVELOPMENT OF A CONSTANT-VOLUME COMBUSTION CHAMBER FOR OPTICAL INVESTIGATION OF HYDROGEN AND WATER INJECTION UNDER ENGINE-LIKE CONDITIONS 138

ANALYSIS OF BATTERY CHARGING AND DISCHARGING BEHAVIOR FOR ELECTRIC VEHICLE APPLICATIONS 148

IMPACT OF HEAT PUMP SYSTEMS ON WINTER ENERGY USE AND DRIVING RANGE IN BATTERY ELECTRIC VEHICLES 158

THE ROLE OF INTERMODAL TRANSPORTATION FOR THE SUSTAINABLE MOBILITY 166

EMISSION REDUCTION OF MARINE PROPULSION SYSTEMS IN SECA ZONES THROUGH THE INTEGRATION OF HYDROGEN TECHNOLOGIES 176

A COMPREHENSIVE ANALYSIS OF VENTILATION SYSTEM FOR ENHANCED ENERGY EFFICIENCY IN MARINE PROPULSION APPLICATIONS 190

DESIGN AND TOPOLOGY OPTIMIZATION OF A LIGHTWEIGHT CHAIN SPROCKET FOR ELECTRIC MOTORCYCLE APPLICATIONS 200

3. ECONOMIC AND BUSINESS PRESPECTIVE 211

FEASIBILITY OF ELECTRIC BUS DEPLOYMENT IN MONTENEGRO: A CASE STUDY OF BUDVA 212

MANAGING RENEWABLE ENERGY RESOURCES AS A FOUNDATION FOR SUSTAINABLE MOBILITY TRANSITIONS 224

4. SOCIAL AND ENVIRONMENTAL IMPACT 231

SMART MOBILITY TECHNOLOGIES AND THEIR IMPACT ON URBAN SUSTAINABILITY: INSIGHTS FROM EUROPEAN AND WESTERN BALKAN CITIES 232

THE DISAPPEARING SQUARES: SOCIAL AND ENVIRONMENTAL IMPACTS OF URBAN MOBILITY PLANNING IN DURRËS.. 244

THE CITY THAT DEMANDS CONTINUOUS MOVEMENT: THE DISAPPEARANCE OF THE RIGHT NOT TO MOVE WITHIN THE FRAMEWORK OF SUSTAINABLE MOBILITY........... 256

COMPARISON OF LIFECYCLE EMISSIONS OF A SUV WITH FUEL CELL AND BATTERY ELECTRIC POWERTRAINS.. 264

BETWEEN RHETORIC AND REALITY: DISCURSIVE FRAMINGS, GREENWASHING AND OUTCOMES IN SUSTAINABLE MOBILITY.. 272

TOWARDS SUSTAINABLE TRANSPORT: A COMPARATIVE ANALYSIS OF ELECTRIC VEHICLE ADOPTION IN MONTENEGRO AND ALBANIA.. 284

LINKING MORPHOLOGY, PERCEIVED SAFETY, AND SUSTAINABLE MOBILITY IN POST-SOCIALIST URBAN CONTEXTS 296

REIMAGINING THE CITY THROUGH GREEN MOBILITY STRATEGIES: THE CASE OF TIRANA 304

5. CONTROVERSIES AND CHALLENGES.. 313

THE ADOPTION OF ELECTRIC VEHICLES IN ALBANIA: A COMPARATIVE STUDY WITH OTHER WESTERN BALKAN COUNTRIES 314

APPLICATION OF QUALITY TOOLS IN THE ANALYSIS OF FACTORS INFLUENCING THE DEVELOPMENT OF ELECTROMOBILITY IN MONTENEGRO.. 326

6. CASE STUDIES AND GOOD PRACTICES.. 335

CHILDREN PATHS AS AN URBAN REGENERATION STRATEGY: NAIM FRASHËRI'S CASE STUDY.. 336

7. FUTURE SCENARIOS.. 345

GENAI LITERACY AS A TRANSVERSAL SKILL FOR EMERGING PROFESSIONALS: IMPLICATIONS FOR SUSTAINABILITY-CRITICAL KNOWLEDGE WORK........................... 346

CYBERSECURITY VULNERABILITIES IN ELECTRIC VEHICLE OPERATING SYSTEMS: A GLOBAL AWARENESS ANALYSIS.. 362

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

CYBERSECURITY CHALLENGES IN MODERN VEHICULAR COMMUNICATION NETWORKS *372*

MAPPING DISTANCE AND TIME: LEVERAGING ISOCHRONE INTELLIGENCE IN EMERGING CITIES *382*

THE HISTORICAL DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND ITS INFLUENCE ON THE JOB MARKET IN AUTOMOTIVE ENGINEERING *394*

GREEN TRANSITION IN ALBANIA: CHALLENGES AND FUTURE ACTIONS *406*

OPTIMIZING PUBLIC TRANSPORT CORRIDORS USING AI-BASED SCENARIO MODELLING: A CASE STUDY ON TIRANA'S RING ROAD *414*

USE OF AI IN THE PROCESS OF GREEN TRANSFORMATION AND IMPACT ON PUBLIC HEALTH *426*

EFFECTS OF TECHNICAL TRAFFIC CALMING MEASURES *432*

CAN AI DEVELOP ITS OWN "TASTE" AUTOMOTIVE DESIGN? *440*

THREAT LANDSCAPE AND MULTI-LAYERED PROTECTION MECHANISMS FOR AUTONOMOUS AND ELECTRIC VEHICLE SYSTEMS *448*

DEVELOPMENT OF A RISK ASSESSMENT MODEL FOR THE TRANSPORT OF HAZARDOUS MATERIALS USING ALOHA AND GIS SOFTWARE TOOLS *460*

DEVELOPMENT OF AN AUTOMATIC TRAFFIC SIGN DETECTION SYSTEM USING YOLOV8 .... *470*

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

THE HISTORICAL DEVELOPMENT OF ARTIFICIAL INTELLIGENCE AND ITS INFLUENCE ON THE JOB MARKET IN AUTOMOTIVE ENGINEERING

DOI: 10.37199/c41001036

David Josef PILGRAM
University of Applied Science Graz, Austria
david.pilgram@edu.fh-joanneum.at

Abstract

The historical progression of Artificial Intelligence (AI) from early symbolic algorithms in the mid-20th century to today's large-scale, self-optimising deep learning architectures has initiated profound structural changes across engineering-driven industries. Automotive engineering, traditionally defined by deterministic modelling, iterative prototyping, and specialised human expertise, is increasingly shaped by digitalisation and automation trends. Despite extensive research into AI-assisted vehicle functions, the implications of this technological evolution for the automotive engineering labour market remain insufficiently examined. The sector now faces a fundamental shift in required skill profiles as AI systems progressively influence design cycles, simulation environments, manufacturing operations, and testing workflows.

This study conducts a structured historical and technical analysis based on seminal AI literature, contemporary engineering sources, and automotive-specific research reports. The methodology integrates: (1) a chronological review of AI development from early symbolic systems to large-scale deep neural architectures; (2) a systematic mapping of AI techniques onto specific engineering activities across the automotive value chain; and (3) a comparative assessment of AI-enabled automation relative to traditional deterministic and physics-based engineering workflows. Emphasis is placed on conceptual design, simulation (Computational Fluid Dynamics (CFD), Finite Element Method (FEM) and Multi-Body Simulation (MKS)), control system development, validation workflows, and manufacturing processes.

The analysis shows that the transition from rule-based reasoning to data-driven learning systems enabled a substantial expansion of engineering automation capabilities. Modern AI, particularly deep learning and surrogate modelling, reduces simulation times, accelerates design-space exploration, and enhances prediction accuracy in complex nonlinear systems. AI-driven perception and decision-making support advanced driver-assistance systems and autonomous vehicles, while

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

machine-learning-based analytics automate calibration, anomaly detection, test prioritisation, and real-time manufacturing quality control. However, challenges persist regarding explainability, data sufficiency, safety validation, and the integration of AI systems into established regulatory frameworks such as International Organization for Standardization (ISO 26262) and Safety Of The Intended Functionality (SOTIF).

AI has catalysed a paradigm shift toward adaptive, data-driven and partially autonomous engineering processes in the automotive industry. While it enables significant productivity gains and new functional capabilities, it does not fully replace human engineering expertise. Instead, emerging engineering workflows increasingly rely on human-in-the-loop collaboration. Understanding the historical trajectory of AI is therefore essential for guiding future research, ensuring safe implementation, and preparing the engineering workforce for the continuing transformation of automotive development.

Keywords: Artificial Intelligence, Future workplace, Engineering, Industry 4.0

I. INTRODUCTION

Artificial Intelligence (AI) has evolved from a speculative research topic into one of the most influential technological drivers of the 21st century. Its impact is particularly pronounced in automotive engineering due to the sector’s high complexity, safety requirements, and socio-economic relevance. Modern vehicles increasingly rely on intelligent algorithms for design, simulation, manufacturing, and operation, reflecting a broader industrial shift toward automation, digitalisation, and data-driven decision-making. Russell and Norvig (2021) and Nilsson (2014) describe AI as one of the most powerful technological tools in human history.

Traditionally, automotive engineering has depended on human expertise, deterministic models, and manual optimisation across tasks such as Computer-Aided Design (CAD) modelling, Finite Element Method (FEM) and Computational Fluid Dynamics (CFD) simulation, testing, calibration, control design, and virtual vehicle development. The emergence of AI systems capable of learning from large datasets, optimising nonlinear systems, and supporting automated decision-making offers substantial potential to accelerate and extend engineering workflows. At the same time, it raises critical questions regarding workforce transformation, system reliability, explainability, and the redefinition of engineering roles.

The objective of this paper is twofold: first, to outline the historical development of AI and the key breakthroughs enabling modern applications; second, to analyse the impact of AI on engineering automation in the automotive domain. Based on scientific literature and industry reports, the paper examines how AI enhances design, simulation, automated driving, testing, and production processes, and concludes with a discussion of limitations, ethical considerations, and future hybrid approaches combining physical and data-driven models, as well as the evolving role of human engineers.

While the reviewed technological developments are globally relevant, the discussion of workforce implications primarily reflects the European automotive industry, given its regulatory environment, industrial structure, and education system.

This study follows a structured qualitative literature review methodology. Relevant sources were selected based on scientific relevance, citation impact, and applicability to automotive engineering. The analysis is conceptual in nature and does not aim to provide statistical generalisation or predictive claims, but rather a systematic synthesis and critical interpretation of established research.

1. Historical Development of Artificial Intelligence

1.1. Early Conceptual Foundations (1940s–1960s)

The foundations of artificial intelligence were established in the 1940s through the formalisation of cognition using mathematical and computational principles. McCulloch and Pitts (1943) from Russell and Norvig (2021) introduced a binary neuron model demonstrating that neural networks are computationally universal and capable of implementing logical operations, thereby linking neural structures with symbolic reasoning. Hebb's learning rule (Hebb, 1949) provided the first theory of synaptic adaptation through repeated co-activation and remains a core concept in learning theory. Early implementations such as the SNARC by Minsky and Edmonds demonstrated the physical feasibility of neural networks, while symbolic AI emerged through game-playing programs by Strachey and Samuel. Turing's seminal work Computing Machinery and Intelligence (Turing, 1950) framed intelligence as a computational phenomenon and introduced learning-based machine intelligence. The Dartmouth Conference of 1956 formally established AI as a research field. Systems such as the Logic Theorist by Newell and Simon demonstrated that symbolic reasoning could be automated, shaping early AI research (Newell & Simon, 1956).

1.2. Symbolic AI and Expert Systems (1970s–1980s)

Early AI relied on general-purpose weak methods, which proved insufficient for complex problems. This led to knowledge-based systems that embedded domain expertise to reduce search complexity. DENDRAL demonstrated the effectiveness of expert knowledge in scientific problem-solving (Feigenbaum et al., 1965), while MYCIN extended this approach to medical diagnosis using

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

rule-based reasoning and certainty factors (Shortliffe, 1976). Despite industrial success, expert systems suffered from poor scalability, limited learning capability, and high maintenance effort, ultimately leading to the AI winter (Russell & Norvig, 2021).

1.3. Machine Learning Revolution (1990s – 2010)

From the 1990s onward, AI shifted from symbolic reasoning toward data-driven statistical learning. As described by Russell and Norvig (2021), this transition enabled AI systems to model uncertainty and complex nonlinear relationships. Key advances included support vector machines, ensemble methods, and reinforcement learning algorithms such as Q-learning, which proved especially relevant for control and robotics applications. Nilsson (2014) and Winston (1992) emphasise that AI became increasingly empirical and performance-driven. Rising computational power and early Graphics Processing Unit (GPU) usage enabled larger neural networks, reviving connectionist approaches originally proposed by Rosenblatt (Rosenblatt, 1958). These developments laid the groundwork for modern deep learning architectures (Goodfellow et al., 2016). In automotive engineering, this era introduced scalable tools for predictive maintenance, adaptive calibration, and early driver-assistance systems, forming the basis for later autonomous technologies.

1.4. Deep Learning Era (2010 – Today)

Since 2010, deep learning has become the dominant AI paradigm, enabled by large datasets, GPU acceleration, and architectural innovations. The ImageNet breakthrough by Krizhevsky et al. (2012) demonstrated the superiority of deep convolutional networks over traditional methods. Deep learning models learn hierarchical representations directly from raw data, as detailed by Goodfellow et al. (2016), and have expanded to include transformers, attention mechanisms, and generative models. In automotive engineering, deep learning underpins perception, sensor fusion, trajectory prediction, control optimisation, and surrogate modelling for CFD and FEM acceleration. AI-driven automation has become integral to testing, validation, and manufacturing, while simultaneously raising challenges related to explainability, robustness, and safety compliance with the International Organization for Standardization ISO 26262 (International Organization for Standardization, 2018), the Safety Of The Intended Functionality ISO 21448 (SOTIF) (International Organization for Standardization, 2019), and United Nations Economic Commission for Europe (UNECE) regulations (United Nations Economic Commission for Europe, 2021a, 2021b). Overall, this era marks the transition from narrow AI solutions to scalable learning systems that fundamentally reshape automotive development processes.

2. Automation in Engineering and Automotive Development

2.1 AI in Conceptual Vehicle Design

AI has become a key enabler in conceptual vehicle design by accelerating design-space exploration and reducing reliance on computationally expensive simulations. Machine learning and deep learning models (Goodfellow et al., 2016) support early-stage optimisation and generative design, enabling the automatic synthesis of geometries that satisfy aerodynamic, structural, and packaging constraints. Neural-network-based surrogate models predict CFD and FEM results with significantly reduced computation time, enabling large-scale optimisation and sensitivity analysis. Automotive Original Equipment Manufacturers (OEMs) increasingly apply these methods to lightweight structures, battery integration, and thermal-management concepts. As emphasised by Nilsson (2014), this marks a shift from rule-based design support toward adaptive, learning-based design intelligence.

2.2 AI in Simulation (CFD, FEM, MKS)

CFD, FEM, and Multi-Body Simulation (MKS) simulations are essential to automotive development but are computationally intensive. AI-based surrogate models, physics-informed neural networks, and neural operators provide fast approximations while preserving physical consistency (Goodfellow et al., 2016). Deep learning models predict flow fields, stress distributions, and dynamic responses, while reinforcement learning optimises system parameters and control trajectories (Russell & Norvig, 2021). AI is also applied to automated meshing, boundary-condition inference, and solver monitoring. These approaches establish hybrid AI‑physics frameworks that reduce computational cost without compromising engineering validity.

2.3 AI in Control Systems and Autonomous Driving

AI enables adaptive, perception-driven control strategies that extend beyond classical deterministic controllers. Deep learning architectures (Krizhevsky et al., 2012) form the basis of perception systems for Advanced Driver-Assistance Systems (ADAS) and autonomous vehicles, enabling object detection, sensor fusion, and environment understanding. Reinforcement learning allows control policies for trajectory planning, energy management, and vehicle stability to be learned through interaction with simulated environments (Russell & Norvig, 2021), supported by deep function approximators (Goodfellow et al., 2016). Despite these advances, deployment in safety-critical systems requires strict validation, robustness, and compliance with ISO 26262 and SOTIF standards.

2.4 AI-Supported Testing and Validation Workflows

Testing and validation generate large volumes of heterogeneous data. AI automates data interpretation through anomaly detection, clustering, and pattern recognition using statistical learning (Nilsson, 2014) and deep learning (Goodfellow et al., 2016). Machine learning supports

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

intelligent test-case selection, identification of coverage gaps, and generation of rare edge-case scenarios, particularly in autonomous-driving validation. These methods align with the transition toward virtual validation environments, reducing dependence on physical testing and accelerating approval processes.

2.5 AI in Automotive Manufacturing Engineering

Automotive manufacturing increasingly follows Industry 4.0 principles, with AI enabling adaptive and self-optimising production systems. Computer vision systems based on deep neural networks (Krizhevsky et al., 2012) perform automated quality inspection, while predictive-maintenance models reduce downtime. Reinforcement learning optimises robotic motion, assembly sequencing, and logistics flows, leveraging intelligent-agent principles described by Russell and Norvig (Russell & Norvig, 2021). AI thus extends automation from design and simulation into production, forming a continuous digital value chain.

2.6 Organizational and Workforce Implications

The integration of AI reshapes engineering roles by shifting human engineers toward supervision, validation, and system integration. AI augments rather than replaces human expertise, as emphasized by Winston (1992) and Russell and Norvig (2021). Successful adoption requires new competencies in data science, machine learning, and digital systems, as well as organisational processes that ensure transparency, robustness, and regulatory compliance with ISO 26262 (International Organization for Standardization, 2018), ISO 21448 (International Organization for Standardization, 2019), and UN R155 (United Nations Economic Commission for Europe, 2021a). Strategically, AI integration has become a key determinant of competitiveness in the automotive sector, influencing development speed, innovation capacity, and long-term technological relevance.

2.7 Transformation of Engineering Roles and Workforce Requirements

The integration of artificial intelligence into the field of automotive engineering has been shown to result in a targeted transformation of specific roles within engineering, rather than leading to general workforce displacement. In particular, simulation engineers (CFD, FEM, MKS) and calibration engineers are shifting away from manual model execution, parameter sweeps, and test-intensive tuning toward the supervision of AI-supported simulation pipelines, surrogate models, and learning-based calibration frameworks, with increased responsibility for result validation and system-level decision-making. Concurrently, industry data from automotive OEMs and suppliers signifies an augmentation in demand for hybrid profiles that integrate mechanical or electrical engineering with competencies in machine learning, data engineering, and functional safety, concomitant with a decline in demand for narrowly tool-centric roles. These trends have direct implications for engineering education within the regional context of applied-science and automotive-focused programmes, where curricula must increasingly integrate data-driven methods, software-oriented development workflows, and AI validation alongside classical vehicle dynamics, simulation, and control theory. Consequently, the role of the automotive engineer as a system integrator and safety-responsible decision-maker is reinforced by AI. This necessitates continuous upskilling rather than replacement.

2.8 Evidence-Based Trends in Automotive Engineering Workforce Transformation

Secondary industry and institutional data indicate a measurable structural shift in the automotive engineering workforce associated with the increasing adoption of artificial intelligence. Industry analyses and OEM publications report a sustained increase in demand for engineers with combined competencies in vehicle engineering, software development, and data-driven modelling, alongside a declining emphasis on narrowly tool-centric roles in simulation, testing, and calibration (AVL List GmbH, n.d.; BMW Group, n.d.; Continental AG, n.d.; McKinsey & Company, 2020; Robert Bosch GmbH, n.d.). These sources consistently identify productivity gains in AI-supported CFD, FEM, and validation workflows, where surrogate modelling and automated test prioritisation reduce execution time while increasing the need for human supervision and result validation. This trend is explicitly reflected in publications by major automotive manufacturers and engineering service providers such as BMW Group and AVL, which describe the systematic integration of AI-based methods into vehicle development, simulation, and testing processes (AVL List GmbH, n.d.; BMW Group, n.d.). In these organisations, AI is reported to function primarily as an efficiency-enhancing and decision-support technology, reinforcing the role of engineers as system integrators and validation-responsible experts rather than replacing technical personnel. In parallel, regulatory datasets and safety frameworks such as ISO 26262, ISO 21448 (SOTIF), and UNECE regulations imply additional staffing requirements in system validation, functional safety, and compliance engineering, reinforcing a shift from manual task execution toward system-level responsibility rather than overall workforce reduction (International Organization for Standardization, 2018, 2019; United Nations Economic Commission for Europe, 2021a, 2021b). It is also important to note that these statements reflect quantitative performance improvements reported in the literature reviewed and in industry sources, and are presented as aggregate results rather than results from original empirical measurements.

3. Critical aspects of integrating AI into everyday engineering work

3.1 Benefits of using AI

Artificial intelligence provides significant benefits to automotive engineering by improving efficiency, accuracy, and scalability across the development process. Machine learning and deep learning techniques enable the extraction of complex patterns from large datasets, allowing robust modelling of nonlinear and high-dimensional systems and outperforming purely deterministic

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

approaches (Goodfellow et al., 2016). AI-based surrogate models drastically accelerate CFD, FEM, and MKS simulations, enabling extensive design-space exploration and automated optimisation based on principles described by Russell and Norvig (2021). Product quality and reliability are enhanced through AI-supported defect detection in manufacturing, predictive maintenance, and automated identification of critical test scenarios, particularly in safety-critical autonomous driving applications (Krizhevsky et al., 2012). From an organizational perspective, AI supports knowledge retention and standardised decision-making by learning from historical engineering data, reducing dependence on tacit expertise and reinforcing consistent engineering practices (Nilsson, 2014; Winston, 1992). Overall, AI functions as a strategic enabler that shortens development cycles, improves product quality, and addresses the growing complexity of electrified, autonomous, and software-defined vehicle architectures.

3.2 Limitations of AI-Based Methods in Automotive Engineering

Despite its advantages, AI in automotive engineering faces several fundamental limitations. Deep learning models depend heavily on large, high-quality datasets, and their performance degrades when exposed to conditions not represented during training. As highlighted by Goodfellow et al. (2016), such models often lack interpretability, making it difficult for engineers to understand the underlying reasoning or validate decisions in safety-critical contexts. Data-driven models also struggle with extrapolation beyond known design or operating domains, where physics-based methods remain more reliable. Consequently, effective application of AI still requires human engineering judgement and creative problemsolving, particularly in model formulation, boundary-condition definition, and the interpretation of novel or unexpected system behavior. Furthermore, the integration of AI into established workflows requires substantial computational resources, specialised expertise, and organisational adaptation.

3.3 Technical and Operational Risks of AI-Based Systems

The use of AI introduces several technical and operational risks. Learning-based models may exhibit unpredictable behavior in rare or unseen scenarios, particularly in autonomous driving and automated control systems. Vulnerabilities to adversarial perturbations, as noted in the deep learning literature, pose additional safety concerns. From a technical perspective, data-driven models may fail outside their training domain, while insufficient validation can lead to unsafe system behavior. In addition to system-level risks, the integration of AI also affects human behavior within engineering workflows. Increased automation and decision support may lead to cognitive offloading, where engineers rely excessively on AI-generated outputs, reducing active critical evaluation. Over time, this may contribute to deskilling, particularly in tasks that are no longer regularly performed manually, such as detailed model tuning or boundary-condition definition. Over-reliance on AI tools can therefore weaken engineering judgement if human oversight and

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

validation responsibilities are not explicitly maintained. From an organizational and business perspective, inadequate data governance, insufficient model transparency, or weak validation processes can result in incorrect design conclusions, compromised product quality, and non-compliance with functional safety and regulatory requirements.

3.4 Ethical and Regulatory Considerations

AI deployment in the automotive domain raises ethical issues related to transparency, accountability, and fairness. Safety-critical applications require explainability to ensure that system decisions can be verified, consistent with the principles described by Russell and Norvig (2021). Regulatory frameworks such as ISO 26262 (International Organization for Standardization, 2018), ISO 21448 (SOTIF) (International Organization for Standardization, 2019), and UN R155 (United Nations Economic Commission for Europe, 2021a) mandate rigorous validation, cybersecurity controls, and traceability for AI-based functions. Ethical concerns also arise regarding the use of customer data, potential workforce displacement, and responsibility in automated decision-making. In the European context, the European Union (EU) Artificial Intelligence Act introduces a binding, risk-based regulatory framework that directly affects the development, validation, and deployment of AI systems in automotive engineering, particularly for safety-critical and high-risk applications.

Many AI applications in automotive engineering, particularly ADAS and automated driving functions, fall under the high-risk category defined by the EU Artificial Intelligence Act (European Union, 2024) due to their direct impact on safety and fundamental rights. High-risk classification entails mandatory requirements for data governance, risk management, model transparency, human oversight, and post deployment monitoring, directly affecting engineering workflows from model training to system validation. While standards such as ISO 26262 and SOTIF focus on functional and intended safety, the EU AI Act extends regulatory control to data quality, learning behavior, and lifecycle governance of AI-based systems. In this context, a critical ethical risk lies in overestimating the autonomy and competence of AI systems. While AI can outperform humans in narrowly defined tasks, it lacks general understanding, contextual reasoning, and responsibility. Treating AI as a substitute for human decision-making may obscure accountability, weaken human oversight, and create false assumptions about system reliability. Ensuring compliance and ethical integrity therefore requires clear governance structures, explicit human-in-the-loop responsibility, interdisciplinary oversight, and continuous monitoring of AI behavior throughout the vehicle life cycle.

II. CONCLUSION AND OUTLOOK

Artificial intelligence has become a central enabler of modern automotive engineering by complementing classical physics-based methods with data-driven approaches. Across design, simulation, validation, and manufacturing, AI accelerates design-space exploration, reduces computational effort through surrogate models, and supports perception and control in automated vehicle systems.

A core development is the emergence of hybrid AI‑physics methodologies, in which machine learning models are integrated with established CFD, FEM, and multibody simulations. These approaches enable faster model evaluation, digital-twin concepts, and continuous simulation-based validation while retaining physical consistency. Reinforcement learning and generative models further support automated optimisation and adaptive control, particularly in software-defined vehicle architectures.

The deployment of AI remains limited by challenges in explainability, robustness, data availability, and compliance with safety standards such as ISO 26262 and SOTIF (International Organization for Standardization, 2018, 2019). As a result, AI systems require continuous human supervision and validation and cannot operate independently in safety-critical engineering contexts.

From a workforce perspective, AI leads to a redefinition rather than a replacement of engineering roles. Routine tasks are increasingly automated, while demand grows for engineers with combined expertise in vehicle engineering, data-driven modelling, and AI validation. Consequently, the automotive engineer’s role is shifting toward system integration, safety responsibility, and critical assessment of AI-supported results.

In summary, AI fundamentally changes how engineering knowledge is generated and applied, but its effective use depends on hybrid modelling strategies, transparent validation frameworks, and sustained human involvement. Further research is required to improve validation methods for learning-based systems and to quantitatively assess long-term workforce effects.

Accordingly, statements concerning future developments should be interpreted as informed trends rather than forecasts. The dynamic nature of technological progress, regulatory evolution, and economic conditions prevents reliable prediction of how AI-driven automation will affect employment structures in the long term. Future research will require empirical studies, longitudinal data, and quantitative labour-market analyses to substantiate or refine the trends identified in this review.

ACKNOWLEDGEMENT

This paper was created with the assistance of various AI systems. In particular, ChatGPT was used for literature research and structuring, and DeepL was used to improve the language style. Nevertheless, the author bears sole responsibility for the content.

REFERENCES

AVL List GmbH. (n.d.). *Simulation and artificial intelligence in vehicle development.* AVL List GmbH. Graz, Austria.

BMW Group. (n.d.). *Artificial intelligence in vehicle development and production.* BMW Group. Munich, Germany.

Continental AG. (n.d.). *Ai-based solutions for automated and connected mobility.* Continental AG. Hanover, Germany.

Regulation (EU) 2024/1689 laying down harmonised rules on artificial intelligence (Artificial Intelligence Act) (2024). Retrieved February 9, 2026, from https://eur-lex.europa.eu/eli/reg/2024/1689/oj

Feigenbaum, E. A., Buchanan, B. G., & Lederberg, J. (1965). *On generality and problem solving: A case study using the dendral program.* In B. Meltzer & D. Michie (Eds.), Machine intelligence 6 (pp. 165–190). Edinburgh University Press.

Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep learning.* MIT Press.

Hebb, D. O. (1949). *The organization of behavior: A neuropsychological theory.* Wiley.

International Organization for Standardization. (2018). Iso 26262: *Road vehicles – functional safety*.

International Organization for Standardization. (2019). Iso 21448: *Road vehicles – safety of the intended functionality* (sotif).

Krizhevsky, A., Sutskever, I., & Hinton, G. E. (2012). *Imagenet classification with deep convolutional neural networks.* Advances in Neural Information Processing Systems, 1097–1105.

McCulloch, W. S., & Pitts, W. (1943). *A logical calculus of the ideas immanent in nervous activity. The Bulletin of Mathematical Biophysics*, 5(4), 115–133. https://doi.org/10.1007/BF02478259

McKinsey & Company. (2020). *Artificial intelligence in automotive engineering and manufacturing.* McKinsey Global Institute.

Newell, A., & Simon, H. A. (1956). *The logic theory machine.* Proceedings of the Western Joint Computer Conference, 218–239.

Nilsson, N. J. (2014). *Principles of artificial intelligence.* Morgan Kaufmann.

Robert Bosch GmbH. (n.d.). *Artificial intelligence in automotive systems*. Robert Bosch GmbH. Stuttgart, Germany.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

Rosenblatt, F. (1958). *The perceptron: A probabilistic model for information storage and organization in the brain.* Psychological Review, 65(6), 386‑408.

Russell, S. J., & Norvig, P. (2021). *Artificial intelligence: A modern approach* (4th ed.). Pearson.

Shortliffe, E. H. (1976). *Computer-based medical consultations: Mycin* [Doctoral dissertation, Stanford University].

Turing, A. M. (1950). *Computing machinery and intelligence.* Mind, 59(236), 433‑460.

UN Regulation No. 155: *Cybersecurity and cybersecurity management system* (2021).

UN Regulation No. 156: *Software update and software update management system* (2021).

Winston, P. H. (1992). *Artificial intelligence* (3rd ed.). Addison-Wesley.

International conference on sustainable mobility

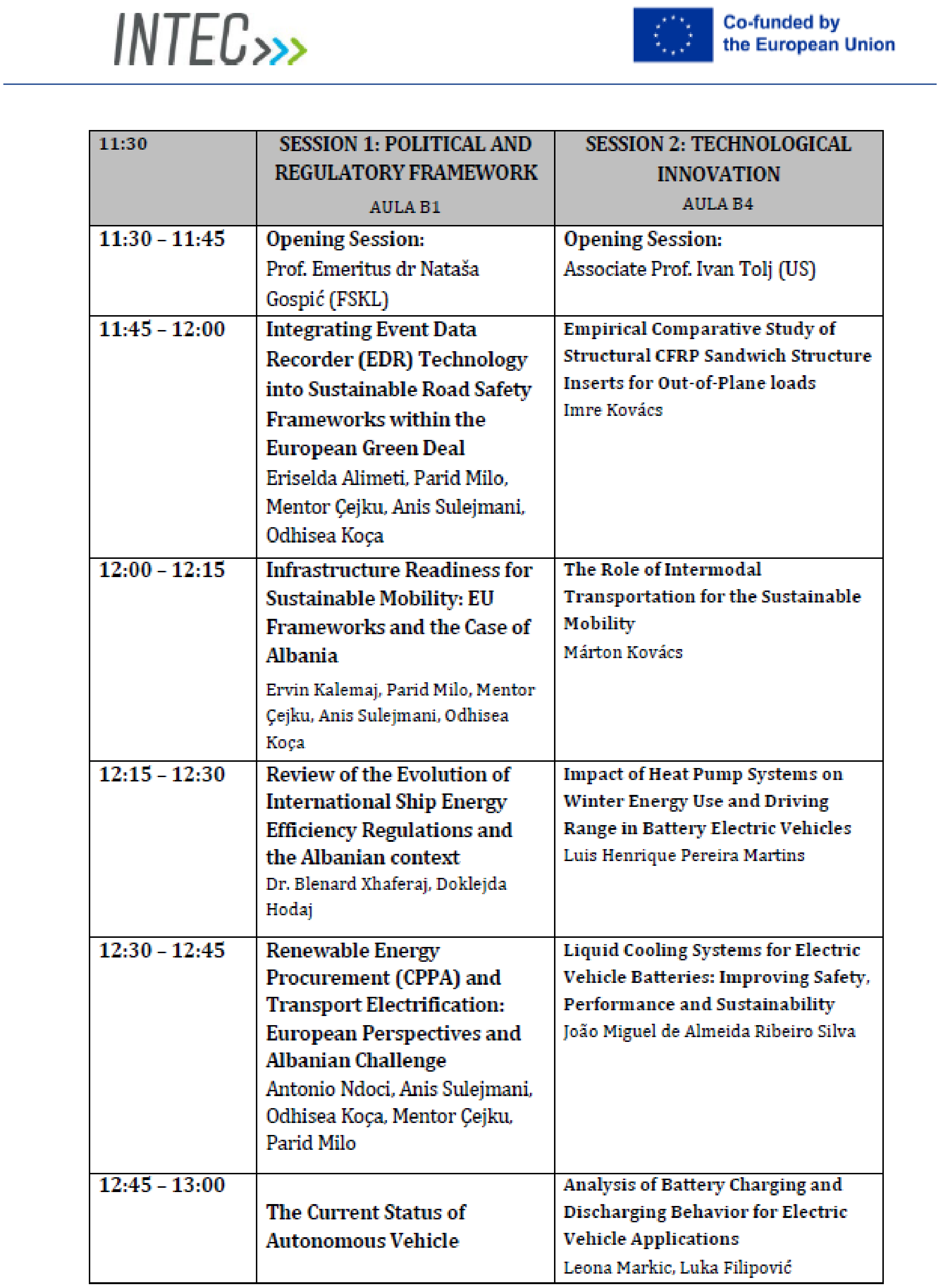
Agenda

Project title: International Engineering Competence Centres to push Sustainable Mobility Development in Albania and Montenegro
Acronym: INTEC

Work package	
WP11	**International conference**
TASK	
11.4	Coummunity Building Events

Dates	05.03.-06.03.2026
City	Tirana
Meeting venue	POLIS University Entrance Hall
Address	Rr. Bylis 12, Kodi Postar 1051, Kutia Postare 2995, Tirana, Albania

05.03.2026	
Entrance Hall, POLIS University	
8:30 – 9:00	**Registration**
9:00 – 9:30	**Opening Performance**
Welcome session – Auditorium A5 (Ground floor)	
9:30 – 10:00	**Opening Remarks** **Dr. Elona Karafili** (Vice Rector, POLIS University) **Dr. Flora Krasniqi** (Head of Office of Projects and Internationalization, POLIS University) **DI Daniela Wenzl** (INTEC Project Coordinator)
Auditorium A5 (Ground floor)	
10:00 –11:00	**Keynote speakers** **DI Horst Pflügl AVL** Collaborative Research for sustainable Mobility **DPSHTRR Representative** – (General Directorate of Road Transport Services in Albania)
11:15 – 11:30	**Coffee break (Moving into parallel sessions)**



11:30	SESSION 1: POLITICAL AND REGULATORY FRAMEWORK AULA B1	SESSION 2: TECHNOLOGICAL INNOVATION AULA B4
11:30 – 11:45	Opening Session: Prof. Emeritus dr Nataša Gospić (FSKL)	Opening Session: Associate Prof. Ivan Tolj (US)
11:45 – 12:00	**Integrating Event Data Recorder (EDR) Technology into Sustainable Road Safety Frameworks within the European Green Deal** Eriselda Alimeti, Parid Milo, Mentor Çejku, Anis Sulejmani, Odhisea Koça	**Empirical Comparative Study of Structural CFRP Sandwich Structure Inserts for Out-of-Plane loads** Imre Kovács
12:00 – 12:15	**Infrastructure Readiness for Sustainable Mobility: EU Frameworks and the Case of Albania** Ervin Kalemaj, Parid Milo, Mentor Çejku, Anis Sulejmani, Odhisea Koça	**The Role of Intermodal Transportation for the Sustainable Mobility** Márton Kovács
12:15 – 12:30	**Review of the Evolution of International Ship Energy Efficiency Regulations and the Albanian context** Dr. Blenard Xhaferaj, Doklejda Hodaj	**Impact of Heat Pump Systems on Winter Energy Use and Driving Range in Battery Electric Vehicles** Luis Henrique Pereira Martins
12:30 – 12:45	**Renewable Energy Procurement (CPPA) and Transport Electrification: European Perspectives and Albanian Challenge** Antonio Ndoci, Anis Sulejmani, Odhisea Koça, Mentor Çejku, Parid Milo	**Liquid Cooling Systems for Electric Vehicle Batteries: Improving Safety, Performance and Sustainability** João Miguel de Almeida Ribeiro Silva
12:45 – 13:00	**The Current Status of Autonomous Vehicle**	**Analysis of Battery Charging and Discharging Behavior for Electric Vehicle Applications** Leona Markic, Luka Filipović

	Technology Adoption in the Balkan Region Darjana Lopičić, Oliver Popović, Miloš Ilić, Bojan Kocić	
13:00 – 14:00	**Lunch**	
14:00 – 14:15	**Reviewing the European Green Deal in Energy, Mobility and Industry** Veselinka Calasan, Ivana Ognjanovic	**Automotive Cooling Systems Sustainability: A Focus on the Expansion Tank** Ana Inês Barbeiro Casimiro
14:15 – 14:30	**The European Green Deal and its National Implementation: From Strategy to Practice** Blerina Bektashi, Andi Bektashi	**Design and Development of a Constant-Volume Combustion Chamber for Optical Investigation of Hydrogen and Water Injection Under Engine-like Conditions** Julius Hollerith, Prof. Dr. Bhavin Kapadia
14:30 – 14:45	**From Prediction to Regulation: Evidence Production Approaches in Autonomous Mobility Research and Their Policy Implications** Sadmira Malaj	**Emission Reduction of Marine Propulsion Systems in SECA Zones Through the Integration of Hydrogen Technologies** Motalleb Miri, Ivan Radaš, Marija Mandić, Ivan Tolj
14:45 – 15:00	**Questions and Discussion**	**A Comprehensive Analysis of Ventilation System for Enhanced Energy Efficiency in Marine Propulsion Applications** Sara Blašković, Gojmir Radica, Jakov Šimunović

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2

15:00 - 15:15		**Design and Topology Optimization of a Lightweight Chain Sprocket for Electric Motorcycle Applications** Teo Čolović, Ivo Marinić-Kragić
15:15 - 15:30	**SESSION 3: ECONOMIC AND BUSINESS PRESPECTIVES + CASE STUDIES AND GOOD PRACTICES** Aula B1	**Questions and Discussion**
	Opening Session: Dr. Anis Sulejmani (PUT)	
15:30 - 15:45	**Managing Renewable Energy Resources as a Foundation for Sustainable Mobility Transitions** Deivi Sinanaliaj, Martin Bektashi	
15:45 - 16:00	**Feasibility of Electric Bus deployment in Montenegro: A Case Study of Budva (Erasmus+ INTEC / IECC Context)** Anastasija Mrkajic, Vinko Nikic.	
16:00 -16:15	**Children Paths as an Urban Regeneration Strategy: Naim Frasheri Study Case** Dejvi Dauti	
16:15 - 16:45	**Questions and Discussion**	

International conference on sustainable mobility

Agenda

Project title: International Engineering Competence Centres to push Sustainable Mobility Development in Albania and Montenegro
Acronym: INTEC

Work package	
WP11	**International conference**
TASK	
11.4	Coummunity Building Events

Dates	05.03.-06.03.2026
City	Tirana
Meeting venue	POLIS University Entrance Hall
Address	Rr. Bylis 12, Kodi Postar 1051, Kutia Postare 2995, Tirana, Albania

06.03.2026		
First Floor Hall, POLIS University		
8:30 – 9:00	Registration	
9:00– 9:15	SESSION 4: SOCIAL AND ENVIRONMENTAL IMPACT AULA B1	SESSION 5: FUTURE SCENARIOS AULA B4
9:00 – 9:15	Opening Session: Prof. Dr. Bhavin Kapadia (FHF)	Opening Session: MA Adrian Millward-Sadler (FHJ)
9:15 – 9:30	**Comparison of Lifecycle Emissions of a SUV with Fuel Cell and Battery Electric Powertrains** - Bhavin Kapadia, Alper Sayin, Sandra Eisenträger	**GENAI Literacy as a Transversal Skill for Emerging Professionals: Implications for Sustainability-Critical Knowledge Work –** Adrian Millward-Sadler
9:30 – 9:45	**Smart Mobility Technologies and their Impact on Urban Sustainability: Insights from**	**Effects of Technical Traffic Calming Measures –** Filip Perović

	European and Western Balkan Cities – Alma Gjonaj, Vjola Ziu	
9:45 – 10:00	**The Disappearing Squares: Social and Environmental Impacts of Urban Mobility Planning in Durres –** Arjola Sava	**Cybersecurity Vulnerabilities in Electric Vehicle Operating Systems: A Global Awareness Analysis -** Aleksa Radević
10:00 – 10:15	**The City that Demands Continuous Movement: The Disappearance of the Right not to Move within the Framework of Sustainable Mobility –** Avrili Meshi	**Development of a risk assessment model for the transport of hazardous materials using ALOHA and GIS software tools –** Marko Radetić
10:15 – 10:30	**Between Rhetoric and Reality: Discursive Framings, Greenwashing and Outcomes in Sustainable Mobility –** Kejsi Veselagu	**Mapping Distance and Time Leveraging Isochrone Intelligence in Emerging Cities -** Andia Vllamasi, Erjon Cobani
10:30 – 10:45	**Reimagining the City Through Green Mobility Strategies: The Case of Tirana -** Vjola Ziu, Alma Gjonaj	**Can AI develop its Own "Taste" Automotive Design? -** Gregor Andoni, Kristjana Meço
Coffee Break		
11:00 – 11:15	**Linking Morphology, Perceived Safety, and Sustainable Mobility in Post-Socialist Urban Contexts-** Sindi Doce	**Optimizing Public Transport Corridors Using AI-Based Scenario Modelling: A case Study on Tirana's Ring Road -** Erjon Çobani, Julian Beqiri, Merita Guri
11:15 – 11:30	**Towards Sustainable Transport: A Comparative Analysis of Electric Vehicle Adoption in Montenegro and Albania -** Radmila Milić	**Threat Landscape and Multi-Layered Protection Mechanisms for Autonomous and Electric Vehicle Systems -** Marko Asanovic, Oliver Popović, Zoran Avramović, Nataša Gospić

Co-funded by the European Union

11:30 – 11:45	Questions and Discussion	**Cybersecurity Challenges in Modern Vehicular Communication Networks** - Aleksandar Grgurević, Nataša Gospić, Oliver Popović
11:45 – 12:00		**Green Transition in Albania: Challenges and Future Actions** - Erik Kushta, Andi Hyka, Enea Nasto
12:00 – 12:15	SESSION 6: CONTROVERSIES AND CHALLENGES Aula B1 Opening Session: Prof. Kristofor Lapa (UV)	**Use of AI in the Process of Green Transformation and Impact on Public Health** - Esmeralda Hamiti, Federika Alliaj, Kristi Metushi
12:15-12:30	**The Adoption of Electric Vehicles in Albania: A Comparative Study with Other Western Balkan Countries** - Doklejda Hodaj, Andrea Lapa	**Development of an Automatic Traffic Sign Detection System Using YOLOv8** - Valentina Vojinović, Luka Filipović
12:30-12:45	**Application of Quality Tools in the Analysis of Factors Influencing the Development of Electromobility in Montenegro** - Jelena Šaković Jovanović, Draško Jovanović, Mirjana Grdinić Rakonjac, Marko Lučić, Miloš Perović, Aleksandar Vujović, Gordana Radulović	**The Historical Development of Artificial Intelligence and Its Influence on the job market in Automotive Engineering** - David Josef Pilgram
12:45 – 13:45	Questions and Discussion	Questions and Discussion
13:45	Lunch	

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them. Project ref.: 101081873-ERASMUS-EDU-2022-CBHE-STRAND-2