

# INSODE-2023

13TH WORLD CONFERENCE ON  
INNOVATION AND COMPUTER SCIENCE

www.insode.org

29 - 30 MARCH 2023 | UNIVERSITY OF BARCELONA | BARCELONA - SPAIN



## ABSTRACTS BOOKS

INSODE-2023 Participants Flags



taegcenter taeg\_center taeg-center taeg\_center





**13th WORLD CONFERENCE on INNOVATION and  
COMPUTER SCIENCE  
(INSODE-2023)**

ONLINE and FACE-TO-FACE

University of Barcelona, Facultat de Filosofia, Geografia i Història  
Barcelona, Spain

March 29-30, 2023

**ABSTRACTS  
BOOKS**

**Organized by**

The Academic Event Group  
University of Barcelona

**Honorary Chair**

Osman Nuri Uçan, *Altınbaş University*, Turkey  
Dean of Engineering and Natural Sciences

**Program Chair**

Dogan Ibrahim, *Near East University*, Cyprus

**Co-chairs**

Blerta Prevalla, Computer Science Faculty, *AAB College*, Republic of Kosovo  
Mentor Hamiti, *South East European University*, Macedonia

**International Program Committee**

Adem Karahoca, *Bahcesehir University*, Turkey  
Adisa Daberdini, *Albanian University*, Albania  
Aslıhan Tüfekçi, *Gazi University*, Turkey  
B. Turksen, *University of Toronto*, Canada  
Bashkim Ziberi, *State University of Tetova*, Republic of Macedonia  
Lejla Abazi, *South East European University*, Republic of Macedonia  
Mehmet Karamanoglu, *Middlesex University*, UK  
Kayvan Kaseb, Senior Android Developer/Technical Writer, Turkey  
Levent Çetinkaya, *Çanakkale Onsekiz Mart University*, Turkey  
Naile Demiri, *AAB College*, Republic of Kosovo  
Valentina Gogovska, *Ss. Cyril and Methodius University in Skopje*, Republic of Macedonia  
Venera Llunji, *AAB College*, Republic of Kosovo

**Organizing Committee**

Dr. Tahir Tavukçu, *Cyprus Social Sciences University*, Cyprus  
Dr. Nihat Ekizoğlu, *Ataturk Teacher Training Academy*, Cyprus  
Dr. Blerta Prevalla Etemi, *AAB University*, Kosova  
PhD Candidate Beria Gokaydin, *Near East University*, Cyprus  
PhD Candidate Nesli Bahar Yavaş, *European University of Lefke*, Cyprus  
PhD Candidate Semih Çalışkan, *Izmir Tinaztepe University*, Turkey  
PhD Candidate Zeynep Genç, *Istanbul Aydın University*, Turkey  
PhD. Daniel Sekyere-Asiedu, *Near East University*, Cyprus  
Msc. Mustafa Korucu, *Bahçeşehir Cyprus University*, Cyprus  
Florijeta Hulaj, *AAB College*, Kosova  
Lilia Trushko, *Girne American University*, Cyprus  
Metin Berk Odabası, *Warwick University*, UK  
Tolga Savaskurt, *Istanbul Aydın University*, Turkey

**Secretariat**

Victor Nwaogu  
[wcetr.info@gmail.com](mailto:wcetr.info@gmail.com)

## **International Advisory Board**

Adem Karahoca, Bahcesehir University, Turkey  
Alex James, Indian Institute of Information Technology and Management Kerala, India  
Ali Amiri, University of Zanjan, Iran  
Ali Hennache, Al-Imam Muhammad Ibn Saud Islamic University, Kingdom of Saudi Arabia  
Ali Hussain Mohammed, Sri Sai Madhavi Institute of Science & Technology, India  
Ana Loureiro, Polytechnics Institute of Santarem, Portugal  
Angel Garrido, UNED, Spain  
Ayhan Gün, Dumlupinar University, Turkey  
Balasubramanian, A.C. Tech Campus, Anna University, India  
Benhabib Karim, University de Picardie Jules Verne, France  
Bernard De Baets, Ghent University, Belgium  
Branko Kaučič, University of Ljubljana, Slovenia  
Chee Ken Nee, Universiti Pendidikan Sultan Idris, Malaysia  
Cosmina Ivan, Technical University of Cluj, Romania  
Dianne M. Murray, Computer-Human Interaction, UK  
Dogan Ibrahim, Near East University, North Cyprus  
Eddie YK Ng, Nanyang Technological University, Singapore  
Elton Domnori, Metropolitan University of Tirana, Tirana, Albania  
Fahrettin Sadıkoğlu, Near East University, North Cyprus  
Fezile Özdamlı, Near East University, North Cyprus  
Gabriela Grosseck, University of the West Timisoara, Romania  
Gerhard Ritter, University of Florida, USA  
Gregorio Hernandez-Zamora, National University of Mexico, Mexico  
Hafize Keser, Ankara University, Turkey  
Hany F. EL Yamany, Suez Canal University, Egypt  
Huseyin Uzunboylu, Near East University, North Cyprus  
Jaba Shelia, Anna University, India  
Jack Dongarra, University of Tennessee, USA  
Jacques Bahi, University of Franche-Comte, France  
James C. Crabbe, University of Bedfordshire, UK  
Levent Çetinkaya, Çanakkale Onsekiz Mart University, Turkey  
Marathe Dagadu Mitharam, R. C. Patel IMRD, Shirpur  
Mehmet Erdem, University of Nevada, USA  
Mehmet Karamanoglu, Middlesex University. UK  
Meltem Özturan, Bogazici University, Turkey  
Mohammad S. Obaidat, Monmouth University, USA  
Murat Tezer, Near East University, North Cyprus  
Mustafa İlkan, Eastern Mediterranean University, North Cyprus  
Nadia Tahernia Islamic Azad University, Iran  
Nadire Çavuş, Near East University, North Cyprus  
Nizamettin Aydın, Yıldız Technical University, Turkey  
Orhan Okcol, Bahcesehir University, Turkey  
Oya Kalıpsız, Yıldız Technical University, Turkey  
Özcan Asilkan, Leuphana University Lüneburg, Lüneburg, Germany  
Ramkumar Jaganathan, VLB Janakiammal College of Arts and Science, India  
Rozhan M. Idrus, University Sains, Malaysia  
Sanjay K. Dhurandher, Netaji Subash Institute of Technology, India  
Sevinç Gülseçen, Istanbul University, Turkey  
Simon Vogl, Studio Pervasive Computing Applications, Austria  
Steven M. Ross, John Hopkins University, USA  
Svec Peter, Constantine the Philosopher University in Nitre, Slovakia  
Wibowo Santoso, Central Queensland University, Australia  
Zulkhairi Dahalin, University of Utara, Malaysia

## KEYNOTES



**Prof. Dr. Huseyin Uzunboylu**

**Professor** of Educational Technology

**Member**, Higher Education Planning, Supervision, Accreditation and Coordination Board, Nicosia, **CYPRUS**

**President**, Cyprus Educational Sciences Association (Members of EERA & WERA)

ORCID: <https://orcid.org/0000-0002-6744-6838>

Scopus: <https://www.scopus.com/authid/detail.uri?authorId=14030910200>

Web of Science: <https://www.webofscience.com/wos/author/record/179327>

**Keynote Title:** “Internationalization in Higher Education”

**Bio:** Prof. Dr. Huseyin Uzunboylu he had completed high school at 20 Temmuz High School in Cyprus. In 1995, his higher education career began by winning the Anatolia University, Department of Communication and Planning on Education in Turkey. And after he had completed his preparatory education in one year and he has completed his undergraduate degree in 1991. Prof. Dr. Huseyin Uzunboylu has started his graduate education in Ankara University, the Department of Curriculum and Instruction in 1993 and graduated in 1995. He was accepted into the doctoral program in the same university, Educational Technology Department of Educational Sciences in 1995 and he has completed his PhD degree in 2002. In 2003, he became an Assistant Professor in the Department of Computer Education and Instructional Technology at the Near East University, he was an Associate Professor in 2005 in Ataturk Faculty of Education, and in December 2010, with respect to the members of juries he was appointed as a professor. After doctoral studies he started working at the Near East University, Faculty of Arts and Sciences Department of Psychology in 1996 and he taught courses that educational sciences and research methods. He coordinated of ‘Pedagogy Certificate Program’ which was conducted by the University from 1997 to 1999, and since he conducted Chairman of the Department of Computer Education and Instructional Technology from 2004 to 2013. From 2013 to 2018, he serves as a Dean of Faculty of Education. Since 23 October 2019, he is appointed to member of Higher Education Planning, Supervision, Accreditation and Coordination Board by President of North Cyprus (TRNC). Prof. Dr. Uzunboylu has five academic books published by Turkey’s respected publishing firms; he has supervised five doctoral and 63 master’s theses up to now. He has 103 high-level articles that searching by Web of Science (SSCI, SCI, SCI-Expanded, ESCI); He has 27 searching article and published papers are presented on the international or national conferences. He is editor-in-chief of the Cypriot Journal of Educational Sciences; also, Prof. Dr. Uzunboylu serves as the boards of many journals referee within the searching in the Social Sciences Citation Index. Since 2004, he is taking place on the list as founders, and he is president of the Cyprus Educational Sciences Association (KEB-DER). In 2010, Prof. Dr. Uzunboylu has a major role



**Prof. Dr. Jesus Garcia Laborda**  
Dean of the College of Education  
Universidad de Alcala, Spain

**Keynote Title:** “Why does economy affect education?”

**Abstract:** While most people ignore it, economy shapes most of the decisions we take in management and educational policies. Finding a balance between expenses and quality of education is usually a hard endeavor. However, what do usually know educators about these hard decisions we need to take frequently? This presentation analyzes the factors that have a potential effect in educational decision especially in relation to the development of the most humble sectors of the population.

**Bio:** Jesús García Laborda has a Master’s in ESL (University of Georgia), a Master’s in Comparative Language and Literature (University of Wisconsin), a Ph.D. in English Philology (Complutense University of Madrid) and a Ph. European in Didactics (Complutense University of Madrid). He has been an assistant professor at the University of Georgia and the University of Wisconsin. He has also been a Visiting Scholar at Penn State University and the University of Antwerp and has taught courses in Colombia, Lithuania, Cyprus, Turkey, and Brazil. He has been principal investigator in four R&D projects and participated in seven more. He has also directed five teaching innovation projects at the University of Alcalá and the Polytechnic University of Valencia. He was director of the Department of Modern Philology at the University of Alcalá (2016-19) and since 2019 he is Dean of the Faculty of Education at the same university. He is also Editor-in-Chief of the journals *Global Journal of Foreign Language Teaching*, *Internal Journal of Learning & Teaching* and co-editor of *Computer Assisted Language Learning Electronic Journal (SCOPUS)*, as well as a member of the scientific committee or evaluator of another 15 impact journals (JCR/SCOPUS/ESCI). He is a specialist in language teaching, assessment, educational technology and bilingual education. He has published more than 85 articles indexed in SJR / SCOPUS / WOS <https://www.uah.es/es/estudios/profesor/Jesus-Garcia-Laborda/>



**José Manuel Vicente**

Management Ph. D – Aeronautics Management Research Area  
Escola de Ciências Económicas e das Organizações (ECEO)  
*Professor Universitário e Investigador*  
Universidade Lusófona, Lisboa – Portugal

**Keynote Title:** “The Challenges for the Development of Sustainable Policies for The Madeira Tourist Destination: An Empirical Study”

**Abstract:** The present study aimed to reflect on the reflection and survey among tourists who visit Madeira, on the main challenges to be considered for the development of sustainable policies for the tourist destination Madeira Islands, based on the criteria of the Global Sustainable Tourism Council and their experience in the destination. A structured questionnaire was carried out for the outlined objective, in the city of Funchal, in the month of January 2023, having obtained 1136 valid questionnaires. There is still a long way to go to build a Sustainable Tourist Destination for Madeira. The commitment of all entities involved, Government of the Republic, Regional Government, Private Entities and Public Entities, to the Sustainable Destination certification process is fundamental, with a view to creating value and replicating it in the economy, enhancing and enhancing the well-being of those who visit the Destination as well as those who live in the Region. The main challenges center on: the rebranding of the offer and dissemination of the Madeira tourist product, not only internally, but essentially externally, knowing how to listen to what tourists value in their decision-making when intending to visit a tourist destination sustainable; reinforcement of economic resilience policies and regulation to stimulate the circular economy; reinforcement of policies to improve society’s well-being and social responsibility, due to deficiencies in infrastructure in terms of reduced mobility and accessibility, given the aging of populations, both in the issuing markets and at national level; and, reinforcement of cultural diversity, heritage and identity as pillars for the promotion and enhancement of Madeira’s sustainable tourism product. In short, the results are relevant for a greater understanding of the phenomena inherent to the sustainability of the Madeira Tourist Destination, the weaknesses and challenges, and improvements in decision-making of policies for the development of Sustainable Tourism.

**Keywords:** Accessibilities, Madeira, Resilience, Decision-Making, Sustainable Tourism

**Bio:** José Manuel Vicente is an “Auxiliar” Professor at the Lusófona University – University Center of Lisbon, ECEO – Department of Civil Aviation and Airports, since 2009. PhD in Management (U. Évora) – Research Line Aeronautical Management, master’s in business management (U. Évora), Executive MBA in Air Transport / Civil Aviation Management (ULHT / INAC I.P./ Cranfield University). Degree in Management (U. Nova de Lisboa). Consultant in Transport and Professional Experience in the Transport and Logistics Sector, since 2005. Participation in several national and international Congresses and has articles in the areas of management and aeronautics with Scopus indexing. Researcher at TRIE – Transdisciplinary Research Center for Entrepreneurship and Innovation Ecosystems, Lusófona University, Lisbon. Enthusiast for Island Studies of socioeconomic analysis and development, related to impacts in the areas of tourism, mobility, infrastructure management, transport and quality perception.

# Dispersion Characteristic Analysis of PCFs Based on Effective Index

Amirhassan Talebi, E.Azerbaijan Water and Wastewater Co.

## Abstract

Due to Photonic crystal fibers (PCFs) excellent flexibility for the cross section has achieved unique properties like dispersion control, less confinement loss, controlled effective area and high nonlinearity by varying the air hole size and pitch distance. Photonic crystal fibers are one successful application of the photonic crystal concept. Systematic knowledge of the special guiding properties of Photonic Crystal Fibers permits the achievement of qualitatively novel dispersion curves. In recent years many research efforts have been devoted to understanding the propagation characteristics of such fibers, based on different theoretical methods, and to demonstrating their possible applications. In this paper, by the effective index method, the dispersion characteristics of PCFs for various structures have been analyzed. Further, scalar effective index and full vector effective index methods are represented. In fact, the dispersion properties of these fibers are analyzed for third-order dispersion, zero dispersion at any wavelength, nearly zero ultra-flattened dispersion and a very high negative chromatic dispersion for various designs of PCFs. Also, Using MATLAB software, each parameter was realized and the influence of normalized air hole size and separation between them on zero dispersion wavelengths is studied. The novel design has made the light of higher wavelength to be trapped inside the core of very small diameters.

---

**ADDRESS FOR CORRESPONDENCE:** Amirhassan Talebi, E.Azerbaijan Water and Wastewater Co.

E-Mail Address: [alebi-a@abfaazarbaijan.ir](mailto:alebi-a@abfaazarbaijan.ir)



# ARCHITECTURAL PLAN GENERATION EXPERIMENTS WITH ARTIFICIAL INTELLIGENCE INTERFACES: FRANK LLOYD WRIGHT

Tuğçe Çelik, Ostim Teknik University

## Abstract

Architectural plan production is a problem that is one of the practices in the discipline of architecture and is still up-to-date. Today's new technologies and their new tools offer new methods for architectural plan generation. Artificial intelligence algorithms are one of them. The main motivation of this study is, at this point, the question of whether artificial intelligence can produce a plan scheme or an architectural plan. Traditional design processes are transformed through collective digital environments, and generative design systems create autonomous and autonomous design mechanisms through digital interfaces. Today, when contemporary art and design practices are replaced by artificial intelligence and designs made through autonomous productive interfaces, it proposes a conceptual discussion area for the discipline of architecture, a new agenda for production with artificial intelligence, and creating a discussion area for the possible effects of the digital environment on art and architecture, is the aim of this study. There are studies in which interfaces and codes are written on this subject, but with this study, multiple alternative architectural plan production trials have been made with text-based artificial intelligence bots to get results quickly. In this direction, artificial intelligence and generative design methods, which create a process in which multiple alternatives are produced, have been tried to create different spatial plan schemes. In the study, it was decided to select a single architect from among the plan schemes as a single sample space so that the algorithm can make correct generalizations and give alternatives in artificial intelligence bots (Midjourney, Dall-e2 and Craiyon) to be used as a tool with the aim of producing architectural plan schemes. This sample space was determined as Frank Lloyd Wright plan diagrams. Wright architectural plan schemes, one of the examples of the shape grammar method, were selected as the study sample, and it was tried to reach fast, multi-alternative results by using text-based artificial intelligence bots. In this context, it is aimed to develop a new method proposal in the discipline of architecture by examining the formal and functional use of the outputs of the experiments in architectural design. In this context, the transformation of the identity of the designer into the decision mechanism of multiple alternatives will also be discussed conceptually. Although we cannot talk about a full design action for text-based bots with artificial intelligence interfaces, it is predicted that it can develop into an algorithm that can learn future new algorithms and the act of designing with new hardware. In this context, architecture will transform and develop together with technology.

---

ADDRESS FOR CORRESPONDENCE: Tuğçe Çelik, Ostim Teknik University

E-Mail Address: [tugce.celik@ostimteknik.edu.tr](mailto:tugce.celik@ostimteknik.edu.tr)

# **Contribution of Job Portals towards Employability Matching between Jobseekers and Employers Evidences from Albania**

**Milena Shehu**, Department: Statistics & Applied Informatics

**Arete Stringa**, Department: Statistics & Applied Informatics

## **Abstract**

Nowadays jobseekers find difficulties on searching for a job position that best suits to their interests, skills and their professional background. In Albania, they tend to firstly search for jobs posted on different online job portals. Job Portals have influenced on making job path convenient on both sides: jobseekers on finding jobs and employers on finding suitable employees, mainly because they are a simple, but effective tool. Job portals reduce recruiting costs and fees associated. Since that nowadays jobseekers have internet access even in rural areas, online job portals have also contributed to expand equality of access to employment advertisements even for the ones not living in urban big cities, whom up to now mainly have used personal networks and connections while searching for employment. In Albania there are currently more than 20 online job portals which are seen as the solution where recruiter as well as the jobseeker meets aiming at fulfilling their individual requirements. They are the cheapest and the fastest source of communication reaching wide range of audience on just a single click irrespective of where they live. This paper aims to study how well job portals of Albania help towards Employability Matching between jobseekers and employers, whether the incremental development in technology is being used by online job portals of Albania to increase the employability and job matching and, in the end, it will be given some recommendations on further improvements that job portals should take into consideration.

**Keywords:** Online Job Portals, Employability, Services and Features offered, Job Matching

---

**ADDRESS FOR CORRESPONDENCE:** Milena Shehu, Department: Statistics & Applied Informatics

E-Mail Address: [milena.shehu@hotmail.com](mailto:milena.shehu@hotmail.com)

# **A Data Warehouse Architecture Proposal and ETL Analysis, Case study of an Albanian Banking System**

**Denisa MILLO**, University of Tirana

**Nevila BACI**, University of Tirana

**Shpresim TAHIRAJ**, University of Tirana

## **Abstract**

The increasing phenomenon of information overload is a direct result of the ongoing trend to reduce the cost of data distribution while the development of data processing platforms is not fast enough. Therefore, sending packets of data is not a big issue, but processing an increasing amount of data is a big challenge. Data Warehouse is a concept born in the late '80s and has been improved decade after decade with the growth of technology. Despite many application areas, the data warehouse concept is still new and unknown to Albanian businesses and companies with a large amount of data to store and analyze. This paper aims to provide an in-depth analysis of the concept of a data warehouse, the different architectures applied, and the Extract, Transform Load (ETL) process. The ETL process as a concept consists of extracting the data from a source, transforming them into different formats or dimensions, and then loading them somewhere to be checked for analysis or other purposes. In this paper, we can find different definitions of the data warehouse, where it can be implemented, the different architectures according to the need of the users, and how the ETL process works. The last chapter implements a data warehouse for the banking system seen from a Management Information Systems perspective followed by an application of a step-by-step ETL procedure.

Keywords: Data, Data Warehouse, Extract, Transform, Load (ETL) process, Management Information Systems, analysis.

---

**ADDRESS FOR CORRESPONDENCE:** Denisa MILLO, University of Tirana

E-Mail Address: [denisa.millo@unitir.edu.al](mailto:denisa.millo@unitir.edu.al)

# Applying developed genetic algorithm operators to the knapsack problems

**Mustafa Kaya**, Aksaray University

## **Abstract**

This study investigated the effect of the previously developed random mixed crossover (RMC), back controlled selection (BCSO), double directions sensitive mutation operators (DDSM), and backward controlled termination criteria (BCTC) on the performance of a genetic algorithm (GA). In the first study, the following three benchmark 0-1, bounded, and unbounded knapsack problems were analyzed. In the first stage, the existing operators namely; multi-point crossover operator and tournament selection operator, 1% mutation ratio, and the fitness convergence termination criteria were applied to the benchmark problems. In the second stage of the study, the analysis was conducted by separately applying the previously developed operators, RMC, BCSO, DDSM, and BCTC to the same benchmark problems, and the results obtained from the analysis in this stage were compared with those obtained from the first stage. In the third stage of the study, the previously developed RMC, BCSO and DDSM operators, and BCTC were applied to the same benchmark problems in the same analysis, and the results were compared with those obtained from the first stage. The results of the analysis showed that when the developed operators (crossover, selection and mutation) and termination criteria were collectively used, they were more successful than the existing operators and the developed operators that were separately applied to the benchmark problems.

---

**ADDRESS FOR CORRESPONDENCE: Mustafa Kaya**, Aksaray University

E-Mail Address: [kaya261174@hotmail.com](mailto:kaya261174@hotmail.com)

# DETERMINATION OF REINFORCEMENT DIAMETERS OF REINFORCED CONCRETE DEEP BEAMS WITH GENETIC ALGORITHMS

**Mustafa Kaya**, Aksaray University

## **Abstract**

Genetic algorithms, a stochastic research method, emerged by adapting the development process of biological systems to the computer environment. Operations carried out in genetic algorithms are performed on units stored in computer memory, similar to natural populations. Today, many linear or nonlinear methods have been developed for the solution of optimization problems. It is accepted that the design variables are continuous with these methods of optimization problems. Due to the large number of design variables and constraints in some problems, the use of traditional optimization methods in solving such problems sometimes gives incorrect results or the solution time become too long. Since genetic algorithms are heuristic, they may not find the optimum result for a given problem. However, it gives very close to optimum values for problems that cannot be solved by known methods or whose solution time increases exponentially with the solution of the problem. Genetic algorithms, which were initially applied to nonlinear optimization problems. In this study, back-controlled selection, random mixed crossover, double-sensitivity mutation operator and backward controlled stopping criterion, which were developed and proved successful in previous studies, were applied to a deep beam problem.

---

**ADDRESS FOR CORRESPONDENCE: Mustafa Kaya, Aksaray University**

E-Mail Address: [kaya261174@hotmail.com](mailto:kaya261174@hotmail.com)

# Developing a new model for context-awareness in ambient intelligence

**Berraouna Abdelkader**, University of Souk Ahrasse Algeria

## **Abstract**

Modeling context using ontologies presents the best way of modeling, due to its many advantages, such as expressiveness, knowledge sharing, logic inference, knowledge reuse, and extensibility. Many generic ontologies have been developed to capture and represent the general concepts of context, such as the SOCAM and CoOL ontologies projects, but they are not specific to the field of ambient intelligence and smart homes. Our goal is the development of a specific ontology for this domain, based on more generic adaptations and logical inference

---

**ADDRESS FOR CORRESPONDENCE:** Berraouna Abdelkader, University of Souk Ahrasse Algeria

E-Mail Address: [abdelkader.br@gmail.com](mailto:abdelkader.br@gmail.com)

# **Business Hub Implementation Proposal - Albanian Post Case**

**Gjergji Mulla**, University of Tirana

## **Abstract**

The purpose of this article is to provide an analysis and a methodology for the implementation of a Business Hub Platform. The business hub system is a centralized platform that integrates different business functions. The scope of work, that will be defined in this article identifies all components and work required for the proposed implementation under this article. The proposed solution will be implemented based on a phased approach implementation methodology. The project proposal consists on acceptable range of outputs described in the Methodology, Project Management, Coordination and Reporting Section. The Inception Report includes producing a Project Plan acceptable for the community that will use the platform. Upon acceptance by the institution, the implementation team will carry out the activities defined in the Project Plan. The study evaluates the benefits and challenges of implementing the business hub system and provides insights into the factors that influence its successful implementation. The findings suggest that the implementation of the business hub system can improve operational efficiency, reduce costs, and enhance decision-making. However, the implementation process requires careful planning, effective communication. The study concludes by highlighting the key considerations for organizations looking to implement a business hub system, including selecting the right vendor, defining clear objectives, and ensuring adequate support and resources are available

---

**ADDRESS FOR CORRESPONDENCE:** Gjergji Mulla, University of Tirana

E-Mail Address: [gjergjimulla@gmail.com](mailto:gjergjimulla@gmail.com)

# Deep Learning for Automatic Classification of Identification Documents

**Blerina Vika**, University of Tirana

**Elira Hoxha**, University of Tirana

## **Abstract**

This paper presents a general approach for identification documents classification using deep learning models. Our study gives an explanation of the main steps that need to be followed in order to implement a classification deep learning model. We have used convolution neural networks to extract features from raw image pixels on private datasets of identification documents. The implemented models use different techniques to preprocess the images in order to improve the classification performance on the test dataset and also techniques that can offer a better generalization of the models on the classification task. The experiments demonstrate that the training time-efficiency and accuracy of the models depends on the size, numbers of the pattern for each category and type of the image preprocessing. Various techniques of optimization have been applied to improve the model's performance and as a result we achieved the best classification accuracy of 90.4% on the test dataset.

---

**ADDRESS FOR CORRESPONDENCE:** **Blerina Vika**, University of Tirana

E-Mail Address: [blerina.vika@unitir.edu.al](mailto:blerina.vika@unitir.edu.al)