DISE
WORKSHOP ON DIGITAL AND
INTELLIGENCE
SYSTEMS ENGINEERING

WORKSHOP ON DIGITAL AND INTELLIGENCE SYSTEMS ENGINEERING
DISE'2024

Thursday, December 19, 2024

Polydisciplinary faculty of sidi bennour
El Jadida, Morocco

MORE INFO

DISE

PREFACE

The 1st **Workshop on Digital and Intelligence Systems Engineering**
will held in El Jadida, at the Polydisciplinary faculty of Sidi Bennour,
Chouaib Doukkali University. This Workshop stands as the first platform for the
exchange of innovative ideas, in-depth discussions on solutions, and the sharing of
invaluable experiences among esteemed researchers and professionals from
academia and industry, all deeply invested in digital, artificial intelligence, and
networking privacy. **WDISE'24**, as the flagship workshop of the digital and a
project for an international conference, will be thematically anchored in "Inclusive
and intelligent connectivity" for its upcoming edition

Conferences Focus

WDISE'24 solicited contributions on following topics:

Track 1: Communication system and networking

- Wireless Communication systems
- Signal processing
- Cloud Communications and Networking,
- Biometrics
- Security, privacy & trust
- Internet of things (IoT)
- Smart Cities
- Digital transformation

Track 2: AI and Data

- Big Data,
- Cloud Computing,
- Model-driven engineering (MDE).
- Machine learning
- Deep learning
- Data/Text mining
- Natural Language Processing (NLP)
- Pattern Recognition
- Image processing

Track 3: Renewable energy and environment

- Climate Change Mitigation and Adaptation
- Materials and Nanomaterials for Energy.
- Hydrogen storage
- Energy harvesting
- Geoinformatics
- Remote Sensing (teledetection)
- Geographic Information Systems (SIG)

Track 4: Applied mathematics

- Optimal control
- Statistical analysis
- Information Theory
- Modelling and optimisation
- Information Theory

TECHNICAL PROGRAMME

8h30 - 9h00	Registration
9h00 - 9h30	Opening Ceremony
9h30 - 10h15	**Keynote speaker 1** Prof. Tembine Hamido **"GPT Meets Game Theory, with some applications"** Chair: Prof. Jabir Brahim
10h15 - 10h45	Coffee Break & Posters Visit
10h45 - 11h30	**Keynote speaker 2** Prof. Abdellatif Kobbane **"AI-Driven optimization of resources management in 5G networks"** Chair: Prof. Merzouk Soukaïna
11h30 - 12h30	Panel: **" IT, Job Opportunities & Entrepreneurship "** Mr Mustapha Ahmimid, HR Manager at CMH Mr Mohamed Griguaa, production coordinator at CMH Mr Benzhirou Ahmed, Director of the university agency anapec UCD Prof. Ousghir Sara Chair: Prof. Habib Adnane
12h30 - 14h00	Lunch
14h00 - 14h45	**Keynote speaker 3** Prof. Essaidi Mohamed **"The importance of smart cities in energy savings and economic development"** Chair: Prof. Elboukili Aicha
14h45 - 15h30	**Keynote speaker 4** Prof. Bessate Abdelmajid **" The performing of Wireless communication systems based on MIMO technologies "** Chair: Prof. Bouzidi Morad
15h30 - 17h30	Presentations Sessions
17h30	Closing Ceremony & Coffee Break

WDISE'S SPEAKERS

Dr. Hamidou Tembine is a professor of machine intelligence at the University of Quebec in Trois-Rivieres, Canada and the co-founder of Timadie, which is a platform of platforms that brings together companies, laboratories, and professional associations. It includes various platforms such as Guinaga for blockchain in agriculture, Grabal for livestock & poultry, SK1 Sogoloton for Distributed information, WETE for women's empowerment through entrepreneurship, the knitting and crocheting club, women drone pilots, and more. Since 2010, Tembine has been the founding director of the Learning & Game Theory Laboratory and, since 2020, one of the principal investigators of the Stability Research Centre. He has published over 300 scientific publications and has received over 6500 citations and a h-index of 40 to date. Tembine has received more than 10 awards for best scientific articles. He is also the recipient of the Simons Prize in 2020, the Next Einstein Forum Fellow in 2018, and the Best Young Researcher Award in 2014 from the IEEE Communication Society. He has authored five books on game theory and learning, including his latest publication in 2021 by CRC Press, Taylor & Francis. He is a co-author of the book on Machine Intelligence in Africa in 20 questions, published in June 2023.

Dr. Abdellatif Kobbane is currently serving as a Full Professor at the Ecole Nationale Supérieure d'Informatique et d'Analyse des Systèmes (ENSIAS), Mohammed V University in Rabat, Morocco, since 2009. jointly awarded by Mohammed V-Agdal University (Morocco) and the University of Avignon (France). He previously received a Master of Science in Computer Science, Telecommunication, and Multimedia from Mohammed V-Agdal University in 2003. Additionally, Dr. Kobbane holds the position of Adjunct Professor at the L2TI laboratory, Paris 13 University, France. His research interests primarily revolve around wireless mobile networking, performance evaluation, flexible resource management, and distributed AI in 5G/6G networks utilizing AI and advanced techniques in distributed mean-field game theory. He is the author of numerous scientific publications in prestigious IEEE conferences and journals such as IEEE ICC, IEEE Globecom, IWCMC, ICNC, IEEE WCNC… Furthermore, Dr. Kobbane He actively participates in the research community and holds the distinction of being a Senior Member of ComSoc IEEE, an Ex-Chair of the IEEE Communication Software Technical Committee, and the Ex-President and Founder of the Association of Research in Mobile Wireless Networks and Embedded Systems (MobiTic) in Morocco

Mohamed Essaaidi, Mohamed Essaaidi (Senior Member, IEEE) is currently the Chief of the Party of Interactive Digital Center Morocco and a Professor and the past Dean of the ENSIAS College, IT Engineering of Mohammed V University, Rabat, Morocco, the Past Director of the International Cooperation, Ministry of General Affairs & Governance, Morocco (2019), and a past Faculty Member (Professor and Assistant Professor) with the Faculty of Science, Abdelmalek Essaadi University, Tetuan, Morocco during 1993–2011. His research interests include RF and microwave passive and active circuits and antennas for wireless communications and medical systems. He is the IEEE Global Cities Alliance, MEA Chairman during 2021–2022, IEEE Humanitarian Activities Committee (HAC) Assessment Committee Member during 2021–2022, IEEE EAB Teaching Excellence Editorial Hub, Member during 2021–2022. He was extensively involved in the coordination of the World Bank Morocco Country Partnership Framework during 2019–2024 and OECD Morocco Country Program during 2019–2021 among other international cooperation programs

Abdelmajid Bessate received a Ph.D degree in wireless communication systems from ENSIAS, Mohammed V University in Rabat, Morocco, in 2018, and an M.S. degree in software engineering from Chouaib Doukkali University, El Jadida, Morocco. Parallel to his research work, he has worked as an Associate Professor of computer science with the Polydisciplinary Faculty of Sidi Bennour, Chouchaib Doukkali University, Since November 2020. He is currently the author and a Reviewer of high-rank journals, including IEEE Access, Physical Communication (Elsevier), EURASIP (Springer), and International Journal of Communication Systems (Wiley). His current research interest includes performance analysis of wireless communication systems. Besides, he is an author and member of the organizing committee and TCP at many IEEE international conferences namely WINCOM and CommNet

TECHNICAL SESSIONS

TRACK 1: COMMUNICATION SYSTEM & NETWORKING

ROOM 1 | Chairs: Prof. Ayoub Lahmidi, Prof. Layla Aziz

Artificial intelligence to strengthen security in smart cities
> Kbiri Alaoui Halima, Hamal Oussama, Benkhalifa Mohamed

Optimizing 5g networks through ai-driven edge computing solutions
> Halima Chaouki, Radouane Iqdour and Mohamed Boulouird

Optimal control strategy for a discrete time smoking model with specific saturated incidence rate
> Abderrahim Labzai, Omar Balatif and Mostafa Rachik

The fidelity of teleportation through noisy channels
> Touhami Chamss and Ez-zahraouy Hamid

Robot control using reinforcement learning, liquid neural networks, and hindsight experience replay
> Kaouthar Oubbad, Abdelilah jraifi, Ilias Elmouki and Mohammed Madiafi

TRACK 2: IA AND DATA

ROOM 2 | Chairs: Prof Jabir Brahim, Prof. Abderrahmane Ed-daouadi

Deep learning in medical imaging: challenges, innovations, and the path toward equitable precision medicine
> Adil Karim, El Habib Benlahmar, Sanaa, Elfilali, Mustapha Khiati

Optimizing supply chains in international trade: a deep learning approach to enhance competitiveness and logistics education
> Mustapha Khiati, Halima Raji, Othmane Belhadj, Hind Merzouk, Adil Karim

The economic impact of artificial intelligence on digital transformation: productivity, innovation, and global competitiveness
> Mustapha Khiati, Nada Janah, Said El Ganich, Hind Merzouk, Soukaina merzouk

The impact of artificial intelligence on digital communication: between personalization and dehumanization
> Hind Merzouk, Mustapha Khiati, Soukaina Merzouk, Nada Janah, Jaouad Zerrad and Said El Ganich

Neural network-powered personalized recommendation system
Mohamed Mouhiha and Abdelfettah Mabrouk

kidney cancer detection through artificial intelligence: an approach utilizing radiological image analysis
El Ghazi Amina, Bessate Abdelmajid, Aaroud Abdessadek,

Artificial intelligence models for IoT intrusions detection system
Meziane Hind

Model inversion attack: detection, prevention and mitigation in artificial intelligence systems
Kouskous Nouhayla, Brahim Jabir and Hassan Silkan

Predicting mortgage credit defaults in morocco using machine learning
Mohamed Elhia and Amine Hade

Enhancing the standardization of learning models through emerging technologies in digital learning environments
Roukaya Gandoul, Soukaina Merzouk, Nadia Chafiq and Mohamed Ghazouani

leveraging big data, data science, and artificial intelligence to enhance the resilience of financial markets and the global economy
Mustapha Khiati, Mustapha Khouilid, Tarik Quamar, Fatima-Zahra Aazi, Hind Merzouk, Driss El Omari, Soukaina Merzouk and Nada Janah

TRACK 3: RENEWABLE ENERGY & ENVIRONMENT

ROOM 3 | **Chairs: Prof Aicha El Boukili, Prof Said Laasri**

New technologies for plant disease detection: a review
Alaoui Fatima-Zahra, Elfilali Sanaa, Ait Abdelouahdi Rachida and Merzouk Soukaina

Advanced modelling and control techniques for hydrogen conversion in pem fuel cell systems
Gouhail Mohamed and El Houssine El Mazoudi

Performance modelling of Cu2NiGes4-based solar cells using DFT and SCAPS-1D simulations
Nassima El Ouarie, J. El Hamdaoui, G.S. Sahoo, K.G. Rodriguez-osorio, M. Courel, M. Zazoui, L.M. Pérez, d. Laroze and e. Feddi

The new systems based on magnetocaloric effect materials for magnetic refrigeration

Said Laasri, El Boukili Aicha and Ez-zahraouy Hamid

TRACK 4: APPLIED MATHEMATICS

ROOM 4 | Chairs: **Prof Kouidere Abdelfattah, Prof. Ammar Abdelghali**

Modeling alcohol consumption: stochastic stability and global dynamics analysis
Sara Soulaimani

stability analysis of a fractional order unemployment model with a non-linear job creation
Moujid Salma, El Aallaoui Mohamed, Kaddar Abdelilah

mathematical modeling, global stability, sensitivity analysis, and optimal control of merchant adoption dynamics in e-commerce
Hssouni Habib and Omar Balatif

A new approach to modeling multidrug-resistant tuberculosis
Laouina Aziza, Bheraoui Zuhair and El Rhoubari Zineb

Modelling the therapy and the adaptive immune response in an HBV infection model in both liver and the extrahepatic tissue
Fatima Ezzahra Fikri and Karam Allali

The optimal control strategies for typhoid transmission with cost-effectiveness
Khadija Oubouskour and Omar Balatif

bifurcation analysis of a kaldor-kalecki business cycle model with population effect
Sanaa El Fadily and Abdelilah Kaddar

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Abstracts

Artificial intelligence to strengthen security in smart cities

Communication Info	Résumé
Auteurs: KBIRI ALAOUI Halima[1], HAMAL Oussama[2], BENKHALIFA Mohamed[3] *1,2,3 FS. Mohamed V University in Rabat, Morocco* *2 National School of Architecture, Marrakech, Morocco.* **Keywords:** Artificial Intelligence, Smart Cities, Security, Urban Development.	Smart cities represent the future of urban development by integrating advanced technologies to improve citizens' quality of life. However, the increasing reliance on interconnected systems poses security challenges, particularly in protecting sensitive data and ensuring the resilience of critical infrastructure. Artificial intelligence (AI) offers powerful tools to address these challenges, such as automated threat detection, reduced response times, and predictive analytics to prevent potential attacks [1]. These solutions also improve cyber threat management through the analysis of data from connected objects (IoT) for continuous monitoring [2]. However, gaps persist, particularly in the interoperability of systems and the transparency of AI decisions [3]. This review explores current AI solutions to enhance security in smart cities and proposes a roadmap for the integration of robust and adaptive systems [4]. It draws on case studies from several smart cities around the world to identify best practices and innovative applications [5]. This study aims to contribute to the debate on the use of AI to create safer and more sustainable urban environments. **© WDISE 2024 Proceedings**

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[2] USAII, "AI and Blockchain for Building Smart Cities," 2023.
[3] Elsevier, "Artificial Intelligence and Urban Security," 2023.
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[5] IEEE, "Emerging Trends in Smart City Security," 2024.

Optimizing 5g networks through ai-driven edge computing solutions

Communication Info	Abstract
Authors: Halima Chaouki 1*, Radouane Iqdour 2 and Mohamed Boulouird 1 *1 SSA Team, National School of Applied Sciences , Cadi Ayyad University, Marrakech, Morocco* *2 Department of Computer Science, CRMEF Marrakech-Safi, Morocco* 	The synergies between Multi-access Edge Computing (MEC) and 5G networks highlight the potential of MEC as a new computing model developed in response to the rapid growth of IoT, AI, and big data [1]. MEC brings cloud capabilities closer to the edge of the network, thereby reducing the distance between the data source and the processing resources [3]. Artificial intelligence, used in various domains and for numerous functionalities, plays a crucial role in 5G communication networks and beyond, enabling task distribution among nodes called "Edge nodes," organized according to a precise topology between mobile terminals and large cloud computing canters. To efficiently manage and plan tasks across these nodes, several AI algorithms are utilized. Among them, Deep Learning is deployed for anomaly detection, task scheduling, and resource allocation [4]. Reinforcement learning and deep reinforcement learning enable the training of models through dynamic interaction with the environment, particularly using approaches such as Multi-Armed Bandit, Deep Q-Networks, and Actor-Critic [2]. These models are integrated into Edge Computing servers to optimize task offloading, flow management, energy consumption reduction, and decision making. Furthermore, Deep Q-Networks with Graph Neural Networks (GNN) rep resent Edge servers and their connections as a graph, where each server corresponds to a node with a feature vector. This model is particularly useful for managing user mobility, service migration, and decision-making in Edge Computing. The Worst-Fit migration algorithm, for instance, ranks Edge servers based on the difference between their available CPU capacities and CPU demand, migrating each service to the first server that meets the system requirements. These algorithms significantly enhance the performance of 5G networks, particularly in terms of latency (reducing transmission and communication delays), resource allocation (optimizing computing and storage capacities), and energy consumption (reducing energy usage across the network) [5].

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Optimal control strategy for a discrete time smoking model with specific saturated incidence rate

Communication Info	Abstract
Authors: Abderrahim Labzai [1], Omar Balatif [2], Mostafa Rachik[1] *1 Polydisciplinary Faculty of Sidi Bennour, Chouaïb Doukkali University, El jadida, Morocco* *2 FPSB, UCD, El jadida, Morocco* 	The aim of this paper is to study and investigate the optimal control strategy of a discrete mathematical model of smoking with specific saturated incidence rate. The population that we are going to study is divided into five compartments: potential smokers, light smokers, heavy smokers, temporary quitters of smoking, and permanent quitters of smoking. Our objective is to find the best strategy to reduce the number of light smokers, heavy smokers, and temporary quitters of smoking. We use three control strategies which are awareness programs through media and education, treatment, and psychological support with follow-up. Pontryagins maximum principle in discrete time is used to characterize the optimal controls. The numerical simulation is carried out using MATLAB. Consequently, the obtained results confirm the performance of the optimization strategy.

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The fidelity of teleportation through noisy channels

Communication Info	Abstract
Authors: Touhami Chamss, EZ-ZAHRAOUY Hamid *Faculty of Sciences of Rabat, Mohammed 5 University, Rabat, Morocco* **Keywords:** Quantum teleportation, qubit, noise	In this study, we investigate the fidelity of quantum teleportation in the presence of noise by utilizing Bell states as quantum channels [1] . Our focus is on sending a single qubit through Bell states under various noise conditions to analyse how different types of noise impact the fidelity of the teleportation process [2]. By comparing the performance across several noisy channels, we aim to determine the optimal noise conditions that maximize teleportation fidelity, contributing to a better understanding of robust quantum communication strategies [3] . Our findings provide insights into selecting the input based on the type of noise to optimize fidelity, even under realistic noisy conditions.

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Robot control using reinforcement learning, liquid neural networks, and hindsight experience replay

Communication Info	Abstract
Authors: Kaouthar Oubbad, Abdelilah Jraifi, Ilias Elmouki, Mohammed Madiafi *National School of Applied Sciences, Cadi Ayyad University, Safi, Morocco* **Keywords:** Liquid Time Constant, Reinforcement Learning, Robot control, Hindsight Experience Replay	In robotic control, a robot must learn from its environment to act appropriately and perform tasks effectively [4]. This process is achieved through Reinforcement Learning (RL) [1]. To adapt to dynamic environments and learn from real-world data, we used Liquid Time Constant (LTC) networks [2]. These networks are represented by a differential equation with a variable time constant, making them well-suited for handling sequential data. Moreover, LTC networks offer advantages such as interpretability and robustness to noise. However, the agent often encounters sparse or binary rewards during training, which can limit its learning potential. To overcome this challenge, Hindsight Experience Replay (HER) is employed [3]. HER enables the agent to reinterpret past actions as if they had been intended to achieve desired goals, allowing it to learn effectively from all experiences [5]. By integrating these advanced techniques, the agent can achieve superior performance in terms of interpretability, sample efficiency, robustness, and real time learning [2].

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Deep learning in medical imaging: challenges, innovations, and the path toward equitable precision medicine

Communication Info	Abstract
Authors: Adil KARIM, El Habib BENLAHMAR, Sanaa ELFILALI, Mustapha KHIATI *Faculty of Sciences Ben M'sik, Hassan II university of Casablanca, Morocco* **Keywords:** Deep learning, artificial intelligence, medical imaging, feature extraction, radiogenomics, transfer learning, federated learning, genomic diversity, data augmentation, precision medicine.	Deep learning, a specialized branch of artificial intelligence (AI), has become instrumental in advancing medical imaging by automating complex tasks such as lesion detection, image segmentation, and radio genomics-based feature extraction. These capabilities have greatly enhanced diagnostic and prognostic workflows across various imaging modalities, including CT, MRI, and PET/CT [1] , [2] . However, the implementation of deep learning in clinical practice faces significant challenges. These include the limited availability of large, diverse, and representative datasets, the heterogeneity of imaging modalities, and the prevalence of noisy or incomplete data. Furthermore, the integration of genetic and physiological variability among patients introduces additional complexity, especially in fields like radio genomics, which aim to link imaging phenotypes with genomic data [3]. Compounding these issues, the underrepresentation of non-European populations in genomic databases has hindered the development of equitable and generalizable AI models, limiting their application in precision medicine [4]. To address these challenges, innovative methodologies have emerged. Techniques such as transfer learning and fine-tuning enable models to achieve high performance with limited datasets by leveraging pre-trained architectures. Federated learning offers a promising solution for privacy-preserving collaborations, allowing institutions to share model insights without exposing sensitive patient data [1] . Multi-modal deep learning frameworks, which integrate imaging, genomic, and clinical data, have shown exceptional promise in improving predictive accuracy, particularly in applications like oncology and cardiovascular imaging [2], [3] . Additionally, advances in self-supervised learning, synthetic data generation, and robust data augmentation techniques are redefining how AI models are trained on sparse and heterogeneous datasets [1] . These approaches not only enhance model robustness but also address challenges related to data imbalance and label scarcity. This work emphasizes the critical need for collaborative, multidisciplinary efforts in standardizing imaging

protocols, expanding genomic diversity in research, and fostering international data-sharing initiatives. By addressing these systemic barriers, we can unlock the full potential of deep learning in medical imaging, paving the way for more personalized, equitable, and efficient healthcare solutions. This contribution aims to stimulate discourse and collaboration among AI researchers, clinicians, and policymakers to ensure that advancements in medical AI translate effectively to improved patient outcomes.

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Optimizing supply chains in international trade: a deep learning approach to enhance competitiveness and logistics education

Communication Info	Abstract
Authors: Mustapha KHIATI 1, Halima RAJI 1 , Othmane Belhadj 1, Hind Merzouk 2, Adil Karim 1 1 Faculty of Sciences Ben M'sik, Hassan II university of Casablanca, Morocco, 2 ENCG business school of Settat, Morocco **Keywords:** Deep Learning, Supply Chain Optimization, International Trade, Logistics Education, Predictive Models, Risk Mitigation	The optimization of supply chains (SC) in international trade is increasingly essential due to the complexity of global markets (GLMARK) . This study explores how deep learning (DeeL) technologies can improve SC efficiency, fostering economic competitiveness and advancing logistics education. Predictive DeeL models play a crucial role in forecasting disruptions and enhancing decision-making in global trade logistics [1]. Furthermore, DeeL-driven platforms have proven effective in skill development through simulation-based training, modernizing logistics education systems [2]. The research focuses on 3 key areas: (1) employing DeeL to optimize SC and mitigate risks in real time, (2) leveraging DeeL to identify trade patterns and support strategic decisions, and (3) integrating DeeL technologies into curricula to address logistics skill gaps. Case studies demonstrate the value of DeeL algorithms in forecasting demand fluctuations, improving resilience, and supporting sustainable practices [3]. Moreover, DeeL's transformative potential in creating innovative, tailored educational content for logistics professionals is highlighted. This paper provides a pathway for embedding DeeL in logistics operations and education, enabling greater resilience and competitiveness in the dynamic landscape of international trade.

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The economic impact of artificial intelligence on digital transformation: productivity, innovation, and global competitiveness

Communication Info	Abstract
Authors: Mustapha KHIATI 1 , Nada JANAH 2 , Said EL GANICH 2 , Hind MERZOUK 3 , Soukaina MERZOUK 4 1 Faculty of Sciences Ben M'sik, Hassan II university of Casablanca, Morocco, 2 ENCG business school of Settat, Morocco 2 National School of Business and Management of Beni Mellal USMS University 3 ENCG business school of Settat 4 Polydisciplinaire Faculty of Sidi Bennour, Chouaib Doukkali University,	The digital transformation (DT) of enterprises, driven by Artificial Intelligence (AI) systems, is reshaping productivity, innovation, and competitiveness in the global economy [1]. AI technologies, including process automation, data-driven (DD) decision-making (DM), and supply chain optimization (SCO), have significantly enhanced operational efficiency [2]. These advancements allow businesses to innovate and introduce new products and services more rapidly, strengthening their market position [3]. This research explores the economic implications of AI adoption across various sectors, analysing its impact on both developed and developing economies [4]. Special attention is given to how AI technologies can be leveraged to improve the competitive advantage of enterprises at a global scale, addressing the challenges of technology diffusion and internationalization [5]. The study highlights key factors influencing AI integration, including infrastructure, human capital (HC), and regulatory frameworks [2], [4]. By understanding these dynamics, this research provides insights into the broader economic impact of DT in the context of modern economies [1], [5].

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The impact of artificial intelligence on digital communication: between personalization and dehumanization

Communication Info	Abstract
Authors: Hind MERZOUK 1 , Mustapha KHIATI 2 , Soukaina MERZOUK 4, Nada JANAH 3 , Jaouad ZERRAD 1 , Said EL GANICH 4 1 Faculty of Sciences Ben M'sik, Hassan II university of Casablanca, Morocco, 2 ENCG business school of Settat, Morocco, 3 National School of Business and Management of Beni Mellal USMS University 4 Polydisciplinary Faculty of Sidi Bennour, Chouaib Doukkali University, **Keywords:** AI , Digital communication strategies, Personalization, Ethics, Dehumanization	The swift integration of AI into digital communication strategies is transforming interactions among businesses, institutions, and individuals in an increasingly digitalized world [1]. This study investigates AI's influence on digital communication, emphasizing two critical dimensions: personalization and the risk of dehumanization [2]. AI-driven tools, including chatbots, automated content creators, and advanced data analytics systems, are enabling highly customized communication experiences tailored to individual preferences and behaviours [3]. This innovation enhances user engagement and satisfaction by fostering more efficient and targeted interactions. However, the growing adoption of AI raises pressing ethical concerns, particularly surrounding privacy, bias, and manipulation [4]. While AI-powered personalization facilitates seamless and dynamic exchanges, it may inadvertently erode the human touch. Automated responses and algorithm-driven systems, although efficient, often lack the empathy, emotional intelligence, and nuanced understanding inherent in human interactions [5]. This evolution risks increasing reliance on machine-generated communication, potentially compromising the authenticity and depth of human connections. This paper explores the opportunities and challenges posed by AI in digital communication. It examines how organizations can harness AI's potential while adhering to ethical principles and safeguarding genuine human engagement. Moreover, it underscores the importance of balancing technological innovation with ethical considerations, offering insights into the future of communication in an AI-centric era. By aligning technological progress with fundamental human values, this paper advocates for a digital communication paradigm that is both effective and humane.

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Neural network-powered personalized recommendation system

Communication Info	Abstract
Authors: Mohamed Mouhiha, Abdelfettah Mabrouk *Department of Computer Science, ESTSB, Chouaïb Doukkali University* 	Movie recommendation systems are a hot topic in research these days, thanks to the easy access to fast internet and the growing love for movies and multimedia entertainment. But it's not just about suggesting what movie to watch next ; these systems are also handy for suggesting courses or products when you're shopping online. They're even useful for spreading information around. Building recommendation systems is challenging due to issues like the cold start problem, sparsity of data, the long-tail problem, and the lack of explicit feedback. This research emphasizes the need for advanced recommendation systems to navigate the abundance of choices we encounter daily, highlighting the importance of making strategic recommendations. Our research delves into the realm of Deep Learning (DL), employing sophisticated methodologies such as Deep Neural Networks (DNNs)[1], Convolutional Neural Networks (CNNs) [2][3], Recurrent Neural Networks (RNNs) [4], and AutoEncoders (AEs) [5][6][7]. While previous studies have explored these techniques, our primary emphasis lies in enhancing deep collaborative neural networks to augment recommendation systems reliant on implicit feedback. Our approach aims to enhance recom- mendation system performance by addressing the limitations of traditional algorithms, particularly in scenarios where explicit user feedback is lacking. We evaluated our method using a variety of assessment metrics, incorporating loss functions, success rates (Hit@ratio), and relevance scores (NDCG@ratio). Excitingly, our experiments demonstrate that our approach surpasses prior methods in recommending items based on indirect feedback. This represents a significant advancement in the development of more intelligent and efficient recommendation systems. © WDISE 2024 Proceedings

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kidney cancer detection through artificial intelligence: an approach utilizing radiological image analysis

Communication Info	Abstract

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Kidney cancer poses a significant oncological burden, with more than 400,000 new cases each year globally. Five-year survival rates for localized tumours are greater than 90%, but these rates drop below 30% once tumours become metastatic. Therefore, early detection is critical. In this context, our work should be positioned as a new methodology for the early detection of kidney cancer through the fusion of deep learning methods and radiological image analysis. We built a modified architecture of NASNet, which was used for analysing renal CT images. Using the proposed approach on a large clinical dataset resulted in strong performance, with 93% accuracy, 91% sensitivity, 94% specificity, and independent validation of results. These results represent a significant improvement over classic diagnostic method. These findings pave the way for multiple announcements. First, our model is deployment-ready. Second, we still need to further refine our model. Third, there are numerous other routes to explore. Future studies could enhance diversity through more heterogeneous populations or more clinical imaging. It may take a while before more intelligent software is put to use in clinics, but these models can still be developed with careful hyperparameter tuning. A critical piece missing from these performance metrics is the type of imaging for which the photographs were taken. In summary, our study represents a remarkable step forward in the application of AI for kidney cancer. The decrease in the most significant aspects of mortality without sacrificing diagnostic accuracy can be attributed to our adjustments to the image processing capabilities of the commonly known NASNet. This demonstrates how the performance of analytical telemedicine models can impact their effectiveness.

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Artificial intelligence models for IoT intrusions detection system

Communication Info	Abstract
Authors: MEZIANE Hind *Faculty of Sciences (FSO), Mohammed First University* 	The Internet of Things (IoT) become a real technological innovation in almost all domain, such as smart home, healthcare, industry, logistics,…, yet the evolution of IoT-based systems raised new security challenges, due to the its specifications: its heterogeneity, the restricted resources and the continuous enormous of generated and exchanged sensitive data. Therefore, the contribution studies new techniques based on Artificial Intelligence (AI) and related, in particular, to machine learning and deep learning. AI is about choosing the right decision at the right time. The domain of application of AI has become unlimited. Therefore, any field that exists now benefits from AI. The contribution consists in presenting the state of the art of attacks classification and detection techniques. We discuss the limitation of existing detection mechanisms like signature-based detection. We finally compare the different methods to synthesize the most effective detection method. The proposed system will help improve accuracy, reliability, and trustworthiness.

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Model inversion attack: detection, prevention and mitigation in artificial intelligence systems

Communication Info	Abstract
Authors: kouskous nouhayla [1], brahim jabir [2], hassan silkan [1] [1] *laboratory in optimization, emerging systems, networks and imaging,laroseri, faculty of science,el jadida* [2] *polydisciplinary faculty of sidi bennour, el jadida,* **Keywords:** Artificial Intelligence (AI), Cybersecurity, Language Models (LLM, SLM), Model Inversion, Model Extraction Attacks, Data Privacy, Security Vulnerabilities, Defense Mechanisms, Threat Mitigation,	Since 2010, Artificial Intelligence has experienced a strong convergence, notably with the emergence of Deep Learning fuelled by the availability of training data, opening up new prospects for value creation in a variety of fields, including healthcare, e-commerce, finance, and cybersecurity. In the realm of cybersecurity, AI plays pivotal role, enhancing defences against threats while introducing new risks. Language models as advanced applications of AI, exemplify this duality: while they outperform traditional methods in security, their near-human reasoning capabilities make them vulnerable to specific threats, such as model inversion and data extraction. These attacks exploit the structure of language models to retrieve sensitive information, presenting significant security and privacy concerns. This research focuses on the security of language models (LLM and SLM) by exploring their architectures, characteristics, and vulnerabilities through exploratory analyses. Studying model extraction attacks, with a focus on model inversion, combining theoretical and experimental approaches, and quantitatively analysing different attack scenarios (e.g., environment, language, and model size) to understand key vulnerability factors. The purpose is to propose robust strategies for detecting, preventing and mitigating these attacks, while preserving model efficiency and performance. By combining exploratory, experimental and analytical approaches, this research aims to make significant contributions to language model security, a key issue in an increasingly connected world.

Predicting mortgage credit defaults in morocco using machine learning

Communication Info	Abstract
Authors: Mohamed Elhia, Amine Hade *MAEGE Laboratory, FSJES Ain Sebaa, Hassan II University, Casablanca, Morocco* 	This study investigates the application of machine learning to predict mortgage defaults in Morocco, leveraging a dataset of 17,220 mortgage contracts approved between 2015 and 2023 from a leading financial institution. Key pre-processing steps, including data normalization and class balancing with SMOTE, were employed to ensure data quality. Variable selection was guided by the Kruskal-Wallis test, Cramér's V, and Information Value. A total of ten classification models were assessed, ranging from traditional methods like logistic regression to advanced ensemble techniques such as Bagging Classifier and XGBoost, with performance evaluated using metrics like accuracy, F1-score, and AUC. The results demonstrate that ensemble models, particularly Bagging Classifier and XGBoost, outperform others, achieving AUC scores above 90%. These findings underscore the potential of machine learning to improve credit risk assessment by effectively distinguishing between creditworthy and default-prone borrowers. The study provides actionable insights for financial institutions aiming to strengthen risk management in an evolving economic landscape.

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Enhancing the standardization of learning models through emerging technologies in digital learning environments

Communication Info	Abstract
Authors: Roukaya Gandoul[1] , Soukaina Merzouk[2], Nadia Chafiq[3] , Mohamed Ghazouani[4] *1 3 Faculty of science Ben M'sik, Hassan II University Casablanca, Morocco* *2 Polydisciplinary Faculty of Sidi Bennour, Chouaïb Doukkali University, El Jadida, Morocco* *4 laboratory of Technology information and Modeling Faculty of science* **Keywords:** Student modelling, Standardization, Learning styles; emerging technology.	The student model is a critical component in any adaptive learning environment. Numerous student modelling approaches have been proposed in the literature, focusing on learners: competencies, preferences, and other personal attributes. In this context, the process of constructing metadata, data structures, and communication protocols based on an imposed model raises several issues and perspectives regarding standardization. This process is therefore crucial to ensure the interoperability of learning content across different platforms and to make it accessible to the widest number of learners [1] [2]. The adaptability of provided learning content depends on the available information about the learner's characteristics and traits [3]. Many efforts have been made to standardize learner profiles. Among the most widely adopted standards are IEEE Personal and Private Information (PAPI) and IMS Learner Information Package (LIP). In this paper we establish the relations between learners' category, in PAPI which can be implicitly identified within LIP through various records in the Identification category. Both standards share a common limitation: they do not cover student' learning style and cognitive traits, which could be an area for improvement by multiple solution using emerging technology in different approaches [4].

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leveraging big data, data science, and artificial intelligence to enhance the resilience of financial markets and the global economy

Communication Info	Abstract
Authors: Mustapha KHIATI [1], Mustapha KHOUILID [2], Tarik QUAMAR [3], Fatima-Zahra AAZI [4], Soukaina MERZOUK[4], Driss EL OMARI [5] *[1] Faculty of Sciences Ben M'Sik (FSBM) , Hassan II University of Casablanca, Morocco (ECAF / LASTIE)* *[23] FSJES Faculty, Hassan II University of Casablanca, Morocco (ECAF)* *[4] Polydisciplinaire Faculty of Sidi Bennour , Chouaib Doukkali University, Eljadida Morocco* *[5] ENCG Business school , USMBA Unversity Fes* **Keywords:** Big Data, Data Science, AI, Financial Markets, Global Economy	In the context of an increasingly interconnected global economy (GLE), the resilience of financial markets (FINMARK) has become a critical concern for policymakers, investors, and economists. This paper explores how the integration of Big Data (BD), Data Science (DS), and AI can play a pivotal role in strengthening the stability and responsiveness of FINMARK. By leveraging advanced analytical techniques, such as machine learning algorithms (MLA) and predictive modelling (PM), these technologies enable the real-time monitoring of market dynamics and the identification of potential risks [1]. Additionally, the application of these tools extends to GLE systems, providing insights into cross-border financial interactions and improving the management of international economic shocks [2]. This study investigates the potential of these technologies to optimize decision-making, enhance risk assessment, and promote more efficient market behaviours, ultimately contributing to a more resilient and adaptive global financial ecosystem [3][4]. **© WDISE 2024 Proceedings**

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New technologies for plant disease detection: a review

Communication Info	Abstract
Authors: ALAOUI Fatima-zahra, ELFILALI SANAA, AIT ABDELOUAHDI Rachida, MERZOUK Soukaina *Polydisciplinaire Faculty of Sidi Bennour , Chouaib Doukkali University, Eljadida Morocco* 	The detection of plant diseases is important for ensuring agricultural productivity and food security worldwide. This review explores the latest studies on advanced technologies used in plant disease detection, focusing on the integration of Artificial Intelligence (AI), Internet of Things (IoT), and advanced imaging techniques. Through a detailed analysis of different detection methods—including visual symptom analysis via computer vision, real-time environmental monitoring with IoT sensors, and machine learning models for disease classification—this review highlights the strengths and limitations of each approach. While these technologies offer significant improvements in detection accuracy, automation, and real-time response, challenges such as high costs, data requirements, and environmental variability persist. This paper discusses the comparative efficiency of these advanced technologies, emphasizing the importance of further research to develop accessible, scalable solutions for diverse agricultural settings

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Advanced modelling and control techniques for hydrogen conversion in PEM fuel cell systems

Communication Info	Abstract
Authors: Gouhail Mohamed, El houssine El Mazoudi *CISIEV Laboratory, Cadi Ayyad University,* 	Modelling and control of Proton Exchange Membrane Fuel Cell (PEMFC) systems are vital for optimizing hydrogen energy conversion and ensuring system efficiency and reliability. This study presents an overview of state-of-the-art techniques for the dynamic modelling and advanced control of PEMFC systems. Nonlinear system dynamics are captured using detailed physical and empirical models, including reactant flow, electrochemical behaviour, and thermal effects [1]. Control strategies such as Takagi-Sugeno fuzzy logic, combined with Parallel Distributed Compensation (PDC), are explored to address nonlinearities and improve system stability under varying operating conditions [2,3]. Linear Matrix Inequality (LMI)-based methods are applied to guarantee robust stabilization, ensuring reliable performance during disturbances and dynamic load variations. Optimization algorithms, notably Particle Swarm Optimization (PSO), are employed to fine-tune control parameters, resulting in improved voltage stability and power efficiency [4]. Simulation results, validated using MATLAB, account for real-world challenges, including the impact of Equivalent Series Resistance (ESR) on system performance [5]. These findings highlight the potential of integrated modelling and control methodologies for advancing hydrogen energy applications. *© WDISE 2024 Proceedings*

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Performance modelling of Cu2NiGes4-based solar cells using DFT and SCAPS-1D simulations

Communication Info

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Abstract

The electronic and optical properties of Cu_2NiGeS_4 (CNGS) are investigated through first-principles DFT calculations, employing the mBJ + U potential method for accurate bandgap determination. With an impressive absorption coefficient of 10^4 cm^{-1}, CNGS emerges as a promising material for photovoltaic applications. Using the SCAPS-1D simulation tool, a thin-film solar cell featuring a Mo/MoS$_2$/CNGS/CdS/ZnO/ZnO:Al structure is analyzed. The study evaluates the influence of key parameters, including layer thickness, donor and acceptor concentrations, and defect density in the CNGS layer. Additionally, various buffer layers, such as CdS, ZnS, and Cd$_{1-x}$Zn$_x$S alloys, are assessed for compatibility with different doping concentrations and thicknesses. The results indicate that optimal performance is achieved with an absorber layer thickness of 2000–2400 nm, a MoS$_2$ layer thickness of 100 nm, and a buffer layer thickness of 20–50 nm. Maintaining a CNGS defect density below 10^{14} cm^{-3} is critical for maximizing efficiency. Under optimized conditions, the solar cell achieves a conversion efficiency of 20.05%, a fill factor of 66.77%, a short-circuit current density of 29.67 mA/cm^2, and an open-circuit voltage of 0.983 V.

The new systems based on magnetocaloric effect materials for magnetic refrigeration

Communication Info	Abstract
Authors: El-asri mohamed [1], El boukili aicha [2], Ez-zahraouy Hamid [1] [1] Mohammed v university, rabat [2] Polydisciplinary Faculty of Sidi bennour,Chouaib Doukkali Unversity, El jadida, **Keywords:** Refrigeration systems Magnetocaloric effect (MCE) Magnetic material	Magnetic refrigeration is currently considered one of the serious alternatives to replace traditional refrigeration systems. The problem of emissions from conventional refrigerants (CFC and HCFC), which are used in regular refrigeration machines, could thus be completely resolved by replacing them with new magnetic refrigeration systems. Based on the magnetocaloric effect (MCE), this phenomenon results in the heating or cooling of a magnetic material when magnetized or demagnetized [1]. And the Understanding correlations between crystal structure and magnetism is key to tuning the response of magnetic materials systems that exhibit large functional effects in response to small excursions in magnetic field or strain. In general, The MCE is characterized by the magnetic entropy change (), the adiabatic temperature change (), and the relative cooling power (RCP) [2]. **© WDISE 2024 Proceedings**

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Modelling alcohol consumption: stochastic stability and global dynamics analysis

Communication Info	Abstract
Authors: Sara Soulaimani *Chouaib Doukkali University of El Jadida, FS, Department of Mathematics*	Our paper explores the stochastic stability and global dynamics of a mathematical model for alcohol consumption behaviour. The population is stratified into four compartments: potential drinkers, current drinkers, temporary quitters, and permanently quit drinkers. The model uses a set of deterministic differential equations to describe the interactions and transitions between these groups, further extended to include stochastic components through Brownian motion to reflect real-world variability and randomness. The global stability of the system is assessed using Lyapunov functions, with equilibrium points determined under both deterministic and stochastic scenarios. The inclusion of stochastic perturbations allows for an in-depth analysis of the model's resilience to random fluctuations, emphasizing conditions necessary for the maintenance of alcohol-free and alcohol-present states. Numerical simulations support the theoretical findings, demonstrating the effects of key parameters on drinking behaviour dynamics and the potential success of interventions aimed at reducing alcohol consumption.

Stability analysis of a fractional order unemployment model with a non-linear job creation

Communication Info	Abstract
Authors: MOUJID Salma [1], El AALLAOUI Mohamed [2], KADDAR Abdelilah [1] *1, Chouaib Doukkali University, Morocco* *2 University Hassan II, Casablanca, Morocco*	In this study, we propose a new analysis of a fractional order unemployment model, our system of fractional differential equations considers three dynamic variables: the number of unemployment U, the number of employees E and the number of available vacancies V besides non-linear functions in the matching process and job creation are introduced, in order to enhance the model's realism. The existence and the uniqueness of the model solutions are proved. Also, local and global stability of the two-equilibrium point are established
Keywords: Fractional Order Differential Equations, Unemployment Model, Lyapunov Function, Stability Analysis.	

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mathematical modelling, global stability, sensitivity analysis, and optimal control of merchant adoption dynamics in e-commerce

Communication Info	Abstract
Authors: Hssouni Habib, Omar Balatif *Laboratory of Fundamental Mathematics and Their Applications, Department of Mathematics, Faculty of Sciences El Jadida, Chouaib Doukkali University,* 	In this paper, we introduce a novel mathematical model to analyse the dynamics of ecommerce adoption among merchants. The model captures the key factors influencing adoption behaviours and examines both the spread of e-commerce and resistance to its uptake. Using the next-generation matrix method, we establish the model's well-posedness and derive the basic reproduction number $R0$. Two equilibrium points are identified: the rejection equilibrium $E0$, representing a state of non-adoption, and the widespread adoption equilibrium $E*$, representing a state of large-scale e-commerce adoption. A global stability analysis, based on LaSalle's invariance principle and Lyapunov functions, demonstrates that $E0$ is globally asymptotically stable if $R0 \leq 1$, while $E*$ is globally stable when $R0 > 1$. [1] [2] [3]

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A new approach to modelling multidrug-resistant tuberculosis

Communication Info	Abstract
Authors: Laouina aziza, Bheraoui Zuhair, El Rhoubari Zineb *Faculty of sciences, Chouaïb Doukkali University, El jadida,* **Keywords:** Epidemic models, tuberculosis, drug resistance, global stability.	This talk introduces and examines a new mathematical model for the drug-resistant tuberculosis epidemic. We determine the basic reproduction number R0 and conduct a sensitivity analysis. Furthermore, we investigate the existence and stability of both the disease-free and endemic equilibrium states. **© WDISE 2024 Proceedings**

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Modelling the therapy and the adaptive immune response in an HBV infection model in both liver and the extrahepatic tissue

Communication Info

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Keywords:

Adaptive immune response,
fractional order model,
HBV infection,
intrahepatic global
stability,
numerical simulation.

Abstract

The objective of this paper is to investigate a mathematical model describing the infection of hepatitis B virus (HBV) in intrahepatic and extrahepatic tissues. Additionally, the model includes the effect of the cytotoxic T cell (CTL) immunity, which is described by a linear activation rate by infected cells. The positivity and boundedness of solutions for non-negative initial data are proved, which is consistent with the biological studies. The local stability of the equilibrium is established. In addition to this, the global stability of the disease-free equilibrium and the endemic equilibrium is fulfilled by using appropriate Lyapunov functions. Finally, numerical simulations are performed to support our theoretical findings.

The optimal control strategies for typhoid transmission with cost-effectiveness

Communication Info	Abstract
Authors: Khadija OUBOUSKOUR, Omar BALATIF *Laboratory of Fundamental Mathematics and Their Applications, Department of Mathematics, Faculty of Sciences El Jadida, Chouaib Doukkali University* 	Salmonella is a prevalent bacterium that poses a significant public health concern due to its potential to cause food borne illnesses like typhoid fever. Understanding Salmonella's behaviour and developing effective management strategies are crucial steps in safeguarding public health. This research examines various methods of managing the environment to clear out Salmonella germs and restrict the extension of typhoid fever in Taiwan. To achieve this, we use Pontryagin's maximum principle to find the most efficient control measures by Repetitively solving the optimal system. To validate our theoretical study, we run numerical simulations using MATLAB.

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Bifurcation analysis of a kaldor-kalecki business cycle model with population effect

Communication Info	Abstract
Authors: Sanaa EL Fadily[1], Abdelilah Kaddar[2] *[1] Mohammadia School of engineering, Mohammed V University, Rabat, Morocco.* *[2] ENSA, Chouaib Doukali University, El jadida, Morocco* 	In this work, we consider the Kaldor-Kalecki business cycle model with two delays. We first discuss the existence of local Hopf bifurcation. The study investigates the stability of positives equilibria and the existence of limit cycles by using Hopf bifurcation theorem. The role of the time delays in the variables of the proposed model and possible links between them at various phases (stability, limit cycle and instability) are also examined in this study. Finally, to illustrate our analytical results, some numerical simulations are presented.

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