2024 Mediterranean Smart Cities Conference (MSCC 2024)

Martil - Tetuan, Morocco
2-4 May 2024

IEEE Catalog Number: CFP24VE5-POD
ISBN: 979-8-3503-7401-8

Copyright © 2024 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number: CFP24VE5-POD
ISBN (Print-On-Demand): 979-8-3503-7401-8
ISBN (Online): 979-8-3503-7400-1

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

Table of Contents

Linear Programming for Real-Time Renewable Energy Operation in Low Energy Buildings 1
El Hafdaoui, Hamza; Khallaayoun, Ahmed
Cooperative and Connected Mobility Services in the Cloud-Edge Continuum with Function As A Service Technology and AI-enabled Orchestration 10
Lalaguna, Antonio; Townend, Paul; Ojaghi, Behnam; Vázquez, Constantino
Multi parameter Multilevel (MPML) Based Trust Management System for Healthcare 16
Ahire, Bhawana A; Sakhare, Dr.S. R.
Towards a framework for building a decision support systems for customer satisfaction assessment in tourism sector 21
Souha, Adnane; Benaddi, Lamya; Ouaddi, Charaf; Jakimi, Abdeslam; Elmahi, Bouziane
Process-Aware Internet of Things Model: A Discovery Method Using IoT Data and Process Mining Techniques 26
Kodssi, Iman El; Hanae, Sbai; Mustapha, Kabil
Sustainable Paths: Strategies for Efficient Routes in Reducing Fuel Consumption and Pollutant Emissions in Sao Paulo 30
Blasio, Murilo; Cipparrone, Flavio
Deformation monitoring surveys of roads and railways 34
Mickrenska, Christina; Ivanov, Roumen; Babunska-Ivanova, Nevena
Stakeholder involvement in sustainable urban development: An analytical approach to the Tangier case. 38
Salim, Jihane; Abakouy, Mostafa
Feasibility Study of a Piezoelectric Footstep Power Generator for Smart University Campus 46
Bamoumen, Hatim; El Hafdaoui, Hamza; Khallaayoun, Ahmed
Fine-Tuning PI Controller Parameters for an Efficient Wind Energy Extraction System through Mean Squared Error (MSE): A Control System based on Ant Colony Optimization for MPPT 55
Mrabet, Najoua; Benzazah, Chirine; El Akkary, Ahmed; Chakib, Mohssine; Lahlouh, Ilyas
Towards Smart and Inclusive Cities: MOBILAÎNÉS Project - Innovating Age-Friendly Mobility Solutions for Older Adults 61
Tahir, Sahar; Abdulrazak, Bessam; Baillargeon, Dany; Bahrampoor Givi, Sara; Girard, Catherine; Pigot, Hélène Hp; Provencher, Véronique
Smart Cooling System Applied for Vaccines Warehouse Temperature/Humidity Monitoring 67
Tribak, Hicham; Gaou, Mehdi; Hamidi, Charaf; Bendahmane, Ahmed; Gaou, Salma
Light-PoEDDP: A Fast and Lightweight RSA-Based Proof of Possession of Outsourced Data & Correct Computation 73
Harchaoui, Abdel Ali A; Machti, Abdellatif; Younes, Ali; El Hibaoui, Abdelaaziz; Bendahmane, Ahmed
Transformer Models for EV Charging Demand Forecasting: Comparing Attention Mechanisms 81
Manzoor, Taniya
Estimation of Transmission Line Parameters in Modern Power Systems from Phasor Measurements 86
Saldanha, Emmanuel; Pacheco, Maria F.; Ferreira, Ângela
Towards an Integrated Smart City Platform: A Prototype for Enhancing Urban Services 91
Tanji, Assia; Essaaidi, Mohamed; Halhoul Merabet, Ghezlane
Integrating UAV-Based Aerial Monitoring and SSD for Enhanced Traffic Management in Smart Cities 97
Bakirci, Murat; Bayraktar, Irem
Improving Coastal and Port Management in Smart Cities with UAVs and Deep Learning 103
Bakirci, Murat; Bayraktar, Irem
Towards Effective Local Financial Cybercrime Detection using Machine Learning 109
Dirchaoui, Marouane; Abarda, Abdallah
Robot Path Planning Using Fuzzy Tsukamoto Simulated Annealing 115
Meliani, Hibatallah; Ohamouddou, Said; Elafia, Hanaa; Boulaich, Mohamed Hamza; Elafia, Abdellatif
Enhanced Cascade Schemes for Advancing Machine Learning-Based Prediction of Heating and Cooling Loads in Residential Buildings 119

Izonin, Ivan; Tkachenko, Roman; Shcherbii, Ostap; Muzyka, Roman; Faramarzi, Asaad; Mitoulis, Stergios Aristoteles

Exploring Feedforward Knowledge Management for Smart and Substainable Cities 124
Laurini, Robert D.

Dynamic Decomposition of Monolith Applications Into Microservices Architectures 130
Ait Mansour, Nassima; Sbai, Hanae; Baina, Karim

Transforming Student Advising in Smart Cities: **A Deep Learning Conversational AI Chatbot** 134
Assayed, Suha K.; Al Khatib, Manar; Shaalan, Khaled

The Impact of Earthquakes on Air Pollution: **Machine Learning-Based Air Quality Analysis Following the Kahramanmaras¸ Earthquakes** 140
Eryilmaz, Furkan; Güzel, Metehan; Şimsek, Mehmet Ulvi; Kök, Ibrahim; Ozdemir, Suat

Supervised Machine Learning Algorithms for the Prediction of Students Long Jump distance 146
Karim, Midoul; Badr Eddine El Mohaijr, El Mohaijr; Outman, El Hichami; Souri, Adnan

Port Waste Management: **Comparative Study of Ship Generated Waste System** 152
Hamraoui, Anass; Lissaneelhaq, Saad; Ech-Cheikh, Hamid; Chaoui, Mohammed; Loukili, Ahmed

The Living Lab Approach and the Challenges of Urban Mobility within a Moroccan Context: **The Mediating Role of Open Innovation** 158
El Broumi, Soufiane; Eddelani, Oumhani; Eddahmouny, Hicham

Enhancement of Diabetic Retinopathy Prediction-Based Capsule Network and DenseNet-121 Utilizing Wavelet Decomposition 164
Oulhadj, Mohammed; Riffi, Jamal; Khodriss, Chaimae; Mahraz, Mohamed Adnane; Yahyaouy, Ali; Abdellaoui, Meriem; Andaloussi, Idriss Benatiya; Tairi, Hamid

A New Design of a Planar High Gain Base Station Antenna Array for 5G Cellular Communication 170
Farid, El Ghaoual; Jamal, Zbitou; Aziz, Oukaira; Ahmed, El Oualkadi; Salaheddine, Aourik

IoT-based Adaptive Traffic Signal Controller to Optimize the Flow of Traffic and Reduce Congestion 175
Almulla, Kendah; Ashkanani, Shathar; Hassan, Fatimah; Almesbahi, Hawraa; Alazmi, Manar; Nadeem, Muhammad

Enhanced Brain Tumor Segmentation via Transfer Learning and Attention Mechanism 181
Aboussaleh, Ilyasse; Riffi, Jamal; Khalid, El Fazazy; Mahraz, Mohamed Adnane; Tairi, Hamid

Smart Grid Security: **Innovative Approaches for Threat Detection and Countermeasures** 187
Bhadani, Ujas

Numerical study on the effect of thermal pad on thermal management of multi-chip LED COB 195
Elnouino, Houda; Bendaou, Othmane

Crowd Understanding in Railway Station using Video Analytics and Hybrid Belief Rule Base 201
Hidayat, Fadhil Fh; Elviani, Ulva; Supangkat, Suhono; Alunjati, Figo Agil; Kinanda, Rezky

Enhancing Road Safety: **Automated Traffic Violation Detection and Counting System Using YOLO Algorithm** 206
Charef, Ayoub; Jarir, Zahi; Quafafou, Mohamed

Assessment Transformation in the Age of AI: **Moving Beyond the Influence of Generative Tools** 212
Farag, Wael A; Nadeem, Muhammad; Helal, Magdy

Global Fuzzy Mamdani Simulated Annealing applied to traveling salesman problem 218
Meliani, Hibatallah; Boulaich, Mohamed Hamza; Elafia, Hanaa; Ohamouddou, Said; Elafia, Abdellatif

A Method for Anomaly Detection of Unmanned Aerial Vehicles (**UAVs**) 222
Yavuz, Muhammed; Kaya, Mehmet

Exploring The Use of Robotic Process Automation in Smart Cities 228
El Haoulani, Mariame; Bendahmane, Ahmed; El Yazid, Dari

Decadal Trends in Smart Healthcare: **A Bibliometric Review of Smart City Innovations** 234
Lafraxo, Mohammed Amine; Soulaymani, Abdelmajid; Hami, Hinde

Advancements in Airport Security Technologies: **A Patent Analysis** 240
Eleimat, Mahmoud; Alharasees, Omar; Oszi, Arnold

A Sketch of a MDA Approach to Accelerate the Development of User Interfaces in Tourism Web Applications 245
Naimi, Lahbib; Elmahi, Bouziane; Jakimi, Abdeslam; El Bermi, Lahcen

Single Row Facility Layout Problem using Fuzzy Larsen Simulated Annealing 250
Meliani, Hibatallah; Ohamouddou, Said; Boulaich, Mohamed Hamza; Elafia, Hanaa; Elafia, Abdellatif

Exploring the Efficacy of Methods used in Student Orientation Systems: **A Review** 254
Reguragui, Samira; Bendahmane, Ahmed; El Aidi, Abdellatif; Boudra, Said; Ennakra, Mouad

Design of a planar Transversal Signal Interference-Based Bandstop Filters for Millimeter-Wave 259

Applications
Salaheddine, Barou; Jamal, Zbitou

Normalized frequency calculation and associated dispersion fields profiles of a multilayered FGM structure 263
Naciri, Ismail; Raghib, Rabab; Khalfi, Hassna; Elmaimouni, Lahoucine; Benami, Abdellah; Tribak, Hicham

Optimizing Waste Sorting: A CNN-Based Solution Offering Incremental Improvements in Image Classification Over VGG16 269
Ajana, Laila; Souri, Adnan; El Mohajir, Badr Eddine; El Hichami, Outman; Al Achhab, Mohammed; Zbakh, Abdelali

FWM Crosstalk Reduction in 32-Channel DWDM Optical Network using Unequal Channel Allocation and Chirped FBG 275
Chaoui, Fahd; El Harrak, Abdellah Yassine; Chakkour, Mounia; Chaari, Mohamed Zied; Aghzout, Otman

Smart Education, Robot-Prof: Principles of Programming for Personalized Pedagogy 281
Saber, Elotmani

DeBERTa-Enhanced Extreme Multi-Label Classification for Biomedical Articles 286
Ndama, Oussama; Ismail, Bensassi; El Mokhtar, En-Naimi

Long-range, low-power for IoT devices: The LoRa Network a review 291
Bougaddou, Hasnaa; Cherkaoui, Nazha; Mouhib, Omar

The Digital Transformation as a Lever for Territorial Development – Case Study of an Urban Municipality in Morocco 297
Benjouid, Zakaria; Aboulhouda, Zineb; Bounou, Salah Eddine

Leveraging AI and Deep Learning for Spiritual Focus in the Modern Muslim Experience 303
Boudakkou, Safouane; El Hibaoui, Abdelaaziz

Ultra-Wideband Cross-Polarization Conversion Metamaterial Unit Cell Stable To Incident Angles At C-Band 308
Barkal, Youssef; Jamal, Zbitou; El Abdellaoui, Larbi; Oukaira, Aziz; Hefnawi, Mostafa

Cultural Heritage Preservation in the Digital Age: Balancing Tradition and Innovation in Mediterranean Smart Cities 313
Al Hosni, Aida

Rethinking Assessment Methodologies in the Era of Artificial Intelligence: Expanding Beyond ChatGPT's Scope 319
Nadeem, Muhammad; Farag, Wael; Helal, Magdy

A New Design of a Microstrip BandPass Filter based on SRR Structure 325
El Maimouni, Soufiane; Aytouna, Fouad; Jamal, Zbitou

A Lightweight Blockchain Architecture for IoT Based on Delegated Nodes 329
Yassin, Elgountery; Lasaad, Meryem; Mohamed, Oualla; Jakimi, Abdeslam; Sadki, Hassain

Handover Detection based on Dimension estimation 335
El Hanjri, Adnane

CFD Simulation of Wind Load on tall Modified Building Shapes 340
Abdellah, Idrissi; El Amraoui, Rachid; El Mghari, Hicham

Classification of Indoor CO2 Levels: Exploring the Impact of Humidity, Temperature, and Occupancy on Air Quality Using Machine Learning Model 344
Dani, Yassine; Belouaggadia, Naoual; Jammoukh, Mustapha; Ennadafy, Hamza

Enhancing Disaster Enhancing Disaster Management by leveraging Smart Cities Technologiesr Management by leveraging Smart Cities Technologies 352
Elshoukry, Hossam Hm

Machine Learning Algorithms Applied to Post-bac Academic Guidance 360
Lafdoul, Salim; Baadou, Sana; Bendahmane, Ahmed

Smart irrigation integrate to IOT technology based on deep learning's algorithm LSTM 364
Meddaoui, Mohamed Amine; Erritali, Mohammed

Optimizing City Services through Configurable Change Mining: Implementation of the Variability Change Tree Approach 369
Hmami, Asmae

Leveraging Mobile Apps for Citizen-Centric Urban Planning: Insights from Tajawob Implementation 375
Kettani, Houssain; Fahsi, Alae

RIS-aided Downlink NOMA MIMO VLC-Based IoT Devices 379
El Jbari, Mohamed; Moussaoui, Mohamed; Chahboun, Noha

Smart guidance systems for Moroccan Students 385

Reguragui, Samira; Bendahmane, Ahmed; El Aidi, Abdellatif; Boudra, Said; Ennakra, Mouad

The Growing Influence of Environmental Psychology in Architectural Design 390
Benthami, Abdelilah

Intelligent Agent Systems: Evolving Decision-Making Models and Applications 395
Boujia, Mohammed Amine; Sabbane, Mohamed M.

People-Centric Smart City Services Measurement Using Garuda Smart City Framework 400
Santosa, Iqbal; Supangkat, Suhono; Arman, Arry Akhmad

An Improved Hybrid Sampling Method for Classifying imbalanced Data to Predict Student Performance 405
Bellaj, Mohamed; Bendahmane, Ahmed; Boudra, Said; Ennakra, Mouad

A systematic review of smart campus technologies to improve students' educational experiences. 412
Bellaj, Mohamed; Bendahmane, Ahmed; Younes, Ali; Boudra, Said; Ennakra, Mouad

Fuzzy Takagi-Sugeno Simulated Annealing for simple assembly line balancing problem 419
Meliani, Hibatallah; Boulaich, Mohamed Hamza; Ohamouddou, Said; Elafia, Hanaa; Elafia, Abdellatif

New Approach: Intelligent System-Based Object Detection in Smart Parking 423
Boulaich, Mohamed Hamza; Ohamouddou, Said; Meliani, Hibatallah; Ennasar, Mohammed Ali; Elafia, Abdellatif

An advanced Technology Utilizing IoT and Machine Learning to Predict Power Consumption 429
Boulaich, Mohamed Hamza; Ohamouddou, Said; Meliani, Hibatallah; Ennasar, Mohammed Ali; Elafia, Abdellatif

A New Configuration of a Microstrip 180° Hybrid Reconfigurable Coupler 435
Guermal, Mohamed; Jamal, Zbitou; Hefnawi, Mostafa; Aytouna, Fouad; Khoulji, Samira

Tourist experiences in smart Cities. 439
Kacem, Salmi; Aziz, Hmioui

Study and design of a 64-element millimeter radar antenna for automotive applications 444
El Haiddad, Mohamed Lemine Mohamed; Jamal, Zbitou; Hefnawi, Mostafa; Aourik, Salaheddine

Recommender Systems with Graph Neural Networks: A Comparative Study 448
Hamidi, Charaf; Gaou, Mehdi; Tribak, Hicham; Gaou, Salma

Synergistic Interplay in Smart Cities: Mobility, Governance, and Environment – A Review 454
Dribi, Asmae; Essaaidi, Mohamed; Halhoul Merabet, Ghezlane

Low-Cost Real-Time Fire Detection in Smart Cities: Logistic Regression Is All You Need 461
Ohamouddou, Said; Boulaich, Mohamed Hamza; Meliani, Hibatallah; Ennasar, Mohammed Ali; El Afia, Abdellatif

Intelligent Water Faucet for Real-Time Water Conservation in Smart Cities 467
Ohamouddou, Said; Boulaich, Mohamed Hamza; Meliani, Hibatallah; Ennasar, Mohammed Ali; El Afia, Abdellatif

Streetlight Inventory and Illuminance Mapping with Low-Cost IoT and Cloud-based GIS Integration for Enhanced Energy Efficiency 473
Ben Hichou, Badr; Mouhti, Malika; Jamil, Abdelmajid

Enhancing Photovoltaic System Electrical Efficiency through Integration of Thermoelectric Generators: A Numerical Investigation 480
Amallal, Fatima; Belkassmi, Youssef; Kotri, Abdelhadi; Sahal, Mustapha Prof.

Transforming Customer Experiences with Customer-Centric AI-Powered Chatbots in the Fourth Industrial Revolution 485
Waladi, Chaimae; Lamarti Sefian, Mohammed; Khaldi, Mohamed

Enhancing Personalised learning through smart education: A catalyst for workforce development in smart cities 490
Jdidou, Youssef; Aammou, Souhaib

AI Chatbots Use Among Bachelor Students in Morocco : Perspectives and Concerns 495
El Aida, Kaoutar; Yassine, Fatima Ezzahra; Lahiala, Mohamed Amine; El Kortbi, Imane; Maati Alaoui, Fennane Moulay; Lahiala, Abdelfattah

Voice Biometric Technology: Enhancing Public Safety and Security in Smart Cities 500
Ben Abdel Ouahab, Ikram; Elaachak, Lotfi; Bouhorma, Mohammed; Alluhaidan, Yasser; Zafar, Bassam

Intelligent Recommendation Systems: Literature Review on Recommendation Techniques and Their Use in Education 506
Baadou, Sana; Lafdoul, Salim; Bendahmane, Ahmed

Optimizing Student Classification in Smart Education using Factor Analysis by Deep Boltzmann Machines and a Deep Learning Approach Improved by Bayesian optimization. 510

Laakel Hemdanou, Abde Rrafik

Integrating Blended Learning in Teacher Training: A Comprehensive Review 515
Chekour, Mohammed; El Morabit, Nadir; Benqassou, Issam; Lechhab, Abdelhamid; Elhars, Fouad; Hafid, Moulay Mustapha

Intelligent Energy Harvesting and Magnet Induction for Mobile Phone Charging 519
Mrij, Abdellah; Saidi, Tarik; El Bakkali, Abdelmajid; Atourki, Lahoucine; Foshi, Jaouad

Unveiling the Influence of AI-Social Fusion: Enhancing Consumer Community Engagement and Advertising Dynamics 526
Yassine, Fatima Ezzahra; El Kortbi, Imane; Nekhass, Houssame; El Aida, Kaoutar; Lahiala, Mohamed Amine; Housni, Hamid

Examining the role of Artificial Intelligence on Educational Enhancement: A Comprehensive Literature Review 532
Azzi, Oumaima; Ben Boumediane, Manar; Nekhass, Houssame; Janati-Idrissi, Rachid; Zerhane, Rajae

Digital Transformation and Artificial Intelligence: A New Horizon for Higher Education Effectiveness 537
Nekhass, Houssame; Yassine, Fatima Ezzahra; Ben Boumediane, Manar; Azzi, Oumaima; Lahiala, Mohamed Amine; Lahiala, Abdelfattah