



Book of Abstracts

2026 International Conference on Recent Advances in Information Systems (ICRAIS)

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Editors

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Preface

We are pleased to present the Book of Abstracts for the 2026 International Conference on Recent Advances in Information Systems (ICRAIS). The research compiled within this volume showcases the evolution of information systems, increasingly shaped by advancements in artificial intelligence. A central theme is the integration of AI and machine learning not as standalone technologies, but as core components that enhance the design, function, and impact of modern information systems.

This is reflected in a broad spectrum of research. Readers will find a strong focus on large language models and Retrieval-Augmented Generation (RAG), with studies on conversational knowledge systems for tax auditing, semantic document retrieval in public administration, the transfer of RAG to internal audit, automated industry classification, and the provisioning of data for LLM agents. Distributed and trustworthy architectures are another recurring theme, from decentralized federated learning and blockchain-based orchestration to tamper-proof digital evidence and routing in payment channel networks. The practical utility of computer vision is demonstrated in warehouse inventory counting, edge-based semantic surveillance, computational pathology, plant disease detection, and human motion analysis, while further contributions address explainable and fairness-aware machine learning for churn prediction, customer segmentation, healthcare screening, and energy-aware model selection.

Furthermore, the scope of this work extends beyond technical implementation to address the role of information systems in tackling pressing societal challenges. Many contributions examine generative AI in education and research, addressing academic integrity, ethical and normative frameworks, AI-supported admissions, inclusive vocational training, and the perceptions of students and software developers. Cybersecurity and digital safety are considered for organisations, senior citizens, and young digital users, and the theme of sustainability is prominent in work on green AI, sustainable digital infrastructure, citizen air-quality portals, and secure fisheries monitoring for the blue economy. These abstracts reflect the global and collaborative nature of our field, bringing together perspectives on digital transformation, e-government adoption, and responsible AI governance across Africa, Europe, Asia, and the Americas.

We hope this collection serves as a valuable reference for attendees and the wider research community, providing insight into current trends and acting as a catalyst for future discussions and collaborations. We are grateful to all authors, reviewers, and session chairs who have contributed to making this conference a success.

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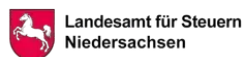
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This conference would not have been possible without the generous support and commitment of our sponsors and partners. We are deeply grateful for their contribution to advancing research in information systems and technology. We extend our heartfelt thanks to all our sponsors who have made this event a reality through their dedication to fostering academic excellence and innovation.

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Classification of learning strategies using artificial intelligence for ultra-personalization in higher education

Paper ID: P7

Karla Yohana Sánchez-Mojica, Ender José Barrientos Monsalve and Luis Asunción Pérez-Domínguez

Abstract. Hyperpersonalized education has become a key strategy for addressing the diverse profiles and needs of students in higher education, relying on the use of data analytics and artificial intelligence. In this context, this study proposes the development and evaluation of supervised learning models for the automatic classification of learning strategies, aiming to provide empirical evidence to support data-driven pedagogical decision-making. To this end, an open educational dataset of 1,933 records and variables associated with auditory, visual, concentration, and linguistic competence difficulties was used, with preferred learning strategy serving as the target variable.

Methodologically, the study adopts a quantitative, non-experimental and cross-sectional approach, framed within Educational Data Mining and Learning Analytics. Three widely used classification models were trained and compared: Logistic Regression, Random Forest, and Support Vector Machines (SVM). Model performance was evaluated using standard metrics such as accuracy, recall, F1-score, and area under the ROC curve (AUC). The results show outstanding model performance, with accuracy and F1-score values exceeding 96% and AUCs approaching. Logistic Regression and SVM stood out for their greater overall accuracy. These findings confirm the viability of using classic machine learning models to support the hyper-personalization of learning in higher education, contributing to the design of adaptive, explainable, and student-centered learning environments.

Keywords: Educational analytics, Supervised learning, Learning strategies, Artificial intelligence, Educational hyperpersonalization

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An Empirical Evaluation of BMSSP and Dijkstra's Algorithm for the Lightning Network

Paper ID: P9

Danila Valko, Rohan Paranjpe and Jorge Marx Gómez

Abstract. Efficient routing is critical for payment channel networks (PCNs) such as the Lightning Network (LN), where shortest-path computations are commonly performed using Dijkstra-based algorithms. Recent theoretical work introduced the Bounded Multi-Source Shortest Path (BMSSP) algorithm, which achieves an asymptotically faster running time than Dijkstra's algorithm on sparse directed graphs. This paper presents an empirical evaluation of BMSSP on real-world LN topology snapshots and compares its performance with a standard Dijkstra implementation written in Rust. Across five LN snapshots and 100 randomized source-node trials per snapshot, BMSSP consistently exhibited higher runtimes than Dijkstra's algorithm, with statistically significant differences observed in all evaluated datasets. These findings indicate that, for current LN graph sizes and the implementations studied, BMSSP does not provide practical runtime advantages despite its stronger asymptotic guarantees. Rather than demonstrating a routing acceleration technique, this work contributes an LN-specific empirical case study of a recently proposed shortest-path algorithm and highlights the gap between theoretical complexity improvements and practical performance on contemporary payment-channel-network topologies.

Keywords: Routing algorithms, Dijkstra's Algorithm, Sparse graphs, Payment channel networks, Lightning network

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Computer Vision for Automated Inventory Counting in Warehouse Environments: A Structured Literature Review

Paper ID: P10

Steffen Meeuw and Jorge Marx Gómez

Abstract. Accurate inventory counting is essential for warehouse efficiency, yet traditional methods remain labor-intensive and error-prone. Recent advances in computer vision (CV) enable automated, scalable, and non-intrusive inventory counting by leveraging visual perception for object detection, identification, and localization. This paper presents a structured literature review on computer vision-based automated inventory counting in warehouse environments, aiming to map the current state of the art and identify research gaps. Based on a systematic search across six major databases and qualitative content analysis of 35 peer-reviewed studies, we analyze approaches along four core components: detection of stored objects, item identification, quantity determination, and assignment to storage locations. Our findings reveal a strong research bias toward indoor, structured warehouse settings with standardized handling units, predominantly using unmanned aerial vehicles (UAVs) or mobile robots with RGB cameras. While label-based counting and object detection dominate, methods for irregular or bulk items, robust spatial assignment, and integration with Warehouse Management or Enterprise Resource Planning systems are underdeveloped. This review provides a comprehensive synthesis of existing work, highlights methodological trends, and outlines open challenges to guide future research toward more practical and adaptable vision-based inventory solutions.

Keywords: Computer Vision, Inventory Management, Object Detection, Systematic Literature Review

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Characterizing Outdoor Warehouse Environments for Automated Inventory

Paper ID: P11

Steffen Meeuw and Jorge Marx Gómez

Abstract. Inventory management in outdoor warehouses presents unique challenges due to the high heterogeneity of storage environments, storage units, and identification means, which prevents the direct transfer of established indoor automation approaches to outdoor settings. Existing approaches to automated inventory are predominantly designed for indoor warehouses with standardized handling units and fixed rack systems. A systematic description model that captures the diversity of outdoor warehouse environments is currently missing. In this paper, we develop a morphological box for outdoor warehouse environments following the taxonomy development method by Nickerson et al. The model builds upon an existing abstract spatial representation of outdoor warehouses and comprises three main categories (Storage Area, Storage Unit, and Inventory Object), twelve dimensions, and 49 characteristics. It is developed through three iterations combining conceptual-to-empirical and empirical-to-conceptual approaches, drawing on published literature and practical field experience. We demonstrate the applicability of the model by classifying five real-world outdoor warehouse scenarios. The model provides a technology-independent foundation for the context-specific design of automated inventory solutions – whether based on UAVs, autonomous ground vehicles, stationary camera systems, or other sensing platforms.

Keywords: Outdoor Warehouse, Morphological Box, Inventory Management, Inventory Automation, Logistics

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A preliminary enquiry: Toward conceptually stating the performance complexity problem of a single electronic health record for South Africa

Paper ID: P12

Wesley Moonsamy

Abstract. Electronic health records (EHRs) support patient care by facilitating doctors' access to patients' medical information prior to or during a patient examination. A single EHR could afford further benefits by providing a more comprehensive view of the patient. The Federated Health Information Architecture in South Africa proposes centralizing patient records, enabling a single EHR. However, a centralized repository requires more than just architectural design input; it also requires an understanding of the performance considerations involved in combining patient records. This conceptual research paper contributes to a preliminary understanding of how to state the performance considerations for a single EHR. The existing South African healthcare landscape was first used to conceptualize an initial formula for estimating the requisite time to compile an individual patient's single EHR. Three other models, (1) the traveling salesman model, (2) the neighborhood search model, and (3) the queueing model, were assessed to determine whether they can contribute towards stating the performance considerations of a single EHR for South Africa. The preliminary performance estimation formula revealed that transferring the processing to the edges (facilities) can have unknown performance consequences, as these facilities are not centrally controlled. Bandwidth and the probability of finding the patient record also play a crucial part in compiling the single EHR.

Keywords: single electronic health record, electronic health records, Federated Health Information Architecture, traveling salesman, neighborhood search, queueing model, edge computing, digital health

Blockchain Technology in Higher Education Management: A Scoping Review

Paper ID: P14

Silvio Langer, Fabiano Hessel and Jorge Marx Gómez

Abstract. This scoping review maps empirical research on blockchain applications in higher education from a business and management perspective. Following the methodological framework proposed by Arksey and O'Malley, enhanced by Levac et al., and aligned with the Kitchenham and Charters guidelines for software engineering reviews, we report our findings using the PRISMA extension for scoping reviews (PRISMA-ScR). We searched three academic databases (ERIC, Web of Science, and Scopus), retrieved 628 articles, and selected 39 empirical studies for analysis. Our results identify management opportunities presented by blockchain, including process optimization (38.46%), decentralized data management (36.54%), and fraud prevention (25.00%). Certificate and diploma management (32.56%) and academic records management (34.88%) emerged as the most prevalent applications. Policy impact was distributed across credentialing, data security, governance, and interoperability, while integration and scalability issues (36.36%) and data privacy compliance (27.27%) represent the main challenges. The review concludes by suggesting future research directions on legal frameworks, system integration, and skill development to facilitate blockchain adoption in higher education.

Keywords: Blockchain, Scoping Review, Higher Education, Management, Business

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VCGForFed: A Fault-Tolerant Blockchain Orchestration Protocol for Decentralized Federated Learning

Paper ID: P17

Juan A. Torres De La Chica, Bruno Ramos-Cruz, Francisco J. Quesada-Real and Luis Martínez

Abstract. Unlike traditional Federated Learning (FL), Decentralized Federated Learning (DFL) operates without a central server for model aggregation and global synchronization. However, the absence of a global orchestrator introduces critical operational bottlenecks: (i) liveness failures and deadlocks caused by complex inter-client dependencies in mesh or ring topologies; and (ii) state inconsistencies and asynchronous model drift arising from heterogeneous communication capabilities. Collectively, these issues severely limit the robustness and convergence of DFL in real-world scenarios characterized by unpredictable node churn. To address these challenges, this contribution introduces a blockchain-based orchestration protocol tailored for DFL systems. By providing a deterministic coordination plan, this work establishes a robust reference architecture designed to guide researchers and practitioners in deploying fault-tolerant, serverless federated networks.

Keywords: Decentralized Federated Learning, Blockchain, Blockchain Orchestration, Smart Contracts, VCG Mechanism, Fault Tolerant

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The Role of TikTok's Algorithm in the Creation of Echo Chambers that Shape Mental Health Beliefs and Perceptions of Users

Paper ID: P20

Kian Joubert and Maureen Tanner

Abstract. This study examined how TikTok's algorithmic personalisation and engagement loops influence the visibility of mental-health content, shaping users' beliefs and perceptions within echo chambers. Following a digital ethnography approach, the research applies the Feedback Loop Model and the Echo Chamber Detection Pipeline to analyse data from semi-structured interviews and mental health tagged videos available on TikTok. Five interconnected themes emerged: the Algorithmic Funnel, Echoes of Validation, the Rise of the TikTok Diagnosis, the Emotional Economy, and Wrestling with the Machine. These themes illustrate how algorithmic curation, confirmation bias, cognitive dissonance, and homophily create emotionally cohesive yet informationally narrow spaces that normalise self-diagnosis and influence digital identities. Two conceptual contributions are proposed: affective homophily, describing clustering based on shared emotions, and negotiated control, referring to how users' limited agency manifests in resisting algorithmic influence. The study has practical implications for algorithmic transparency, and the development of healthier online mental-health environments.

Keywords: TikTok, recommendation algorithm, digital echo chambers, confirmation bias, digital identity

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Tamper-Proof Digital Evidence in Consumer Protection: A Hybrid DLT and Crowd-Verification Architecture

Paper ID: P21

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Abstract. Consumer protection organisations face increasing difficulty preserving court-admissible evidence of online violations. Web content is transient and easily modified, while conventional preservation methods lack the integrity guarantees that civil procedural law demands. Existing approaches rely on a single capturing entity, offering no independent corroboration of the documented state. This paper presents EVIDENTT, a hybrid architecture that combines distributed ledger-based integrity anchoring with automated crowd-based re-capture. When a potential violation is reported, multiple independent machines concurrently document the same web content, each producing a separately anchored cryptographic proof. A strict separation between immutable on-chain hash records and encrypted off-chain evidence files reconciles blockchain permanence with General Data Protection Regulation (GDPR) deletion obligations, while client-side encryption prevents any intermediary from accessing plaintext evidence. Nine regulatory requirements derived from German civil procedural law, the Regulation on electronic identification and trust services (eIDAS), and the GDPR guided the architectural design. A functional prototype was validated through a small-scale test and expert interviews with a judge, lawyers, and consumer protection practitioners, confirming both technical feasibility and practical relevance. While grounded in German enforcement practice, the architecture generalises to any jurisdiction requiring tamper-proof preservation of transient web content for legal proceedings.

Keywords: Digital Evidence Preservation, Distributed Ledger Technology (DLT), Consumer Protection, Crowd-based Verification, Tamper Resistance

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Towards an ICT Readiness Assessment Framework for Under-Resourced Schools: Evidence from the Eastern Cape, South Africa

Paper ID: P22

Reino Erasmus

Abstract. This study establishes an empirical foundation for designing a context-sensitive ICT readiness assessment framework for under-resourced schools, drawing on data collected in the Eastern Cape, South Africa. Although ICT integration is widely promoted as a means of enhancing teaching and learning, existing approaches are often fragmented and insufficiently responsive to socio-technical and contextual realities. A two-stage mixed-methods design was employed. An initial survey was conducted across 80 public Quintile 1-3 schools in the Eastern Cape, after which 20 schools displaying comparatively strong combinations of enabling conditions for ICT integration were purposively selected for focused investigation. These schools therefore constituted an information-rich purposive sample rather than a statistically representative cross-section of all schools in the province. The findings revealed seven persistent misalignments across the key dimensions of ICT integration, including infrastructure and access, teacher capacity, leadership support, pedagogical practice, learner agency, institutional digital culture, and socio-economic and contextual constraints. The findings demonstrate that ICT readiness emerges through the interaction of these dimensions rather than through isolated indicators. The study contributes a structured and layered approach to understanding ICT readiness, providing a foundation for developing an integrated, context-sensitive assessment framework for under-resourced educational environments.

Keywords: ICT readiness, ICT in education, under-resourced schools, socio-technical systems, digital inequality, educational technology, mixed-methods research, South Africa, ICT integration, context-sensitive frameworks

Navigating the Ethical Landscape of Generative AI in Higher Education: A Multi-Level Normative Framework

Paper ID: P24

David Klotz

Abstract. The rapid integration of Generative AI (GenAI) tools into higher education institutions raises profound ethical questions that existing institutional policies are ill-equipped to address. While a growing body of literature examines individual ethical concerns, such as academic integrity, data privacy, or algorithmic bias, there is a notable absence of comprehensive normative frameworks that systematically connect macro-level regulatory principles to meso-level institutional governance and micro-level pedagogical practice. This paper addresses this gap by developing a multi-level conceptual framework for the ethical integration of GenAI in higher education. Drawing on a structured analysis of established normative instruments, including the EU AI Act, the UNESCO Recommendation on the Ethics of Artificial Intelligence, and the OECD AI Principles, we identify and synthesise recurring ethical dimensions across three analytical levels: regulatory, institutional, and pedagogical. Our framework organises these dimensions along six core pillars: transparency and explainability, fairness and non-discrimination, privacy and data governance, accountability, human oversight, and educational integrity. For each pillar, we articulate specific implications for higher education stakeholders: policymakers, institutional leaders, educators, and students. The paper contributes to the discourse on responsible digital transformation in higher education by offering a structured, theoretically grounded instrument that makes explicit the translation steps between high-level ethical principles and their operationalisation in educational practice, providing a basis for empirical validation and institutional application.

Keywords: Generative AI, Higher Education, AI Ethics, Normative Framework, EU AI Act, Educational Integrity

Towards a Transferability-Ready Qualitative Protocol for Cross-National Youth GBV Research Informing AI-Enabled Interventions: Evidence from German and Spanish Focus-Group Pilots

Paper ID: P28

Timothy Nyasha Musharu, Jorge Marx Gómez, Isotta Rossoni, Megan Rosales Gómez and Ignasi Navarro Soria

Abstract. Gender-based violence (GBV) among young people increasingly unfolds in digitally mediated environments, while artificial intelligence (AI) can both amplify technology-facilitated harms and enable new forms of prevention, detection, and support. Despite growing policy attention, cross-national qualitative evidence that is methodologically comparable, ethically robust, and directly usable for AI-enabled intervention design remains limited. This paper proposes a transferability-ready qualitative protocol for future cross-national research on youth GBV in digitally mediated contexts, with a particular focus on informing AI-enabled interventions. It specifies participant safeguarding, consent and confidentiality, data management, and transparent analytic quality assurance, and operationalises a pathway from qualitative narratives to an auditable coding framework and bias-and-harm schema. The approach is demonstrated through two feasibility pilots conducted with the same topic guide and analytic spine: a German focus group with ten attendees (eight active speakers) and a Spanish pool of ten consented participants (six active speakers). The pilots refine instruments and illustrate preliminary outputs, including a codebook, cross-site schema, and governance-oriented requirements addressing representational bias, privacy and surveillance risk, escalation uncertainty, and accessibility constraints. The contribution is methodological rather than population-level and draws on expert-informed rather than survivor-centred material. Recurrence in one translated second-site dataset is treated as an analytic stress-test, not as proof of multilingual or cross-national transferability. The protocol is an adaptable starting-point toolkit rather than a fixed model and is expected to evolve through larger samples, broader cultural deployment, and survivor-, youth-, and practitioner-centred validation.

Keywords: Gender-based violence, technology-facilitated gender-based violence, youth digital safety, qualitative research protocol, cross-national study design, artificial intelligence governance, participatory methods

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Design of Personalised Social Comparison-based Learning Analytics Dashboard Informed by Kolb's Experiential Learning Theory

Paper ID: P30

Anthony Kingsley Sackey, Baldreck Chipangura and Hugo Lotriet

Abstract. Learning analytics dashboards (LADs) have gained prominence in online education, enabling students to visualise their academic behaviours and performance patterns and supporting improved academic success. However, the effectiveness of LADs largely depends on the relevance and interpretability of the feedback they provide. Most social comparison implementations adopt a “one-size-fits-all” approach, often producing irrelevant reference frames that lead to disengagement, negative emotions and demotivation. To address this gap, this study proposes a personalised social comparison-based LAD that leverages students’ learning styles. Drawing on Kolb’s experiential learning theory, and guided by Design Science Research methodology, the study identifies key requirements for dashboards, including the formation of psychologically meaningful peer groups, the alignment of comparison metrics with learners’ preferences and the use of context-sensitive visualisations tailored to different learning styles. The study demonstrates how the requirements inform the design of a personalised social comparison LAD.

Keywords: Learning analytics dashboard, social comparison, personalisation, learning style, experiential learning

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Edge-Based Semantic Surveillance Using ONNX Object Detection and Vision-Language Models with Prompt-Constrained Inference

Paper ID: P32

Waldon Hendricks

Abstract. Modern intelligent surveillance systems rely heavily on object detection models, yet these systems lack the semantic reasoning capabilities necessary for interpreting human and environmental behavior. This paper presents a hybrid architecture integrating Frigate (a real-time detection platform), inference acceleration based on the Open Neural Network Exchange (ONNX) format, and a locally deployed vision-language model (VLM) served through Ollama to enable context-aware scene description.

The proposed system generates natural language descriptions of detected objects in real time, transforming raw detections into interpretable semantic insights. A structured prompt engineering strategy is introduced to mitigate hallucinations and enforce factual grounding. In a preliminary evaluation on 50 manually assessed event descriptions, the constrained prompt reduced the observed hallucination rate from 38% to 12% while maintaining interactive inference latency on edge-deployable models (2B–8B parameters). A subsequent held-out evaluation on 55 independently collected events found no hallucinated descriptions, consistent with the original result.

The system operates entirely on local infrastructure, avoiding transmission of video data to cloud-based AI services. This work contributes a locally deployable framework for augmenting surveillance systems with interpretable, description-level outputs.

Keywords: Computer Vision, Video Surveillance, Generative AI, Edge AI, Vision-Language Models, Explainable AI

Cheating Modality Shift in the Age of AI - Computer Science Students' Perceptions from Germany and South Africa

Paper ID: P33

Andre P. Calitz, Margaret Cullen and Ines Oldenburg

Abstract. Academic integrity is the dedication to honesty, trust and accountability in scholarship. Academic integrity is undergoing a significant transition in the current educational environment, due to Generative Artificial Intelligence (Gen AI). Students' cheating is primarily driven by performance pressure and capacity constraints, enabled by low perceived risk and reinforced by social normalisation.

Studies on the perceptions of students regarding academic integrity and cheating have shown the major implications that cheating has on all academic stakeholders, including the institution, academics, students and industry. Students must be taught how to critically engage with AI-generated content and use. The aim of the study was to determine the perceptions of academic cheating occurrence from the perspectives of post-graduate Computer Science students from Germany and South Africa. The findings indicate that cheating is primarily a response to academic performance anxiety, the pressure on students to achieve good marks and the fear of failing. The findings showed a noticeable shift in student awareness to digitally mediated forms of cheating, with GenAI tools and personal devices emerging as the most used technologies. Differences between the German and South African post-graduate students' perceptions at the two institutions are highlighted. The study confirmed the 3 constructs specified in the Fraud Triangle theory.

Keywords: Academic Integrity, Cheating Modality Shift, GenAI

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Human First When AI Helps Review the Literature: A Checkpoint Protocol Piloted in an Ongoing Scoping Review of AI in Alopecia

Paper ID: P35

Timothy Nyasha Musharu, Jorge Marx Gómez and Roopesh Kevin Sungkur

Abstract. AI can help reviewers handle large search results, but it must not quietly decide which evidence survives. This paper presents a human-first checkpoint protocol for AI-assisted evidence reviews. The protocol limits AI to declared roles, separates development from independent testing, keeps a record of every AI-supported judgment, and stops the workflow when a safety threshold is not met. It was piloted within an OSF-registered, ongoing scoping review of AI in alopecia. The review contains 5,071 unique records from 13,117 search results. In a 50-record development experiment, screening rules were influenced by search and review-history fields. After those fields were removed and the rules were adjusted on the same sample, sensitivity was 0.857 (95% CI 0.487–0.974), specificity was 0.837 (0.700–0.919), and was 0.511. The result failed the prespecified 0.61 checkpoint and was therefore not approved for use. In a stratified internal audit of 30 packeted full texts, the pipeline classified all 20 papers judged scope-relevant by the first author as retained. External-validation assertions were supported in 13 of 15 evaluable cases, while other detailed labels showed greater uncertainty. The pipeline also created 194 traceable full-text evidence packets. The packet branch generated interim candidate signals about AI tasks and reported validation practices; these signals were not used to determine eligibility or final review conclusions. These results show how checkpoints can expose leakage, reject weak automation, and preserve material for human review. They do not complete the alopecia evidence map; formal human screening and an independent holdout remain required.

Keywords: AI-assisted evidence synthesis, systematic review automation, scoping review, review-process leakage, human oversight, auditability, evidence packets, alopecia

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Designing a Fair, Explainable, and Context-specific AI Admissions Framework for South African Higher Education

Paper ID: P36

Indu Pramod and Darelle van Greunen

Abstract. Artificial intelligence (AI) is increasingly being considered for higher education admissions, where it can support application screening, document checking, applicant communication, program matching and institutional planning. In South Africa, however, admissions are high-stakes decisions shaped by transformation imperatives, uneven schooling contexts, institutional resource constraints and the Protection of Personal Information Act (POPIA). This paper presents a conceptual, design-oriented AI admissions framework for South African higher education. Drawing on literature on digital transformation, AI-enabled admissions, fairness, explainability, privacy and human oversight, the framework integrates five components: an AI-powered admissions engine, a bias and fairness module, student profiling and program matching, AI-enhanced applicant support and a data analytics dashboard. The contribution is not an implemented system, but a context-specific conceptual artefact that clarifies design requirements, governance controls and evaluation dimensions for future validation. The framework positions AI as decision support, with final admissions decisions remaining subject to accountable human review.

Keywords: artificial intelligence, higher education admissions, explainable AI, fairness, applicant experience, Protection of Personal Information Act (POPIA), South Africa

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Cybersecurity and ICT Risk Management in the Financial Sector with Artificial Intelligence: An AI-Based Method for Compliance Checking of Internal Bank Documents Against DORA and RTS RMF

Paper ID: P37

Hergen Pargmann

Abstract. In the current geopolitical environment, the resilience of critical infrastructures has become increasingly important. Alongside the supply of energy, water, and essential goods, the financial sector is exposed to a growing number of digital threats. Banks, insurance providers, and financial market infrastructures face the challenge of securing complex ICT architectures and digital services against cyber risks. With the introduction of the Digital Operational Resilience Act (DORA) and the associated Regulatory Technical Standards on the ICT Risk Management Framework (RTS RMF), the European Union established a binding set of requirements aimed at strengthening the operational resilience of financial institutions. Implementing these requirements demands extensive documentation of processes, governance structures, and ICT controls, while a shortage of qualified personnel limits the feasibility of manual assessments.

The underlying compliance-checking problem resembles the NP-complete SAT problem, as multiple interdependent conditions must be evaluated simultaneously. This paper introduces an artificial-intelligence-based approach to assess whether internal regulatory documents comply with DORA and the RTS RMF. Building on advances in contradiction detection and prompt-engineering-based analysis of regulatory texts, the proposed method uses large language models to evaluate internal policies against legal requirements, identify inconsistencies, and detect omissions. The approach aims to support financial institutions in systematically assessing compliance, reducing manual effort, and improving the traceability and reliability of ICT risk management documentation.

Keywords: ICT Risk Management, DORA, RTS RMF, Artificial Intelligence, Compliance Checking, Regulatory Documents

Germany and South African Industry Software Developers' Use of GenAI Tools

Paper ID: P38

Andre P. Calitz, Margaret Cullen and Ines Oldenburg

Abstract. Software development is the process of creating, designing, deploying and maintaining software. Modern organisations often use a DevOps model, a set of practices, protocols, and technologies that accelerate the delivery of higher-quality software applications and services. Generative Artificial Intelligence (GenAI) has had a significant impact on the software development industry globally. Software developers in the industry are increasingly using GenAI in the application development process and software development life cycle. This exploratory study aimed to investigate the GenAI tools used by software developers in industry. Software developers in Germany and South Africa participated in the survey. The quantitative data were analysed using descriptive statistics, and the open-ended questions were thematically analysed. The results of the study indicate that GenAI tools are used in all stages of the software development life cycle. All respondents agreed on the productivity benefit from GenAI tool use and made use of AI-generated code, but the code is not inherently trusted. The findings reveal a progression from “AI as a tool” to “AI as an integrated development layer” in the IT industry software development process and software development life cycle.

Keywords: Software development, GenAI tools, IT industry practices

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From Risk to Rigour: Safeguarding Substantial Equivalence in AI-Augmented Research through the Precautionary Principle

Paper ID: P39

Brenda Scholtz and Lynn Fletcher

Abstract. The pressure on academics to publish, supervise and guide postgraduate students through the academic research process is immense. Artificial Intelligence (AI) promises to be a quick and easy solution to relieve this pressure and increase efficiency to support academics. AI-augmented research is often assumed to be substantially equivalent to traditional research. However, many who have adopted AI tools in the research process have reported critical concerns and risks that affect academic quality, including rigour and validity. Given the inherent uncertainty about the quality and integrity of AI-generated outputs, researchers and other stakeholders should adopt a precautionary, reflective stance. Therefore, the precautionary principle provides a valuable lens for understanding the integration of AI into academic research by placing the burden of responsibility on the researcher to ensure that AI use does not compromise the quality or integrity of scholarly work. This paper provides an overview of the concerns and risks of AI adoption in the academic research process. A critical literature review was conducted alongside a thematic analysis of articles reported by stakeholders on the use of AI in the academic research process. The results assisted in developing a Precautionary-Equivalence Research Framework (PERF-AIR) that stakeholders can use in the research process to guide and evaluate AI-augmented research outputs. The proposed conceptual framework applies the precautionary principle to address the AI benefits versus risks paradox by ensuring the substantial equivalence of AI-augmented research to traditional research.

Keywords: Artificial intelligence, AI-augmented academic research, research stakeholders, substantial equivalence, precautionary principle, PERF-AIR

A Semantic-Based Chatbot for Medical Information Retrieval

Paper ID: P40

Vimal Panchoo, Ibrahim Dowlut, Geerish Suddul, Sandhya Armoogum, Ajit Kumar Gopee and Loovesh Sharma Ramwodin

Abstract. In this study, we evaluated four different approaches for information retrieval with the focus of designing a chatbot that can assist with Frequently Asked Questions (FAQ) in healthcare. Our system allows users to ask medical questions in plain language and receive the answers from trusted National Institutes of Health databases, using the MedQuAD dataset. After cleaning the data, 16359 FAQ were divided into train, validation and test splits, focusing on user queries. Our experimental results, based on 2247 test queries, demonstrate that the semantic retriever model produced the best overall ranking quality with a Recall@1 of 0.9314, Precision@1 of 0.9617, Recall@5 of 0.9980, MRR@5 of 0.9797 and nDCG@5 of 0.9848. The implementation of our chatbot prototype is therefore based on the semantic retriever model, and was deployed through a Gradio interface. Our tests further demonstrate that the lightweight retrieval methods work well for medical questions.

Keywords: medical question answering, medical chatbot, information retrieval, MedQuAD, semantic retrieval, BM25, TFIDF

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Generative AI Risks in the Banking Sector: A Systematic Literature Review

Paper ID: P41

Chuma Dyasi and Lynn Fletcher

Abstract. The rapid adoption of Generative Artificial Intelligence (GenAI) in financial services presents significant opportunities for efficiency, innovation, and enhanced decision-making. However, it introduces a wide range of emerging risks that threaten financial stability, regulatory compliance, and ethical integrity. These risks remain fragmented across the literature, limiting a consolidated understanding of their scope and implications. This study addresses this gap by systematically synthesising existing research on the risks associated with GenAI in the banking sector. A systematic literature review (SLR) was conducted to identify, screen, and analyse relevant studies. The findings were thematically synthesised to develop an integrated understanding of GenAI-related risks across key domains. The review reveals that GenAI amplifies existing risks inherent in traditional AI systems, while introducing novel challenges such as hallucinations, prompt injection attacks, systemic market dependencies, and increased opacity in decision-making. These risks are further exacerbated by unequal data access, under-developed regulatory frameworks, and infrastructural disparities, particularly in developing economies. Collectively, these factors create significant barriers to safe, transparent, and equitable adoption of GenAI in financial contexts. The study concludes that effective governance of GenAI in financial services requires a multidisciplinary approach, combining robust regulatory oversight, ethical AI frameworks, enhanced technical safeguards, and continuous human oversight to ensure alignment with principles of fairness, accountability, transparency, and financial stability.

Keywords: Banking Sector, Generative Artificial Intelligence, GenAI Risks

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Designing a Conversational Knowledge Information System with Retrieval-Augmented Generation for Data Exploration in the Domain of German Tax Auditing

Paper ID: P42

Lukas Hein, Jonas Boekhoff, Nico Greb, Matthis Heese, Tom Holthusen, Simon Ostermann, Jabe Peters, Luca Rinesch, Barbara Rapp, Tim Siedenburg, André Klümpen and Jorge Marx Gómez

Abstract. Tax collection analytics increasingly require the integration and interpretation of many heterogeneous, largely unstructured information sources, including statutory law, administrative guidance, case law, and organizational documents. Grounded in Design Science Research methodology, this research-in-progress paper investigates the recent advancements in large language models and how they can contribute to the future of taxation by developing (and partially evaluating) a self-hosted conversational knowledge system that supports exploratory analysis and compliance in financial and tax-related advisory contexts. The system leverages Retrieval-Augmented Generation to facilitate transparent, conversational access to high-value information, incorporating privacy protection, auditability, and source traceability in line with compliance-by-design principles. Internal data sources are user-uploaded using a frontend, whereas external data sources are web-scraped from a predefined whitelist. A formative evaluation with a focus group of 15 domain experts influences the ongoing design of the artifact by contributing suggestions for potential improvement for knowledge sharing in tax auditing. This paper contributes both a prototypical practical artifact and an initial set of design principles for Retrieval-Augmented Generation-based conversational knowledge and information systems for the legally sensitive domain of tax auditing.

Keywords: German Tax Auditing, Conversational System, Retrieval-Augmented Generation, Design Science Research

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Psychological and Affective Factors of User Satisfaction in Mandatory Student Information Management Systems (SIMS)

Paper ID: P43

Emmanuel Opoku Debrah, Corné J. van Staden and Sunet Eybers

Abstract. Student Information Management Systems (SIMS) are mandatory systems for managing student registration, academic records, academic fees, exams, timetables, program plans, and lecturer-student communication in higher education institutions (HEIs). Most of the academic literature on developing countries focuses on technical and pre-adoption requirements, overlooking psychological and affective post-adoption factors. This systematic review gathers and synthesizes empirical evidence on the psychological and affective factors that influence user satisfaction when engaging with HEI mandatory SIMS in a developing country such as Ghana. Following PRISMA 2020, eight sources were searched. The records were screened for quality and risk of bias, independently appraised by 2 reviewers. The evidence was integrated using reflexive thematic analysis and narrative synthesis. From 1,284 records, 20 studies (17 quantitative, 2 mixed methods, 1 qualitative) met the inclusion criteria; 11 (55%) were low risk of bias, 8 (40%) moderate, and 1 (5%) high, with a mean Mixed Methods Appraisal Tool (MMAT) score of 79%. Five interacting clusters emerged, namely: cognitive appraisals (system/information quality, usefulness, confirmation), positive effect (satisfaction, enjoyment), negative affect (anxiety, technostress, distress), behavioral outcomes (continuance, attitude, use behavior), and trust and self-regulation factors (trust, transparency, self-efficacy). Satisfaction (65%), trust (25%), and perceived usefulness (20%) were the most prevalent items. Post-adoption satisfaction in mandatory SIMS is driven as strongly by affective and psychological factors as by system/information quality; neglecting these factors risks silent dissatisfaction in Ghanaian and similar settings.

Keywords: Student Information Management Systems (SIMS), User Satisfaction, Psychological factors, Affective factors, Developing countries

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Retrieval-Augmented Generation in the Assurance Ecosystem: A Systematic Literature Review on Transferability to Internal Audit

Paper ID: P44

Maurice Saluschke

Abstract. The growing complexity and data intensity of internal audit demand innovative approaches beyond traditional assurance methods. Retrieval-Augmented Generation (RAG), which combines large language models with external knowledge sources, has shown promise in related fields like compliance and risk management, but its application in internal audit remains underexplored. Through a systematic literature review and qualitative content analysis of related assurance domains, this paper examines the patterns and requirements for transferring RAG to internal audit. Results reveal RAG's potential to enhance audit processes through greater efficiency, accuracy, and traceability, while also revealing hurdles and domain constraints such as data access, objectivity, and technical limitations. These insights underscore the importance of tailored adaptation strategies and robust governance frameworks to unlock RAG's transformative capabilities in internal audit.

Keywords: Retrieval-Augmented Generation, Internal Audit, Large Language Models, Governance, Evidence-grounded AI

Graph-Guided Synthetic Question-Answer Dataset Generation for Evaluating Retrieval-Augmented Generation in Internal Audit

Paper ID: P45

Maurice Saluschke and Jorge Marx Gómez

Abstract. Retrieval-Augmented Generation (RAG) provides a mechanism for grounding large language models in organisation-specific knowledge derived from internal document collections. However, the evaluation of RAG systems in specialised domains such as internal audit is hindered by the lack of suitable, evidence-based benchmark datasets. This paper addresses this gap by proposing a graph-guided pipeline for the automated generation and validation of synthetic question-answer (QA) datasets from internal documents. The approach is based on a document knowledge graph that represents hierarchical document structure, sequential chunk relations, and multiple similarity edges between text segments. On this basis, an end-to-end process for evidence selection, controlled QA generation, and multi-stage validation is developed. The method is evaluated on a confidential corpus of process standards from the internal audit function of a large European corporation. Results show that the proposed pipeline achieves the strongest overall performance compared with RAGAS and DeepEval, particularly in qualitative fidelity and contextual answerability, while different similarity edge types contribute complementary strengths to multi-hop question construction. The findings suggest that graph-guided, domain-adapted benchmark generation is a promising approach for constructing realistic and evidence-grounded QA datasets for RAG evaluation in internal audit and related document-heavy domains.

Keywords: Retrieval-Augmented Generation, Internal Audit, Synthetic Question Generation, Document Knowledge Graph, RAG Evaluation

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Hierarchical Fine-Tuning of German BERT for Domain-Specific Construction Process Classification

Paper ID: P47

Sasapu Venkatesh, Jorge Marx Gómez and Prasanjeet Kumar

Abstract. This paper presents a domain-specific German text classification framework for automating the categorization of construction-related textual descriptions, referred to as Langtext, into predefined process identifiers known as Baustein IDs. The dataset, provided by STRABAG AG, a major construction company, comprises over 100,000 German-language entries describing construction activities, materials, and processes, each labeled with a standardized Baustein ID. We investigate a progressive modeling strategy comprising four experimental configurations: (i) traditional machine learning classifiers on BERT and GPT embeddings, (ii) flat fine-tuning of a German BERT model, and two hierarchical fine-tuning pipelines that decompose the 1,986-class problem into cascading sub-classifiers aligned with the native four-level Baustein taxonomy — namely (iii) a two-level and (iv) a three-level cascade. Our three-level hierarchical pipeline achieves 92.77% accuracy at the top-level category, 87.29% at the second level, and 70.64% at the full Baustein ID level, with Top-3 recoverability reaching 81.53%. An LLM-based re-ranking module applied to the Top-K candidates further recovers semantically valid predictions that static classifiers misclassify due to label ambiguity. The results demonstrate that, while hierarchical decomposition yields Baustein-level accuracy comparable to flat fine-tuning, it substantially improves top-level routing accuracy, error localization, and interpretability, offering a scalable and transparent solution for industrial cost estimation workflows.

Keywords: German BERT, Text classification, Hierarchical fine-tuning, Construction NLP, Domain adaptation, Baustein ID, Langtext

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Factors influencing the intention to adopt blockchain for cybersecurity in South African organisations

Paper ID: P48

Buhle Mathivha and Luzuko Teken

Abstract. Organisations worldwide face increasing cybercrime threats that disrupt normal operations and threaten the confidentiality and integrity of sensitive organisational data in the pursuit of monetary gain. This problem is more pronounced in emerging markets such as South Africa, where cyber threats continue to evolve despite the implementation of various cybersecurity measures. While blockchain technology has been proposed as a potential solution to enhance cybersecurity through decentralisation, immutability, and cryptographic security mechanisms, its adoption for cybersecurity purposes remains limited. Existing research has predominantly focused on developed economies and sector-specific applications, particularly within financial services, leaving a gap in understanding the broader organisational adoption context in South Africa.

This study develops a conceptual model grounded in the Technology–Organisation–Environment (TOE) framework to examine the factors influencing organisational intention to adopt blockchain for cybersecurity. The model integrates technological, organisational, and environmental determinants and proposes empirically testable hypotheses. The study contributes to the literature by providing a context-specific instantiation of established adoption frameworks for the South African cybersecurity setting and offers practical insights for decision-makers seeking to strengthen cybersecurity resilience.

Keywords: Blockchain, Cybersecurity, Technology Adoption, TOE Framework, South African Organisations

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From Module Descriptions to Curriculum Graphs: LLM-Based Identification of Semantic Inter-Module Dependencies

Paper ID: P49

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Abstract. Higher education institutions increasingly face demand for flexible micro-degrees. These could be composed from existing modules of established study programs. However, the prerequisite structures and conceptual overlaps determining valid module combinations are buried in module handbook PDFs, making manual curriculum analysis labour-intensive and error-prone. We present a prototype that extracts inter-module dependencies and conceptual relationships from PDF module catalogues into a queryable knowledge graph using the Qwen3:32B large language model for semantic assessment of 25,440 module pairs and Neo4J for graph storage, querying, and visualization. Applied to the engineering sciences catalogues of the Jade Hochschule, a university of applied sciences, the workflow yields a graph of 159 modules and 5,508 concepts (totalling 5,667 nodes) connected by 19,648 relationships. First observations suggest the graph is a promising artifact for exploration, surfacing foundational modules, beginner/advanced dyads, and prerequisite gaps, with potential for future work on curriculum analysis, validation, and the composition of stackable micro-degrees.

Keywords: Academic Module Description, Knowledge Graph, LLM, Neo4J, Dependency Graphs, Educational Knowledge Graph, Micro-Credentials, Micro-Degrees, Stackable Micro-Degrees

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The implementation of Artificial Intelligence Frameworks in Banking Institutions in South Africa

Paper ID: P50

Mulalo Rasivhaga, Ayanda Pekane and Luzuko Tekeni

Abstract. The rapid adoption of Artificial Intelligence (AI) in the banking sector necessitates robust Artificial Intelligence Governance (AIG). AIG is essential for addressing ethical, regulatory, and operational challenges. However, the implementation of AIG in organisations remains an underexplored phenomenon in IS research. Particularly in regulatory environments like the South African Banking sector. Therefore, the objective of this study was to understand how major banking institutions in South Africa implement AIG frameworks. In addressing this objective, qualitative methods were adopted. A case study design was employed involving interviews with seven governance practitioners across four major banks in South Africa. The inductive reasoning approach was adopted, with the Hourglass Model of Organisational AIG applied as a sensitising tool. Thematic data analysis was employed to analyse the collected data. The analysis yielded three principal contributions. First, the integration of AIG is embedded within existing risk and enterprise Frameworks in South African banks. Second, banks employ deliberate balancing mechanisms that demonstrate that AIG is not perceived as a barrier but as the essential architecture that enables sustainable and trustworthy innovation. Third, and most significantly theoretically, it identified and proposed a Mediation Layer within the Hourglass Model: a dynamic sub-process that actively translates environmental regulatory expectations into operational governance mechanisms. The findings reframe AIG not as a compliance burden but as a strategic enabler of trustworthy AI adoption, with generalisable implications for regulated industries navigating the global-local regulatory divide.

Keywords: Artificial Intelligence Governance, Responsible AI, Regulatory Compliance

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Automated Patch Sampling From Whole-Slide Images Using Image Texture

Paper ID: P51

Thabo Maibi, Leon Eldon Burger and Anna-Mart Engelbrecht

Abstract. Whole-slide images (WSIs) are widely used in digital pathology, but their large size makes direct processing with machine learning models computationally infeasible. Consequently, WSIs are divided into smaller patches prior to model training. Patch extraction generates non-informative patches that contain blank background, preparation artifacts, or artificial black regions. Non-informative patches reduce data quality and increase computational cost. Existing patch selection methods rely on manual annotation, random sampling, or threshold-based rules, which limit robustness and scalability. This study proposes a data-driven, annotation-free framework to identify informative patches. WSIs from The Cancer Genome Atlas are divided into non-overlapping patches. Contrastive learning is applied to generate patch embeddings, and k-means clustering is used to group visually similar patches. Gray-level co-occurrence matrix and local binary pattern texture features are extracted from patches and analysed across clusters to characterise structural differences between informative and non-informative groups. Logistic regression, random forest, XGBoost, and support vector machine classifiers are trained using the extracted texture features to classify informative and non-informative patches. Results show clear separation between informative and non-informative patches, with the random forest model achieving an accuracy of 0.993. The selected patches are then used to train a Vision Transformer for tissue classification, which achieves an accuracy of 0.985, comparable to state-of-the-art methods while using fewer patches. Evaluation on unseen GrandQC data demonstrates accurate tissue localisation, with Dice similarity coefficients up to 0.927. These findings show that informative patches can be identified using lightweight handcrafted features and conventional machine learning models, which provide a scalable and computationally efficient solution for WSI analysis.

Keywords: Whole-Slide Imaging, Patch Sampling, Image Texture, Computational Pathology

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The Progress of Digital Transformation among Small and Medium Enterprises: The Case of the Financial Sector in South Africa

Paper ID: P52

Awongiwe Siyolise Nkata and Ayanda Pekane

Abstract. SMEs are critical to South Africa's economy but have been slow to embrace digital transformation (DT). Most SMEs fail or remain stagnant in the initial two years of their operation. This is because SMEs face challenges, not limited to financial, technological and human resource constraints, often resulting in poor investments into digital tools and technologies. This study evaluates the progress of DT that has been made by SMEs in South Africa, within the financial sector. Using qualitative methods, the research applied the Holistic Digital Maturity Model, semi-structured interviews were used as a data collection technique and data analysis adopted the thematic analysis method. Findings show that most SMEs fall within the performer and adaptor stages of digital maturity, with leadership and vision being stronger dimensions than strategies, operating models and business models. Key influences include artificial intelligence (AI), regulation, and resource constraints, while skills and leadership gaps remain major challenges.

Keywords: Digital Transformation, SMEs, Digital Maturity

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Designing and Evaluating a Conversational Knowledge Information System with Retrieval-Augmented Generation for Data Exploration in the Domain of German Tax Auditing

Paper ID: P56

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Abstract. The information environment of contemporary tax auditing increasingly comprises heterogeneous and unstructured data sources, including statutory law, administrative guidance, case law, and organizational documentation. This study presents the design and evaluation of a self-hosted conversational knowledge information system for tax data exploration, developed following the methodology of design science research. Building on recent advancements in large language models, the system integrates Retrieval-Augmented Generation to provide transparent and comprehensible access to heterogeneous information sources while ensuring privacy protection, auditability, and traceable source attribution in accordance with compliance-by-design principles. The knowledge base combines user-uploaded internal documents with curated external sources obtained through web scraping from a predefined whitelist. The system's design process incorporates formative feedback from domain experts. Using established evaluation metrics, Large Language Model-as-a-judge methods, and synthetic test cases, the study identifies fitting configurations for key system components. In doing so, this work contributes not only a practical prototype and reusable evaluation pipeline but also empirically grounded configurations for this prototype of a conversational knowledge system in the domain of German tax auditing.

Keywords: German Tax Auditing, Large Language Models, Retrieval-Augmented Generation, Design Science Research, Evaluation

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Explainability in Prompt-Based Music Generation for AI Literacy Education: A Survey and Conceptual Framework

Paper ID: P57

Saira Philip and Jorge Marx Gómez

Abstract. The rapid growth of artificial intelligence has led to significant progress in music generation, with prompt-based models emerging as a prominent approach that enables music creation through natural language descriptions. However, existing prompt-based music generation systems generally provide limited user-facing transparency into how textual prompts are interpreted and how musical outputs are produced. This paper presents a focused survey of selected prompt-based music generation models and tools, and a comparative analysis is done and the systems are compared in terms of output inspectability, prompt-interpretation transparency, process-level explainability, user control, and educational scaffolding. The analysis identifies a recurring gap: although some systems provide symbolic outputs or limited insight into prompt interpretation, they generally lack explicit mechanisms for connecting prompt concepts to generated musical features and are not designed specifically for AI-literacy education. The proposed framework is designed to serve as an interactive platform for developing AI literacy among students, leveraging music as an accessible and engaging medium for teaching core AI concepts. The identified gaps and proposed framework establish a foundation for future research at the intersection of explainable AI, music generation, and AI literacy education.

Keywords: Music Generation, Generative AI, Explainable AI, Prompt-Based Models

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Investigating Critical Constructs of User Satisfaction in Mandatory Student Information Management System

Paper ID: P58

Emmanuel Opoku Debrah, Corné J. van Staden and Sunet Eybers

Abstract. Ghanaian Higher Education Institutions (HEIs) are increasingly adopting mandatory Student Information Management Systems (SIMS) to handle registration, grading, and other financial and student information management tasks. Despite this, most Information Systems (IS) literature continues to examine voluntary acceptance and behavioral intentions in mandatory settings, leaving administrators without evidence on which constructs are important for long-term acceptance of use. To investigate and explore the critical constructs, a systematic literature approach was adopted focusing on Scopus, Web of Science, ScienceDirect, IEEE Xplore, Education Resources Information Center (ERIC), PsycINFO, African Journals Online databases (AJOL) as well as Google Scholar. Twenty-two studies were evaluated using the Mixed Methods Appraisal Tool (MMAT) and were synthesized narratively. An integrated DeLone & McLean IS Success Model, complemented by the Unified Theory of Acceptance and Use of Technology (UTAUT), was the most widely used in studies and seemed like the most appropriate lens for evaluation. In addition, the most frequently reported constructs to evaluate mandatory SIMS were system, information, and service quality, with various studies reporting negative or non-significant paths and a decoupling of system use from satisfaction, particularly for information and service quality. The results raise the question of how to shift the focus of evaluation from intention to satisfaction and net benefits when using a mandatory SIMS system.

Keywords: Student Information Management Systems, User Satisfaction, Mandatory IS Use, DeLone and McLean Model, UTAUT, Higher Education, Ghana, Developing Countries

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Topology Matters: A Benchmark of Decentralised Federated Learning for Mental Health Treatment-Response Monitoring Using Synthetic Multimodal Behavioural Data

Paper ID: P59

Elsie Kaaya, Jorge Marx Gómez and Antje Wulff

Abstract. Decentralised Federated Learning (DFL) is a promising approach for privacy-preserving mental health monitoring, where sensitive smartphone and wearable data cannot be centrally stored. However, DFL performance is strongly influenced by the underlying network topology, particularly under client heterogeneity and resource constraints. This study benchmarks six DFL topologies (star, bus, ring, mesh, tree, and hybrid) for treatment-response monitoring in Major Depressive Disorder (MDD) using synthetic multimodal behavioural data. Logistic Regression (LR) and Multilayer Perceptron (MLP) models were evaluated under IID and non-IID settings with 20 and 100 clients. Results show that no single topology consistently dominated across all conditions. Bus provided strong communication efficiency and robustness for LR under non-IID settings, ring showed balanced scalability, mesh performed best for several MLP settings with strong fault tolerance but higher communication cost, while hybrid was promising in smaller non-IID settings. These findings demonstrate that topology selection in DFL should be treated as a multi-objective design decision that balances predictive performance, communication cost, privacy, fault tolerance, and scalability. The study provides a benchmark foundation for topology-aware DFL design in resource-constrained digital mental health applications.

Keywords: Decentralised Federated Learning, Network Topology, Major Depressive Disorder

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A Multi-Tier Genetic Algorithm for Large-Scale Liner Shipping Network Design

Paper ID: P60

Nirmal Rampersand and Oomesh Gukhool

Abstract. The Liner Shipping Network Design Problem (LSNDP) is a combinatorial optimisation problem that jointly determines vessel routes, fleet deployment and cargo routing to maximise profit while satisfying weekly demand. As traditional methods struggle to scale efficiently for realistic global liner shipping networks, this study proposes a hierarchical hub-and-spoke GA architecture designed with a demand-driven network construction strategy. A new formulation is proposed that maximises profit as well as demand delivery. The proposed framework integrates four routing strategies including direct services, inter-regional trunk routes, feeder services and regional loops to improve network connectivity and cargo accessibility. The developed Multi-Tier GA incorporates demand-based chromosome initialisation, adaptive mutation, elitism, tournament selection as well as an aggressive demand-weighted fitness function. In order to allocate vessels across multiple categories, demand-proportional allocation strategies are employed. Experiments conducted on benchmark instances from the Liner-Lib dataset demonstrate that the proposed Multi-Tier architecture and demand-driven optimisation strategy significantly improve solution quality, scalability and convergence behaviour on large scale problem instances. It achieves an average demand fulfilment of 91.2% with profits exceeding 37 million USD with a very fast execution time of 158s on the WorldSmall instance. These findings indicate that the proposed Multi-Tier GA algorithm provides an effective and scalable approach for large-scale liner shipping network design.

Keywords: GA, optimisation, liner shipping network design problem

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Interpretable Machine Learning for Autism Spectrum Disorder Screening

Paper ID: P61

Ronizza Mangaya-Ay and Bertram Haskins

Abstract. High assessment costs, specialist shortages and delays in clinical evaluation are barriers to the early screening for Autism Spectrum Disorder (ASD). Machine learning presents an opportunity to develop a platform to assist with earlier identification and referral. The work in this paper trained six models based on Logistic Regression, Decision Trees, Support Vector Machines, Random Forests, XGBoost, and Multi-Layer Perceptrons (MLP) to assist with ASD screening. The models are trained using publicly available datasets and evaluated using imbalance-aware metrics, including F1-score, precision-recall area under the curve, sensitivity, specificity, and balanced accuracy. Synthetic Minority Oversampling Technique (SMOTE) was used to address dataset imbalance during training. Experimental results demonstrated that interpretable decision tree models achieved performance comparable to more computationally intensive MLP models while offering substantial advantages in transparency and computational efficiency. To demonstrate practical operationalisation, the selected model was integrated into a publicly accessible Streamlit-based prototype screening support tool. The findings suggest that interpretable AI systems can provide practical support for ASD screening workflows while maintaining strong predictive performance and improved explainability.

Keywords: Autism Spectrum Disorder, Machine Learning, Explainable AI, Decision Trees, Nested Cross-Validation, Streamlit, Healthcare AI

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AI-Enabled Cybersecurity Challenges for the Elderly: Vulnerabilities and Risks Faced by Senior Citizens in South Africa

Paper ID: P62

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Abstract. The rapid proliferation of artificial intelligence (AI) has fundamentally transformed the cybercrime landscape, enabling offenders to execute hyper-personalized, scalable attacks that systematically exploit the cognitive, psychological, and technological vulnerabilities of elderly populations. This paper presents the findings of an exploratory qualitative study using Constructivist Grounded Theory (CGT) as articulated by Charmaz (2014) and Urquhart (2013). The study investigated how AI-enabled cybersecurity threats manifest among elderly South Africans, examined which structural and individual factors amplify their risk exposure, and assessed which interventions hold promise for mitigation. Drawing on extant data sources, including published empirical studies, documented case reports, and policy literature, the study constructed theoretical categories through constant comparison and inductive analysis. The conceptual framework integrated Lichtenberg's Financial Decision-making Screening Scale (LFDSS) with Human-Computer Interaction (HCI) principles as the sensitizing lens. Four focused codes emerged as the central theoretical pillars: AI-augmented impersonation and deception; Exploiting compounded digital vulnerability; Negotiating informal family guardianship; and Structural readiness and infrastructure gaps. Together, these constitute a substantive grounded theory of AI-enabled cybercrime vulnerability in elderly South Africans as a socially produced, structurally amplified, and technologically accelerated condition. The paper concludes with recommendations at the individual, relational, and structural levels.

Keywords: Constructivist Grounded Theory, Human-Computer Interaction, South Africa

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A Bibliometric analysis of the effects of Generative Artificial Intelligence on Knowledge Risk Management

Paper ID: P64

Stevens Phaphadi Mamorobela

Abstract. The rapid expansion of Generative Artificial Intelligence (GenAI) has introduced critical challenges in Knowledge Risk Management (KRM) processes. In this study, we present a bibliometric analysis of over 190 publications between 2020 and 2026 on GenAI and KRM issues, using Scopus bibliometric database. Findings revealed several key knowledge risks associated with GenAI, including issues related to transparency and accountability; ethics and compliance; security and data privacy; bias and overreliance; trust, reliability and explainability; as well as the risk of misinformation, highlighting the need for robust frameworks to guide the effective and responsible use of GenAI in safeguarding the knowledge assets. Future studies could adopt empirical approaches to further investigate the identification of emerging knowledge risks, the mechanisms through which GenAI influences knowledge processes, and the strategies that could be implemented to mitigate these risks. Overall, this study provides important insights that can inform future research and development efforts aimed at understanding the evolving dynamics of GenAI in the transformation of KRM practices.

Keywords: Knowledge Risk Management, GenAI, Bibliometric analysis

Beyond One-Size-Fits-All Digital Government: A User-Centric Conceptual Model for Citizens' Adoption of E-Government Services in Developing Countries

Paper ID: P65

Anass Bayaga

Abstract. E-government services are increasingly positioned as instruments for improving public service delivery in developing countries, yet citizen adoption remains uneven. Existing adoption models often assume a generic user and give insufficient attention to how citizens interpret digital public services through risk, trust, institutional experience and socio-demographic realities. This paper develops and tests a user-centric conceptual model for e-government service adoption in a developing-country context. The model incorporates security risk factors, privacy risk factors, institutional logics and socio-demographic characteristics as dimensions of citizen-centred adoption. A quantitative cross-sectional survey design was used, with data collected from 149 respondents in urban and peri-urban areas of the City of uMhlathuze, South Africa. The data were analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM). The final tested model shows that institutional logics significantly influence citizens' adoption of e-government services ($\beta = .444$, $t = 5.722$, $p < .001$), while security risk factors ($\beta = -.006$, $p = .951$) and privacy risk factors ($\beta = .133$, $p = .130$) do not show significant direct effects. Socio-demographic moderation was also not supported. The model explains 23.4% of the variance in e-government adoption. The study contributes by repositioning citizen perspectives as central to conceptual model development and by showing that adoption in developing-country settings is shaped not only by technical risk perceptions, but also by institutional credibility, public service experience and trust.

Keywords: e-government adoption, user-centric model, public service delivery, institutional logics, security risk, privacy risk, developing countries, PLS-SEM

Security, Privacy Risk and Institutional Logics in Citizens' Adoption of E-Government Services for Public Service Delivery

Paper ID: P66

Anass Bayaga

Abstract. This study examines how perceived security risk, perceived privacy risk and institutional logics influence citizens' adoption of e-government services for public service delivery in South Africa. Although e-government is widely promoted as a mechanism for improving access, efficiency and responsiveness in public administration, adoption remains uneven in developing contexts where citizens' trust in digital systems is shaped by both technical and institutional conditions. Drawing on privacy risk perspectives and institutional logics, the study develops and tests a conceptual model that positions security risk, privacy risk and institutional logics as predictors of citizens' adoption of e-government services. A cross-sectional survey design was employed, with data collected from 149 respondents in urban and peri-urban areas of the City of uMhlatuze, South Africa. The data were analysed using PLS-SEM. The results show that institutional logics significantly and positively influence citizens' adoption of e-government services ($\beta = .444$, $t = 5.722$, $p < .001$), while security risk ($\beta = -.006$, $p = .951$) and privacy risk ($\beta = .133$, $p = .130$) do not have significant direct effects. The model explains 23.4% of the variance in e-government adoption. The findings suggest that adoption decisions are shaped more strongly by institutional credibility, legitimacy and public-service expectations than by direct technical risk perceptions alone. The paper contributes by positioning institutional logics as a central explanatory construct in digital public service delivery, while acknowledging the limited external validity of a single-site self-report study.

Keywords: e-government adoption, public service delivery, security risk, privacy risk, institutional logics, PLS-SEM, South Africa

Automated NACE Classification Using Large Language Models: A Comparison of Fine-Tuning and Prompting

Paper ID: P70

Michael Birke, Tim Siedenburg, Gerrit Schumann and Jorge Marx Gómez

Abstract. Industry classification is central to economic statistics, sustainability reporting, and financial analysis, yet assigning NACE codes to companies remains a largely manual and labour-intensive process. Large language models (LLMs) offer a promising route to automation, but their application to NACE classification has received little systematic research, particularly for German-language administrative data. This study compares two LLM adaptation strategies for top-level NACE classification. We use a labelled dataset of 1,417 commercial register entries covering 13 top-level NACE categories. A BERT-based model is fine-tuned on the training portion of this dataset, while autoregressive decoder models are assessed under zero-shot and few-shot prompting. Both are evaluated on a shared held-out test set and achieve comparable classification performance: the fine-tuned BERT model reaches a Weighted-F1 of 0.80 and the best prompting configuration with domain background knowledge and few-shot examples reaches 0.81. Their operational characteristics differ substantially, however. The fine-tuning-based approach processes entries roughly eight times faster. The prompting-based approach requires considerably more powerful infrastructure and is considerably slower, but needs no labelled training data and adapts more easily to new tasks and data sources. The qualitative analysis confirms this adaptability, showing that the prompting approach generalises to unstructured company website content, though accuracy depends strongly on website quality. Misclassifications in both approaches are driven primarily by semantic overlap between NACE categories rather than by class imbalance. Overall, the fine-tuning-based approach is better suited for high-throughput classification of semi-structured register data with limited infrastructure, while the prompting-based approach is preferable when flexibility, rapid adaptation, or the absence of labelled training data makes retraining impractical.

Keywords: NACE Codes, Industry Classification, Commercial Register, Fine-Tuning, Prompting, Large Language Models

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Secure IoT-Based Fisheries Monitoring and Traceability Framework for Sustainable Blue Economy in South-West Indian Ocean (SWIO) Small Island Developing States

Paper ID: P71

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Abstract. Small Island Developing States (SIDs) in the South-West Indian Ocean (SWIO) including Mauritius, Seychelles, Madagascar and Comores, relies heavily on its marine resources for food security and economic development, yet managing fisheries remains a challenge due to illegal, unreported, and unregulated (IUU) fishing. Existing fisheries monitoring systems are often manual, fragmented, resource-intensive, and lack real-time data integration which is insufficient for effective maritime surveillance across large Exclusive Economic Zones (EEZs). This paper proposes a conceptual secure IOT-based fisheries monitoring and traceability framework tailored for SWIO SIDs. The system integrates a mobile application for fishers, a backend validation engine based on local fishing regulations, and a web-based dashboard for fisheries authorities and coast guard monitoring. Fishers can register their catches by entering species and size, while the system validates whether the catch complies with legal requirements and provides immediate feedback. A lightweight ThingsBoard-Based IOT Simulation is presented to demonstrate automated catch validation, GPS tracking, MQTT-Style telemetry communication, ship route visualization and traceability workflows. The novelty of this system lies in integrating catch validation, GPS-based monitoring and ship-route visualization via an IOT dashboard tailored for small-scale fisheries.

Keywords: Blue Economy, Fisheries Monitoring, Traceability, Catch Validation, Telemetry communication, ship-route visualization

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Requirement analysis for data fusion based on non-camera-based sensors for cyclist detection

Paper ID: P74

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Abstract. This contribution investigates how requirements for non-camera-based sensor fusion can be derived for cyclist detection and the assessment of potentially dangerous overtaking situations in road traffic. The work is motivated by the limited comparability of existing studies, the underrepresentation of cyclists in available datasets, and the still insufficiently explored role of multimodal fusion for this specific use case. A structured literature review was used to identify relevant concepts from vulnerable road user detection, LiDAR, radar and thermal sensing, sensor fusion, tracking, distance estimation and overtaking-risk research. The empirical component comprised a 22-item exploratory online survey with 12 respondents, four initial expert interviews and three additional validation-oriented interviews. The results show that cyclist detection cannot be treated as an isolated classification task. Overtaking-risk assessment also requires localization, object continuity, relative motion, lateral distance, timing, road context, vehicle class and transparent handling of degraded sensor conditions. The paper therefore derives requirements for a future perception-and-assessment pipeline rather than for a single detector. A limited cross-check against an existing prototype supports the technical feasibility of synchronization, multimodal fusion and track-level processing, but its performance remains below the elicited targets and does not constitute operational validation.

Keywords: Artificial Intelligence, cycling, traffic safety, sensor fusion, structured literature review

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Beyond Digitisation: RAG-Enabled Semantic Search for Public Sector Document Retrieval

Paper ID: P75

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Abstract. Municipal administrations generate substantial volumes of documentation as a result of ongoing political and administrative decision-making processes. Retrieving relevant information from these document collections presents a significant challenge, as existing systems largely rely on keyword-based search and metadata matching, requiring users to possess precise knowledge of document titles and administrative terminology. This paper presents the design, implementation, and evaluation of a Retrieval-Augmented Generation (RAG)-based prototype tailored to the document retrieval needs of the city of Oldenburg, Germany. Grounded in qualitative expert interviews with municipal civil servants, the system addresses identified deficiencies through the integration of semantic search, a two-stage retrieve-and-rerank pipeline, and a locally deployed Large Language Model. The retrieval pipeline combines jina-embeddings-v4 for dense vector retrieval with the BGE-M3 cross-encoder reranker, evaluated against a manually annotated dataset of 15 queries and 150 chunks. Results demonstrate that the reranking stage yields consistent and substantial improvements across all metrics, achieving an MRR of 0.83 and an nDCG of 0.80, while proving robust to the choice of distance metric. These findings suggest that a two-stage RAG architecture constitutes a viable and practical solution for semantic document retrieval in municipal administration, reducing reliance on institutional knowledge and improving accessibility for both civil servants and the general public.

Keywords: Retrieval-Augmented Generation, Large Language Models, Information Retrieval, Semantic Search, Municipal Administration, Public Sector, Document Retrieval

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Towards Inclusive AI-Enhanced Vocational Training: A Project-Based Framework for Learners with Intellectual Disabilities

Paper ID: P76

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Abstract. Artificial intelligence is increasingly promoted as a means of personalising education, improving accessibility, and supporting learner autonomy. However, its application in vocational education and training (VET) for learners with intellectual disabilities remains limited and fragmented. This paper presents an ongoing European cooperation project that develops AI-enhanced vocational training in electronics for learners with intellectual disabilities. The project responds to persistent barriers in access to vocational learning, recognised qualification pathways, and transitions into employment by combining an accessible digital learning platform, adaptive learning support, gamified training materials, hands-on vocational tasks, and micro-credentials.

The paper proposes an integrative conceptual framework that links AI technologies, inclusive pedagogical design principles, inclusive AI-supported VET, and employability-oriented outcomes. It further draws on first findings from an accompanying systematic literature review on digital vocational support tools for learners with intellectual disabilities: existing studies tend to focus on isolated support tools, structured task assistance, or specific workplace scenarios, while fewer approaches integrate adaptive learning, vocational pedagogy, skills recognition, and employment-oriented implementation.

By connecting the project's design to literature-informed needs and to inclusive pedagogical principles, the paper contributes a transferable framework for inclusive AI-supported vocational training and identifies design principles for future work in AI and education. A Best Practices Handbook, developed as a further project result and openly available for download, complements the framework with practice-oriented guidance.

Keywords: Artificial Intelligence in Education, Inclusive Vocational Education and Training, Intellectual Disabilities, AI-Enhanced Learning, Digital Accessibility, Adaptive Learning, Micro-Credentials, Learner Autonomy, Employment Inclusion

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Toward Sustainable Digital Infrastructure: Decentralized Resource Utilization Using Existing Edge Systems

Paper ID: P77

Khurram Shehzad, Sreedhar Kokkarachedu, Matthias Wendland and Jorge Marx Gómez

Abstract. This paper presents NordLink, a sustainable approach to digital infrastructure that utilizes existing, locally available computational resources within a decentralized architecture. In contrast to the rising energy demands of centralized cloud systems, this model integrates edge-level hardware, decentralized High-Performance Computing (HPC) through HEAppE middleware, MinIO S3-compatible cloud storage, and open-source monitoring tools such as Prometheus and Grafana to enable efficient task execution and system observability. The configuration, deployed in support of Open Web Search (OWS), a European initiative developing an open, federated search index, demonstrates the effective reuse of on-premises infrastructure for large-scale digital services. Two physical servers and three virtual machines are used for web crawling and workflow staging, with Prometheus collecting system metrics and Grafana providing performance visualization; to date the pipeline has written approximately 15 terabytes of test data to a 50-terabyte object store, and both monitoring endpoints have maintained verified uptime. Aligned with advancements in hardware efficiency and software optimization, this decentralized setup promotes resource awareness and edge-level computation. We structure a sustainability estimate using the Software Carbon Intensity (SCI) methodology (ISO/IEC 21031:2024) and report the current limitations of this evaluation, including the absence of direct power metering and of a controlled cloud comparison, contributing a transparent, reproducible basis toward more sustainable and resilient digital infrastructures.

Keywords: High-Performance Computing, Sustainable Infrastructure, HEAppE, Cloud Storage, Distributed Systems, Monitoring, Software Carbon Intensity

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From Open-Source Building Blocks to a Multi-Channel Citizen Air-Quality Portal: A Design-Science Reference Architecture and Its Instantiation

Paper ID: P78

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Abstract. Air-quality data from governmental monitoring networks and low-cost citizen sensors is openly available, yet for citizens it remains fragmented, heterogeneous, and hard to access. Building on a multi-year research programme that identified citizen groups, information needs and access barriers, and on a systematic review of existing open-source and citizen-science systems, this paper takes the step from inventory to construction. Following the Design Science Research paradigm, we assess the reviewed corpus along data ingestion, processing, and provision plus a cross-cutting participation dimension, map the derived requirements onto mature open-source building blocks (CKAN, OGC SensorThings/FROST, OpenAQ, Sensor.Community, GeoNode), and derive five design principles and a layered reference architecture. We demonstrate the architecture in a prototype running publicly in Germany that combines official open APIs (air quality, water levels, weather, pollen, severe-weather warnings) with citizen-contributed observations, delivers the same harmonised data through a progressive web app, a Telegram bot, and web push, and adds a self-hosted large language model for assistance and image-based species identification. The instantiation confirms the multi-channel and participation principles but surfaces two findings: real-time, messenger, and language-model requirements demand an orchestration and assistance layer absent from the building-block catalogue, and standard-based harmonisation was realised pragmatically without OGC SensorThings, leaving an interoperability adapter as future work.

Keywords: Environmental information systems, Open-source software, Air quality, Citizen science, Open government data

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Agent-Ready Data Provisioning: Toward Discoverable, Interpretable, and Reproducible Data for LLM Agents

Paper ID: P79

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Abstract. Large language models increasingly act as agents. They break a task into steps, choose sources, and call interfaces on their own. How well such an agent performs therefore depends not only on the model, but also on how data are provided, that is, through which interfaces, metadata, and structures they can be accessed. We argue that designing this provisioning layer for autonomous agents is a task of its own. It differs from two known tasks, making data broadly machine-findable and reusable (FAIR) and preparing data for machine learning (AI-ready). This paper scopes this emerging field, places it conceptually, and names the open research gap. We make three contributions. First, we delimit agent-ready data against FAIR and AI-ready. Second, building on the literature, we bring together three target dimensions that a provisioning layer should satisfy: Discovery & Selection, Semantic Interpretability, and Reproducibility & Provenance. Third, we map the surrounding research onto these dimensions. The gap is not where one might first expect it. Provider-side mechanisms are already available, but in the literature we reviewed their effect on agent performance has been evaluated only narrowly. Sustainability (ESG) data provide an instructive boundary case because they combine heterogeneous formats, ambiguous concepts, and audit requirements.

Keywords: LLM agents, agent-ready data, data provisioning, FAIR, sustainability data, ESG, semantic metadata, provenance

Anomaly Detection in Metro

Paper ID: P80

Kim-Fen Gary Timothy Lew Chuk Wai and Soulakshmee D. Nagowah

Abstract. In recent years, there has been a surge in the number of anomalies in metros, particularly related to behaviour such as violence and aggression. Most metro systems heavily rely on human operators to detect such anomalies, which are inefficient and prone to missing incidents. This paper thus presents a deep learning and computer vision prototype for detecting violent behaviour in recorded metro-related video footage. The system processes a video, segments it and feeds it to a model that returns a violence confidence score. Three models were implemented: an RGB6 model, focusing on changes in appearance; a pose-based model, which focuses on the body geometry; and a fusion model that combines both representations. A MobileNetV3 backbone was used for the RGB6 model, and a BiLSTM together with an attention head was used for the posed-based model. For training, a custom dataset had to be created, containing 5,800 video clips from diverse sources, including bus surveillance footage, stock footage and real-world violence in the metro. The models were evaluated using standard evaluation metrics, namely accuracy, precision, recall, F1-score and confusion matrices. The fusion model was chosen since it had the highest recall, of 96.6%, while still having the second-best accuracy of 96.4%. It must be noted that the current implementation operates on uploaded video footage and represents a research prototype rather than a fully deployed real-time metro surveillance system.

Keywords: Violence detection, Metro surveillance, Anomaly detection, Computer Vision, Deep Learning

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Generative Deliberation for Responsible GenAI: A Pre-Adoption Method for Education and Healthcare

Paper ID: P82

Noluxolo Gcaza, Timothy Nyasha Musharu, Darelle van Greunen and Jorge Marx Gómez

Abstract. Generative artificial intelligence (GenAI) is entering education and healthcare before institutions have stabilised what responsible adoption requires. This paper argues that the core governance problem is not simply multi-stakeholder complexity, but the need to generate shared problem definitions where legal, professional, technical, and ethical framings are not yet commensurable. It distinguishes extractive processes, which elicit already-formed preferences, from generative deliberation, which produces requirements through structured confrontation with concrete artefacts before lock-in. Drawing on a higher-education practitioner reflection and an in-progress PhD design case on South Africa–Germany federated alopecia prognosis, the paper contributes a four-stage pre-adoption method in which every stage produces an inspectable artefact: a framing map, an artefact disagreement log, a boundary object or unresolved-dependency register, and a ratified implementation-principles register. The cases illustrate how the method converts latent disagreements over “responsible use” in education and the legal status of a model gradient in healthcare into governable categories before policy, architecture, or validation practices harden; they do not constitute an independent effectiveness evaluation.

Keywords: Generative AI, Responsible AI, Deliberative governance, Higher education, Healthcare AI

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AI-IoT Integrated System for Early Plant Disease Detection and Treatment

Paper ID: P83

Urshita Devi Lukhoo and Soulakshmee D. Nagowah

Abstract. Plant diseases have a huge impact on agriculture and often result in the excessive use of pesticides. This paper proposes an AI and IoT-based precision plant-care robot that can automatically detect plant diseases, monitor the environmental conditions and recommend the bio-treatment. Sensors such as ultrasonic sensor detects the presence of the plant. A Raspberry Pi camera takes pictures of the leaves of the plant. The leaves are then analysed by the MobileNetV2 deep learning model to detect if the plant has any disease. IoT sensors monitor the environment of the plant such as the temperature, humidity, soil moisture and the light intensity. A robotic arm sprays the plant with a bio-treatment and coloured LEDs indicate the health of the plant. Finally, a web dashboard allows the users to monitor their plants remotely and stores all monitoring data in a database. The results of this project show that integrating AI, IoT and robotic technology into one single device can effectively detect and monitor plant diseases. This paper thus proposes a solution that is a low-cost prototype developed using commercially available components for smart agriculture and that may reduce the use of pesticides on crops.

Keywords: Plant disease detection, AI, Internet of Things, Precision agriculture, Smart farming

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Safety Awareness for Young Digital Users against Digital Predators and Threats

Paper ID: P85

Sithokozile Mcanyana, Elmarie Kritzinger and Dorothy Scholtz

Abstract. The digital space has created an era whereby younger digital users are exposed to online environments such as social media, digital gaming and online educational platforms. There is no doubt that digital technologies provide access to the digital world and can contribute to a positive educational environment. However, it is important to note that the digital world poses a serious threat to younger digital users. The aim for this research is to analyze and examine the factors that are used to contribute to and/or determine how effective digital safety awareness programs are in assisting younger digital users from online predators and other related digital threats. This research conducted a systematic literature review (qualitative research approach) of 39 academic articles (through PRISMA approach). The research includes a thematic approach by identifying a coding structure using ATLAS.ti to identify codes and themes. Within those 39 articles, the identified codes were categorized into 10 themes, these themes include 1) Knowledge and Awareness, 2) Behavior and Practice, 3) Parental and School Involvement, 4) Educational Content and Program Design, 5) Technology Access and Exposure, 6) Cultural and Contextual Issues, 7) Reporting and Incident Management, 8) Impact of Interventions, 9) Vulnerabilities and Threats, 10) Emotional and Psychological factors. The themes and sub-themes are grouped in factor groups and can be used in creating, guiding, and monitoring digital safety awareness programs. The 10 themes were further classed into 6 factor groups. The results revealed that positive knowledge, involvement, and behavioral change among younger digital users were created by interactive culturally relevant awareness campaigns.

Keywords: Cyber, Digital, Safety, Young Digital Users, Predators, Awareness Programs, Evaluation

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Educational Leadership for Digital Transformation: Cultivating a Sustainable Digital Leadership Approach

Paper ID: P86

Elmarie Kritzinger

Abstract. This research addresses the responsibility of educational leaders to establish and sustain a culture of digital transformation for all role players in the educational environment. Educational spaces are becoming increasingly dependent on Information and Communication Technology (ICT), including access to and use of the Internet and digital devices. With the increased use of new digital technologies to improve pedagogy, educational structures must identify, adopt, and implement necessary safeguards to ensure digital cultures. The custodians of this digital transformation rest on the shoulders of educational leaders. Educational leaders (from government-oriented positions to school principals) must take ownership of ensuring that learners and educators have the needed digital awareness, knowledge, and skills to ensure a digital culture. A scoping literature review and limited scoping survey questions are used in this article to obtain a baseline to determine whether educators receive the required digital assistance from educational leaders. It is important to note that a digital culture will differ from one educational environment to another. The research concludes by proposing a guideline for achieving digital transformation in educational environments. Educational leaders are responsible for fostering a safe digital culture in an educational environment.

Keywords: Culture, digital transformation, leadership, responsibility, education

RFM-Based Customer Segmentation with K-Means: A Benchmark on the UCI Online Retail Dataset

Paper ID: P87

Loovesh Sharma Ramwodin, Doorgesh Sookarah, Vinaye Armoogum and Chiranjiv Mahesh Kumar Aungnoo

Abstract. In this paper, the UCI Online Retail dataset is used to study how a simple behavioural representation can be converted into useful customer segments. The work combines Recency-Frequency-Monetary (RFM) feature engineering with K-Means clustering. The objective is not to propose a new clustering algorithm, but to present a complete and reproducible analytical process for customer segmentation in an applied e-commerce setting.

The methodological process includes transaction cleaning, customer-level RFM construction, 95th percentile capping of extreme RFM values, feature standardisation, K-Means clustering, internal validation, and business interpretation. From 541,909 original transaction rows, the cleaning process retained 397,884 rows and 4,338 unique customers. K-Means was evaluated for $K = 2$ to $K = 10$. The $K = 2$ solution obtained the highest Silhouette score and Dunn index among the tested configurations, with values of 0.525 and 0.0091, respectively. However, the Davies-Bouldin index favoured $K = 3$, which shows that the selection of K is dependent on the validation criterion retained. The selected two-cluster solution separated the data into a large low-value/infrequent group and a smaller high-value/loyal group. Cluster 0 contained 80.04% of customers and 27.60% of revenue, whereas Cluster 1 contained 19.96% of customers and 72.40% of revenue.

The results indicate that RFM-K-Means remains a practical and interpretable baseline for customer segmentation when a lightweight workflow is required. Since the dataset is UK-based, the empirical findings do not describe Mauritian customer behaviour. Mauritius is discussed only as a possible setting where SMEs could adapt the same workflow using their own transaction data.

Keywords: Customer segmentation, RFM, K-Means, e-commerce, Online Retail dataset, internal validation, SME analytics, emerging markets

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Explainable and Fairness-Aware Telecom Churn Prediction for a Small-Island Market: Evidence from Mauritius

Paper ID: P88

Doorgesh Sookarah, Loovesh Sharma Ramwodin, Vinaye Armoogum, Chiranjiv Mahesh Kumar Aungnoo and Prasad M

Abstract. Customer churn prediction is an important data mining task for telecommunications operators because retention decisions need to be made before a subscriber effectively leaves the service. This requirement becomes more pronounced in small and concentrated markets where foreign or public churn datasets may not fully represent local service conditions, payment behaviour and geographic differences. This paper considers an anonymised Mauritian home-service subscriber dataset containing 5,000 records and 40 variables. Four supervised models, namely Logistic Regression, Random Forest, Support Vector Machine and XGBoost, were evaluated using an 80/20 stratified split, 5-fold stratified cross-validation, confusion matrices and McNemar's test. The modelling process was complemented by Wald testing, tree-based feature importance, subtractive analysis, SHAP explanations and a diagnostic fairness audit across gender, area type and district. The results obtained indicate that XGBoost achieved the strongest overall performance with Accuracy = 0.982, F1-score = 0.9159 and AUC-ROC = 0.9966, while Logistic Regression offered the highest recall. Financial stress, late payments, service frustration, resolution delays, app engagement and age/tenure patterns were repeatedly observed as relevant churn signals. The study therefore provides an explainable and fairness-aware decision-support view of telecom churn, although its conclusions remain limited by the static single-operator dataset, the absence of causal inference and the need for leakage and fairness monitoring.

Keywords: Customer churn prediction, Telecommunications, Explainable AI, SHAP, Fairness-aware machine learning, XGBoost, Mauritius

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The Energy–Accuracy Frontier: Multi-Objective Ensemble Search as a Procurement Instrument for Resource-Constrained Institutions

Paper ID: P89

Bhekisipho Twala

Abstract. Ensemble learning delivers the accuracy on which public institutions increasingly depend. Still, it purchases that accuracy with computation—and therefore with energy, cost, and carbon that are rarely accounted for at the point of model selection. This paper argues that the accuracy-maximising default embedded in most machine learning practice is not merely wasteful but frequently Pareto-dominated. For many administrative-scale problems, configurations exist that are simultaneously more accurate and cheaper to run. We formalise ensemble configuration as a constrained bi-objective problem—minimising classification error and estimated energy subject to an institutional energy budget—and solve it with NSGA-II over a heterogeneous ensemble search space. Because hardware energy counters are unavailable in the shared, virtualised environments typical of resource-constrained institutions, we adopt a portable CPU-time energy proxy and show that the Pareto ordering is invariant to its calibration constant. Across three benchmark problems, evaluated under 10×5 repeated stratified cross-validation with distribution-free bootstrap confidence intervals, the default-configuration random forest—the de facto industry baseline—was dominated on two: the tuned configuration was significantly more accurate while drawing less energy. On the third, accuracy was statistically indistinguishable from the baseline at 68% lower energy. A complementary study enumerating all 32,767 subsets of a fixed fifteen-model pool recovers exact frontiers and shows that the knee arrives early and consistently: across four datasets, 95% of achievable accuracy is available for roughly 5% of the full ensemble’s energy. We argue that the frontier is not a research artefact but a governance object, and we propose that public-sector AI procurement should require disclosure of the frontier rather than a single accuracy figure.

Keywords: Green AI, Ensemble Learning, Multi-Objective Optimisation, NSGA-II, AI Procurement, Sustainable Digital Transformation

Wide Knowledge Discovery as a Digitalisation Strategy for Hybrid Augmented Intelligence: Evidence from Three Iterations on Technical Trading Models

Paper ID: P90

Norma P. Rodríguez-Cándido, Rafael A. Espín-Andrade and Jorge Marx Gómez

Abstract. Digitalisation is understood here as the empowerment of organisations for problem solving and decision making, and Wide Knowledge Discovery (WKD) as a strategy to achieve it by integrating knowledge engineering, knowledge discovery and decision analysis into a single process supporting Hybrid Augmented Intelligence (HAI). This paper does not propose a new model. It examines what WKD contributes when applied repeatedly to one problem, using a case in which three successive iterations have been reported: technical trading models built on Compensatory Fuzzy Logic. The first iteration formalised expert rules as compensatory fuzzy predicates; the second made the initial truth degrees of those rules conditional on the market scenario, raising the hit rate from 65.4% to 76.4% at the level of the individual operation; the third replaced the analyst-supplied decision threshold with one estimated sequentially under a causal constraint, attaining a hit rate of 80.6% against 74.3% for an unfiltered baseline at the level of the portfolio. The two pairs are measured on different decision units and do not form a single progression. Read together, the three interventions traverse the representation, evaluation and search modalities that organise the framework, and they do so in an order that is not reversible: a decision threshold presupposes a scale whose ordering is already meaningful. The system gained adaptive capacity without acquiring any parameter that lacks a reading in the operator's language. The evidence supports the individual gains more strongly than the ordering, which rests on one trajectory in one domain, and the paper states that asymmetry explicitly.

Keywords: Wide Knowledge Discovery, Hybrid Augmented Intelligence, Compensatory Fuzzy Logic, Explainable AI, Digitalisation, Technical Analysis

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Development of an AI-Assisted Human Motion Analysis Framework for Automated Push-Up Technique Assessment and Coaching

Paper ID: P91

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Abstract. Push-up is a vital bodyweight exercise. It involves multiple muscle groups simultaneously. When performed with a proper technique it serves as a potential workout. On the other hand, an incorrect movement may lead to body strain and injury risk. In the absence of professional coaching, self-assessment methods, which may be inaccurate, are usually used. Now, with emerging technologies, it is possible to automate exercise monitoring as well as providing feedback. In this paper, we present an AI-assisted human motion analysis framework for coaching and assessing push-up techniques through video acquisition, pose estimation, landmark extraction, and joint-angle analysis, among others. Results from our preliminary assessment of the feasibility and performance of the proposed framework are promising.

Keywords: Human Motion Analysis, Push-Up Assessment, Pose Estimation, Computer Vision, Artificial Intelligence, Exercise Coaching

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