KICLS 2025
Track on Information Science & AI

POSTERS

Restore: An Artificial Intelligence Software to Assess Tooth Restorability

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Abstract

Background: Tooth restorability assessment is inherently subjective, relying heavily on clinical judgment and experience.[1] Radiographic imaging, detailed clinical parameters, and various patient factors all contribute to the decision-making process regarding whether a damaged tooth can be restored or should be extracted.[1]

Objective: The objective of this invention was to harness the potential of advanced Artificial Intelligence systems—specifically, a multimodal deep learning model—for predicting the restorability of damaged teeth.

Software development: The model developed is a multimodal deep learning classifier that accepts panoramic, bitewing, and periapical radiographs alongside tabular clinical parameters. 700 images with corresponding meta data and clinical data of patients were used to train the model. Radiographic inputs are processed via a pretrained convolutional neural network backbone (ResNet50), which extracts rich imaging features following standard ImageNet preprocessing protocols In parallel, clinical and demographic data are preprocessed through data cleaning, one-hot encoding for categorical variables, and standard scaling for numerical quantities. These features are then fused within the network to serve a binary classification task-predicting whether a tooth is suitable for restoration or should be extracted. Suitable data preprocessing, feature integration, and model optimization techniques are implemented throughout training. To prevent data leakage, the dataset is split into training and testing subsets with strict patient grouping.

Results and outcomes: The multimodal deep learning model achieved a classification accuracy of 91% in predicting whether a tooth can be restored or should be extracted. Future improvements could be realized by training on larger, more diverse, multi-center datasets, further refining the model's predictive accuracy and clinical applicability.

Benefits: This high level of performance demonstrates the model's potential to greatly assist clinicians in treatment planning, thereby minimizing risks and enhancing patient expectations and outcomes.

Ethical Implications of AI Integration in Knowledge Management Systems in Research and Academic Institutions: A Systematic Review Using the PRISMA Framework

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Abstract

Artificial Intelligence (AI) is increasingly integrated into knowledge management systems in research and academic institutions. These systems support automation in classification, data retrieval, and workflow optimization. While AI offers clear operational benefits, it also introduces ethical concerns, particularly in environments where data integrity, transparency, and research quality are critical. This study presents a systematic review of peer-reviewed literature examining the ethical implications of AI use in knowledge management within research and academic institutions. The review follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and consistency. Databases including Scopus, Web of Science, and google scholar were searched for studies published between 2020 and 2025. Inclusion criteria required studies to focus on AI applications within institutional knowledge systems and explicitly address at least one ethical concern. Articles were screened, and data were extracted and analyzed thematically. A total of 21 articles met the inclusion criteria. Thematic analysis highlighted five recurring ethical challenges: lack of algorithmic transparency, data privacy risks, limited stakeholder involvement in AI governance, bias in AI-driven classification, and insufficient institutional accountability mechanisms. The review also found that most institutions have yet to adopt standardized ethical frameworks for AI deployment in their knowledge systems. The findings suggest a growing recognition of AI ethics in institutional settings but indicate a gap between ethical awareness and implementation. This review contributes to the discourse on responsible AI use in academic and research knowledge infrastructures and proposes directions for future policy development and institutional practice.

Harnessing Cytokine Signatures and AI for Early Disease Detection and Predictive Medicine

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Abstract

The integration of cytokine profiling with artificial intelligence (AI) offers a transformative approach to early disease detection and personalized medicine. Cytokines—small signaling proteins involved in immune regulation—serve as dynamic biomarkers that reflect physiological and pathological processes. By analyzing specific cytokine expression patterns or "signatures," it is possible to detect diseases at their preclinical or early stages, monitor disease progression, and predict therapeutic responses. However, the complexity and high dimensionality of cytokine data present analytical challenges that traditional methods often fail to address.

Recent advances in AI, particularly machine learning and deep learning, have enabled the extraction of meaningful insights from multidimensional cytokine datasets. These technologies can identify subtle, non-linear patterns that may precede clinical symptoms, thus offering unprecedented diagnostic sensitivity and specificity. This chapter explores the synergistic potential of cytokine signatures and AI tools in predictive medicine, reviewing current methodologies, key applications in infectious and chronic diseases, and real-world examples. It also discusses the challenges related to data standardization, model validation, and clinical translation, emphasizing the importance of interdisciplinary collaboration to bring these innovations from bench to bedside.

Comparative Analysis of AI and Human Radiographer Performance in Radiographic Image Assessments

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Abstract

Objectives: To determine whether an interpretable, criteria-based AI can match or augment practising Kuwaiti radiographers' image-acceptance decisions and to contextualise local patterns against international reports.
Methods: Thirty anonymised radiographs (chest = 3; spine = 3; abdomen/KUB = 2; upper extremity = 15; lower extremity = 7) were reviewed by 43 radiographers (1,290 decisions) and by an interpretable, rules-based AI constructed from radiographer training-script criteria (1,290 parallel decisions). The primary outcome was "keep" vs. "not keep.″ Secondary outcomes included case-level agreement (Pearson r), examination-specific differences, and compliance with preliminary "Keep" *or* "Reject" labels. Descriptive benchmarking used published European cohorts. Ethical approval was obtained from the Kuwait Ministry of Health Ethical Committee.
Results: Radiographers kept 52.6% of images versus 32.5% for AI ($\chi^2(1) = 105.6$, $p < 0.001$; OR = 2.30, 95% CI 1.96–2.70). Case-level "keep" tendencies showed weak correlation (r = 0.16). Radiographers kept more images than AI in all examination categories; the most significant gap occurred for chest radiographs (~47 percentage points). Relative to initial labels, AI was more aligned with 'Reject', whereas radiographers were more aligned with 'Keep'. Descriptive benchmarking suggested differences from some European cohorts, indicating a need for threshold calibration.
Conclusions: An interpretable, criteria-based AI behaved more conservatively than radiographers and aligned only weakly at the case level. With exam-specific calibration, transparent criterion-level rationales and benchmarking to recognised quality criteria, such AI can augment radiographic image-quality assessment.

Critical relevance statement

Interpretable AI grounded in radiographer criteria can standardise quality checks, but conservative thresholds suppress acceptance. Calibrating to diagnostic sufficiency, while referencing international benchmarks, may improve safety, reduce repeats and support consistent, defensible acceptance decisions.

Key Points

- Radiographers' acceptance was higher compared to AI across all body regions.
- The AI was systematically conservative, aligning more with "reject" decisions.
- Exam-specific calibration to diagnostic sufficiency is needed for clinical utility.
- Criterion-level, interpretable outputs support learning, audit, and governance.

Beyond the Algorithm: A Perspective on Tackling Bias and Cultural Sensitivity in AI-Guided Aesthetic Standards for Cosmetic Surgery in the Middle East and North Africa (MENA) Region

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Abstract

Artificial intelligence (AI) is increasingly reshaping cosmetic surgery by enhancing surgical planning, predicting outcomes, and enabling objective aesthetic assessment. Through narrative synthesis of existing literature and case studies, this perspective paper explores the issue of algorithmic bias in AI-powered aesthetic technologies and presents a framework for culturally sensitive application within cosmetic surgery practices in the Middle East and North Africa (MENA) region. Existing AI systems are predominantly trained on datasets that underrepresent MENA phenotypes, resulting in aesthetic recommendations that disproportionately reflect Western beauty ideals. The MENA region, however, encompasses a broad spectrum of beauty standards that merge traditional cultural aesthetics with modern global trends, posing unique challenges for AI integration. To ensure ethical and clinically relevant deployment, AI systems must undergo fundamental changes in algorithm design, including the incorporation of culturally diverse datasets with adequate MENA representation, implementation of cultural competency principles, and active collaboration with regional healthcare professionals. Developing culturally aware AI tools is both a moral obligation and a clinical priority. This framework provides both a moral imperative and clinical pathway for ensuring AI serves to support, rather than homogenize, the region's diverse aesthetic traditions.

AI-Driven Data Analysis of Clinical Gram-negative Bacterial Isolates

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Abstract

Background: Whole-genome sequencing (WGS) is a critical tool in modern clinical microbiology for characterizing bacterial pathogens, providing in-depth insight into bacterial genetic composition, including resistance genes, plasmid profiles, virulence factors, and transposable elements. Consequently, WGS has become a vital asset for patient care and public health. Nevertheless, understanding the complex data generated by WGS, especially at the tertiary level of analysis, demands a high level of bioinformatics expertise, which is limited in many healthcare settings. The study aims to utilize artificial intelligence (AI), specifically ChatGPT4 and GitHub Copilot, to assist in data integration and the creation of user-friendly software that provides visual and graphical representations of generated data.

Methodology: A total of 20 multidrug-resistant (MDR) Gram-negative bacterial isolates were obtained from inpatients in Farwaniya Hospital. The total genomic DNA of these isolates were extracted using the Monarch gDNA extraction kit and sequenced using Oxford Nanopore technology (ONT). ChatGPT4 and GitHub Copilot were used to design user-friendly software enabling primary, secondary, and tertiary data analysis. The freely available analysis packages Nanoplot, NanoFilt, Flye, Medaka, and ABRicate were implemented in the software for quality control, assembly, antimicrobial resistance, and virulence factor detection, respectively. In addition, ChatGPT4 and GitHub Copilot were used to sort the data results and generate graphical outputs.

Results: The software integrated by AI tools ChatGPT4 and GitHub Copilot successfully separated sequencing data files based on their quality and only processed the pass data files. The generated results were first combined in a .csv file format and then visualized in an easy-to-read graphical output showing bacterial resistance genes and virulence factors.

Conclusion: Using AI tools enables the development of data analysis software for complex genetic techniques, which therefore empowers the interpretation of complex genomic data easily and accurately without bioinformatic involvement.

- *Acknowledgement:* This work was supported by Kuwait University Research Sector grant no. (pryMI04/22)

Storytelling Meets Technology: Creating a Structured Kuwaiti Arabic Corpus from Community-Driven Stories

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Abstract

The growing demand for Natural Language Processing (NLP) tools across diverse linguistic communities has brought attention to the critical lack of resources for many spoken Arabic dialects. Among them, Kuwaiti Arabic (KA) remains significantly underrepresented in computational linguistics. This paper presents the development of a textual corpus consisting of 100 short stories written in KA, collected through a public survey of native Kuwaiti speakers. The methodology embraces a community-driven approach to ensure the data reflects authentic linguistic variation and everyday usage. Narrative texts, particularly short stories, offer rich linguistic features—morphological complexity, informal syntax, and pragmatic nuance—that make them highly effective for training NLP models, especially in low-resource settings. By leveraging stories, this corpus captures the stylistic and lexical diversity of Kuwaiti Arabic in contextually meaningful ways. This enables applications such as morphological analysis, dialect identification, and sentiment analysis.

To enrich the corpus linguistically, the CAMeL tools for Gulf Arabic were applied to automatically generate morphological annotations for the entire corpus. To ensure annotation quality, the entire corpus was also manually validated by two expert annotators, demonstrating the reliability and usefulness of automated tools for KA processing. This work highlights the linguistic and cultural value of KA, while also addressing the technical need for dialect-specific resources in NLP. The resulting corpus serves as a foundational corpus for advancing computational models tailored to KA varieties. It contributes to broader efforts in preserving and processing Gulf Arabic through digital technologies.

Physicians' Online: A TAM-Based Study of Social Network Adoption Pre- and Post-Pandemic

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Abstract

Social networks have revolutionized numerous activities in daily life, affecting the behavior of professional conduct. Professionals, especially healthcare professionals, directly impact community members' health and well-being through online social networks. However, limited studies have considered the use of social networks by medical and healthcare professionals, especially during the Coronavirus disease pandemic (COVID-19). Understanding how healthcare professionals use social networks is crucial, as it can influence public health communication and education. By studying their social media interactions, we can gain insights into how information is disseminated and how it impacts patient care and community health outcomes. Furthermore, this knowledge can help develop guidelines to enhance the effective and responsible use of social networks in the medical field.

To understand the effect of COVID-19 on medical professionals' behavior on social networks for healthcare and medical purposes, we conducted a comprehensive survey based on the Technology Acceptance Model (TAM), which is a framework used to explain how users come to accept and utilize technology. It focuses on two key factors: perceived usefulness (how much a person believes a technology will improve their performance) and perceived ease of use (how easy the technology is to use). We developed a longitudinal survey covering two samples of medical professionals from Kuwait before and after COVID-19. The results of the study suggest that physicians do not strongly favor using social media as a healthcare tool. Therefore, it is critical to promote more healthcare awareness on social media. It is also important to study healthcare professionals' needs so that they can employ social media positively for healthcare.

Guided vs. Prohibited AI Assistance in Higher Education: Psychological and Ethical Implications

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Abstract

The rise of AI tools has reshaped many aspects of daily life, particularly in education. Large language models and other generative AI technologies have become increasingly integrated into students' learning experiences. While some students use them to deepen their understanding of course material or to assist with assignments, others rely on them more extensively. These tools are powerful, and students continue to discover new and creative ways to use them. However, this widespread adoption has also encountered significant resistance. Many instructors have chosen to prohibit the use of AI altogether, often due to concerns about academic integrity, learning outcomes, or fairness. Others have adopted a different approach, guiding students to use AI responsibly and ethically rather than prohibiting it entirely.

This research investigates students' psychological and ethical responses to instructors' approaches to AI use in higher education. It examines whether the forbidden-fruit effect applies in this context and how instructor policies influence students' comfort, confidence, and academic behavior.

To examine this, we surveyed 150 university students who had experienced either guided AI use or strict prohibitions in their courses. Their responses provided insights into how these differing instructional approaches affected students' academic mindset, confidence, and ethical considerations. These data form the basis for evaluating the real-world consequences of instructor attitudes toward AI and for assessing whether support, rather than restriction, fosters a healthier learning environment.

Key findings:

- 69% of students reported having at least one instructor who encouraged or guided AI use, whereas 31% indicated that their instructors discouraged or prohibited AI tools.
- Among students who experienced AI prohibition, 43% were uncertain whether it promoted ethical behavior, 30% indicated that it did, and 27% indicated that it did not.
- Regarding the impact of the AI prohibition on their usage, 55% reported an increase in usage, while 16% reported a decrease.
- Among students who received AI guidance, 57% indicated that the guidance helped them use AI more ethically or responsibly, 29% were unsure, and 14% reported that it did not.
- Finally, 69% of students reported increased AI usage under instructor guidance, 27% reported no change, and only 4% reported decreased usage.

Our findings underscore the value of ethical guidance over strict prohibitions. Guidance not only fosters responsible AI use but also supports student performance and engagement. In contrast, prohibiting AI may trigger a "forbidden fruit" effect, whereby restrictions unintentionally encourage unethical behavior and increase students' reliance on AI. These results indicate that supportive, guidance-based policies are more effective than prohibitions in promoting responsible AI use in higher education.

Responsible AI and Indigenous Environmental Knowledge: Toward Ethical and Culturally Inclusive Innovation

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Abstract

Artificial Intelligence (AI) holds significant potential for environmental monitoring, climate resilience, and sustainable development. Its strength lies in scaling methodologies efficiently and replicating processes with precision while reducing time and labor costs. However, this sought-after efficiency often imposes uniform approaches with minimal criticism and sensitivity to local knowledge systems. Indigenous environments are embedded with knowledge; long-standing, inherited logics carried through technologies and practices that shape how communities understand, interact with, and manage their surroundings. Yet AI-based environmental strategies - which, in contemporary practice, underlie nearly all environmental decisions - often disregard these systems, leading to epistemic injustice, cultural erasure, and environmental harm. A homogenized approach has risks that are both immediate and long term, with effects that can be vast and damaging, often setting environmental practices back many years. The pervasiveness of AI makes this soft colonialism almost impossible to detect. This paper approaches this issue by interrogating the foundational guidelines and protocols on ethical AI and responsible innovation; including those published by the UN, EU, and the IEEE's Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems. These guidelines are assessed in how they embed universalist assumptions that overlook non-Western epistemologies. The critique is developed through comparative textual analysis, identifying key epistemic blind spots and offering culturally grounded adaptations. While conceptually positioned, the paper outlines practical strategies and application pathways for adapting these frameworks to real-world environmental monitoring contexts. This bridges the gap between critique and implementation, ensuring the work is relevant to both ethical discourse and applied AI development. Ultimately, this paper calls for a multidisciplinary approach to AI ethics: centering cultural data sovereignty and technical integration, to ensure AI systems support environmental stewardship without overriding cultural histories or reproducing new forms of soft colonialism.

Energy-Efficient AI for Building Simulation: Parallel Monte Carlo-Based Surrogate Optimization

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Abstract

Surrogate optimization is a method of optimizing black-box functions that are computationally expensive to evaluate, often due to long simulation runtimes. In the context of energy-efficient AI, the primary goal is to explore promising regions of the design space using as few high-cost evaluations as possible, thereby minimizing energy consumption during the optimization process. Recent versions of EnergyPlus introduced multi-threading capabilities, allowing for parallel simulation of multiple parametric building models. Leveraging this, we proposed in [1] a computationally and energy-efficient methodology for parallel surrogate optimization of building energy models, where simulation outputs are treated as opaque black-box responses.

Our approach uses gradient-boosted regression tree ensembles (XGBoost) to model responses across real, integer, and categorical parameters. This model enables fast, low-energy approximations of simulation outcomes. The surrogate is optimized via a Monte Carlo-based method to approximate the Pareto front between predicted function values and an associated uncertainty measure.

Candidate designs are partitioned into groups with low, medium, and high uncertainty. New simulation points are then selected strategically: exploiting the most promising low-uncertainty candidates, sampling diverse Pareto-optimal points from the medium group and exploring high-uncertainty areas to refine the surrogate when necessary. This adaptive sampling strategy reduces redundant evaluations, contributing to more sustainable AI workflows.

We demonstrate the method on both synthetic benchmarks and a real-world energy model of a residential villa in Kuwait. Results indicate that the proposed method not only maintains high optimization performance but also does so with fewer simulation calls, thereby offering a computationally and energy-efficient alternative to genetic algorithms.

Acknowledgement: This research was supported by the Science Fund of the Republic of Serbia, #6767, Lazy walks and spectral radius of graphs - LZWK.