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Accepted Papers

Tiny Diffusion, Big Brain: Lightweight Dual-control Stable Diffusion for Brain MRI Synthesis

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ABSTRACT

We present a lightweight pipeline using Stable Diffusion v1.5 [7] for generating anatomically accurate brain MRI images depicting tumors. Using a public dataset of 1,426 glioma MRI slices from 233 patients [5,2] we condition image generation on both descriptive text prompts (text input) and visually transformed grayscale MRI slices (visual input). We explore three visual transforms: Gaussian-blurring, checkerboard-masked, and edge-mapped. Inspired by ControlNet [9], our method supports dual conditioning during both training and inference but avoids duplicating the U-Net architecture—significantly reducing memory overhead. This enables training on standard GPUs such as a single 15GB T4 in Google Colab. To assess image realism on synthesized images, we use both qualitative inspection and Fréchet Inception Distance (FID). This model is an important step towards building more flexible, privacy-preserving methods for creating high-quality medical images in low-data, low-memory settings— with potential applications in rare disease research and AI-driven healthcare.

Keywords

Stable Diffusion, ControlNet, healthcare, medical imaging.

Generative Artificial Intelligence in Higher Education: Opportunities, Challenges, and Future Directions

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ABSTRACT

The integration of Generative Artificial Intelligence (GAI) in higher education has garnered significant scholarly attention. This comprehensive review synthesizes current literature to examine the transformative potential, implementation challenges, and future trajectories of GAI in academic settings. Our analysis reveals that GAI offers substantial opportunities for personalized learning, pedagogical innovation, and creative skill development while simultaneously presenting critical challenges related to academic integrity, data privacy, and algorithmic bias. We analyze these developments through three interconnected dimensions: technological applications, stakeholder perceptions, and contextual implementation. The paper concludes by proposing six key research priorities: assessment integrity and pedagogical strategies, ethical frameworks and policy development, teaching-learning process impacts, stakeholder perceptions research, technological enhancements, and future skills preparation. These findings provide both theoretical foundations and practical guidance for the responsible integration of GAI technologies in higher education institutions.

Keywords

Generative Artificial Intelligence, Higher Education, Systematic Review, ChatGPT, Academic Integrity

AHT-ViT: Adaptive Halting Transformer with Planned Depth Execution

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ABSTRACT

Vision Transformers (ViTs) offer strong performance but face high computational costs from processing all tokens through their full depth. Standard ViTs lack adaptivity. This work introduces Adaptive Halting Transformer (AHT-ViT) to enhance efficiency by dynamically adjusting processing depth per token. AHT-ViT employs hierarchical "planner" modules predicting token-specific target halting depths and an extremely parameter-efficient "supervisor" mechanism (two shared parameters) generating per-layer halting scores. Tokens halt when their cumulative score crosses a threshold. A novel KL divergence-based loss, $L_{\text{target depth}}$, explicitly aligns executed halting distributions with planned depths. Evaluation on ImageNet, Places365, and CIFAR-100 using DeiT-S shows AHT-ViT achieves an improved accuracy-efficiency trade-off compared to its static baseline and demonstrates competitive performance against other adaptive methods (DynamicViT, A-ViT) evaluated under the same conditions, while significantly reducing FLOPs. Key hyperparameters were selected via grid search on a validation split.

Keywords

Vision Transformer, Adaptive Computation, Early Exit, Dynamic Depth, Model Efficiency, Image Classification.

Rag in Specialized Domains: a Survey of QA Chatbots

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ABSTRACT

This paper explores the evolution of large language models (LLMs) and the growing role of retrieval-augmented generation (RAG) systems in overcoming challenges in domain-specific applications. Although LLMs have revolutionized natural language processing (NLP), they face critical limitations in high-stakes domains such as medicine, engineering, and law—where accuracy, factuality, and trust are paramount. These shortcomings include hallucinations, outdated knowledge, and vulnerability to adversarial prompts. RAG systems address these issues by integrating LLMs with external, domain-specific knowledge sources to improve factual grounding and response reliability. Frameworks like Almanac in clinical settings and KEAG in complex QA tasks demonstrate how RAG reduces hallucinations, enhances interpretability, and delivers accurate, evidence-backed responses. In healthcare, combining LLMs with RAG has raised accuracy from around 93.25 percent up to 99.25 percent, showing its impact on real-world decision support. This paper proposes a structured synthesis of advancements, challenges, and optimization strategies in RAG for specialized domains, paving the way for safer, transparent, and adaptive AI systems.

Keywords

Retrieval Augmented Generation, Large Language Models, Fine Tuning, Maximum Marginal Relevance Retrieval, Neural Generative Question Answering.

Fuzzy Clustering & Modernity: The Intelligent Machines of the 21st Century

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ABSTRACT

The original intention of the pioneer of Artificial Intelligence (AI) was to create machines that completely replicate human intelligence; so they can think with their minds, in the full and literal sense of it, are able to allow inferences, of the likes of humans – i.e. to make the deductions like: “Moses is a man. All men are mortal. Therefore Moses is Mortal “. This paper shows that the ambition is no longer any distant goal – and will be passed by 2029 - with the continued progress in advanced fuzzy clustering and Machine Learning.

Keywords

Artificial Intelligence (AI), Machine Learning, Clusters, Fuzzy Clustering, data science, humans, algorithm.

Unified Load Balancing Strategies for Enhanced Cloud Computing Solutions

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ABSTRACT

Cloud computing provides scalable, on-demand resources that support a wide range of services and applications. Efficient load balancing in cloud environments is critical when maintaining performance and quality of service. A hybrid Ant Colony Optimisation – Genetic Algorithm (ACO-GA) method is proposed for task scheduling in a hybrid cloud, implemented and evaluated using the CloudAnalyst simulator. The custom algorithm leverages ACO's rapid local search for assigning workloads to virtual machines and GA's global evolutionary search to diversify solutions. The ACO-GA is compared against Round Robin, pure ACO, and pure GA strategies. Performance is measured by overall response time and data centre processing time. Simulation results indicate that the proposed ACO-GA outperforms the baseline strategies in both response time and data centre processing time, demonstrating that combining ACO's pheromone-guided optimisation and GA's genetic exploration leads to more balanced loads.

Keywords

Cloud Computing, Load Balancing, Round Robin, Ant Colony Optimisation, Genetic Algorithm.

Integrating Virtual Reality Approaches to Simulations in Interprofessional Education: A Case Study

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ABSTRACT

This paper provides a case study illustrating how virtual reality (VR) simulations for training interprofessional students in health and human service professions to work with vulnerable populations were developed and implemented in an interprofessional education (IPE) curriculum. Key challenges and strategies are discussed and include the need and justification for the simulation programs, the challenge of changing technology and educational trends over time, and plans for enhancing existing programs and creating new programs and cases.

Keywords

Virtual Worlds, Healthcare, Educational Technology.

Gamification in Education: A Systematic Review of Engagement and Learning Outcomes

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ABSTRACT

This literature review examines the role of gamification in enhancing student engagement and learning outcomes across diverse educational contexts. Grounded in psychological theories including Self-Determination Theory, Flow Theory, Constructivist Learning Theory, and Behaviorism, the review synthesizes evidence on how game-design elements such as points, badges, leaderboards, challenges, and storytelling influence motivation, academic performance, and retention. Case studies of widely used platforms (e.g., Duolingo, Classcraft, Kahoot, Minecraft, ABCmouse) illustrate practical implementations and highlight both benefits and challenges. While research generally supports gamification's positive impact on engagement, findings are inconsistent across age groups, disciplines, and cultural settings. Limitations include an excessive reliance on extrinsic rewards, limited long-term studies, and not enough focus on accessibility and equity. Recommendations emphasize the need for adaptive, inclusive designs and rigorous evaluation of sustained effects. Overall, the findings highlight that although gamification offers considerable promise, its effectiveness depends greatly on thoughtful integration with sound pedagogical objectives.

Keywords

Gamification, Student Engagement, Learning Outcomes, Motivation Theories, Educational Technology, Game-Based Learning, Self-Determination Theory, Digital Learning Tools.

New Pointwise Biprojectivity as an Extension of Banach Algebras

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ABSTRACT

In the present paper, we study the Pointwise Biprojectibility of Banach Algebras. We indicate that a Pointwise Biprojective Banach Algebra is a super-amenable if and only if it has an identity. In addition, we investigate other Pointwise Biprojective properties including, the relationship between Pointwise Biprojectibility and amenability for Banach Algebras. We also maintain what kind of relationship is between Pointwise Biprojectibility $L1(G)$ and G . Finally, we define the concept of Pointwise projectibility and investigate the relationship between Pointwise Projectibility and Pointwise Biprojectibility. We consider any conditions for proof that biprojective and projective are two definition similar to pointwise projective and pointwise biprojective in extension of Banach algebras. In several structures, we prove that almost everywhere, Banach algebras satisfy another

situations. In Future we will find that we can develop all theorems and lemmas of this paper for Pointwise amenability. We Recommend authors show that there is a Banach algebra that it does not apply to the conditions mentioned in this article.

Keywords

Banach Algebra, Pointwise Biprojective, Pointwise Projective, Pointwise Amenable.

On Ideals via Generalized Reverse Derivation on Factor Rings

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ABSTRACT

In current article, for a prime ideal P of any ring R , we study the commutativity of the factor ring R/P , whenever R equipped with generalized reverse derivations F and G associated with reverse derivations d and g , respectively. That satisfies certain differential identities involving in P that connected to an ideal of R . Additionally, we show that, for some cases, the range of the generalized reverse derivation F or G repose in the prime ideal P . Moreover, we explore several consequences and special cases. Throughout, we provide examples to demonstrate that various restrictions in the assumptions of our outcomes are essential.

Keywords

Prime Ideal; Integral Domain; Generalized Reverse Derivation; Factor ring.