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Paper 1:

Ariadne: A Hotness-Aware and Size-Adaptive Compressed Swap Technique for Fast Application Relaunch and Reduced CPU Usage on Mobile Devices

Date: 2025-02-18

Time: 12:46:50

Authors:

Yu Liang, Aofeng Shen, Chun Jason Xue, Riwei Pan, Haiyu Mao, Nika Mansouri Ghiasi, Qingcai Jiang, Rakesh Nadig, Lei Li, Rachata Ausavarungnirun

Summary:

- Growing application memory demands and concurrent usage are making mobile device memory scarce. When memory pressure is high, current mobile systems use a RAM-based compressed swap scheme (called ZRAM) to compress unused execution-related data (called anonymous data in Linux) in main memory. We observe that the state-of-the-art ZRAM scheme prolongs relaunch latency and wastes CPU time because it does not differentiate between hot and cold data or leverage different compression chunk sizes and data locality. We make three new observations. 1) anonymous data has different levels of hotness. Hot data, used during application relaunch, is usually similar between consecutive relaunched. 2) when compressing the same amount of anonymous data, small-size compression is very fast, while large-size compression achieves a better compression ratio. 3) there is locality in data access during application relaunch. We propose Ariadne, a compressed swap scheme for mobile devices that reduces relaunch latency and CPU usage with three key techniques. 1) a low-overhead hotness-aware data organization scheme aims to quickly identify the hotness of anonymous data without significant overhead. 2) a size-adaptive compression scheme uses different compression chunk sizes based on the data's hotness level to ensure fast decompression of hot and warm data. 3) a proactive decompression scheme predicts the next set of data to be used and decompresses it in advance, reducing the

impact of data swapping back into main memory during application relaunch. Our experimental evaluation results on Google Pixel 7 show that, on average, Ariadne reduces application relaunch latency by 50% and decreases the CPU usage of compression and decompression procedures by 15% compared to the state-of-the-art ZRAM scheme.

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Paper 2:

BESSTIE: A Benchmark for Sentiment and Sarcasm Classification for Varieties of English

Date: 2025-02-18

Time: 02:34:18

Authors:

Dipankar Srirag, Aditya Joshi, Jordan Painter, Diptesh Kanojia

Summary:

- Despite large language models (LLMs) being known to exhibit bias against non-mainstream varieties, there are no known labeled datasets for sentiment analysis of English. To address this gap, we introduce BESSTIE, a benchmark for sentiment and sarcasm classification for three varieties of English: Australian (en-AU), Indian (en-IN), and British (en-UK). Using web-based content from two domains, namely, Google Place reviews and Reddit comments, we collect datasets for these language varieties using two methods: location-based and topic-based filtering. Native speakers of the language varieties manually annotate the datasets with sentiment and sarcasm labels. To assess whether the dataset accurately represents these varieties, we conduct two validation steps: (a) manual annotation of language varieties and (b) automatic language variety prediction. Subsequently, we fine-tune nine large language models (LLMs) (representing a range of encoder/decoder and mono/multilingual models) on these datasets, and evaluate their performance on the two tasks. Our results reveal that the models consistently perform better on inner-circle varieties (i.e., en-AU and en-UK), with significant performance drops for en-IN, particularly in sarcasm detection. We also report challenges in cross-variety generalisation, highlighting the need for language variety-specific datasets such as ours. BESSTIE promises to be a useful evaluative benchmark for future research in equitable LLMs, specifically in terms of language varieties. The BESSTIE datasets, code, and models will be publicly available upon acceptance.

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Paper 3:

Research on Research Visibility

Date: 2025-02-17

Time: 15:34:22

Authors:

Enrique Orduña-Malea, Cristina I. Font-Julián

Summary:

- This editorial explores the significance of research visibility within the evolving landscape of academic communication, mainly focusing on the role of search engines as online meta-markets shaping the impact of research. With the rapid expansion of scientific output and the increasing reliance on algorithm-driven platforms such as Google and Google Scholar, the online visibility of scholarly work has become an essential factor in determining its reach and influence. The need for more rigorous research into academic search engine optimization (A-SEO), a field still in its infancy despite its growing relevance, is also discussed, highlighting key challenges in the field, including the lack of robust research methodologies, the skepticism within the academic community regarding the commercialization of science, and the need for standardization in reporting and measurement techniques. This editorial thus invites a multidisciplinary dialogue on the future of research visibility, with significant implications for academic publishing, science communication, research evaluation, and the global scientific ecosystem.

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Paper 4:

Prompting in the Dark: Assessing Human Performance in Prompt Engineering for Data Labeling When Gold Labels Are Absent

Date: 2025-02-16

Time: 20:54:26

Authors:

Zeyu He, Saniya Naphade, Ting-Hao 'Kenneth' Huang

Summary:

- Millions of users prompt large language models (LLMs) for various tasks, but how good are people at prompt engineering? Do users actually get closer to their desired outcome over multiple iterations of their prompts? These questions are crucial when no gold-standard labels are available to measure progress. This paper investigates a scenario in LLM-powered data labeling, "prompting in the dark," where

users iteratively prompt LLMs to label data without using manually-labeled benchmarks. We developed PromptingSheet, a Google Sheets add-on that enables users to compose, revise, and iteratively label data through spreadsheets. Through a study with 20 participants, we found that prompting in the dark was highly unreliable-only 9 participants improved labeling accuracy after four or more iterations. Automated prompt optimization tools like DSPy also struggled when few gold labels were available. Our findings highlight the importance of gold labels and the needs, as well as the risks, of automated support in human prompt engineering, providing insights for future tool design.

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Paper 5:

Improved Differentially Private Continual Observation Using Group Algebra

Date: 2025-02-15

Time: 11:27:05

Authors:

Monika Henzinger, Jalaj Upadhyay

Summary:

- Differentially private weighted prefix sum under continual observation is a crucial component in the production-level deployment of private next-word prediction for Gboard, which, according to Google, has over a billion users. More specifically, Google uses a differentially private mechanism to sum weighted gradients in its *private follow-the-regularized leader* algorithm. Apart from efficiency, the additive error of the private mechanism is crucial as multiplied with the square root of the model's dimension d (with d ranging up to 10^{10} trillion, for example, Switch Transformers or M6-10T), it determines the accuracy of the learning system. So, any improvement in leading constant matters significantly in practice. In this paper, we show a novel connection between mechanisms for continual weighted prefix sum and a concept in representation theory known as the group matrix introduced in correspondence between Dedekind and Frobenius (1897) and generalized by Schur (1904). To the best of our knowledge, this is the first application of group algebra to analyze differentially private algorithms. Using this connection, we analyze a class of matrix norms known as *factorization norms* that give upper and lower bounds for the additive error under general ℓ_p -norms of the matrix mechanism. This allows us to give the

first efficient factorization that matches the best-known non-constructive upper bound on the factorization norm by Mathias (1993) for the matrix used in Google's deployment and also improves on the previous best-known constructive bound of Fichtenberger et al. (ICML 2023) and Henzinger et al. (SODA 2023) and the first upper bound on the additive error for a large class of weight functions for weighted prefix sum problems, including the sliding window matrix (Bolot et al. (ICDT 2013).

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Paper 6:

Hyperdimensional Intelligent Sensing for Efficient Real-Time Audio Processing on Extreme Edge

Date: 2025-02-15

Time: 08:19:20

Authors:

Sanggeon Yun, Ryoza Masukawa, Hanning Chen, SungHeon Jeong, Wenjun Huang, Arghavan Rezvani, Minhyoung Na, Yoshiki Yamaguchi, Mohsen Imani

Summary:

- The escalating challenges of managing vast sensor-generated data, particularly in audio applications, necessitate innovative solutions. Current systems face significant computational and storage demands, especially in real-time applications like gunshot detection systems (GSDS), and the proliferation of edge sensors exacerbates these issues. This paper proposes a groundbreaking approach with a near-sensor model tailored for intelligent audio-sensing frameworks. Utilizing a Fast Fourier Transform (FFT) module, convolutional neural network (CNN) layers, and HyperDimensional Computing (HDC), our model excels in low-energy, rapid inference, and online learning. It is highly adaptable for efficient ASIC design implementation, offering superior energy efficiency compared to conventional embedded CPUs or GPUs, and is compatible with the trend of shrinking microphone sensor sizes. Comprehensive evaluations at both software and hardware levels underscore the model's efficacy. Software assessments through detailed ROC curve analysis revealed a delicate balance between energy conservation and quality loss, achieving up to 82.1% energy savings with only 1.39% quality loss. Hardware evaluations highlight the model's commendable energy efficiency when implemented via ASIC design, especially with the Google Edge TPU, showcasing its superiority over prevalent embedded CPUs and GPUs.

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Paper 7:

Machine Learning Approaches for Mental Illness Detection on Social Media: A Systematic Review of Biases and Methodological Challenges

Date: 2025-02-15

Time: 07:27:21

Authors:

Yuchen Cao, Jianglai Dai, Zhongyan Wang, Yeyubei Zhang, Xiaorui Shen,
Yunchong Liu, Yexin Tian

Summary:

- The global increase in mental illness requires innovative detection methods for early intervention. Social media provides a valuable platform to identify mental illness through user-generated content. This systematic review examines machine learning (ML) models for detecting mental illness, with a particular focus on depression, using social media data. It highlights biases and methodological challenges encountered throughout the ML lifecycle. A search of PubMed, IEEE Xplore, and Google Scholar identified 47 relevant studies published after 2010. The Prediction model Risk Of Bias ASsessment Tool (PROBAST) was utilized to assess methodological quality and risk of bias. The review reveals significant biases affecting model reliability and generalizability. A predominant reliance on Twitter (63.8%) and English-language content (over 90%) limits diversity, with most studies focused on users from the United States and Europe. Non-probability sampling (80%) limits representativeness. Only 23% explicitly addressed linguistic nuances like negations, crucial for accurate sentiment analysis. Inconsistent hyperparameter tuning (27.7%) and inadequate data partitioning (17%) risk overfitting. While 74.5% used appropriate evaluation metrics for imbalanced data, others relied on accuracy without addressing class imbalance, potentially skewing results. Reporting transparency varied, often lacking critical methodological details. These findings highlight the need to diversify data sources, standardize preprocessing, ensure consistent model development, address class imbalance, and enhance reporting transparency. By overcoming these challenges, future research can develop more robust and generalizable ML models for depression detection on social media, contributing to improved mental health outcomes globally.

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