

# Research Papers on 'AI'

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## Paper 1:

### **Do Not Trust Licenses You See -- Dataset Compliance Requires Massive-Scale AI-Powered Lifecycle Tracing**

Date: 2025-03-06

Time: 18:45:51

Authors:

Jaekyeom Kim, Sungryull Sohn, Gerrard Jeongwon Jo, Jihoon Choi,  
Kyunghoon Bae, Hwayoung Lee, Yongmin Park, Honglak Lee

Summary:

- This paper argues that a dataset's legal risk cannot be accurately assessed by its license terms alone; instead, tracking dataset redistribution and its full lifecycle is essential. However, this process is too complex for legal experts to handle manually at scale. Tracking dataset provenance, verifying redistribution rights, and assessing evolving legal risks across multiple stages require a level of precision and efficiency that exceeds human capabilities. Addressing this challenge effectively demands AI agents that can systematically trace dataset redistribution, analyze compliance, and identify legal risks. We develop an automated data compliance system called NEXUS and show that AI can perform these tasks with higher accuracy, efficiency, and cost-effectiveness than human experts. Our massive legal analysis of 17,429 unique entities and 8,072 license terms using this approach reveals the discrepancies in legal rights between the original datasets before redistribution and their redistributed subsets, underscoring the necessity of the data lifecycle-aware compliance. For instance, we find that out of 2,852 datasets with commercially viable individual license terms, only 605 (21%) are legally permissible for commercialization. This work sets a new standard for AI data governance, advocating for a framework that systematically examines the entire lifecycle of dataset redistribution to ensure transparent, legal, and responsible dataset management.

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## Paper 2:

### Matrix Factorization for Inferring Associations and Missing Links

Date: 2025-03-06

Time: 18:22:46

Authors:

Ryan Barron, Maksim E. Eren, Duc P. Truong, Cynthia Matuszek, James Wendelberger, Mary F. Dorn, Boian Alexandrov

Summary:

- Missing link prediction is a method for network analysis, with applications in recommender systems, biology, social sciences, cybersecurity, information retrieval, and Artificial Intelligence (AI) reasoning in Knowledge Graphs. Missing link prediction identifies unseen but potentially existing connections in a network by analyzing the observed patterns and relationships. In proliferation detection, this supports efforts to identify and characterize attempts by state and non-state actors to acquire nuclear weapons or associated technology - a notoriously challenging but vital mission for global security. Dimensionality reduction techniques like Non-Negative Matrix Factorization (NMF) and Logistic Matrix Factorization (LMF) are effective but require selection of the matrix rank parameter, that is, of the number of hidden features,  $k$ , to avoid over/under-fitting. We introduce novel Weighted (WNMF $k$ ), Boolean (BNMF $k$ ), and Recommender (RNMF $k$ ) matrix factorization methods, along with ensemble variants incorporating logistic factorization, for link prediction. Our methods integrate automatic model determination for rank estimation by evaluating stability and accuracy using a modified bootstrap methodology and uncertainty quantification (UQ), assessing prediction reliability under random perturbations. We incorporate Otsu threshold selection and  $k$ -means clustering for Boolean matrix factorization, comparing them to coordinate descent-based Boolean thresholding. Our experiments highlight the impact of rank  $k$  selection, evaluate model performance under varying test-set sizes, and demonstrate the benefits of UQ for reliable predictions using abstention. We validate our methods on three synthetic datasets (Boolean and uniformly distributed) and benchmark them against LMF and symmetric LMF (symLMF) on five real-world protein-protein interaction networks, showcasing an improved prediction performance.

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### **Paper 3:**

#### **Ultra-Low-Latency Edge Intelligent Sensing: A Source-Channel Tradeoff and Its Application to Coding Rate Adaptation**

Date: 2025-03-06

Time: 17:32:35

Authors:

Qunsong Zeng, Jianhao Huang, Zhanwei Wang, Kaibin Huang, Kin K. Leung

Summary:

- The forthcoming sixth-generation (6G) mobile network is set to merge edge artificial intelligence (AI) and integrated sensing and communication (ISAC) extensively, giving rise to the new paradigm of edge intelligent sensing (EI-Sense). This paradigm leverages ubiquitous edge devices for environmental sensing and deploys AI algorithms at edge servers to interpret the observations via remote inference on wirelessly uploaded features. A significant challenge arises in designing EI-Sense systems for 6G mission-critical applications, which demand high performance under stringent latency constraints. To tackle this challenge, we focus on the end-to-end (E2E) performance of EI-Sense and characterize a source-channel tradeoff that balances source distortion and channel reliability. In this work, we establish a theoretical foundation for the source-channel tradeoff by quantifying the effects of source coding on feature discriminant gains and channel reliability on packet loss. Building on this foundation, we design the coding rate control by optimizing the tradeoff to minimize the E2E sensing error probability, leading to a low-complexity algorithm for ultra-low-latency EI-Sense. Finally, we validate our theoretical analysis and proposed coding rate control algorithm through extensive experiments on both synthetic and real datasets, demonstrating the sensing performance gain of our approach with respect to traditional reliability-centric methods.

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### **Paper 4:**

#### **SurveyForge: On the Outline Heuristics, Memory-Driven Generation, and Multi-dimensional Evaluation for Automated Survey Writing**

Date: 2025-03-06

Time: 17:15:48

Authors:

Xiangchao Yan, Shiyang Feng, Jiakang Yuan, Renqiu Xia, Bin Wang, Bo

Zhang, Lei Bai

Summary:

- Survey paper plays a crucial role in scientific research, especially given the rapid growth of research publications. Recently, researchers have begun using LLMs to automate survey generation for better efficiency. However, the quality gap between LLM-generated surveys and those written by human remains significant, particularly in terms of outline quality and citation accuracy. To close these gaps, we introduce SurveyForge, which first generates the outline by analyzing the logical structure of human-written outlines and referring to the retrieved domain-related articles. Subsequently, leveraging high-quality papers retrieved from memory by our scholar navigation agent, SurveyForge can automatically generate and refine the content of the generated article. Moreover, to achieve a comprehensive evaluation, we construct SurveyBench, which includes 100 human-written survey papers for win-rate comparison and assesses AI-generated survey papers across three dimensions: reference, outline, and content quality. Experiments demonstrate that SurveyForge can outperform previous works such as AutoSurvey.

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## **Paper 5:**

### **The Next Frontier of LLM Applications: Open Ecosystems and Hardware Synergy**

Date: 2025-03-06

Time: 16:38:23

Authors:

Xinyi Hou, Yanjie Zhao, Haoyu Wang

Summary:

- Large Language Model (LLM) applications, including LLM app stores and autonomous agents, are shaping the future of AI ecosystems. However, platform silos, fragmented hardware integration, and the absence of standardized interfaces limit scalability, interoperability, and resource efficiency. While LLM app stores democratize AI, their closed ecosystems restrict modular AI reuse and cross-platform portability. Meanwhile, agent-based frameworks offer flexibility but often lack seamless integration across diverse environments. This paper envisions the future of LLM applications and proposes a three-layer decoupled architecture grounded in software engineering principles such as layered system design, service-oriented architectures, and hardware-

software co-design. This architecture separates application logic, communication protocols, and hardware execution, enhancing modularity, efficiency, and cross-platform compatibility. Beyond architecture, we highlight key security and privacy challenges for safe, scalable AI deployment and outline research directions in software and security engineering. This vision aims to foster open, secure, and interoperable LLM ecosystems, guiding future advancements in AI applications.

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## **Paper 6:**

### **Exploring Visual Prompts: Refining Images with Scribbles and Annotations in Generative AI Image Tools**

Date: 2025-03-06

Time: 16:24:15

Authors:

Hyerim Park, Malin Eiband, Andre Luckow, Michael Sedlmair

Summary:

- Generative AI (GenAI) tools are increasingly integrated into design workflows. While text prompts remain the primary input method for GenAI image tools, designers often struggle to craft effective ones. Moreover, research has primarily focused on input methods for ideation, with limited attention to refinement tasks. This study explores designers' preferences for three input methods - text prompts, annotations, and scribbles - through a preliminary digital paper-based study with seven professional designers. Designers preferred annotations for spatial adjustments and referencing in-image elements, while scribbles were favored for specifying attributes such as shape, size, and position, often combined with other methods. Text prompts excelled at providing detailed descriptions or when designers sought greater GenAI creativity. However, designers expressed concerns about AI misinterpreting annotations and scribbles and the effort needed to create effective text prompts. These insights inform GenAI interface design to better support refinement tasks, align with workflows, and enhance communication with AI systems.

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## **Paper 7:**

### **Static Vs. Agentic Game Master AI for Facilitating Solo Role-Playing Experiences**

Date: 2025-03-06

Time: 16:21:14

Authors:

Nicolai Hejlesen Jørgensen, Sarmilan Tharmabalan, Ilhan Aslan, Nicolai Brodersen Hansen, Timothy Merritt

Summary:

- This paper presents a game master AI for single-player role-playing games. The AI is designed to deliver interactive text-based narratives and experiences typically associated with multiplayer tabletop games like Dungeons & Dragons. We report on the design process and the series of experiments to improve the functionality and experience design, resulting in two functional versions of the system. While v1 of our system uses simplified prompt engineering, v2 leverages a multi-agent architecture and the ReAct framework to include reasoning and action. A comparative evaluation demonstrates that v2 as an agentic system maintains play while significantly improving modularity and game experience, including immersion and curiosity. Our findings contribute to the evolution of AI-driven interactive fiction, highlighting new avenues for enhancing solo role-playing experiences.

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## **Paper 8:**

### **ValuePilot: A Two-Phase Framework for Value-Driven Decision-Making**

Date: 2025-03-06

Time: 16:02:53

Authors:

Yitong Luo, Hou Hei Lam, Ziang Chen, Zhenliang Zhang, Xue Feng

Summary:

- Despite recent advances in artificial intelligence (AI), it poses challenges to ensure personalized decision-making in tasks that are not considered in training datasets. To address this issue, we propose ValuePilot, a two-phase value-driven decision-making framework comprising a dataset generation toolkit DGT and a decision-making module DMM trained on the generated data. DGT is capable of generating scenarios based on value dimensions and closely mirroring real-world tasks, with automated filtering techniques and human curation to ensure the validity of the dataset. In the generated dataset, DMM learns to recognize the inherent values of scenarios, computes action feasibility and navigates the trade-offs between multiple value dimensions to make personalized decisions. Extensive experiments demonstrate that, given human value preferences, our DMM most closely aligns with human decisions, outperforming Claude-3.5-Sonnet,

Gemini-2-flash, Llama-3.1-405b and GPT-4o. This research is a preliminary exploration of value-driven decision-making. We hope it will stimulate interest in value-driven decision-making and personalized decision-making within the community.

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