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Study and Design of AI-Driven Models for Enhancing Search Engine Visibility and Website Performance Optimization: A Survey-Based Approach

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ABSTRACT

This research focuses on the study and design of Artificial Intelligence (AI)-driven models for enhancing search engine visibility and optimizing website performance. The study adopts a **survey-based quantitative approach**, supported by an extensive literature review, to analyze user behavior, website performance expectations, and awareness of AI applications in Search Engine Optimization (SEO). Data collected from more than **1250 respondents** reveal that website loading speed, navigation, and mobile friendliness are the most influential factors affecting user experience and search rankings.

The findings indicate that AI-based techniques such as automated keyword analysis, semantic content optimization, learning-to-rank models, and predictive performance analytics can significantly improve SEO outcomes and website efficiency. Based on empirical insights and literature synthesis, this study proposes an **AI-driven integrated framework** combining machine learning, natural language processing, and performance monitoring to enhance search visibility and user engagement. The research contributes by bridging the gap between AI-based SEO strategies and website performance optimization within a unified model.

INTRODUCTION

Search Engine Optimization (SEO) has become a critical component of digital presence in an increasingly competitive online ecosystem. Search engines rely on complex algorithms to rank web pages based on relevance, authority, and user experience. The introduction of Artificial Intelligence (AI) has fundamentally transformed how search engines interpret queries, evaluate content, and deliver results.

AI-based systems such as **Google RankBrain**, **BERT**, and **DeepRank** enable search engines to better understand search intent, semantics, and contextual relevance. At the same time, **website performance metrics**, including Core Web Vitals (Largest Contentful Paint, First Input Delay, and Cumulative Layout Shift), loading speed, and mobile responsiveness, have become direct ranking factors.

Despite significant advancements, most existing research focuses either on AI-based ranking mechanisms or website performance optimization as independent domains. There is limited empirical research integrating **AIdriven SEO strategies, website performance optimization, and user perception** within a single framework. This study addresses this research gap by designing a survey-based empirical investigation and proposing an AI-driven model for enhancing both search engine visibility and website performance.

LITERATURE REVIEW

Early search engine ranking models such as **PageRank** relied primarily on hyperlink structures to measure page authority. Subsequent advancements introduced **Learning-to-Rank (LTR)** algorithms such as **RankNet**, **LambdaRank**, and **LambdaMART**, which used supervised machine learning to improve relevance prediction.

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With the evolution of deep learning, **Transformer-based architectures** such as **BERT** significantly improved contextual understanding of search queries and content. Research by Devlin et al. demonstrated how bidirectional transformers enhance semantic interpretation in search systems.

Recent studies emphasize the role of AI in **website performance optimization**, including predictive caching, load balancing, dynamic resource allocation, and performance monitoring using machine learning techniques. Mathur et al. (2024) demonstrated the effectiveness of predictive analytics in optimizing website performance metrics.

Further research highlights AI-driven automation in SEO practices such as keyword prediction, content optimization, personalization, voice-search readiness, and Answer Engine Optimization (AEO). However, existing studies largely treat SEO automation and performance optimization separately, creating a gap that this research seeks to address through an integrated AI-driven approach supported by user-centric data.

METHODOLOGY

This study follows a **quantitative survey-based research methodology** to capture user perceptions and experiences related to search engines, website performance, and AI-driven SEO.

Data Collection

- Tool Used: Google Forms
- Sample Size: **1250+ respondents**
- Respondent Categories: Students, professionals, and business owners

Data Processing and Analysis

- Data Cleaning: Microsoft Excel
- Visualization: Python
- Analysis Techniques: Frequency distribution and thematic categorization

Survey Structure

The survey consisted of **15 structured questions** covering:

- Demographic information
- Search engine usage patterns
- Website performance experience
- Awareness and perception of AI in SEO

RESULTS AND SURVEY ANALYSIS

Demographic Overview

Table 1: Age Distribution of Respondents

Age Group	Respondents	Percentage
Below 18	66	5.3%
18–30	808	64.7%

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31–45	275	22%
46+	100	8%

The majority of respondents belong to the 18–30 age group, indicating strong participation from students and early-career professionals.

Search Engine Preferences

Table 2: Preferred Search Engine

Search Engine	Respondents	Percentage
Google	1150	92%
Bing	59	4.7%
Yahoo	25	2%
Others	16	1.3%

Google clearly dominates search engine usage across all demographic groups.

Website Performance Experience

Table 3: Key Factors Affecting Website Experience

Factor	Importance (%)
Loading Speed	86%
Navigation	78%
Design	74%
Content Quality	68%
Mobile Friendliness	64%

Website loading speed and navigation emerged as the most critical factors influencing user satisfaction and retention.

Awareness and Perception of AI in SEO

Table 4: Awareness of AI in SEO

Awareness Level	Respondents	Percentage
High	209	16.7%
Moderate	512	41.3%
Low	525	42%

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Table 5: Perception of AI Improving SEO

Response	Respondents	Percentage
Strongly Agree	609	48.7%
Agree	409	32.7%
Neutral	150	12%
Disagree	82	6.6%

Over 81% of respondents believe that AI can significantly improve search rankings and website performance.

DISCUSSION

The results confirm that **user experience factors**, particularly website speed and navigation, play a decisive role in influencing search engine trust and rankings. These findings align with prior research emphasizing the importance of Core Web Vitals and performance optimization in SEO.

The strong user belief in AI-driven SEO improvements supports existing literature on automated keyword analysis, semantic optimization, and predictive performance monitoring. By integrating AI techniques across SEO and performance domains, organizations can achieve sustainable improvements in visibility and engagement.

Proposed AI-Driven Model

Figure: AI-Driven Framework for Search Visibility and Performance Optimization

Model Components:

Data Input Layer: Website analytics, keyword trends, user behavior data

AI Processing Layer: NLP for content analysis, ML models for ranking prediction

Optimization Engine: Automated SEO adjustments, speed optimization, layout enhancement

Performance Monitoring Layer: Core Web Vitals tracking and ranking analysis

Feedback Loop: Continuous learning and adaptive optimization

The proposed model is conceptual and intended for future prototype development and empirical validation.

CONCLUSION AND FUTURE WORK

This study demonstrates that AI-driven approaches can significantly enhance search engine visibility and website performance by automating SEO processes and improving user experience. The survey-based findings validate the relevance of AI in modern SEO practices.

Future work will focus on implementing the proposed framework as a functional prototype and evaluating its effectiveness across different industries and web environments.

REFERENCES

1. Page, L., Brin, S., Motwani, R., & Winograd, T. (1999). The PageRank Citation Ranking: Bringing Order to the Web.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue II, February 2026

2. Burges, C. et al. (2005). Learning to Rank Using Gradient Descent. ICML.
3. Devlin, J., et al. (2019). BERT: Pre-training of Deep Bidirectional Transformers. NAACL.
4. Vaswani, A., et al. (2017). Attention is All You Need. NeurIPS.
5. Liu, X. et al. (2018). Performance Optimization of Web Servers Using Machine Learning. IEEE Access.
6. Mathur, S., et al. (2024). AI-based Predictive Analytics for Website Performance Optimization. IC3I.
7. Elkhatibi, Y., & Boussedra, F. (2025). Impact of Artificial Intelligence on SEO and Online Visibility.
8. Pereira, M. et al. (2025). AI in Search—Redefining SEO Strategies.
9. Google Search Central. Core Web Vitals Documentation.
10. Joachims, T. (2002). Optimizing Search Engines Using Clickthrough Data. KDD.
11. L. Page, S. Brin, R. Motwani, and T. Winograd, "The PageRank citation ranking: Bringing order to the web," Stanford InfoLab, 1999.
12. C. J. C. Burges, "From RankNet to LambdaMART: An overview," Microsoft Research Technical Report, 2010.
13. J. Devlin, M.-W. Chang, K. Lee, and K. Toutanova, "BERT: Pre-training of deep bidirectional transformers for language understanding," in Proc. NAACL-HLT, 2019, pp. 4171–4186.
14. A. Vaswani et al., "Attention is all you need," in Advances in Neural Information Processing Systems (NeurIPS), 2017.
15. T. Joachims, "Optimizing search engines using clickthrough data," in Proc. ACM KDD, 2002, pp. 133–142.
16. H. Li, J. Chen, W. Su, Q. Ai, and T.-Y. Liu, "Towards better web search performance: Pre-training, finetuning and learning to rank," arXiv:2303.04710, 2023.
17. J. Zhou and E. Agichtein, "RLIRank: Learning to rank with reinforcement learning for dynamic search," arXiv:2105.10124, 2021.
18. Z. Hu, Y. Wang, Q. Peng, and H. Li, "Unbiased LambdaMART: An unbiased pairwise learning-to-rank algorithm," arXiv:1809.05818, 2018.
19. B. Mitra and N. Craswell, "Neural information retrieval: A review," Foundations and Trends® in Information Retrieval, vol. 13, no. 1, pp. 1–126, 2019.
20. S. MacAvaney et al., "CEDR: Contextualized embeddings for document ranking," in Proc. SIGIR, 2019.
21. X. Liu et al., "Performance optimization of web servers using machine learning," IEEE Access, vol. 6, pp. 67823–67833, 2018.
22. P. Ayyagari, P. Goel, and A. Renuka, "Leveraging AI and machine learning for performance optimization in web applications," Darpan Int. Research Analysis J., vol. 12, no. 2, 2024.
23. S. Mathur, Y. Hasan, D. Bhargava, S. Bhattacharjee, and A. Rana, "Artificial intelligence-based predictive analytics for website performance optimization," in Proc. IC3I, 2024, pp. 795–800.
24. S. K. R. Gowrigari, "AI-driven web performance optimization: Balancing speed, security, and W3C standards," Asian J. Multidisciplinary Res. & Review, vol. 3, no. 6, 2022.
25. Y. Elkhatibi and F. Boussedra, "Impact of artificial intelligence on SEO and online visibility," ResearchGate Preprint, 2025.
26. M. C. Pereira, J. Neves, and L. Mendes, "AI in search—Redefining SEO in digital marketing strategy and practices," Proc. ICBT, 2025.
27. R. K. Maheshwari and S. Sharma, "The role of artificial intelligence in SEO: Enhancing search visibility and user experience," IJNRD, vol. 9, no. 5, 2024.
28. A. Sharma and P. Dhiman, "The impact of AI-powered search on SEO: The emergence of answer engine optimization," ResearchGate, 2025.
29. Q. Mei, D. Zhou, and K. Church, "Query suggestion using hitting time," in Proc. CIKM, 2008.
30. E. Agichtein, E. Brill, and S. Dumais, "Improving web search ranking by incorporating user behavior information," in Proc. SIGIR, 2006.
31. K. Järvelin and P. Ingwersen, "Information retrieval and information seeking: Where IR meets IS," Annu. Rev. Inf. Sci. Technol., 2004.
32. A. Kumar and R. Sharma, "Artificial intelligence techniques in search engine optimization," Int. J. Computer Applications, vol. 182, no. 12, 2021.
33. A. Bansal and M. Kaur, "Keyword prediction using machine learning algorithms for SEO," Procedia Computer Science, vol. 167, pp. 240–249, 2020.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XV, Issue II, February 2026

34. H. Wang, X. Li, and Y. Zhou, "Predicting search engine trends using deep learning methods," IEEE Trans. Neural Netw., 2019.
35. A. Mukherjee et al., "Predictive analytics in digital marketing: Applications and future research," Business Horizons, vol. 61, 2018.
36. S. Gupta and S. Chatterjee, "AI-based content generation and SEO automation," J. Digital Marketing Research, 2021.
37. Y. Duan, J. Edwards, and Y. Dwivedi, "Artificial intelligence for decision making in the era of big data—Evolution, challenges and research agenda," Int. J. Inf. Management, vol. 48, pp. 63–71, 2019.
38. A. Rao and G. Verweij, "Sizing the prize: What's the real value of AI for your business and how can you capitalize?," PwC Report, 2017.
39. Google, "Core Web Vitals & Web Performance Documentation," developers.google.com, 2023.
40. S. Souders, Even Faster Web Sites: Performance Rules for Web Developers., O'Reilly Media, 2009.
41. R. Binns, "Fairness in machine learning: Lessons from political philosophy," Proc. FAT, 2018.
42. J. Zou and L. Schiebinger, "AI can be sexist and racist—it's time to make it fair," Nature, vol. 559, pp. 324–326, 2018.
43. X. Geng, T. Liu, T.-Y. Liu, A. Arnab, and H. Li, "Query dependent ranking model," in Proc. SIGIR, 2008.
44. L. Yang, Q. Ai, J. Guo, and W. B. Croft, "Neural matching models for question retrieval," Information Retrieval Journal, 2019.
45. J. Beel et al., "Research-paper recommender systems: A literature survey," Int. J. Digital Libraries, vol. 17, 2016.
46. Google Search Central Blog, "How AI powers great search results," Google, 2024.
47. TensorFlow Team, "TensorFlow: Large-scale machine learning on heterogeneous systems," Software, 2015.
48. T. Chen and C. Guestrin, "XGBoost: A scalable tree boosting system," in Proc. KDD, 2016.
49. Microsoft Azure, "AI-driven insights for website optimization," White Paper, 2023.
50. OpenAI Research Team, "Using large language models for search and recommendation," OpenAI Technical Report, 2024.