

The Search for Stability: Learning Dynamics of Strategic Publishers with Initial Documents (Abstract Reprint)

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Abstract

We study a game-theoretic information retrieval model in which strategic publishers aim to maximize their chances of being ranked first by the search engine while maintaining the integrity of their original documents. We show that the commonly used Probability Ranking Principle (PRP) ranking scheme results in an unstable environment where games often fail to reach pure Nash equilibrium. We propose two families of ranking functions that do not adhere to the PRP. We provide both theoretical and empirical evidence that these methods lead to a stable search ecosystem, by providing positive results on the learning dynamics convergence. We also define the publishers and users welfare, demonstrate a possible publisher-user trade-off, and provide means for a search system designer to control it. Finally, we show how instability harms long-term users welfare.

References

Madmon, O.; Pipano, I.; Reinman, I.; and Tennenholtz, M. 2025. The Search for Stability: Learning Dynamics of Strategic Publishers with Initial Documents. *Journal of Artificial Intelligence Research*, 83: 15:1–15:36.