Individual Navigation Strategies in the Knowledge Space

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Extended Abstract

The overwhelming volume of digital information in today's world creates challenges in effectively navigating the digital landscape. Understanding how people move through this abundance of knowledge is essential for addressing information overload. While prior work has identified patterns of navigation in geographic [1], social [2], and informational [3] contexts, individual differences in knowledge-navigation strategies remain underexplored. To bridge this gap, we designed an online experiment in which participants played a Wikipedia-based navigation game and completed accompanying questionnaires. Leveraging the hierarchical structure of English Wikipedia alongside a graph embedding trained on it, we uncovered two distinct navigation strategies and observed notable individual variation in their use. Our findings reveal that older, white, and female participants are more likely to rely on a proximity-driven approach, whereas younger participants favor a hub-driven strategy.

In our study, we recruited 802 participants from the United States to complete nine rounds of a Wikipedia navigation game, followed by a survey collecting demographic information and other factors potentially related to their navigation behavior. In the game, players need to move from one Wikipedia article (source page) to another (target page) through the hyperlinks of other Wikipedia articles. Building on insights from prior research in social navigation, we designed the task to focus on navigation between people within the information space: source and target pages were chosen to be the wiki page of well-known individuals spanning different professions, genders, and historical periods.

Previous work has shown that navigation in knowledge spaces draws on both semantic and hierarchical structures [4]. We extend this line of research by providing a more detailed analysis of navigation behavior with respect to these dimensions. To quantify semantic distance, we trained a 64-dimensional embedding of Wikipedia using the DeepWalk algorithm [5], mapping each article to a vector in which semantic closeness c is measured as the cosine similarity among the vectors. To capture hierarchy, we employed a local hierarchy measure h introduced by Muchnik et al. [6], which reflects an article's position in Wikipedia's knowledge hierarchy.

Figure 1 illustrates successful navigation paths in the game where participants moved from "Barack Obama" to "Vincent van Gogh," plotted in terms of hierarchical score h and closeness score c. As the figure shows, some paths were more "hub-driven", ascending the hierarchy to reach hubs before descending toward the target, while others were more "proximity-driven", keeping closer to the target throughout.

To quantify to what extent a navigation path is proximity-driven or hub-driven, we computed a hub-driven score H and a proximity-driven score C, defined as the average hierarchical score h and average closeness-to-target score c of the articles along the path. At the individual level, we further examined how personal characteristics influenced navigation strategies. Regression analyses (full results omitted here for brevity) indicate that older, white and female participants tended to favor a proximity-driven strategy, whereas younger participants were more likely to adopt a hub-driven approach.

Our findings reveal systematic individual differences in knowledge navigation strategies. By highlighting the role of demographic variation, this work advances prior studies that have largely emphasized aggregate patterns of navigation in information networks.

References

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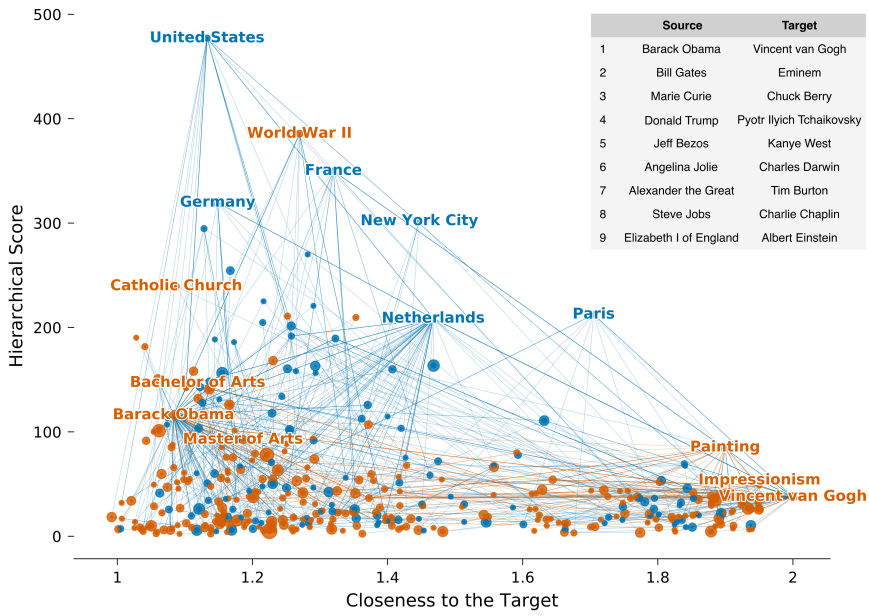

Figure 1: Visualization of the successful navigation paths.