

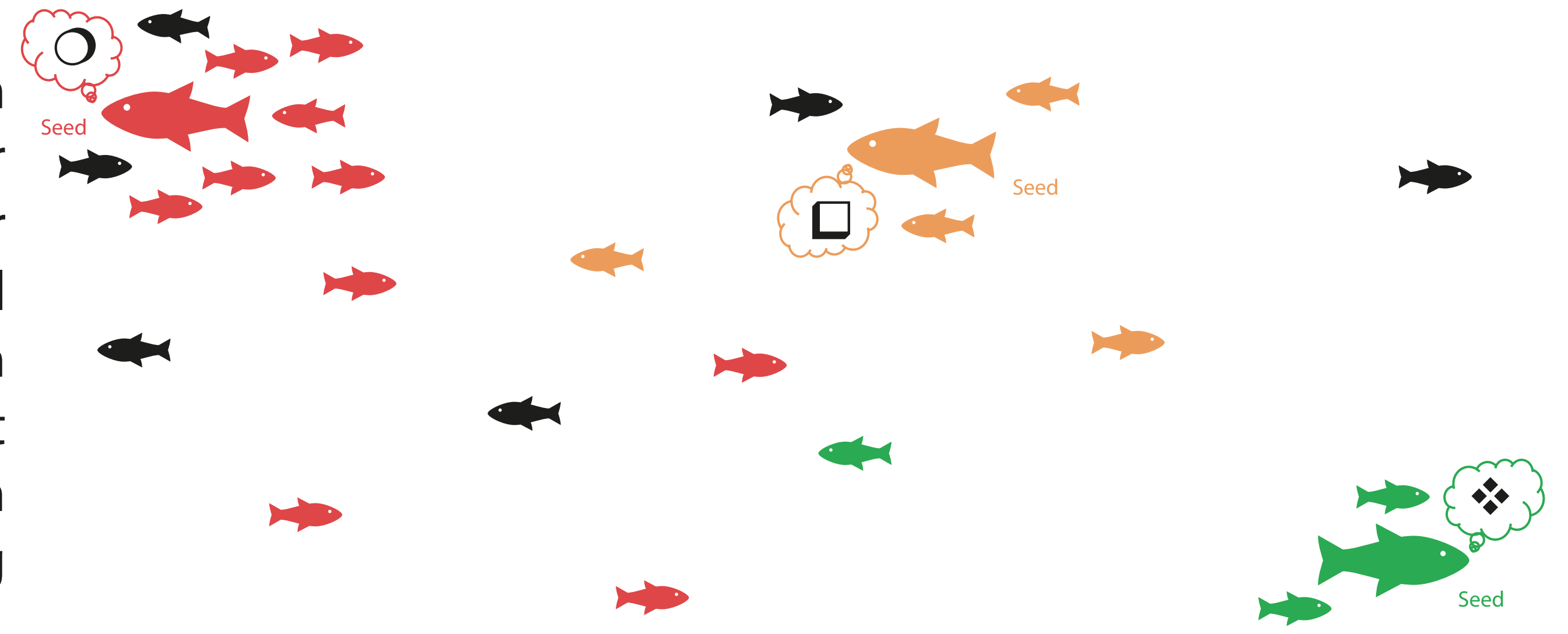
Peeking at Visualization Research on Information Diffusion

Mert Usul¹

Alessio Arleo^{2,1}

Problem Description

An Information Diffusion (ID) process describes the propagation of information (e.g., a pathogen, a malware, fake news) across a network or population, under the assumptions of a diffusion model that encapsulates the high-level behavior of the real phenomenon. Many such models exist, however, the use of Visual Analytics (VA) in the context of ID is still a largely under-investigated research direction. We investigate the state-of-the-art in VA of ID processes across different research domains and categorize 26 papers according to (i) the visualization technique, (ii) main goal, (iii) and auxiliary tasks. This work is intended as a starting point toward a formal characterization of the ID problem in visualization.



Approaches	Visualization Techniques							Main Goal	Key-Player Detection	Comparison Tools	Parameter Tweaking
	Node-Link Matrix	Map Metaphor	Map	River Metaphor	Tree	Timeline	Storyline				
Cao et al., 2012	■		■			■		A	■		
Sun et al., 2017	■					■		A		■	
Han et al., 2023		■	■			■		A	■	■	■
Chen et al., 2017			■			■		A	■		
Chen et al., 2019			■			■	■	A	■		
Chen et al., 2020			■			■		A	■		
Marcus et al., 2011				■		■		A			
Wu et al., 2014	■			■	■	■		A	■	■	
Sun et al., 2014				■		■		A	■	■	
Ren et al., 2014				■		■	■	A	■		
Baumgartl et al., 2021	■					■	■	A	■		
Yuan et al., 2014	■					■		A	■	■	
Von Landesberger et al., 2015	■							B		■	■
Skianis et al., 2016	■							B	■		■
Sulis and Tambuscio, 2020	■							B			■
Maciejewski et al., 2011				■				B			■
Broeck et al., 2011				■				B			■
Yanez et al., 2017				■				B		■	■
Afzal et al., 2011				■		■	■	B		■	■
Li et al., 2020					■	■	■	B			■
Arleo et al., 2022	■	■						C	■	■	■
Long and Wong, 2014				■				C	■		■
Huang et al., 2020						■	■	D	■		■
Shi et al., 2015	■							D	■		■
Vallet et al., 2015	■							E		■	■
Zhao et al., 2014				■	■			F	■		■

■ main view

■ auxiliary or navigational view

Goal Categorization

A - Diffusion Exploration

Offers an extensive and diverse toolkit for the exploration of ID to unfold patterns, analyze trends, and detect key influencers via a comprehensive, often coordinated dashboard. A variety of different visualization methods have been used and combined.

B - Spread Simulation

Focuses on the simulation and prediction of diffusion processes. Performs simulations on network structures and allows for modification of simulation/model parameters.

C - Influence Maximization

Provides tools such as comparison environments and seed set modifications to identify a set of initial spreaders that activate the maximal number of nodes during a diffusion process.

D - Influence Summarization

Leverages VA to analyze Influence Graph Summarization algorithms and unfold flow-like patterns, for example in citation networks.

E - Model Comparison

Focuses on the comparison of two or more diffusion models by providing an appropriate VA environment that highlights differences in the propagation along the network.

F - Anomaly Detection

Distinguishes and identifies unconventional patterns, like the dissemination of rumors or misinformation (anomalies), from more traditional trends such as popular topics, which is rather implemented by methods in Diffusion Exploration.

Full references can be found in the supplementary material, accessible via the QR code:



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