Fact-Checking via Structured Discussions in Virtual Communities

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ABSTRACT

We have recently developed a prototype using a social argumentation framework to allow virtual communities to check alternative facts. We use a graph-theoretic representation of an argument and also utilize semantic web and linked data principles in creating an argumentation graph. The creation of the argumentation graph is crowdsourced and mediated by expert moderators in a virtual community. We also discuss some research challenges and future applications of our framework.

Keywords

Fact Checking; Social Argumentation; Virtual Community;

1. BACKGROUND

So-called "alternative facts" are often shared on social networks and spread like wildfire across all sorts of social media. Some people claim certain facts are true while others call them "alternative facts" to indicate they are false. Who is right when considering these potential "alternative facts"?

Fake news, imbibed with alternative facts, is an age old issue not only in politics but communication in general. In fact, many social scientists [12, 8] have long believed the "public was a malleable, unthinking entity that could be manipulated by whomever possessed the necessary tools and expertise in the field of public relations" and the manipulation of public opinion was considered fundamental to the profession of public relations.

Just as with propaganda and misinformation, these so-called "alternative facts" have to be examined critically using evidence-based reasoning in the age of the World Wide Web. Collaborative interaction is seen as one of the keys for developing critical thinking and evidence-based reasoning in online forums [5, 13]. Some [2] also identify the need to provide argumentation structures to create deeper personalized knowledge and go beyond a simpler social construction of collective knowledge in collaborative online forums using computer supported argumentation [7, 11]. As shown in [9], social argumentation via structured discussions can build essential critical thinking, evidence-based reasoning skills.

We thus use structured discussions to guide users of our virtual community in critically analyzing proposed alternative facts. We utilize fundamental argumentation principles in a graph-theoretic framework that also incorporates semantic web and linked open data principles [1, 4]. This approach requires us to not only critically examine the proposed alternative facts but also design a virtual community that allows the social construction of these arguments by large groups so that many people handle small pieces that assemble into a whole.

2. CONSTRUCTING SOCIAL ARGUMENTS

Argumentation has been shown to be a natural, substantiated approach for analyzing the veracity and reliability of assertions and claims [6, 3]. In considering how to assess critical thinking, [3] asserts the need to identify conclusions, reasons, and assumptions as well as judging the quality of arguments and developing positions on an issue.

Argumentation is a formal way of working through ideas or hypotheses. An argument, in this formal sense, is a structure composed of Stances, Claims, and Evidence. In our argumentation framework, a Stance is the final conclusion composed of Claims and Evidence, and their associated Sources. Stances are fundamental stands on a topic and can be mutually exclusive, should have cohesive substructures, and are composed of atomic argumentation components (Claims, Evidence, and Sources). A Claim can be directly supported by a Source or have multiple Evidence components, each supported by its own Source. Multiple Sources can support multiple Evidence nodes. Our methodology also incorporates Ratings for each Source and user in the system. Different trust, authority, and other attribute dimensions are amalgamated and weighted in a Summary Rating.

We create an *Argumentation Graph*, $G_A = (V, E, f)$, composed of a set of vertices, V, edges, E, and a function, f, which maps each element of E to an unordered pair of vertices in V. Each fundamental Claim, Evidence, or Source in an argument thus constitutes an atomic argumentation component, v_a, and is embedded as a vertex in the graph such that $v_a \in V$. The vertices contain not just the component's semantic content, but also the ratings, authority, trust, and other attribute dimensions of each atomic argumentation component. The edges $e \in E$ contain weights along the various dimensions of trust and authority as well as pro/con positions, while the function f maps how they're

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connected. Depending on the context of the argument, this graph can be undirected or directed, where the temporal component gives the direction to the directed graph.

In terms of a graph, we therefore see the set of vertices V as the set of Claims, Evidence, and Sources; the set of edges E as a set of links that may connect any two vertices. Each subgraph or path traversal that can be obtained from a graph results in a Stance. There are two ways to represent the stances: one way is by making the Stance another node in G_A that is added by the moderators in a top-down manner. The other is to designate each sub-graph as a different Stance. Once he G_A is formed, we can form subgraphs which represent the different stances we can infer from the argumentation graph where each sub-graph would be a separate Stance. Our approach supports both ways of determining the various stances (what we call top-down vs bottom-up).

2.1 Virtual Community for Crowdsourcing

This Argumentation Graph is one component of our three-pronged system which also includes the User Interface and the Social Community Network that actually creates and supports the overall argument. We organize the community and system to work together in helping critically analyze alternative facts. Members of this virtual community can take three major roles: Users: the information seekers who ask questions and examine the resulting Stances; Responders: Users who have some degree of expertise or background to add Claim, Evidence, and Source nodes; Moderators: contributors that guide the question and answer flow, matching Responders to new questions, evaluating answers for quality assurance, etc. These roles are dynamic as they may evolve over time, and may be multi-faceted with different functions and capabilities.

3. FUTURE WORK AND CHALLENGES

This general framework can be adopted for specific applications or communities, whose organization can vary widely. For instance, different sites may certify Responders in different ways: some might require academic qualifications whereas others would allow the Users to also be the expert Responders. In fact, different systems may have very different organizations, with some sites not having any Moderators at all while others employing the Users to also help moderate the site.

These roles can thus be generalized for discussions amongst domain experts as well as for formal classroom settings using threaded discussions between students and teachers. Our framework can be applied to everything from analyzing alternative facts to structuring discussions in online courses. We have also developed an initial set of metrics to quantify the structure of these threaded discussions by measuring the redundancy of posts, the compactness of topics, and the degree of hierarchy in sub-threads [10] which we will incorporate here.

Existing social networking sites like Facebook could leverage their current userbase and use our framework to create a Social Community Network for checking alternative facts within Facebook itself. Even new platforms like the recently announced news platform WikiTribune could be represented in our framework.

More work needs to be done, though, as questions remain: is crowdsourcing fact-checking the best way to verify alternative facts? Is our approach an optimal way to do so? How can we best incentivise people to contribute, especially the Responders who actually construct the argument and provide Evidence and Sources. Other questions surround algorithms to optimize expert-finding, Top-down vs bottom-up construction of these structured discussions, and community question-answering techniques which we can incorporate to deal with newly submitted questions. Finally, we will need to finalize approaches for certifying Responders and Moderators and ensure that he semantic web components which constitute the elements of these arguments are searchable on the Web.

4. REFERENCES

[1] C. Bizer, T. Heath, and T. Berners-Lee. Linked data-the story so far. *International journal on Semantic Web and Information Systems*, 5(3):1–22, 2009.

[2] D. Chen and D. Hung. Personalised knowledge representations: the missing half of online discussions. *British Journal of Educational Technology*, 33(3):279–290, 2002.

[3] R. H. Ennis. Critical thinking assessment, 1993.

[4] T. Heath and C. Bizer. *Linked data: Evolving the Web into a global data space (1st edition)*, volume 1. 2011.

[5] H. Jeong and M. T. H. Chi. Knowledge convergence and collaborative learning. *Instructional Science*, 35(4):287–315, nov 2006.

[6] R. Johnson. *The Rise of Informal Logic*. Windsor Studies in Argumentation, 1996.

[7] C. Reed, D. Walton, and F. Macagno. Argument diagramming in logic, law and artificial intelligence. *The Knowledge Engineering Review*, 22(01):87–109, 2007.

[8] M. B. Sethi. Information, education, and indoctrination: The federation of american scientists and public communication strategies in the atomic age. *Historical Studies in the Natural Sciences*, 42(1):1–29, 2012.

[9] R. J. Sethi and Y. Gil. A Social Collaboration Argumentation System for Generating Multi-Faceted Answers in Question & Answer Communities. In *CMNA at AAAI Conference on Artificial Intelligence (AAAI)*, 2011.

[10] R. J. Sethi, L. A. Rossi, and Y. Gil. Measures of Threaded Discussion Properties. In *Intelligent Support for Learning in Groups at International Conference on Intelligent Tutoring Systems (ITS)*, 2012.

[11] S. Shum and N. Hammond. Argumentation-based design rationale: what use at what cost. *International Journal of Human-Computer Studies*, 40(4):603–652, 1994.

[12] M. J. Sproule. *Propaganda and democracy : the American experience of media and mass persuasion*. Cambridge University Press, Cambridge, U.K. New York, NY, 1997.

[13] Q. Wang and H. L. Woo. Investigating students' critical thinking in weblogs: an exploratory study in a Singapore secondary school. *Asia Pacific Education Review*, 11(4):541–551, may 2010.