Computational Social Choice: A Journey from Basic Complexity Results to a Brave New World for Social Choice

Vincent Conitzer
Duke University
conitzer@cs.duke.edu

Research on computational social choice (for an overview, see [9]) arguably began with the seminal papers of Bartholdi, Tovey, and Trick, who considered the computational complexity of determining the winning alternative under a given voting rule [6], the computational complexity of finding a successful manipulation under a given voting rule [5] (see also [4]), and the computational complexity of election control [7]. This line of work was eventually picked up by computer scientists, and many of their early results concerned similar questions. They further studied the complexity of winner determination [26, 34, 28, 10, etc.], manipulation by strategic voting [19, 25, 45, 24, 32, etc.], and control [27, 23, etc.], as well as technically related problems such as bribery [21, 22, 23, etc.], and the possible and necessary winner problems [16, 29, 42, etc.].

These types of problems in computational complexity, and similar problems in communication complexity [18, 37], have been and continue to be fertile grounds for research in and of themselves. However, they have also served as a springboard for research on a number of new topics in computational social choice that go beyond cleanly defined computational problems. For example, what if social decisions need to be taken in combinatorial domains, where multiple interrelated issues require a decision and ranking all the alternatives becomes infeasible [8, 36, 30, 35, 31, 44, etc.]? What if we have explicit probabilistic models of how voters vote [46, 47, 20, 17, 39, 15, 43, 33, etc.]? What if the setting is highly anonymous—e.g., the Internet—preventing us from assessing the identity of a voter [11, 40, 38, etc.]? What if the voters are organized in a social network [14, 12, 13, etc.]? What if the voters and alternatives coincide, for example, when we consider ranking webpages based on their links to each other [1, 2, 3, etc.]?

These fresh topics generally require more basic social-choice-theoretic analysis as a foundation, with algorithmic considerations being the (all-important!) icing on the cake. Indeed, as the references above indicate, a number of these topics had already received,
social choice community to engage more deeply with the broader social choice community. With a book on computational social choice in preparation and this year’s coordination between the Meeting of the Society for Social Choice and Welfare in Boston and the Workshop on Computational Social Choice immediately afterwards in Pittsburgh, there has never been a better time for such engagement!

References


