Artificial Intelligence at the Service of Society to Analyse Human Arguments

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Abstract

Argument(ation) mining (AM) is an area of research in Artificial Intelligence (AI) that aims to identify, analyse and automatically generate arguments in natural language. In a pipeline, the identification and analysis of the arguments and their components (i.e. premises and claims) in texts and the prediction of their relations (i.e. attack and support) are then handled by argument-based reasoning frameworks so that, for example, fallacies and inconsistencies can be automatically identified. Recently, the field of argument mining has tackled new challenges, namely the evaluation of argument quality (e.g. strength, persuasiveness), natural language argument summarisation and retrieval, and natural language argument generation. In this paper, I discuss my main contributions in this area as well as some lines of future research.

Argument Mining and Generation

AI aims to understand the principles that govern intelligent behaviour and to encode these principles into machines. Argumentation pervades human intelligent behavior, and it is a mandatory element to conceive artificial machines that can exploit argumentation models and tools in the cognitive tasks they are required to carry out. To do so, artificial argumentation (Atkinson et al. 2017) combines formal argumentation, based on critical reasoning, with human natural argumentation extracted through argument mining methods. Intelligent machines enriched with computational argumentation models can extract, analyse, summarise and generate natural language argumentative structures from different contexts, such as user generated content from online social media, clinical trials and political debates. Argument(ation) mining focus on the dimension of artificial argumentation aiming at automatically processing natural language arguments and reason upon them. In the full argument mining pipeline first, the argument components are identified in the text; second, the boundaries of such components are defined; third, the intra-argument relations (relations among the evidences and the claims composing the same argument) and the inter-argument relations (relations among different arguments, like support and attack) are predicted.

Concerning the challenge of identifying argumentative structures from texts, I focused on two main use cases. First, the identification of argument structures from clinical trial documents to support evidence-based reasoning in medicine, where we proposed both a novel annotated resource and an efficient AM pipeline (Mayer et al. 2021). Second, we analysed the arguments extracted from the transcripts of the political debates of the US presidential campaigns from 1960 to 2016. This analysis resulted in the extraction of huge argumentation graphs (where the nodes are the argument components and the edges are the argumentative relations among them) which are then processed through argumentation semantics to compute, e.g., their justification status. To conjugate AM with formal computational models of argumentation, we also analysed these political debates to automatically identify fallacious arguments (Goffredo et al. 2022). Fallacies play a prominent role in argumentation since antiquity due to their contribution to argumentation in critical thinking education. Their role is even more crucial nowadays as contemporary argumentation technologies face challenging tasks as misleading and manipulative information detection in news articles and political discourse, and counter-narrative generation. Therefore, future research includes the automatic generation of counter-arguments to fight online disinformation and hate speech.

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