Title:
Real-time Multimodal Argument Mining

Description:
Argument Mining (AM) is the task of identifying argumentative reasoning patterns and structures in natural language documents [1]. Typically, AM systems have been trained and developed considering only text sources of data (e.g., written essays or debate transcripts), without including any acoustic information in the process [2, 3]. In the case of spoken argumentation such as political debates, audio can contain relevant information that can be used to improve the performance of AM systems [4, 5]. Furthermore, audio is the natural medium in which arguments are exchanged in spoken contexts. Therefore, by being able to effectively process acoustic information, it will be possible not only to enrich the input of the AM systems, but also to make the processing of the discourse faster.

Another important limitation of state-of-the-art AM systems is that they are, generally, defined to work as offline systems. No previous work has investigated AM as a real-time problem yet, limiting the applicability of existing work to real-time scenarios where we want to present an analysis of the argumentative discourse as the discourse itself unfolds. A successful implementation of a real-time AM system could have a major impact on the way electoral debates are consumed, or in the development of time-sensitive decision support systems.

Aimed at overcoming the two previously identified limitations, this PhD project has the following objectives:

- Design and specify a new dataset for real-time multimodal argument mining including both audio and text, together with timestamps of complete discourses.
- Propose new algorithms for AM that model acoustic features and/or combine them with the text features from the discourse transcripts.
- Propose a real-time architecture capable of processing argumentative discourses in real-time without sacrificing performance.

References
[1] Lawrence, J. and Reed, C., 2020. Argument mining: A survey. Computational Linguistics, 45(4), pp.765-818.

[2] Gemechu, D., Ruiz-Dolz, R. and Reed, C., 2024, August. ARIES: A General Benchmark for Argument Relation Identification. In Proceedings of the 11th Workshop on Argument Mining (ArgMining 2024) (pp. 1-14).

[3] Ruiz-Dolz, R., Alemany, J., Barberá, S.M.H. and García-Fornes, A., 2021. Transformer-based models for automatic identification of argument relations: A cross-domain evaluation. IEEE Intelligent Systems, 36(6), pp.62-70.

[4] Lippi, M. and Torroni, P., 2016, March. Argument mining from speech: Detecting claims in political debates. In Proceedings of the AAAI conference on artificial intelligence (Vol. 30, No. 1).

[5] Mancini, E., Ruggeri, F., Galassi, A. and Torroni, P., 2022, October. Multimodal argument mining: A case study in political debates. In Proceedings of the 9th Workshop on Argument Mining (pp. 158-170).

Supervisory Team:
Principal Supervisor: Dr. Ramon Ruiz-Dolz (rruizdolz001@dundee.ac.uk)
Second Supervisor: Prof. Chris Reed (c.a.reed@dundee.ac.uk)