Ph.D. Research Summary

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My research focuses on discourse analysis, mainly in dialogue settings. A document is not a random and independent text spans, but instead sequences of ordered and related sentences which together make coherent and meaningful documents: this organization is called **discourse structure** [6]. I am particularly interested in understanding the connection between sentences: how they interact with each other, what is the inner logic, and how can we represent the coherent structure.

In Natural Language Processing (NLP), discourse analysis is language processing beyond the sentence boundary. It refers to the retrieval of the inherent structure of coherent text, which include different levels of analysis such as *topic structure*: lexical signals and work distribution indicate topic shifts, *referential structure*: coreference links between pronouns and entities in order to create local coherence, and *coherence-relational structure*: two text spans are linked together with specific semantic relation using explicit or implicit connectives [19].

Discourse processing is a high-level form of linguistic analysis that examines the inter-sentence organization of a text, taking into consideration semantic and pragmatic context, as opposed to focusing solely on word or sentence-level coherence as in lexical or syntactic analysis. My research journey started with simple discourse markers that show local textual coherence using, for instance, rhetorical connectives and dialogue acts, I then progressed to complete discourse analysis with discourse structure extraction using distant signals from auxiliary tasks.

I present an overview of my main projects in Fig. 1. With the objective of better understanding discourse structure in dialogues, I performed two directions of research: the former is discourse structure discovery where I made use the discourse markers for classification tasks. Two tasks were conducted in cognitive impairment field: the first one being Schizophrenia detection, which led to two publications [1, 9] and a few communication talks including French national *Health and Language Seminar* and Semantics and Pragmatics of Dialogue Workshop (SemDial 2021); the second one being depressive detection with one international publication [10]. The second direction is discourse structure prediction where I aim to directly predict a formalized discourse structure (graph-like structure) using few (semi-supervised) or no (unsupervised) annotated data. This project was a collaborative work between myself and my collaborators at the University of British Columbia in Vancouver, during my six-month internship at the UBC NLP group. It resulted in a publication in a highly regarded international NLP conference [11].
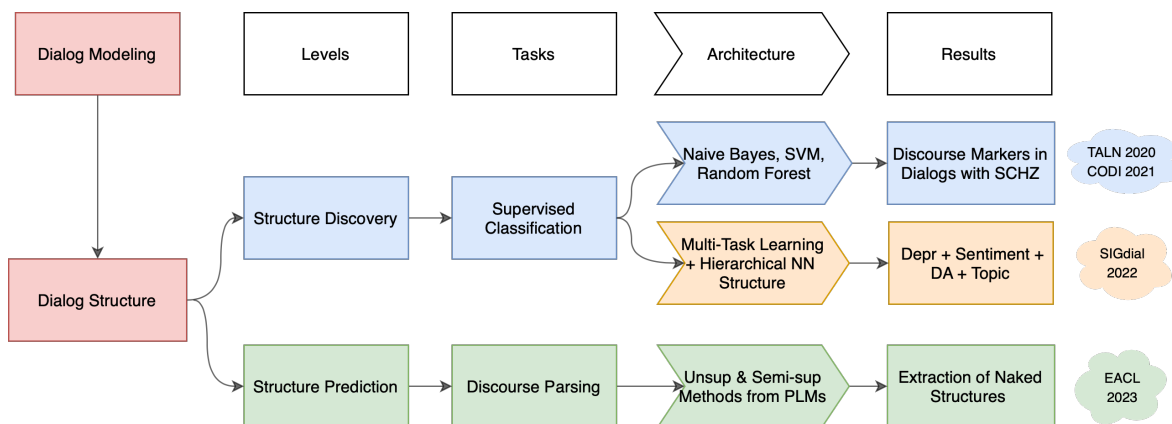

Figure 1: Research projects overview.

References

[1] Maxime Amblard, Chloé Braud, Chuyuan Li, Caroline Demily, Nicolas Franck, and Michel Musiol. Investigation par méthodes d'apprentissage des spécificités langagières propres aux personnes avec schizophrénie (investigating learning methods applied to language specificity of persons with schizophrenia). In *Actes de la 6e conférence conjointe Journées d'Études sur la Parole (JEP, 33e édition), Traitement Automatique des Langues Naturelles (TALN, 27e édition), Rencontre des Étudiants Chercheurs en Informatique pour le Traitement Automatique des Langues (RÉCITAL, 22e édition). Volume 2: Traitement Automatique des Langues Naturelles*, pages 12–26, 2020.

[2] Nicholas Asher, Nicholas Michael Asher, and Alex Lascarides. *Logics of conversation*. Cambridge University Press, 2003.

[3] Nicholas Asher, Julie Hunter, Mathieu Morey, Benamara Farah, and Stergos Afantenos. Discourse structure and dialogue acts in multiparty dialogue: the STAC corpus. In *Proceedings of the Tenth International Conference on Language Resources and Evaluation (LREC'16)*, pages 2721–2727, Portorož, Slovenia, May 2016. European Language Resources Association (ELRA).

[4] Regina Barzilay and Mirella Lapata. Modeling local coherence: An entity-based approach. *Computational Linguistics*, 34(1):1–34, 2008.

[5] Parminder Bhatia, Yangfeng Ji, and Jacob Eisenstein. Better document-level sentiment analysis from RST discourse parsing. In *Proceedings of the 2015 Conference on Empirical Methods in Natural Language Processing*, pages 2212–2218, Lisbon, Portugal, September 2015. Association for Computational Linguistics.

[6] Jerry R Hobbs. Coherence and coreference. *Cognitive science*, 3(1):67–90, 1979.

[7] Christine Howes, Matthew Purver, Rose McCabe, Patrick Healey, and Mary Lavelle. Predicting adherence to treatment for schizophrenia from dialogue transcripts. In *Proceedings of the 13th Annual Meeting of the Special Interest Group on Discourse and Dialogue*, pages 79–83, 2012.

[8] Yangfeng Ji and Noah A Smith. Neural discourse structure for text categorization. In *Proceedings of the 55th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, pages 996–1005, 2017.

[9] Chuyuan Li, Maxime Amblard, Chloé Braud, Caroline Demily, Nicolas Franck, and Michel Musiol. Investigating non lexical markers of the language of schizophrenia in spontaneous conversations. In *Proceedings of the 2nd Workshop on Computational Approaches to Discourse*, pages 20–28, 2021.

[10] Chuyuan Li, Chloé Braud, and Maxime Amblard. Multi-task learning for depression detection in dialogs. In *23rd Annual Meeting of the Special Interest Group on Discourse and Dialogue (SIGDIAL 2022)*, pages 1–8, 2022.

[11] Chuyuan Li, Patrick Huber, Wen Xiao, Maxime Amblard, Chloé Braud, and Giuseppe Carenini. Discourse structure extraction from pre-trained and fine-tuned language models in dialogues. In *Findings of the Association for Computational Linguistics: EACL 2023*, to appear.

[12] Annie Louis, Aravind K Joshi, and Ani Nenkova. Discourse indicators for content selection in summaization. 2010.

[13] Fabian Pedregosa, Gaël Varoquaux, Alexandre Gramfort, Vincent Michel, Bertrand Thirion, Olivier Grisel, Mathieu Blondel, Peter Prettenhofer, Ron Weiss, Vincent Dubourg, et al. Scikit-learn: Machine learning in python. *the Journal of machine Learning research*, 12:2825–2830, 2011.

[14] Syed Arbaaz Qureshi, Gaël Dias, Mohammed Hasanuzzaman, and Sriparna Saha. Improving depression level estimation by concurrently learning emotion intensity. *IEEE Computational Intelligence Magazine*, 15(3):47–59, 2020.

[15] Manuel Rebuschi, Maxime Amblard, and Michel Musiol. Using SDRT to analyze pathological conversations. Logicality, rationality and pragmatic deviances. In Manuel Rebuschi, Martine Batt, Gerhard Heinzmann, Franck Lihoreau, Michel Musiol, and Alain Trognon, editors, *Interdisciplinary Works in Logic, Epistemology, Psychology and Linguistics: Dialogue, Rationality, and Formalism*, volume 3 of *Logic, Argumentation & Reasoning*, pages 343 – 368. Springer, 2014.

[16] Sebastian Ruder. An overview of multi-task learning in deep neural networks. *arXiv e-prints*, pages arXiv–1706, 2017.

[17] Harvey Sacks, Emanuel A Schegloff, and Gail Jefferson. A simplest systematics for the organization of turn taking for conversation. In *Studies in the organization of conversational interaction*, pages 7–55. Elsevier, 1978.

[18] Karin Sim Smith. On integrating discourse in machine translation. In *Proceedings of the Third Workshop on Discourse in Machine Translation*, pages 110–121, 2017.

[19] Manfred Stede. Discourse processing. *Synthesis Lectures on Human Language Technologies*, 4(3):1–165, 2011.