



Conversational Agents based on Argumentation Theory and Ontologies

Débora Cristina Engelmann – debora.engelmann@acad.pucrs.br

Advisor Rafael H. Bordini

Co-advisor Alison R. Panisson

Agenda



Context



Related work



Goal Statement
and
Methodology



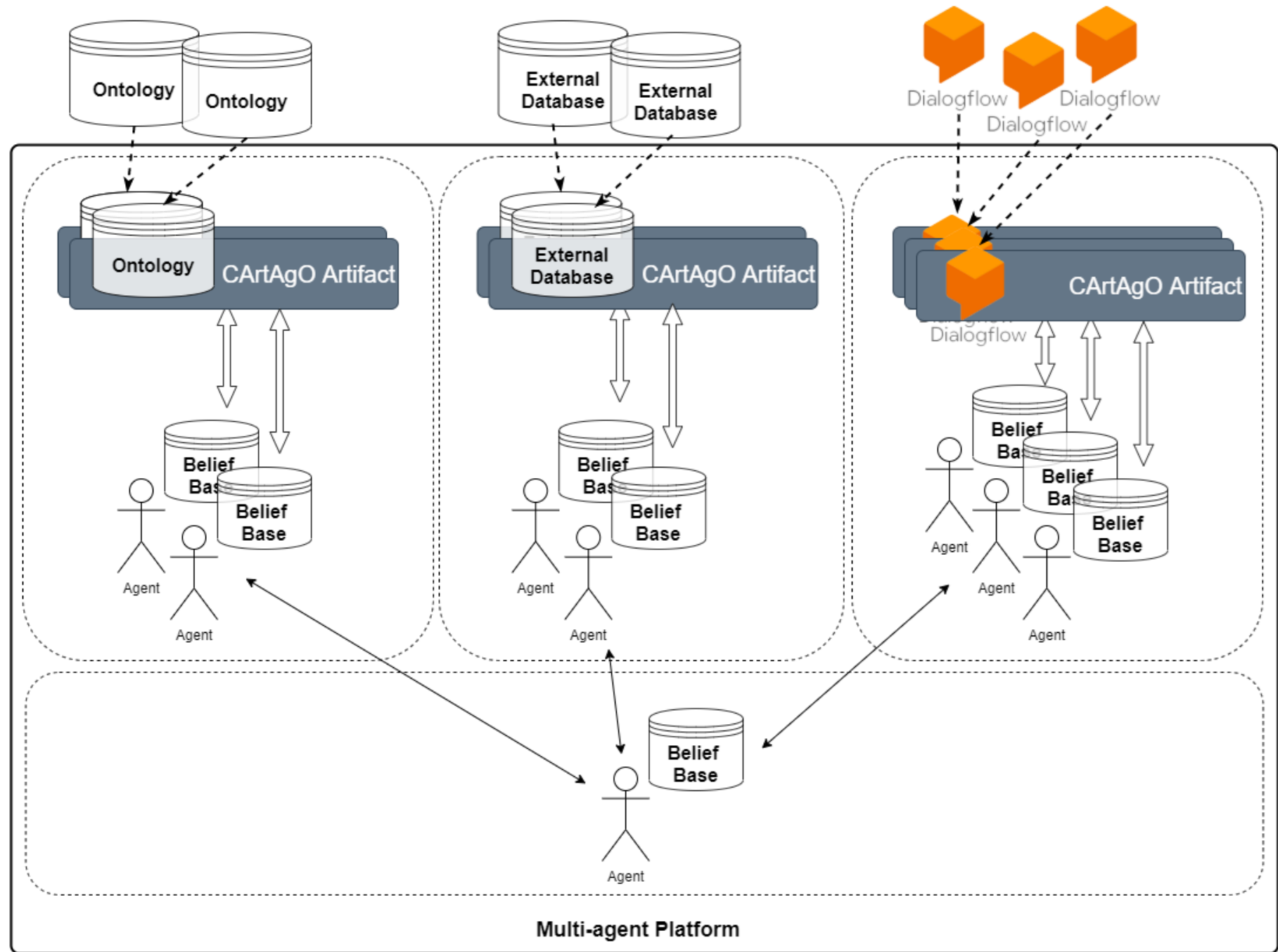
Next Steps



References

Context

Approach



Application domains



- ▷ Healthcare
- ▷ Tax Law

Related work



An Argumentation Framework for BDI Agents

- An Argumentation Framework for BDI Agents (Berariu, 2014)

Effective management of hospital beds

- IMBEDS model (da Silveira Grüber et al, 2018)
- Statistical and data mining approach (Teow et al, 2012)
- Optimisation model based on evolutionary algorithms (e Oliveira et al, 2020)

Artificial intelligence tool to be applied in the judicial system of Rio de Janeiro, Brazil

- Artificial intelligence tool to be applied in the judicial system of Rio de Janeiro in Brazil (Porto, 2018)

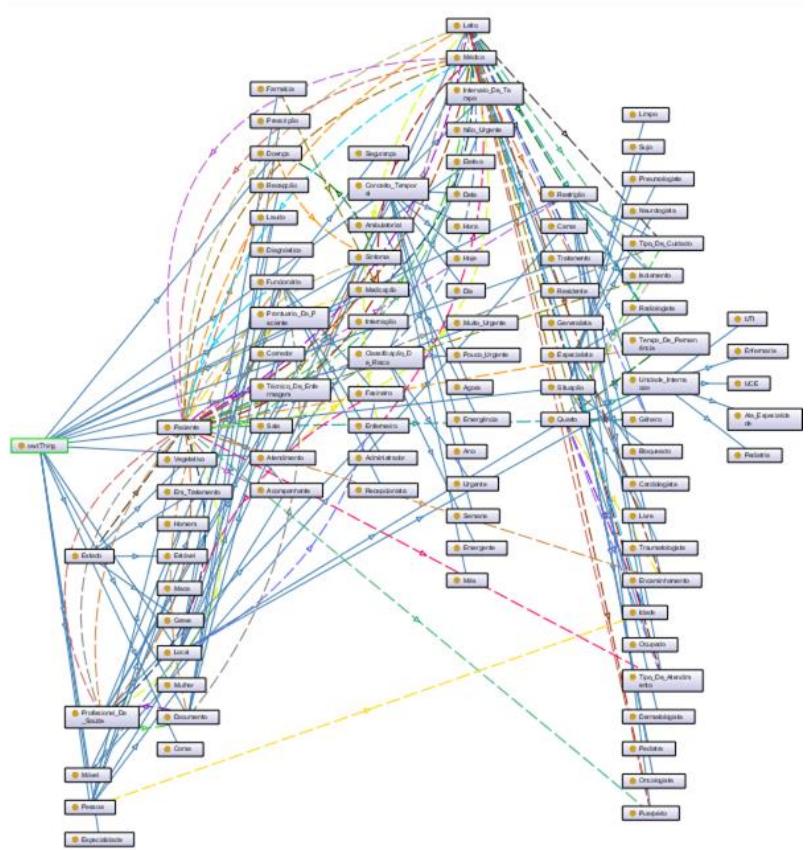
Goal statement and methodology



Research objective: Investigating how argumentation theory and ontology techniques can be used together with reasoning about intentions to build complex natural language dialogues to support human decision making.

Ontologies

▶ Bed Allocation Ontology



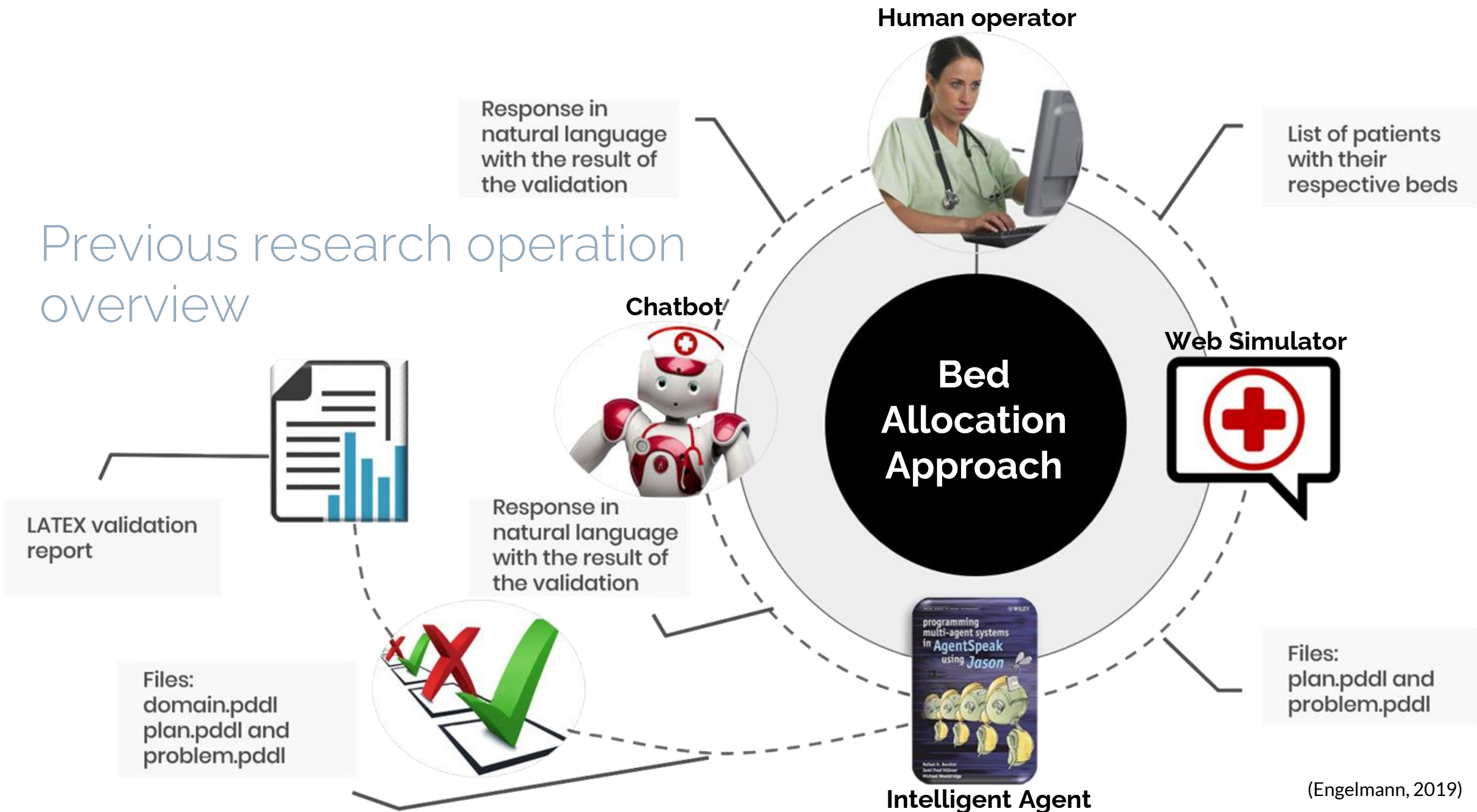
(Engelmann et al, 2019)

▶ Tax Law Ontology

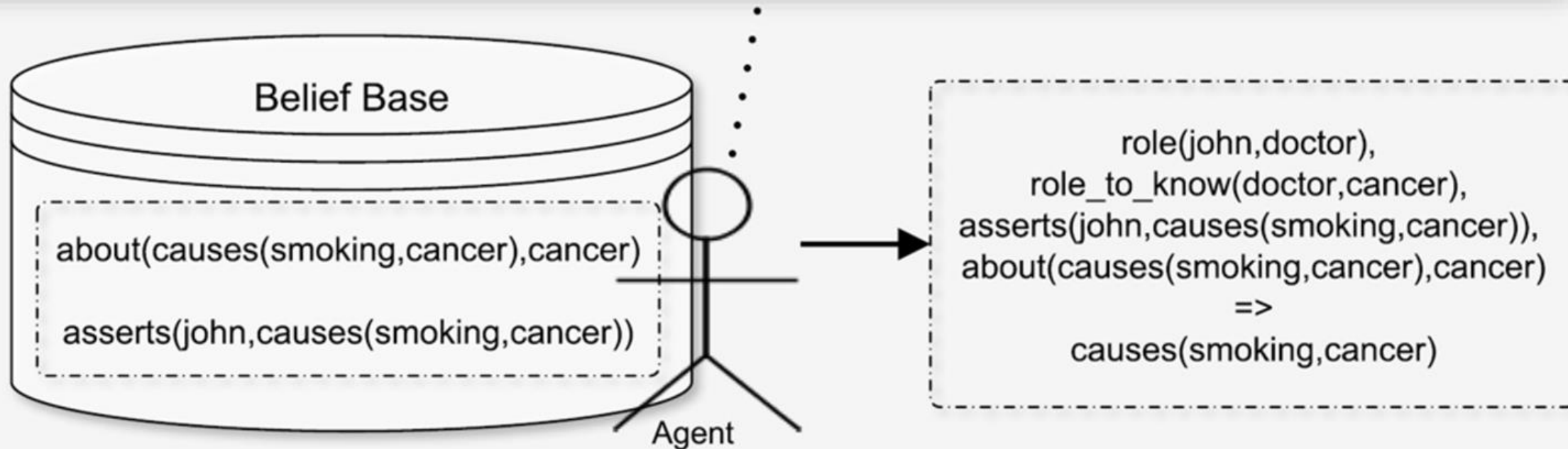
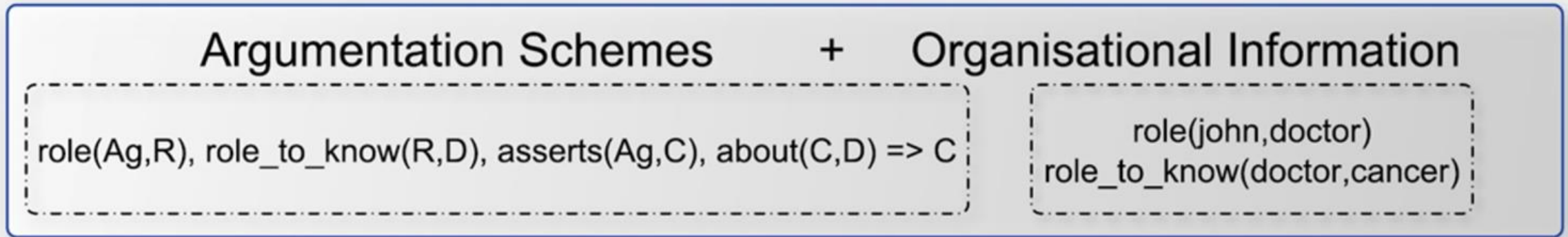


(Engelmann et al, 2020)

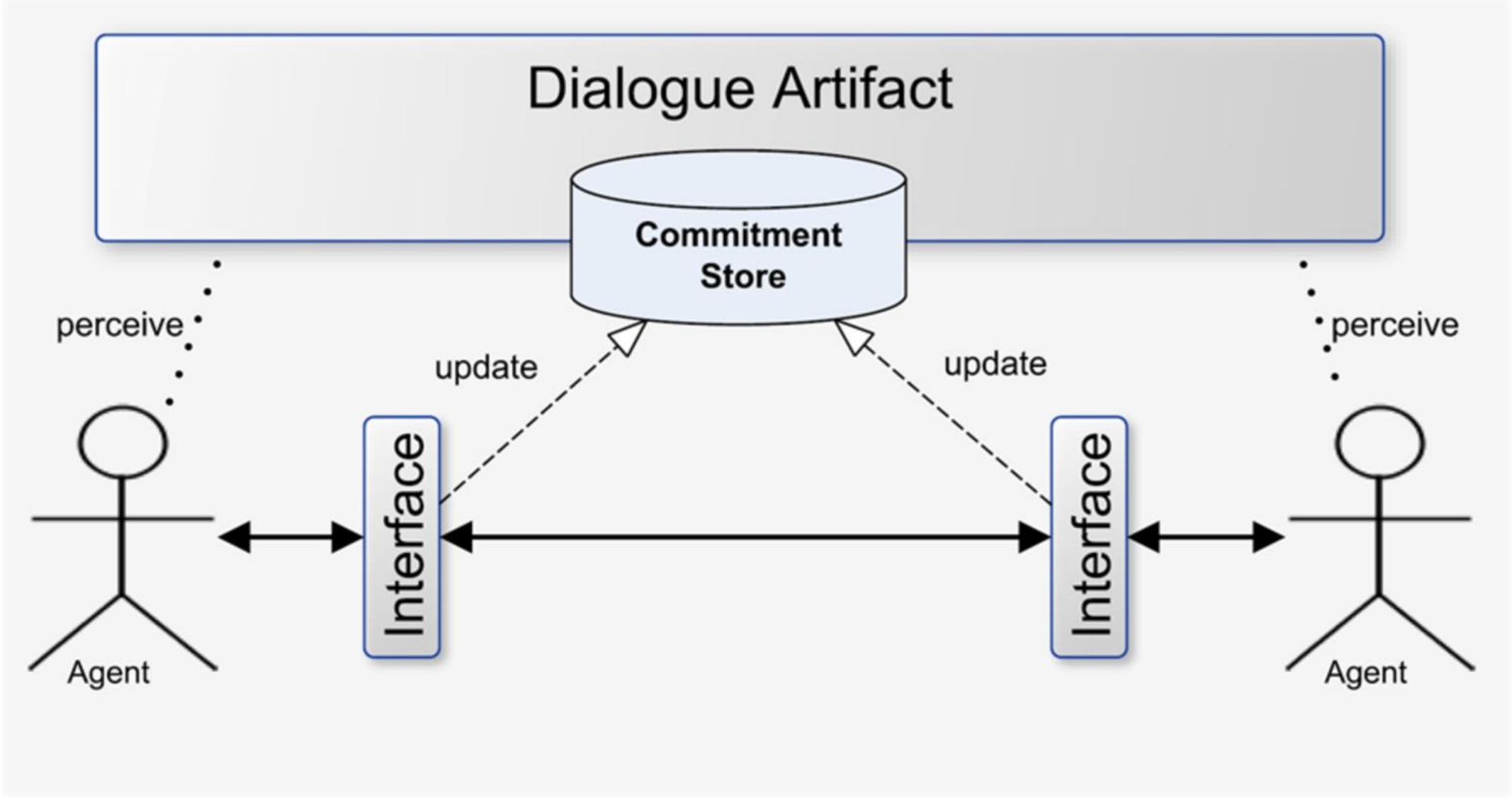
Previous research operation overview



Argumentation-Based Reasoning Mechanism



Infrastructure for Argumentation-Based Dialogues



Next steps



In process

Integrate ontologies with the BDI agent



Formalising argumentation-based dialogues



Literature review



- argument based explanations
- argumentation-based explainable AI

To do

Research on the techniques available in the literature related to argument mining

Develop the two proposed conversational agents

References

- Berariu, T. (2014). An argumentation framework for bdi agents. In *Intelligent Distributed Computing VII* (pp. 343-354). Springer, Cham.
- da Silveira Grüber, M., da Costa, C. A., da Rosa Righi, R., Rigo, S. J., & Chiwiacowsky, L. D. (2018). A hospital bed allocation hybrid model based on situation awareness. *CIN: Computers, Informatics, Nursing*, 36(5), 249-255.
- e Oliveira, B. R. P., de Vasconcelos, J. A., Almeida, J. F. F., & Pinto, L. R. (2020). A Simulation-Optimisation approach for hospital beds allocation. *International Journal of Medical Informatics*, 104174.
- Engelmann D, Panisson AR, Magistrali L, da Rosa JLA, Carlotto E, Dahlem JP, et al. Artificial Intelligence Supporting decision making in Tax Law; 2020. *In press* 2020.8
- Engelmann D, Couto J, Gabriel V, Vieira R, Bordini R. Towards an Ontology to Support Decision-making in Hospital Bed Allocation. In: *Proceedings of 31st International Conference on Software Engineering & Knowledge Engineering*; 2019. p. 71–74.9
- Engelmann DC. An interactive agent to support hospital bed allocation based on plan validation [*dissertation*]. Pontifícia Universidade Católica do Rio Grande do Sul; 2019.
- Panisson, A. R., & Bordini, R. H. (2016, October). Knowledge representation for argumentation in agent-oriented programming languages. In *2016 5th Brazilian Conference on Intelligent Systems (BRACIS)* (pp. 13-18). IEEE.
- Porto, F. R. (2018). O impacto da utilização da inteligência artificial no executivo fiscal. Estudo de caso do Tribunal de Justiça do Rio de Janeiro. In *Tecnologia jurídica & direito digital: II Congresso Internacional de Direito, Governo e Tecnologia–2018*. Belo Horizonte: Fórum (pp. 109-144).
- Teow, K. L., El-Darzi, E., Foo, C., Jin, X., & Sim, J. (2012). Intelligent analysis of acute bed overflow in a tertiary hospital in Singapore. *Journal of medical systems*, 36(3), 1873-1882.



Conversational Agents based on Argumentation Theory and Ontologies

Débora Cristina Engelmann – debora.engelmann@acad.pucrs.br

Advisor Rafael H. Bordini

Co-advisor Alison R. Panisson