# A Framework for the Automatic Description of Healthcare Processes in Natural Language: *Application in an Aortic Stenosis Integrated Care Process*


Contact me!

***Yago Fontenla-Seco*[1], Manuel Lama[1], Violeta González-Salvado[2], Carlos Peña-Gil[2], Alberto Bugarín-Diz[1]***

[1] Singular Research Center in Intelligent Technologies (CiTIUS), University of Santiago de Compostela. Santiago de Compostela, Spain

[2] Department of Cardiology, University Clinical Hospital of Santiago de Compostela, SERGAS IDIS CIBERCV. Santiago de Compostela, Spain

**Correspondence to Yago F. (**yago.fontenla.seco@usc.es**)*

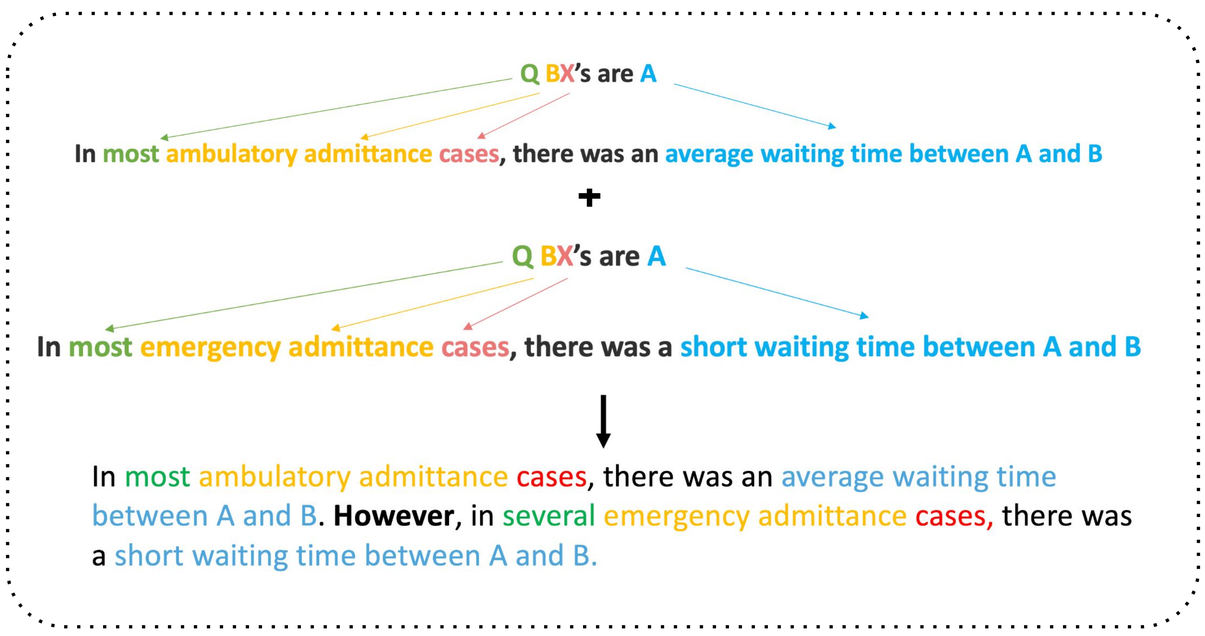

## OBJECTIVE

**Generating Natural Language Descriptions of Healthcare Processes to help on process understanding.**

Due to the nature of **healthcare processes** they usually derive into spaghetti processes, whose process mining results are **difficult to understand** for non expert users:

- The necessity of **new ways of conveying process mining results** is identified.
- It is proven that experts can take better decisions when **supported by textual summaries** rather than graphical displays.

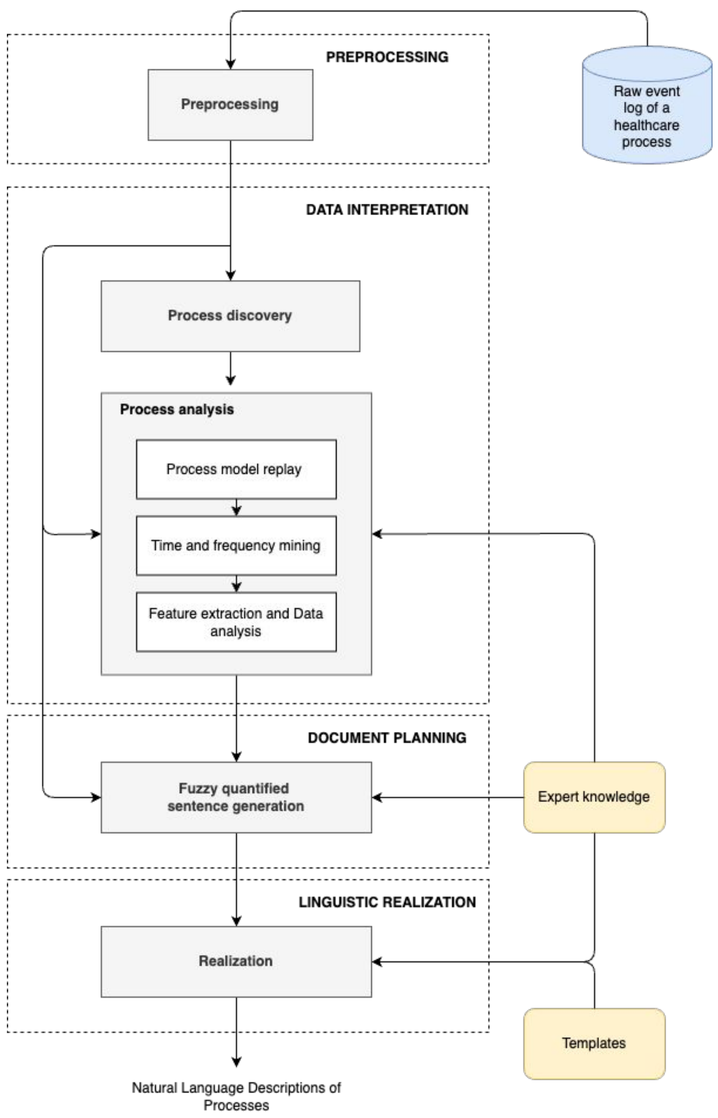
The objective is to develop a **framework** for the **automatic description** of healthcare processes in **natural language.**




*Generation of natural language descriptions via fuzzy quantified sentences [1].*

## ARCHITECTURE

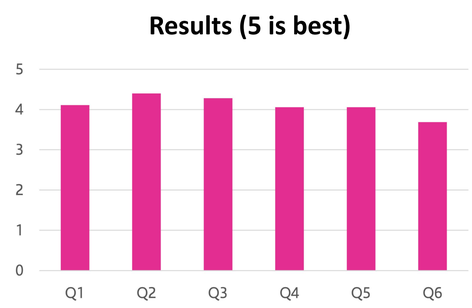
**Data-to-Text** based architecture integrating **process mining techniques** (extraction of relevant features of a process) with **fuzzy logic** (to handle the imprecision of natural language through uncertain expressions)




## EVALUATION AND RESULTS

Manual validation as dictated by **NLG standards** (test with 15 questions in a 1-5 Likert scale):

- **Interesting** descriptions (4.11/5)
- **Ease of comprehension** (4.40/5)
- **Text** better than graphics (4.28/5)
- **Useful** to better understand what happens in their job (4.06/5)
- Allow to **complete tasks quicker** (4.06/5)
- Increase the **quality of the medical professionals' work** (3.69/5)




## CONCLUSIONS

- The framework is complete and **able to handle all stages of the generation**, from the preprocessing of clinical registries to event logs, to the final generation of the natural language texts.
- The framework is **able to handle relevant healthcare process data** such as events and its attributes, temporal relations between events, patient attributes, and quantify them during process life-span, recall temporal relations and waiting times between events and its possible causes and compare patients attributes between groups, among other features.
- Results show i) that the modality which conveyed the information **most efficiently was natural language;** ii) a very clear **preference of texts over the usual graphic representation** of process information; and iii) natural language descriptions provided r**elevant and useful information about the process**, providing ways for its improvement.

## REFERENCES

Open access


[1] **Fontenla-Seco, Y.**, Lama, M., González-Salvado, V., Peña-Gil, C., Bugarín-Diz, A., "A framework for the automatic description of healthcare processes in natural language: Application in an aortic stenosis integrated care process" Journal of Biomedical Informatics 128, 104033, 2022



Project PDC2021-121072-C21 funded by