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STADIUS
Center for Dynamical Systems, Signal Processing and Data Analytics

STADIUS Newsletter

March 2025

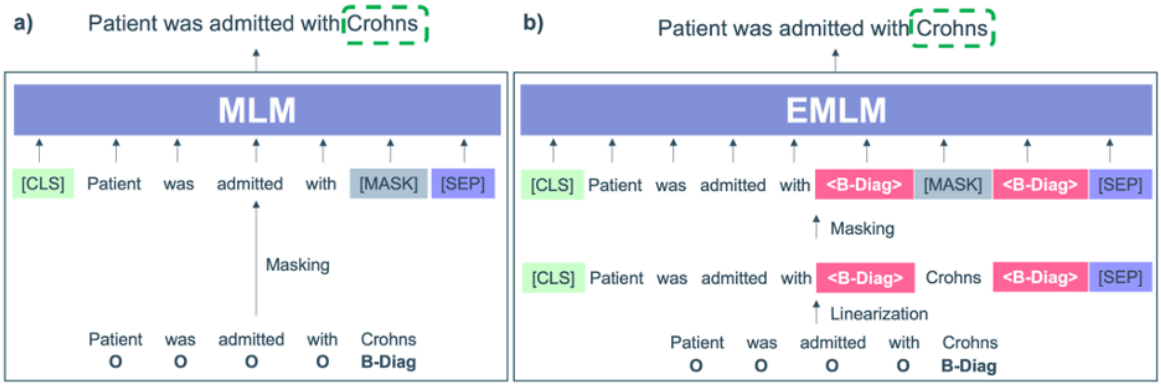
RESEARCH ▪ AWARDS ▪ NEWS ▪ EVENTS ▪ STAFF UPDATE ▪ DEFENDED PHD ▪ PUBLICATIONS

Research of the month by Fernando Crema

"Clinical entity-aware domain adaptation in low resource setting for inflammatory bowel disease

Work under the supervision of Bart De Moor

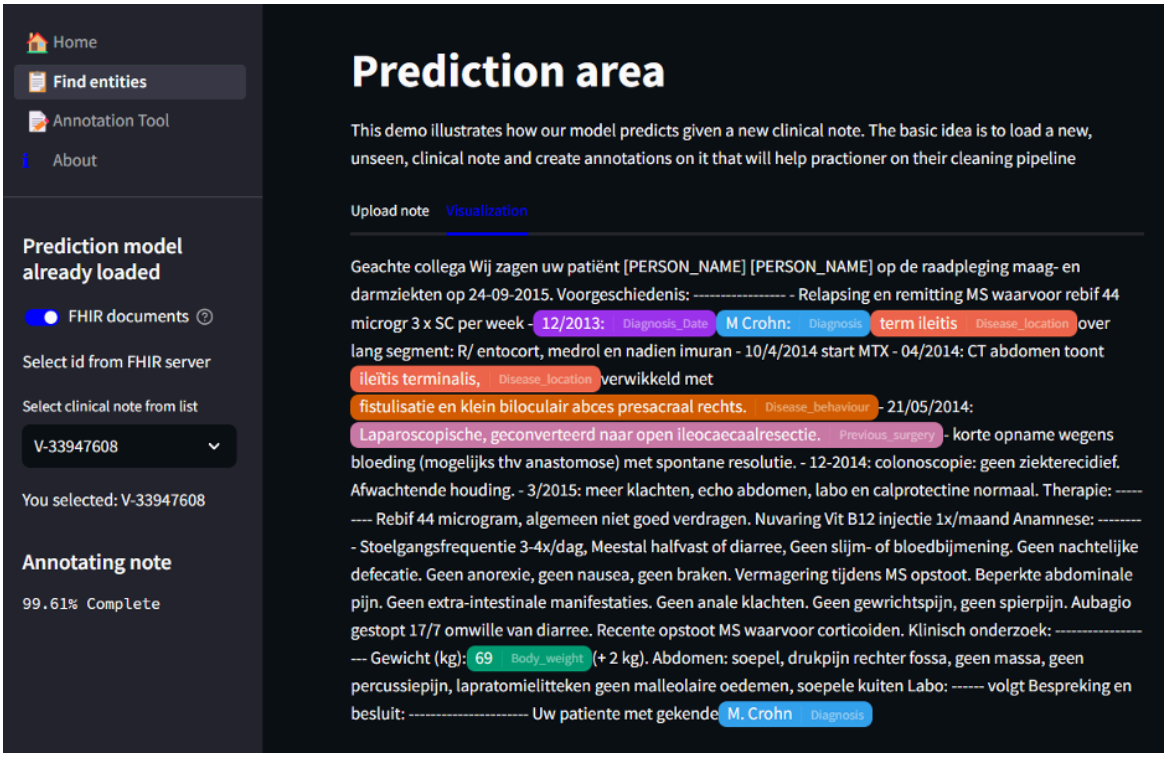
The digitization of patient documents into electronic health records (EHRs) has been a transformative trend in healthcare institutes that has revolutionized medical research and patient care by transforming the way information is stored. However, this has led to the need for curating considerable amounts of structured and unstructured data. Therefore, **automated tools for efficient data mining are needed** so that medical staff can retrieve and clearly visualise critical information from the patients' medical history.



For this purpose, **Natural Language Processing** (NLP) methods have been pivotal in these endeavors, aiming at extracting crucial clinical concepts embedded within free-form text. Our research addresses the imperative request for robust biomedical entity extraction, focusing specifically on Inflammatory Bowel Disease (IBD). By leveraging novel domain-specific pre-training and entity-aware masking strategies with contrastive learning, a general language

model was fine-tuned and adjusted with the purpose of adapting it to IBD-related information extraction scenarios. The created **Named Entity Recognition** (NER) tool streamlines the retrieval process, supporting annotation, correction, prediction, and visualization functionalities. NER proved to be stable and efficient in retrieving and properly displaying information from a dataset of 1,750 records for the training set, 290 for the validation set, and 250 for the testing set provided by the IBD department of UZ Leuven Hospital. Both entity masking strategies have significantly amplified the model's generalization capability, with an increased adaptation to the clinical IBD domain which is evident from the high precision (77.31%), recall (77.27%), and F1-score (77.29%).

This research led to the development of a **comprehensive pipeline for clinical Dutch NER** which encompasses an efficient domain adaptation strategy with domain-aware masking and model fine-tuning enhancements. In addition, an end-to-end entity extraction tool was added, all of which is believed to significantly improve medical record curation and clinical workflows.



If you are interested to read more, check the following link:
https://www.frontiersin.org/journals/artificial-intelligence/articles/10.3389/frai.2024.1450477/full

Awards



Best Junior Presenter Award for Amir Shahhosseini

Amir Shahhosseini, a PhD student of Prof. Rodolphe Sepulchre at KU Leuven, has been awarded the Best Junior Presenter Award at the 2025 **Benelux Meeting on Systems and Control**.
This award recognizes the best presentation among junior researchers, and Amir's talk on "Simulating Neuromorphic Systems at Scale" was well-received by both the audience and the jury.

NEWS

VAIA funding secured for 2025

Flemish Government will continue supporting the **Flemish AI Academy (VAIA)** in 2025 as part of the Flemish AI Policy Plan.
VAIA, **chaired by Bart De Moor (STADIUS)** accelerates AI adoption in Flemish businesses by curating and distributing relevant AI training for professionals. VAIA helps training providers align courses with industry needs by connecting them to academic and business expertise. As a bridge-builder, VAIA fosters AI knowledge exchange and promotes lifelong learning in Flanders.
In 2025, VAIA will strengthen its impact in IT, retail, and logistics and undergo an evaluation in late 2025.
The allocated budget for 2025 is €1.1 million.

STADIUS Colloquium Series

The schedule for the **STADIUS Colloquium Series** is fnalised for this semester.
We are pleased to invite you for the 4 upcoming events!

- **23/04/2025: Kaze W. K. Wong**
  - Title: **"Machine learning in Gravitational wave data analysis"**
  - Time: **14:30 - 15:30**
  - Location: **Aula C (ELEC B91.300)**

- **07/05/2025: Yurii Nesterov**
  - Title: "**Optimization, the philosophical background of artificial intelligence"**
  - Time: **15:00 - 16:00**
  - Location: **Aula C (ELEC B91.300)**

- **04/06/2025: Masoud Ahookhosh**
  - Title: "**Inexact two-level proximal smoothing framework for nonsmooth and nonconvex optimization"**
  - Time: **15:00 - 16:00**
  - Location: **Aula C (ELEC B91.300)**

For more detailed abstract and biographies, please stay tuned and consult the STADIUS Event website

Other events @ STADIUS

PhD defense - Nora Verplaetse: *"A Novel Neural Network Framework for Genome Interpretation in Complex Diseases"*
When: **03/04/2025, 17:00 - 19:00**
Where: **Aula van de Tweede Hoofdwet**

For more information about STADIUS events please visit the STADIUS Event webpages.

Don't forget to check the website of VAIA for a wide choice of courses on (aspects of) AI: www.vaia.be

Publication Digest

Here's the monthly STADIUS Publications Digest, including new reports that have been added to the publications database.
Please remember to have your own reports added in the publications database and make sure your entries are kept up to date (status submitted/accepted/published) at all times.

Contact Ida for new additions and updates, do not add/update database content yourself.

25-65
Geirnaert S., Vanthornhout J., Francart T., Bertrand A., "Performance Modeling for Correlation-based Neural Decoding of Auditory Attention to Speech", Technical Report 25-65, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-67
Devogel A., De Lathauwer L., "Blind Identification of Underdetermined Mixtures via Reduced Tensor Decomposition", Technical Report 25-67, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-68
Pas P., Patrinos P., "Blocked Cholesky factorization updates of the Riccati recursion using hyperbolic Householder transformations", Technical Report 25-68, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-69
Damiano S., van Waterschoot T., "Sound Field Reconstruction Using Physics-Informed Boundary Integral Networks", Technical Report 25-69, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025.

25-71
Colette S., Francois J., De Moor B., van Noort V., "Machine learning for optimal growth temperature prediction of prokaryotes using amino acid descriptors", Technical Report 25-71, ESAT-STADIUS, KU Leuven (Leuven, Belgium), 2025. Submitted for publication in *Bioinformatics*, pp. 1-9.

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