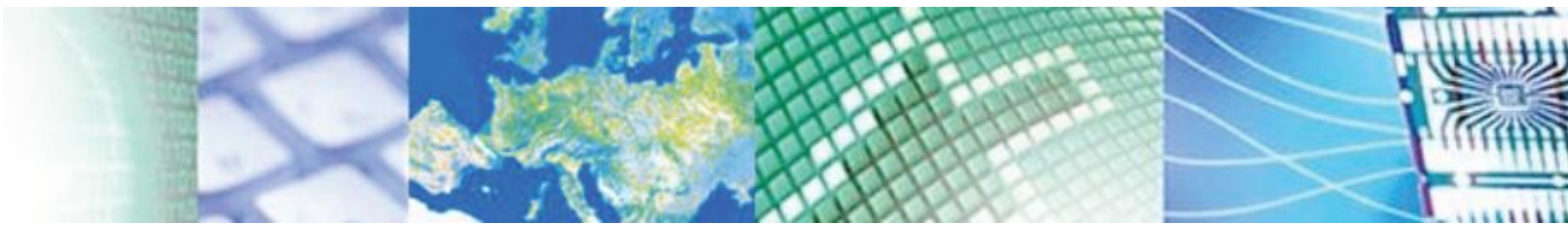




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CHIST-ERA Projects Seminar

Cross Topics

Topic

Life-long Learning Intelligent Systems

Anthony Larcher

April 13th, 2021



Programme co-funded by the
EUROPEAN UNION

The ALLIES Consortium



❖ LIUM (coordinator)

- Speaker diarization
- Machine Translation

❖ IDIAP

- BEAT Open-Science Web Platform for reproducible research

❖ LNE

- Evaluation and protocol development

❖ UPC

- Machine Translation



Introduction: Life-long Learning Intelligent Systems

❖ Machine learning systems rely on human experts to:

- ✓ Select proper data
- ✓ Tune the meta-parameters
- ✓ Choose the training/development/evaluation sets
- ✓ Choose the evaluation protocol

Our aim:

**build autonomous intelligent systems sustaining their performance
across time without machine learning experts**

❖ Objectives:

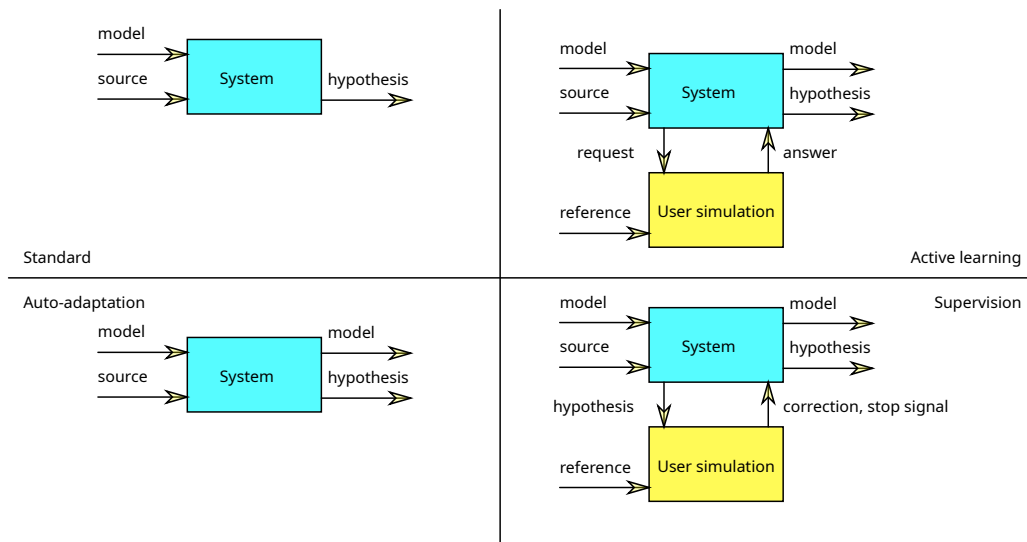
✓ Autonomous systems

- Lifelong learning (supervised and unsupervised)
- Active Learning (user initiative)
- Passive Learning (system initiative)

❖ Tasks:

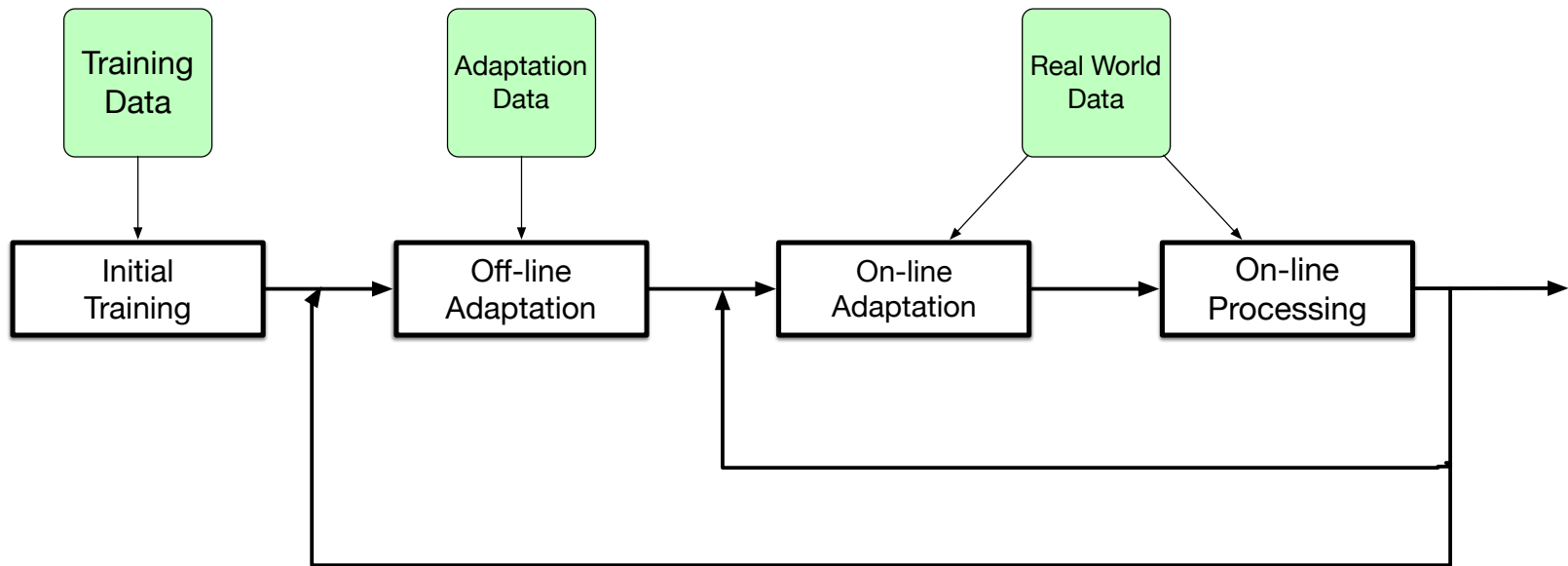
✓ Machine Translation

✓ Speaker diarization





❖ Architecture of the proposed system



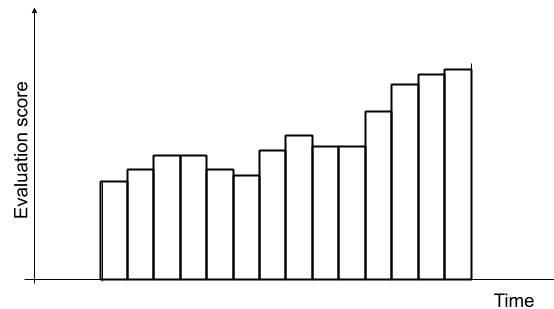
❖ Key challenges:

- ✓ How to evaluate autonomous systems?
- ✓ How to implement autonomous systems?

❖ Potential impact of the project

- ✓ Enable research on autonomous learning by disseminating corpora, protocols and metrics
- ✓ Enable autonomous systems to sustain performance across time without ML experts support

❖ How to measure performance across time?

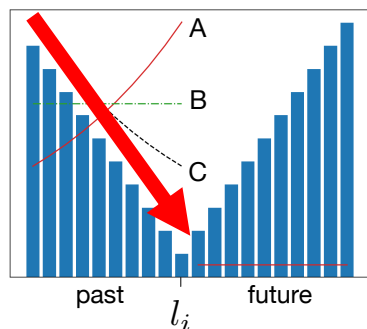


❖ What does the user want to focus on?

1st example of performance metrics

❖ How to measure the ability of a LLIS to follow a user-policy?

❖ A System

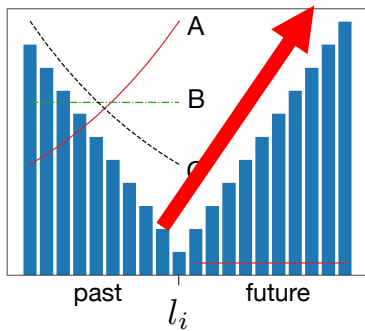


Forgetting effect



1st example of performance metrics

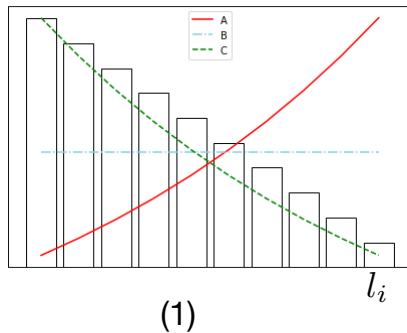
- ❖ How to measure the ability of a LLIS to follow a user-policy?
- ❖ A System adapted until time l_i



Never seen

1st example of performance metrics

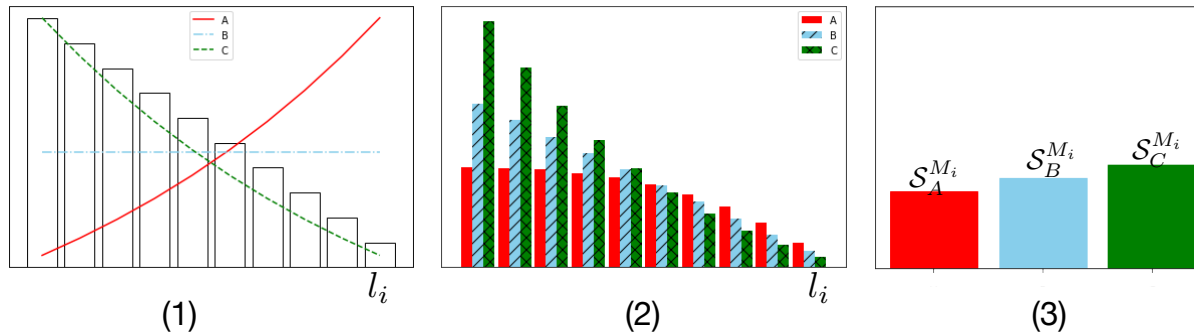
- ❖ How to measure the ability of a LLIS to follow a user-policy?
- ❖ A System adapted until time L_i



- A: focuses on contemporary data
 - B: everything is important
 - C: don't adapt to fast (limited trust in contemporary data, importance of past data...)
- (2) (3)

1st example of performance metrics

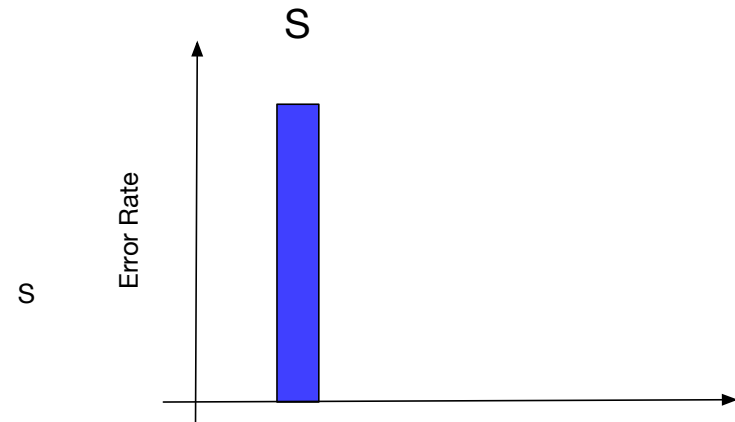
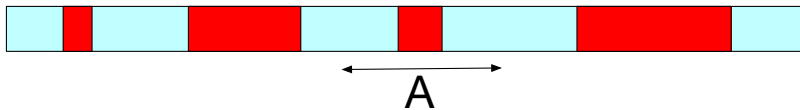
- ❖ How to measure the ability of a LLIS to follow a user-policy?
- ❖ A System adapted until time L :



Weigh the performance on test data according to the time label

Penalization of Human Assisted Learning

Correct
Wrong

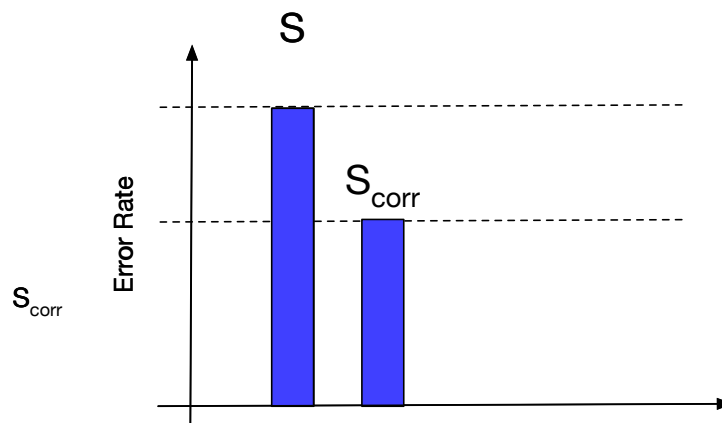
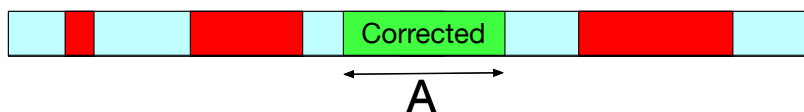


- Given an hypothesis output by the LLIS



Penalization of Human Assisted Learning

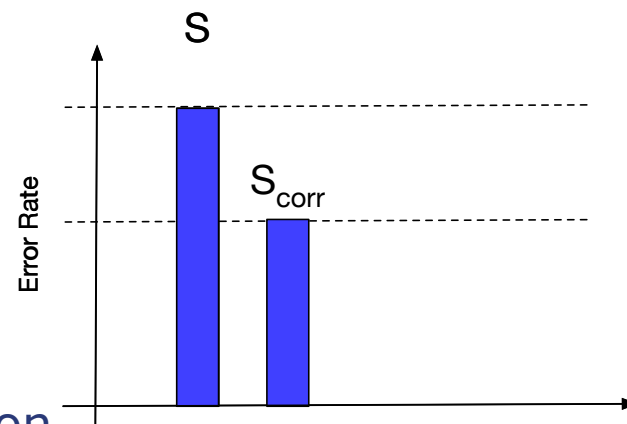
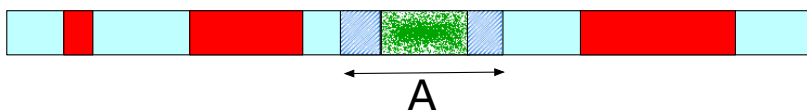
Correct
Wrong
Corrected



- The Domain expert provides a correction



Penalization of Human Assisted Learning

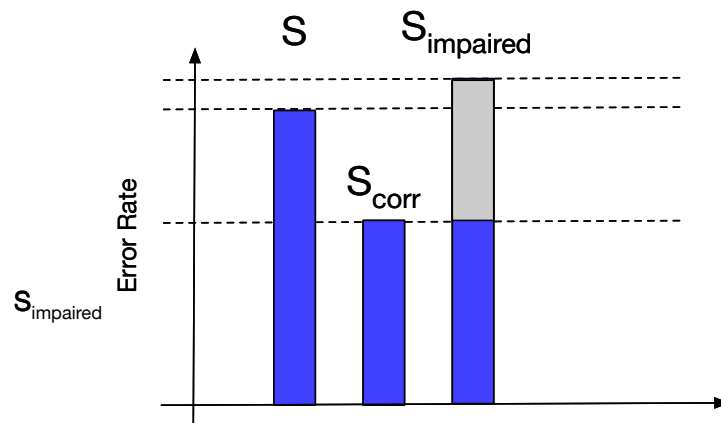
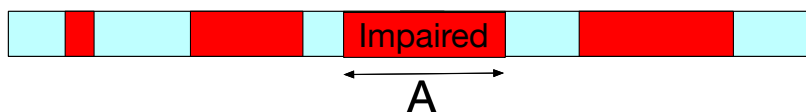


- The Domain expert provides a correction
- Part of the correction is useless (hypothesis was already correct)
- How to quantify the contribution of the information provided ?



Penalization of Human Assisted Learning

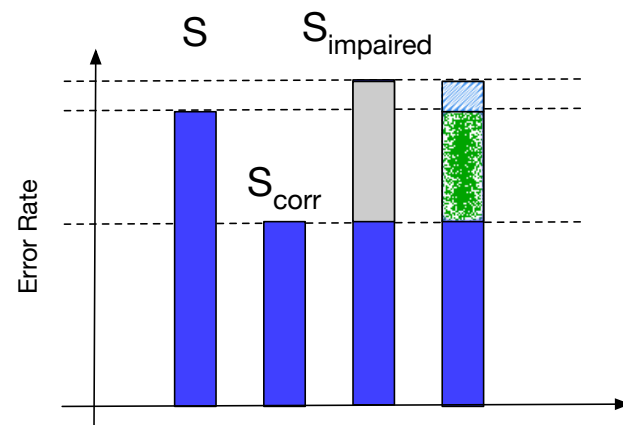
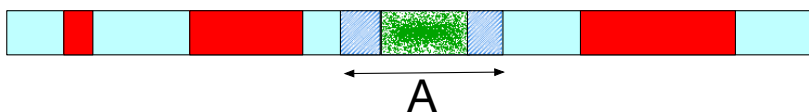
Correct
Wrong



- Make « A » wrong and compute the score



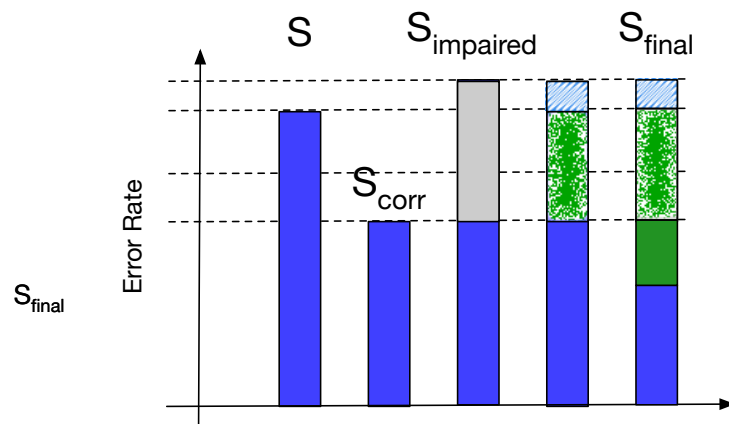
Penalization of Human Assisted Learning



- Make « A » wrong and compute the score



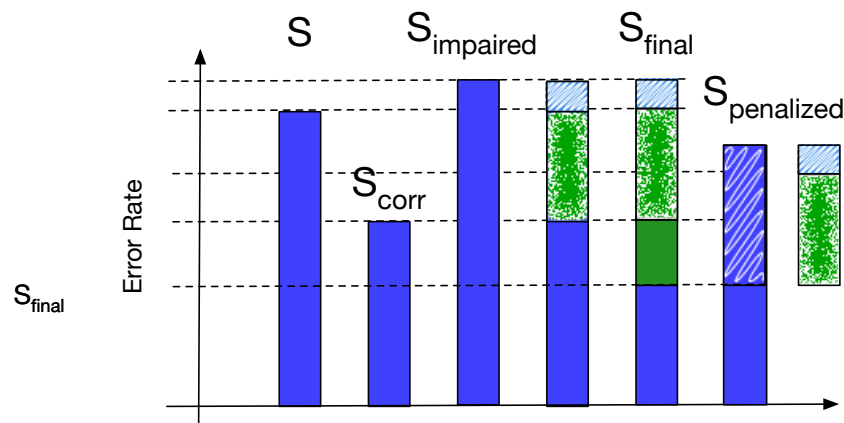
Penalization of Human Assisted Learning



- Given the applied correction, the LLIS adapt its model and generates a final hypothesis: **you expect a benefit**



Penalization of Human Assisted Learning



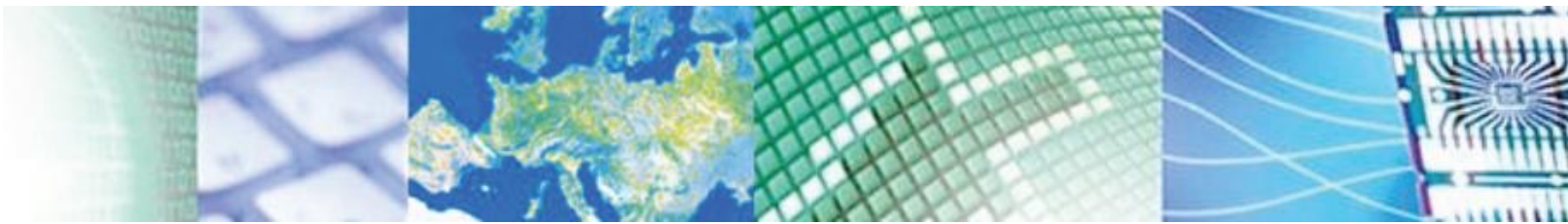
- Penalized score is the final score + human effort expressed in terms of error rate

❖ **Potential impact of the project**

- ✓ Enable research on autonomous learning by disseminating corpora, protocols and metrics
- ✓ Enable autonomous systems to sustain performance across time without ML experts support



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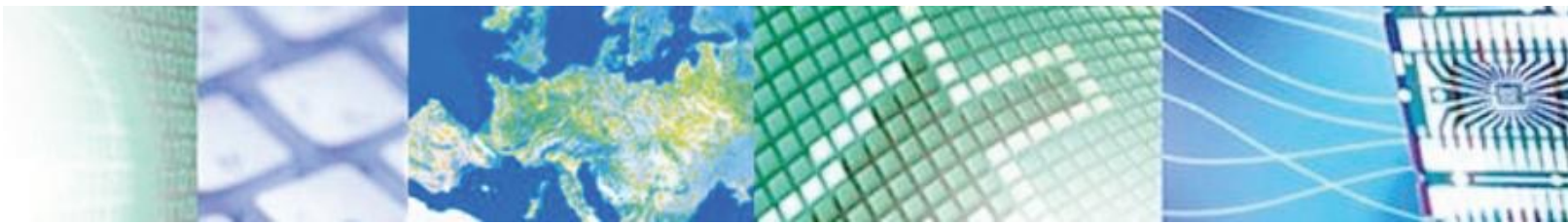
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Sustainability / Exploitation



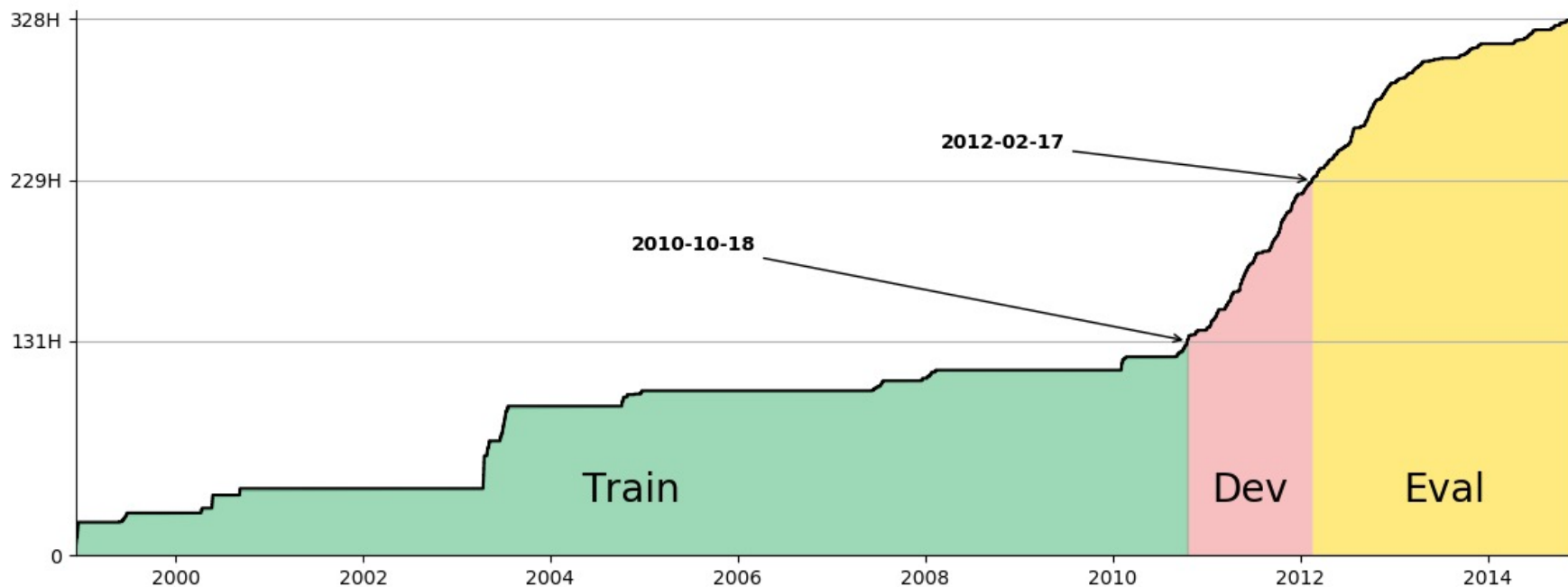
Programme co-funded by the
EUROPEAN UNION

- ❖ **Platform BEAT** (<https://www.idiap.ch/software/beat/>)
- ❖ **Online publicly available baselines**
 - ✓ on Beat GitLab
 - ✓ On GitLab (<https://git-lium.univ-lemans.fr/Larcher/evallies>)
- ❖ **Publicly available corpora:**
 - ✓ Machine Translation
 - ✓ Speaker Diarization (free and publicly available after the evaluation)
- ❖ **Protocols for lifelong learning human assisted**
 - ✓ Machine Translation
 - ✓ Speaker Diarization



❖ Publicly available corpora:

- ✓ Machine Translation
- ✓ Speaker Diarization (free and publicly available after the evaluation)



❖ Metrics

- ✓ New generic metrics to evaluate human assisted learning
- ✓ New framework to evaluate sequential learning across time

❖ Follow-up project:

- ✓ H2020 MSCA-RISE project ESPERANTO
(19 partners for speech processing with a work package on human assisted lifelong learning)

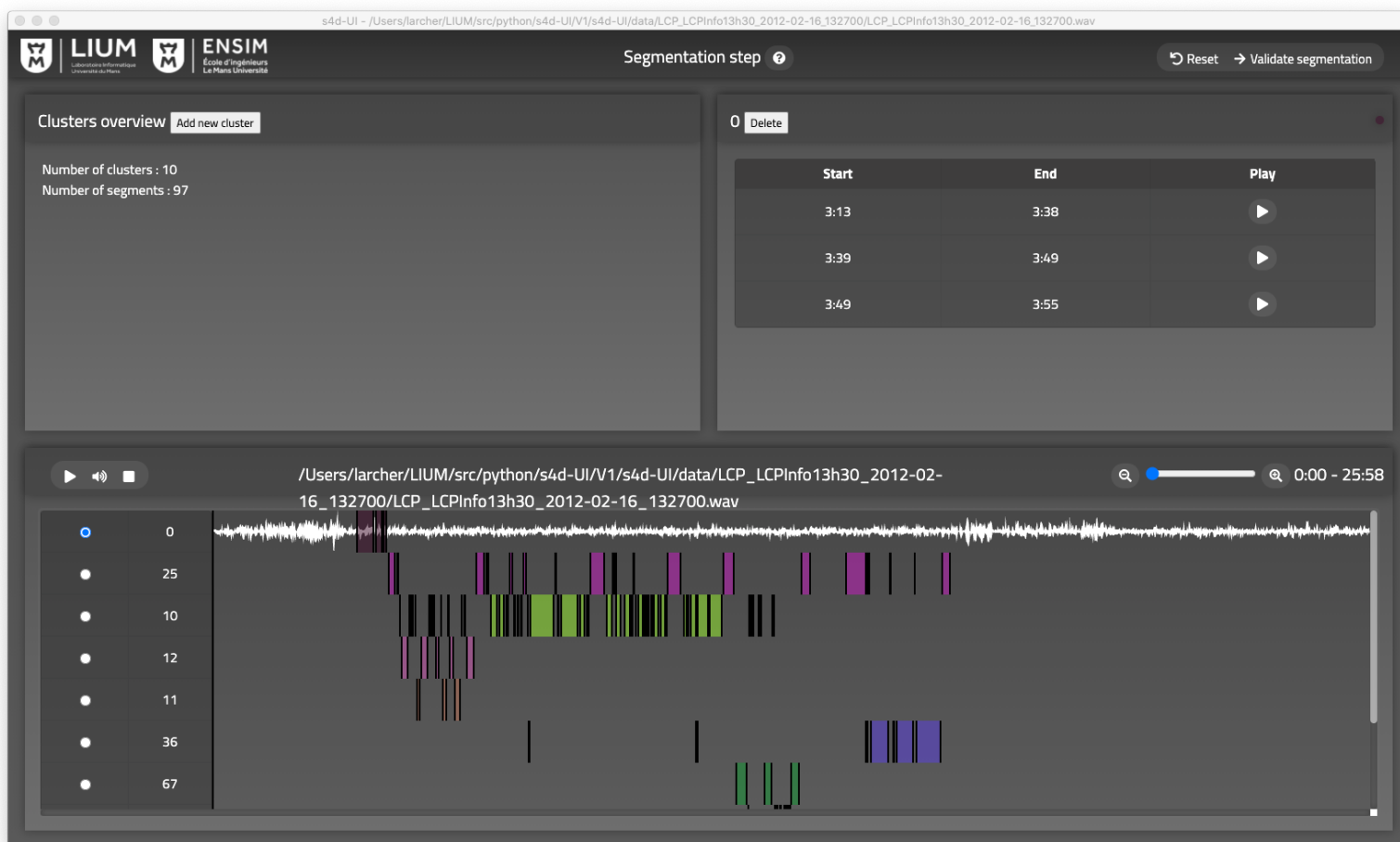
Machine translation and Speaker Diarization

Evaluations: summer 2021

Workshops: autumn 2021 and Spring 2022

Results and dissemination

❖ Interface for Human Assisted speaker diarization



- ❖ YEVHENII PROKOPALO, MEYSAM SHAMSI, LOIC BARRAULT, SYLVAIN MEIGNIER, A. LARCHER « Active correction for speaker diarization with human in the loop » dans IberSpeech, 2020, Spain
- ❖ Costa-jussà, M. R., Creus, R., Domingo, O., Domínguez, A., Escobar, M., López, C., ... & Geleta, M., [Mt-adapted datasheets for datasets: Template and repository](#), arXiv preprint arXiv:2005.13156, 2020
- ❖ Basta, C., Costa-jussà, M.R. & Casas, N. [Extensive study on the underlying gender bias in contextualized word embeddings](#), Neural Comput & Applic., 2020
- ❖ Costa-Jussà, M. R., España-Bonet, C., Fung, P., & Smith, N. A. [Multilingual and Interlingual Semantic Representations for Natural Language Processing: A Brief Introduction](#), Computational Linguistics, 46(2), 249-255, 2020
- ❖ Costa-jussà, M. R., Lin, P. L., & España-Bonet, C. [Gebiotoolkit: Automatic extraction of gender-balanced multilingual corpus of wikipedia biographies](#), in LREC, 2020
- ❖ Carrino, C.P., Costa-jussà, M.R., & Fonollosa, J.A. [Automatic Spanish Translation of the SQuAD Dataset for Multilingual Question Answering](#), in LREC, 2020
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- ❖ Casas, N., Fonollosa, J.A., & Costa-jussà, M.R. [Sparsely Factored Neural Machine Translation](#), ArXiv, abs/2102.08934, 2021
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- ❖ Escolano, C., Costa-jussà, M.R., & Fonollosa, J.A. [From bilingual to multilingual neural-based machine translation by incremental training](#), Journal of the Association for Information Science and Technology, 72, 190 - 203, 2020
- ❖ Escolano, C., Costa-jussà, M.R., & Fonollosa, J.A. [The TALP-UPC System Description for WMT20 News Translation Task: Multilingual Adaptation for Low Resource MT](#), Proceedings of the Fifth Conference on Machine Translation (WMT), 2020
- ❖ Biesialska, M., & Costa-jussà, M.R. [Refinement of Unsupervised Cross-Lingual Word Embeddings](#), Proceedings of the the 24th European Conference on Artificial Intelligence (ECAI), 2020
- ❖ Biesialska, M., Rafieian, B., & Costa-jussà, M.R. [Enhancing Word Embeddings with Knowledge Extracted from Lexical Resources](#), Proceedings of the 58th Annual Meeting of the Association for Computational Linguistics: Student Research Workshop (ACL SRW), 2020
- ❖ Biesialska, M., Biesialska, K., & Costa-jussà, M.R. [Continual Lifelong Learning in Natural Language Processing: A Survey](#), Proceedings of the 28th International Conference on Computational Linguistics (COLING), 2020
- ❖ Barraut, L., Biesialska, M., Bojar, O., Costa-jussà, M.R., Federmann, C., Graham, Y., Grundkiewicz, R., Haddow, B., Huck, M., Joanis, E., Kocmi, T., Koehn, P., Lo, C., Ljubesic, N., Monz, C., Morishita, M., Nagata, M., Nakazawa, T., Pal, S., Post, M., & Zampieri, M. [Findings of the 2020 Conference on Machine Translation](#), Proceedings of the Fifth Conference on Machine Translation (WMT), 2020