

## Master's Internship – Analyze multimedia and topic detection

### I. Mission and Program Plan

#### Title

Automated Topic Modeling for Interactive Video Summaries

#### Internship Description

In recent years, modeling relevant information has been a highly dynamic research field due to its ability to classify and understand vast text corpora. However, user needs have evolved towards a more detailed understanding of documents, topic-focused research, and the identification of crucial document parts. Topic modeling algorithms such as LDA, LSA, PLSA, HLDA, PAM, and CTM have been developed to address these needs. In this context, we have recently proposed a novel approach based on LDA topic modeling. This approach automatically classifies large text corpora based on their relevant topics, discovers new topics, and hierarchically organizes topics by exploiting the semantic structure of documents. These works were presented in [Drissi et al, 2022a] and [Drissi et al, 2022b]. Furthermore, we have reused our contributions to ontology construction by developing methods like LEOnto+ [Sassi et al, 2022], enabling the automatic creation of ontologies from text corpora. Additionally, we have developed expert recommendation systems based on topics of interest directly extracted from documents, utilizing criteria such as expertise, availability, and response quality, as indicated in [Drissi et al, 2023].

In the context of this internship, we aim to expand our work to include video analysis, thereby adding a new data source to enrich our models and analyses. The primary objective of this internship is to create interactive and informative summaries for videos, taking both the visual and spoken content into account. The intern will be tasked with developing unsupervised machine learning algorithms to detect, extract, and hierarchically organize topics addressed in a video, with the goal of creating interactive and informative summaries. This will require exploring video analysis techniques, including speech recognition and object detection, as well as integrating this information into our existing data model. The work will also involve designing a user-friendly interface to present these interactive summaries. This internship offers a unique opportunity to gain experience in natural language processing research, artificial intelligence, and multimedia data analysis. It will contribute to innovative research projects aimed at improving information management during professional meetings by providing content-rich video summaries.

#### Mission - Main Activities

##### 1. Understanding Multimedia Data Analysis

- Gain a comprehensive understanding of multimedia data analysis, encompassing video and audio processing.
- Conduct a literature review to explore existing techniques and tools for video content analysis, summarization, and the detection of interesting topics.

##### 2. Design and Development

- *Multimedia Data Preparation*
  - Collection and Preprocessing of Multimedia Data: this phase involves the collection of multimedia data, including videos, and preprocessing them to eliminate noise, enhance quality, and ensure consistency.

- Development of Data Pipelines: create efficient data pipelines for the storage and optimized retrieval of multimedia content. Ensuring effective data management and access is crucial for subsequent analyses.
- *Topic Detection and Extraction*
  - Implementation of Unsupervised Machine Learning Algorithms: Implement unsupervised machine learning algorithms to detect and extract topics from video content.
  - Exploration of Key Topic Identification Methods: Explore various approaches for identifying key topics and subtopics within videos.
- *Hierarchical Topic Structuring*
  - Exploration of Topic Organization Techniques: Investigate techniques for organizing topics based on their relevance and relationships within the multimedia content.
  - Development of Hierarchical Algorithms and Approaches: Develop algorithms and approaches to hierarchically structure the extracted topics, creating a meaningful hierarchy.
- *Integration with the Existing Data Model*
  - Integration of Multimedia Topics: Integrate the topics extracted from multimedia sources into the existing data model, primarily focused on textual content.
  - Ensure Compatibility and Consistency: Ensure that representations of multimedia and textual data are compatible and consistent to facilitate unified analysis.
- *User Interface Design*
  - Design of User-Friendly Interfaces: Design user-friendly interfaces for presenting interactive video summaries.
  - Consideration of Visual and User Interaction Aspects: Take into account visual layout, intuitive user interactions (e.g., drag-and-drop functionality), and real-time feedback to enhance the user experience.

### | 3. Testing and Optimization

- Thoroughly test the developed interfaces for usability, performance, and reliability.
- Optimize the interfaces for responsiveness and efficiency.
- Debug and resolve any identified issues or bugs during the testing phase.

## II. Application Requirements and Criteria

### | Applicant's Profile:

- Solid understanding of multimedia data analysis.
- Proficiency in video content analysis and topic detection techniques.
- Software engineering skills, including multimedia data management.
- Experience in implementing unsupervised machine learning algorithms.
- User-friendly interface design capabilities.
- Testing, optimization, and debugging skills.
- Passion for interdisciplinary research.

### | Allowance

- Approximately 600 euros per month

### | Working Conditions

- Hosting laboratory: LIUPPA
- Location : Pavillon Montaury, Allée du Parc de Montaury, 64600 Anglet, France
- Laboratory expertise: Computer Science

### | Starting Date

February or March 2024

### | Duration:

Between 4 and 6 months

## **Application**

The application should be submitted as a single PDF file and include the following:

- Curriculum Vitae (CV)
- Cover letter
- Transcript of master's degree grades and ranking
- Letter of recommendation (if available)
- Contact information for at least two professional references (if available)

Application must be sent to the following emails with the title “OpenCEMS-Master's Internship Application”: [richard.chbeir@univ-pau.fr](mailto:richard.chbeir@univ-pau.fr) and [salma.sassi@univ-pau.fr](mailto:salma.sassi@univ-pau.fr).

## **Application Deadline**

February 10, 2024

## **References**

- [Drissi et al, 2022a] Drissi, A., Khemiri, A., Sassi, S., Tissaoui, A., Chbeir, R., Jemai, A. (2022). LDA+: An Extended LDA Model for Topic Hierarchy and Discovery. In: Szczerbicki, E., Wojtkiewicz, K., Nguyen, S.V., Pietranik, M., Krótkiewicz, M. (eds) Recent Challenges in Intelligent Information and Database Systems. ACIIDS 2022. Communications in Computer and Information Science, vol 1716. Springer, Singapore. [https://doi.org/10.1007/978-981-19-8234-7\\_2](https://doi.org/10.1007/978-981-19-8234-7_2) (Conference Ranking B)
- [Drissi et al, 2022b] Drissi, A., Tissaoui, A., Sassi, S., Chbeir, R., Jemai, A. (2022). S-LDA: Documents Classification Enrichment for Information Retrieval. In: Bădică, C., Treur, J., Benslimane, D., Hnatkowska, B., Krótkiewicz, M. (eds) Advances in Computational Collective Intelligence. ICCCI 2022. Communications in Computer and Information Science, vol 1653. Springer, Cham. [https://doi.org/10.1007/978-3-031-16210-7\\_56](https://doi.org/10.1007/978-3-031-16210-7_56)
- [Drissi et al, 2023] Drissi, A., Khemiri, A., Sassi, S., Tissaoui, A., Chbeir, R., Jemai, A : A Hybrid Machine Learning Approach for Automatic Experts Recommendation Systems, INISTA 20-23 Septembre 2023, Hammamet, Tunisia.
- [Sassi et al 2022], Sassi S, Tissaoui A, & Chbeir R. LEOnto+ : A Scalable Ontology Enrichment Approach. World Wide Web: Internet and Web Information Systems. 2022. <https://doi.org/10.1007/s11280-021-00997-x>