A CONTENT AND KNOWLEDGE MANAGEMENT SYSTEM SUPPORTING EMOTION DETECTION FROM SPEECH

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1 INTRODUCTION AND MOTIVATION

▪ Affective Computing is an emerging inter-disciplinary field developing technology with the goal of improving human-computer interaction.
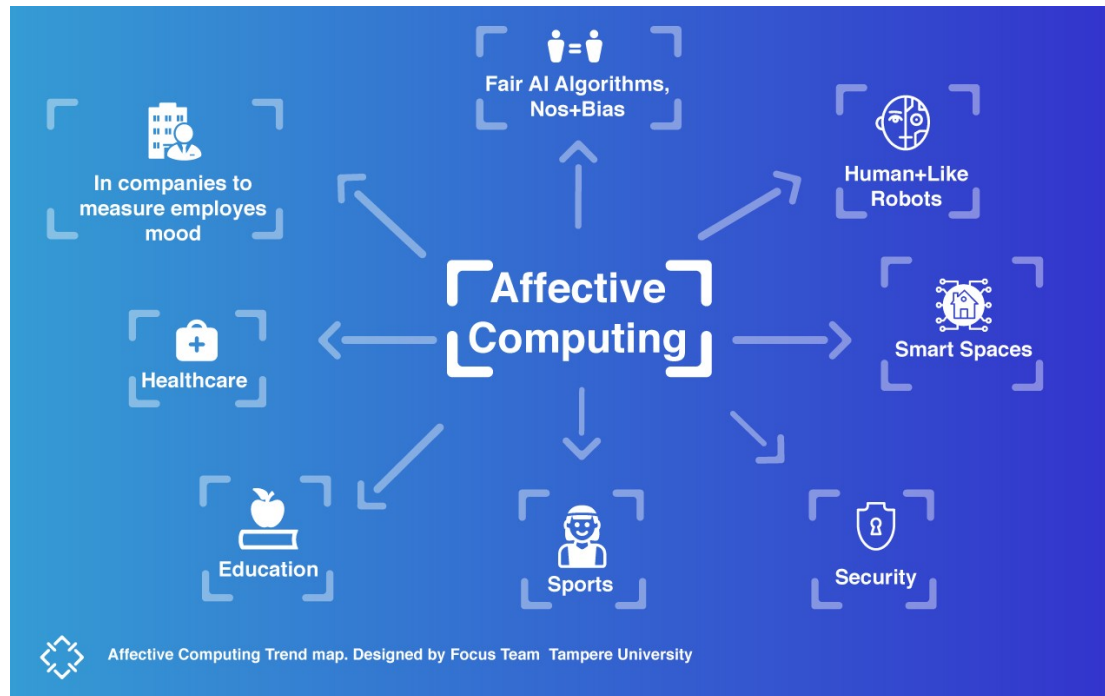
A Content and Knowledge Management System Supporting Emotion Detection from Speech

1 INTRODUCTION AND MOTIVATION

- Affective Computing is an emerging inter-disciplinary field developing technology with the goal of improving human-computer interaction.

- Sensor Enabled Affective Computing for Enhancing Medical Care (SenseCare) is a 4-year project funded by the European Union (EU).

- One of the systems developed in SenseCare is a machine-learning-based emotion detection platform which provides an early insight into the emotional state of an observed person.
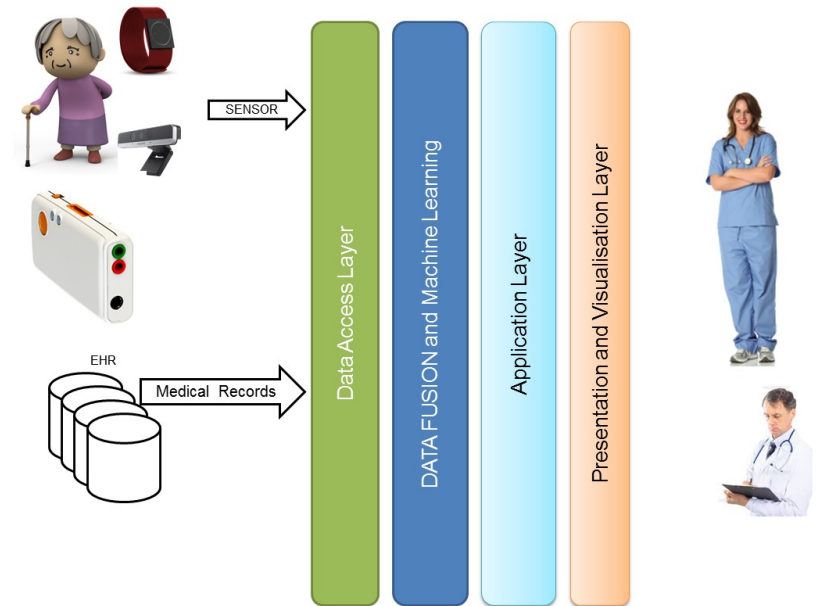

Image source: https://cordis.europa.eu/project/id/690862/reporting

1 INTRODUCTION AND MOTIVATION

- The MENtal Health monitoring through InteRactive conversations (MENHIR) aims to support and improve the mental wellbeing of people by applying Affective Computing.

Image source: http://menhir-project.eu

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- A machine learning-based emotion detection platform, which identifies emotions from speech, has been developed.
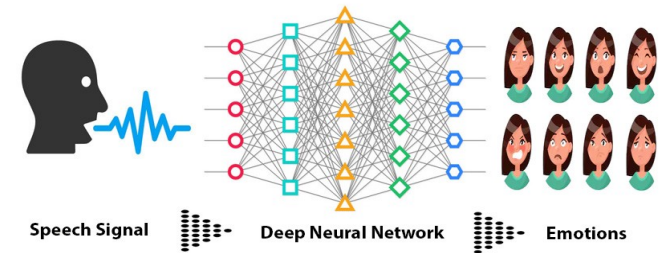
Speech Signal   **Deep Neural Network**   **Emotions**

Image source: https://medium.com/@raihanh93/speech-emotion-recognition-using-deep-neural-network-part-i-68edb5921229

1 INTRODUCTION AND MOTIVATION

- The MENtal Health monitoring through InteRactive conversations (MENHIR) aims to support and improve the mental wellbeing of people by applying Affective Computing.

- A machine learning-based emotion detection platform, which identifies emotions from speech, has been developed.

- Our paper discusses the challenges of emotion detection based on speech and its corresponding transcription in the MENHIR project.

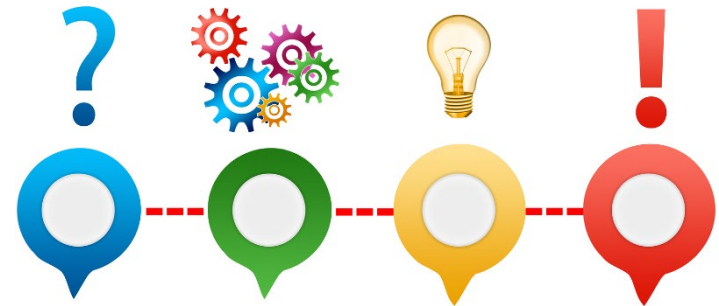- A solution to overcome these challenges is proposed.

Image source: https://ralfw.de/2018/09/two-problem-solving-approaches/

2 PROBLEM STATEMENT AND APPROACH

- Audio files, their metadata, and related data need to be stored in a high-performance repository where other analysis systems can connect to and download them when needed.

Image source: https://contabo.de/

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- Not only multimedia objects but also other kinds of scientific content, knowledge, and their metadata need to be imported, stored, and managed.

Image source: http://www.csrhungary.eu/csr-blog/mier-lehet-ugrodeszka-csr-projekt/

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- It is crucial to have an integration architecture for all the mental health services and applications employed in MENHIR.

Image source: https://www.scnsoft.de/leistungen/software-integration/

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- It is crucial to have an integration architecture for all the mental health services and applications employed in MENHIR.

- For research results to make an impact, they need to be easily found and used. Unfortunately, related publications, datasets, and analysis results are distributed in different locations.

Image source: https://www.vectorstock.com/royalty-free-vector/seo-search-engine-optimization-keyword-research-vector-21787244

2 PROBLEM STATEMENT AND APPROACH

- Without organizing the content created into suitable categories, researchers will not have capacity for insight on the key data produced in MENHIR, discover connections between data or whether something is missing.
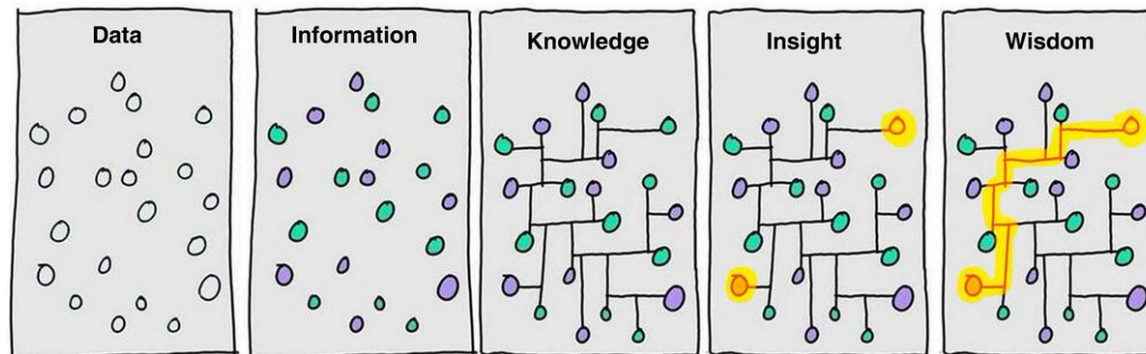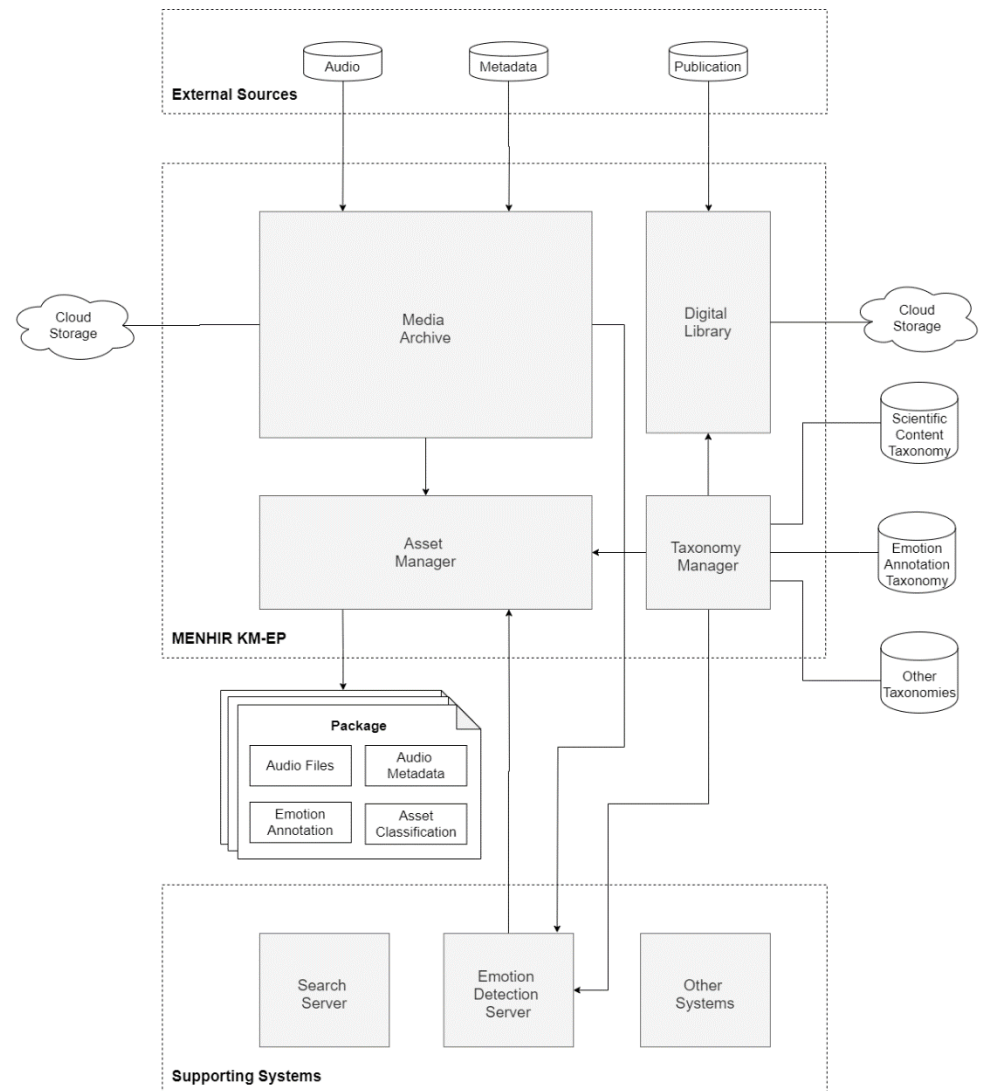
3 SYSTEM DESIGN

- A cloud-based Content and Knowledge Management Ecosystem (KM-EP) for
  - Audio files and metadata persistence.
  - Human emotion detection.
  - Asset packaging, classification, and management.
- Components related and crucial for these tasks:
  - Media Archive (MA)
  - Digital Library (DL)
  - Taxonomy Manager (TM)
  - Asset Manager (AM)

3 SYSTEM DESIGN

- The Media Archive (MA) component manages all multimedia objects in the KM-EP.

- MA enables users to create, persist, manage, and classify different types of multimedia objects, such as, e.g. video, audio, images, presentation slides, along with their metadata.

- In MENHIR, the media files are, e.g., recordings of interviews, which are conducted in order to form a corpus of conversational audio data.

- The uploaded files are stored in a cloud storage service, which is fault-tolerant, flexible, scalable, and has high performance.

- Multimedia objects can be classified into different categories, which enables objects to be searched and accessed easily and quickly by users.
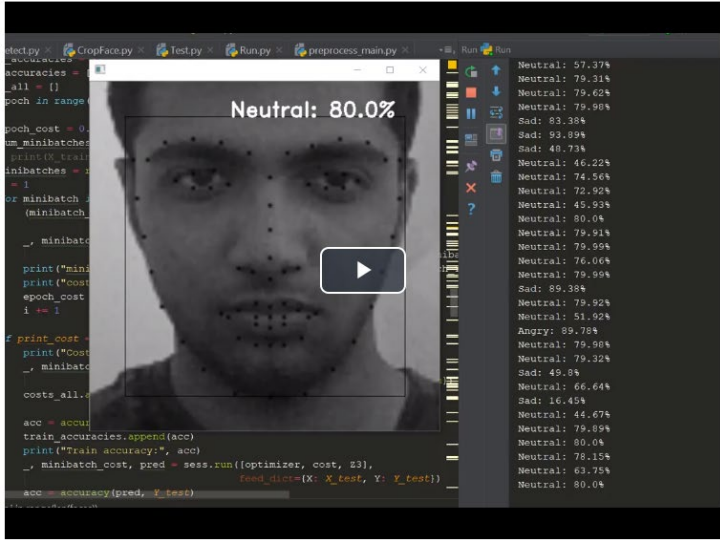

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3 SYSTEM DESIGN

- The Digital Library (DL) component enables users to import publications into the KM-EP, persist, and manage them.

- Using a Mediator-Wrapper Architecture, publications from different sources, such as, e.g. Mendeley, SlideShare, and in different formats, such as BibTex and OAI-PMH, can be queried, uploaded, and integrated into the DL.

- The uploaded documents are also stored in the cloud storage (e.g. Amazon S3) to maintain their availability and scalability.

- By indexing file metadata and classifying publications into existing categories, they can be searched by users based on these criteria.

Posted on Jun 16, 2016 | Rating ★ ★ ★ ★ ★ 0

Informal Learning in Online Knowledge Communities: Predicting Community Response to Visitor Inquiries

by Nicolae Nistor [1], Mihai Dascalu [2], Lucia Larise Stavarache [2], Yvonne Serafin [3], Stefan Trausan-Matu [2]

- [1] Ludwig-Maximilians-Universität
- [2] University Politehnica of Bucharest
- [3] Universität der Bundeswehr München

nformallearninginonlineknowledgecommunities(OKCs)comprises visitor inquiries on specific topics. Learning can occur only if the OKC adequately respond. This study aims to predict OKC response, using a social learning analytics approach based on computational linguistics and Bakhtin's theory of dialogism. Observing the blog topic (cooking vs. politics & economics) and the visitor inquiry format (off-topic vs. on-topic), a field experiment with a 2 × 2 factorial design was conducted on a sample of N = 68 blogger communities with a total of 25,303 members. For the entire sample, the community response was influenced only by the inquiry format. In a separate examination of experimental groups, only for one examined topic (cooking) this remained true, while for the other (politics & economics) the community response only depended on the previously established dialog quality. The findings suggest identification criteria for responsive communi- ties, which can support OKC integration in learning environments.

`social learning analytics` `computational linguistics` `informal learning` `online knowledge communities`

Description   BibTex   ACM   Documents

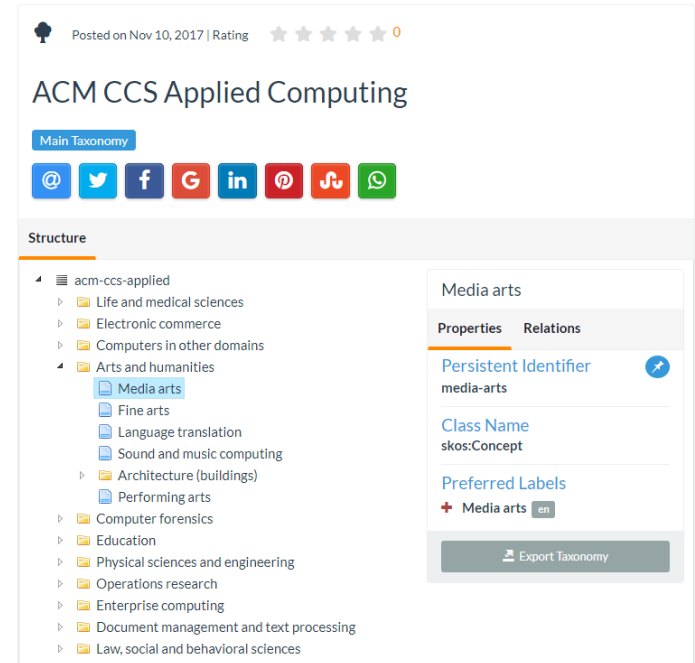**Date of Publication:**
30 November -0001

Year of Publication:
2015

Related Articles

Document
Predicting Newcomer Integration in Online Knowledge Communities by Automated Dialog Analysis
Nicolae Nistor, Mihai Dascalu, Lucia Larise Stavarache, Christian Tarnai, Stefan Trausan-Matu

Document
ICT Tools for Collaboration and Online Teaching
Lilian S. Reventar

3 SYSTEM DESIGN

- The Taxonomy Manager (TM) component supports the construction, collaboration, management, and evolution of taxonomies.

- With the support of its version control system, users can manage the changes of their taxonomies.

- Multimedia objects, publications, and assets of the MENHIR KM-EP can be classified with support of the TM. As a result, users can search and browse contents quickly and easily.

- A rating system is implemented based on crowd voting to support the evaluation of taxonomies in the KM-EP. With the rating system, authors can improve the accessibility of their taxonomies, and users can also choose quickly more relevant taxonomies.

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3 SYSTEM DESIGN

- A caching system enables thousands of taxonomies and terms to be retrieved and constructed in just a few milliseconds.

- In MENHIR, the TM also support the emotion detection platform by providing an emotion annotation taxonomy.

3 SYSTEM DESIGN

- The Asset Manager (AM) component is where related data, metadata, analysis results, and classification are gathered and combined into packages.

- A cronjob is developed and scheduled to run regularly after a given period of time. This cronjob has 3 tasks, which are:
    - searching for new audio files and their metadata and adding them into a new asset,
    - sending the new audio files and their metadata to the emotion detection server for analysis,
    - receiving and adding analysis results into its package.

CronJob Manager

+ New CronJob

ID	Name	Description	Repeat Every	Last Run				
1	ShareTec	This CronJob connects to ShareTec OAI-PMH server, then harvest assets and import them as Software contents.	1 hour(s)	26.05.2020 10:54:27	▶	▤	✎	🗑

3 SYSTEM DESIGN
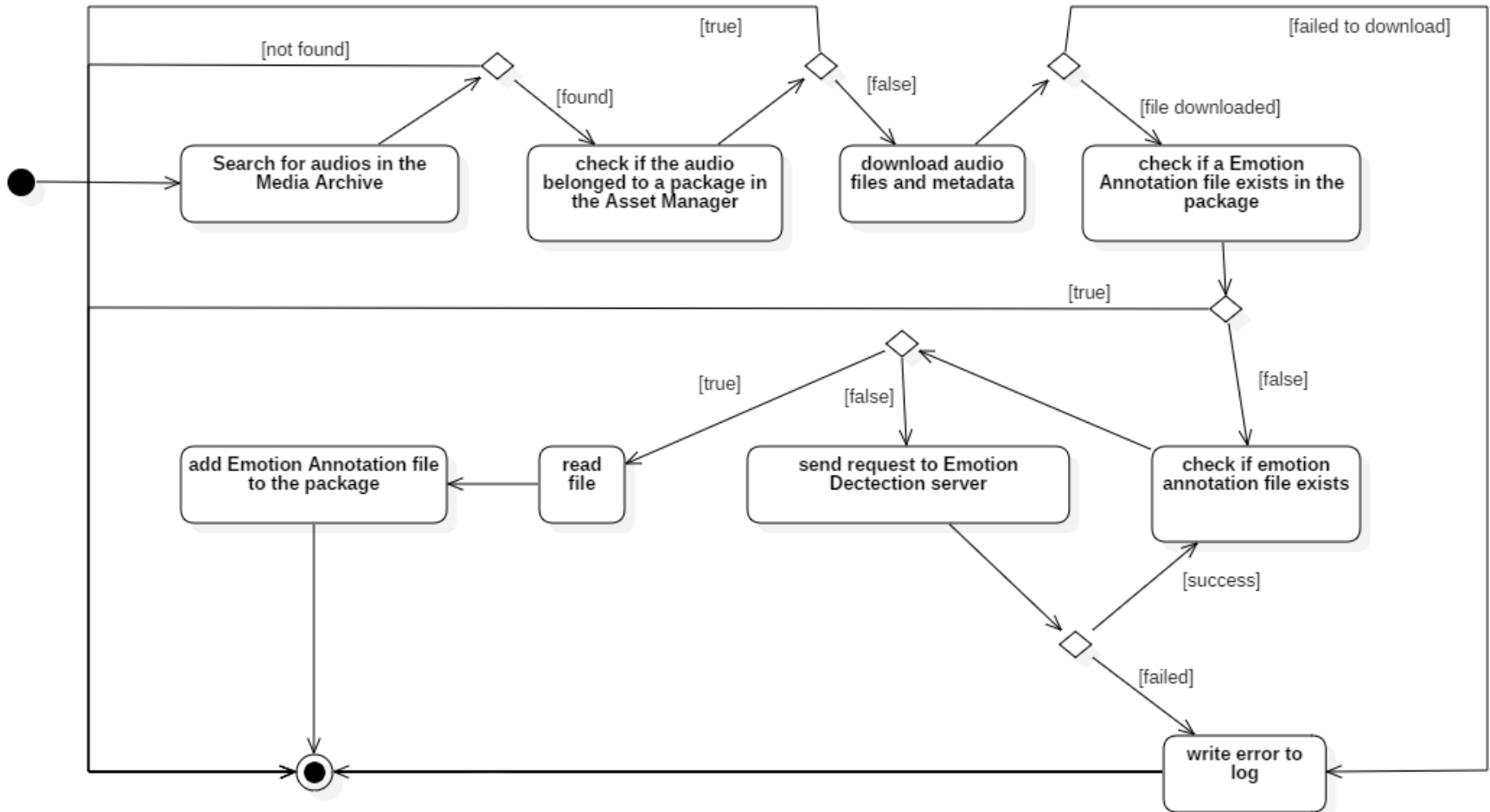
3 SYSTEM DESIGN

- Supporting systems such as Emotion Detection Server and Search Server provide standalone, high-performance services that the MENHIR KM-EP can take advantage of.

- The Emotion Detection Server detects human emotion from speech signals extracted from the audio files and their transcriptions.

- Automatic recognition of spontaneous emotions from speech is complex. To overcome its challenges, two procedures have been conducted:

  1. Annotation task involves the segmentation of the audio samples in order to label them with emotions.

  2. Building a model that is able to distinguish between different emotional states.
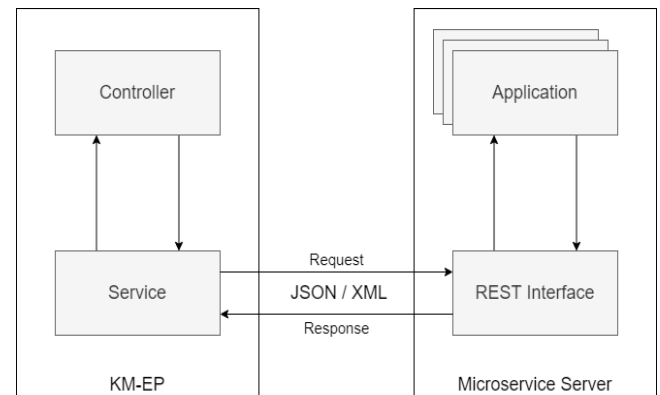
3 SYSTEM DESIGN

- Transcriptions are used to identify the spoken turns, and those turns have been split automatically into segments of between 2 and 5 seconds.

- Each segment is labelled by both professional and crowd annotators following the same questionnaire.

- A model capable of identifying the mood of the speaker through application of neural network algorithms was created.

- This model infers the subject's emotional state using both audio features (such as e.g. pitch, energy, Mel-Frequency Cepstral Coefficients (MFCCs)) or the spectrogram.

context window
= 25ms

step
= 10ms
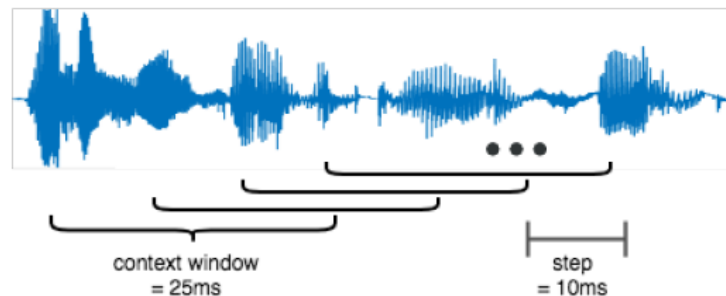
4 CONCLUSION AND FUTURE WORK

- The MENHIR project provides rapid intervention, appropriate feedback and overview on the state of development of subject mood and anxiety levels over time, by monitoring moods, behaviour, and symptoms of subjects in real time.

- We have described the challenges involved in the development and integration of the MENHIR platform. The content and knowledge management ecosystem (KM-EP) was proposed as a cloud-based, high-performance, scalable, and easy to use solution.

- The MENHIR KM-EP will provide a useful foundation for the development of conversational systems in mental health promotion and assistance.

- Nevertheless, the current emotion detection server uses a model, which needs to be trained offline by AI experts and re-trained frequently with updated corpora to enhanced its accuracy.

- The MENHIR KM-EP can be extended in the future to use the uploaded audio records in the MA to form a new corpus. Then, the new model can be trained based on the new data corpus and replace the former model automatically.

THANK YOU FOR YOUR ATTENTION

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