MOOC Rec v2

Feature comparison

Features	Class Central	My MOOC	MOOCRec	MOOCRec V2 Proposed Solution
Direct learning style identification	✗	✗	✗	✓
Video Production Styles	✗	✗	✓	✓
Complex and mixed video production styles	✗	✗	✗	✓
Identify the spoken language of the presenter	✗	✗	✗	✓
Search filter based on specific keywords / topics	✗	✗	✓	✓
User profile and dashboard	✗	✗	✓	✓
Online discussion forums analysis and extraction of sentiments of forum posts for better MOOC recommendations	✗	✗	✗	✓

MOOC Rec v2

SERVICE ORCHESTRATOR FOR PARALLEL CLASSIFICATION

Knowledge Gap

Problems/Limitations/Potential Improvements – In Mooc Rec v1

Traditional workloads are single-threaded and does not utilize memory and CPU to the fullest.
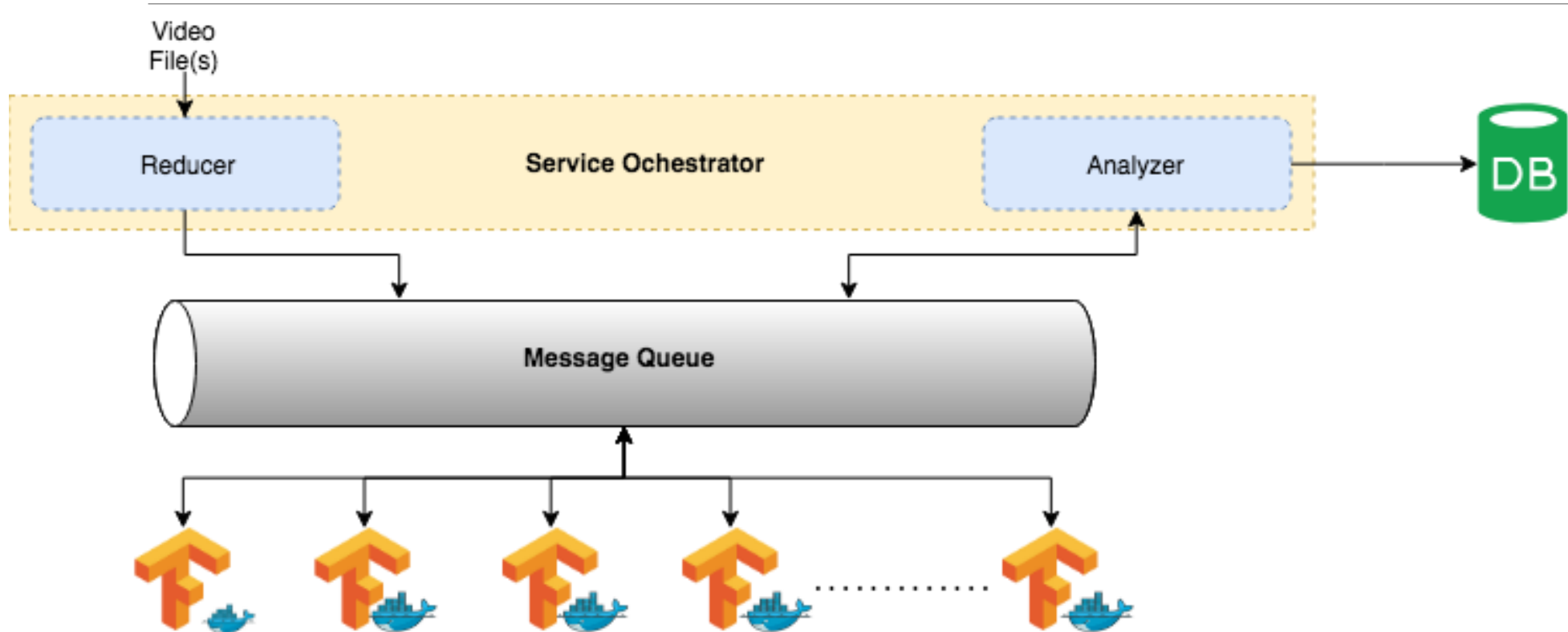
Problems/Limitations/Potential Improvements – In General

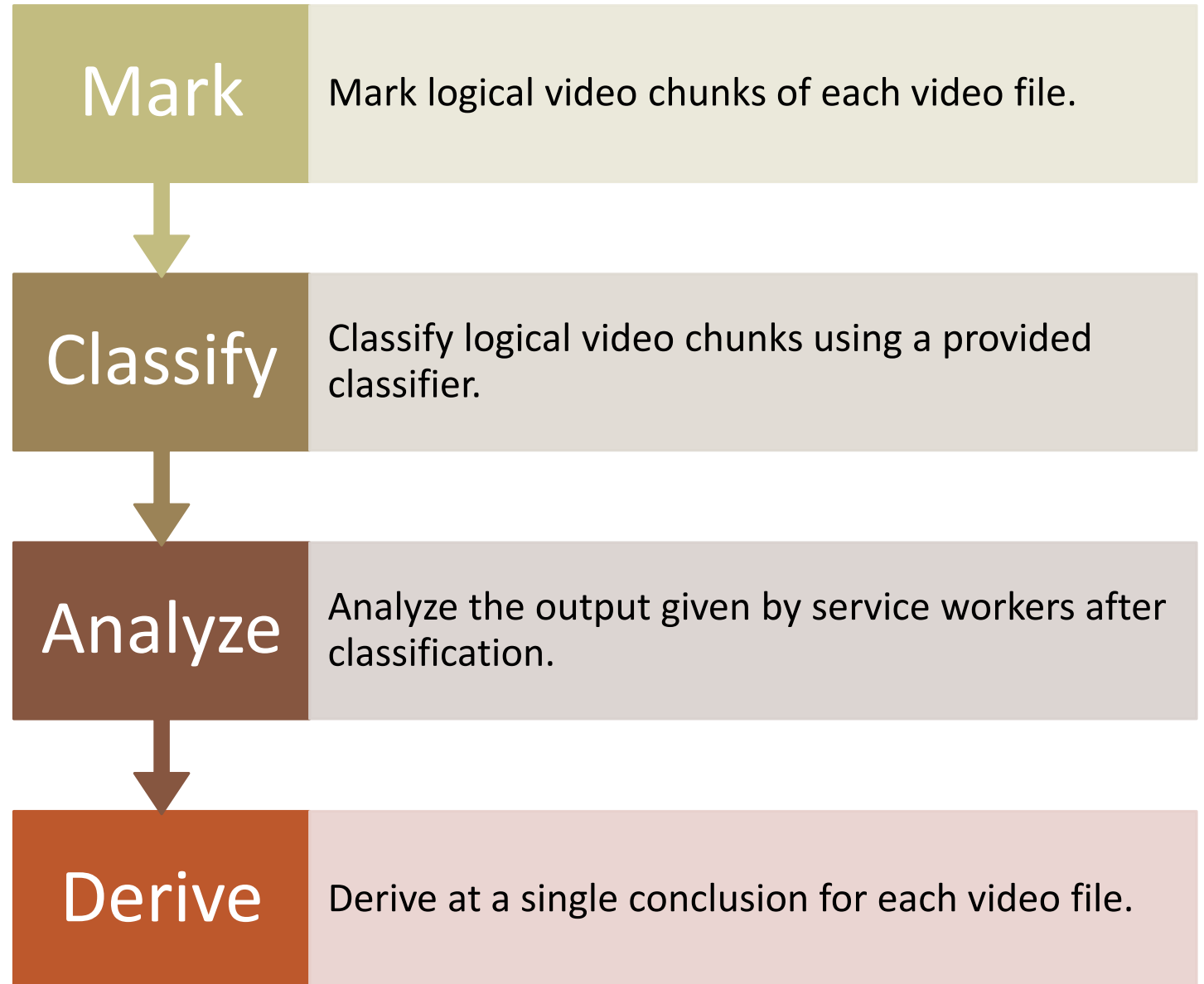GPU based classification is expensive.

Process tends not to be persistent.

Solution

Run multiple instances of the same classifier in the same server;
feed different data to each instance.

System Design

Functional Requirements

Mark	Mark logical video chunks of each video file.
Classify	Classify logical video chunks using a provided classifier.
Analyze	Analyze the output given by service workers after classification.
Derive	Derive at a single conclusion for each video file.

External Interfaces

- Hardware Interfaces
  - 100Mbit network interface.
  - SSD based EBS volume of 50GB or more.
  - At least one EC2 instance with below specifications.
    - 8GB RAM
    - 8GB internal storage for the operating system
    - 4 or more vCPUs
  - Another EC2 instance for running the DB with below specifications.
    - 16GB RAM
    - 25GB SSD based storage
    - 4 or more vCPUs

External Interfaces

- Software Interfaces
  - Amazon Linux 2 operating system
  - Python 3.7
  - Docker
  - RabbitMQ
  - TensorFlow
  - MongoDB

- Communication Interfaces
  - Network connection with Internet Gateway (Provisioned and managed by AWS)

MOOC Rec v2

IDENTIFY USERS' PREFERRED LEARNING MATERIAL TYPE

Knowledge gap

Research problem

- MOOCs recommenders like Class central, My MOOC does not identify :
  - users' preferred learning style
  - learning material types that suit each learning style

- MOOCRec V1 :
  - ILS questionnaire consists of 44 questions, hence lengthy
  - Do not have a proven learning material type to learning style mapping

Solution

- Interactive introductory session

- Introducing learning material type to learning style mapping : Proven using HCI evaluation techniques.

System design
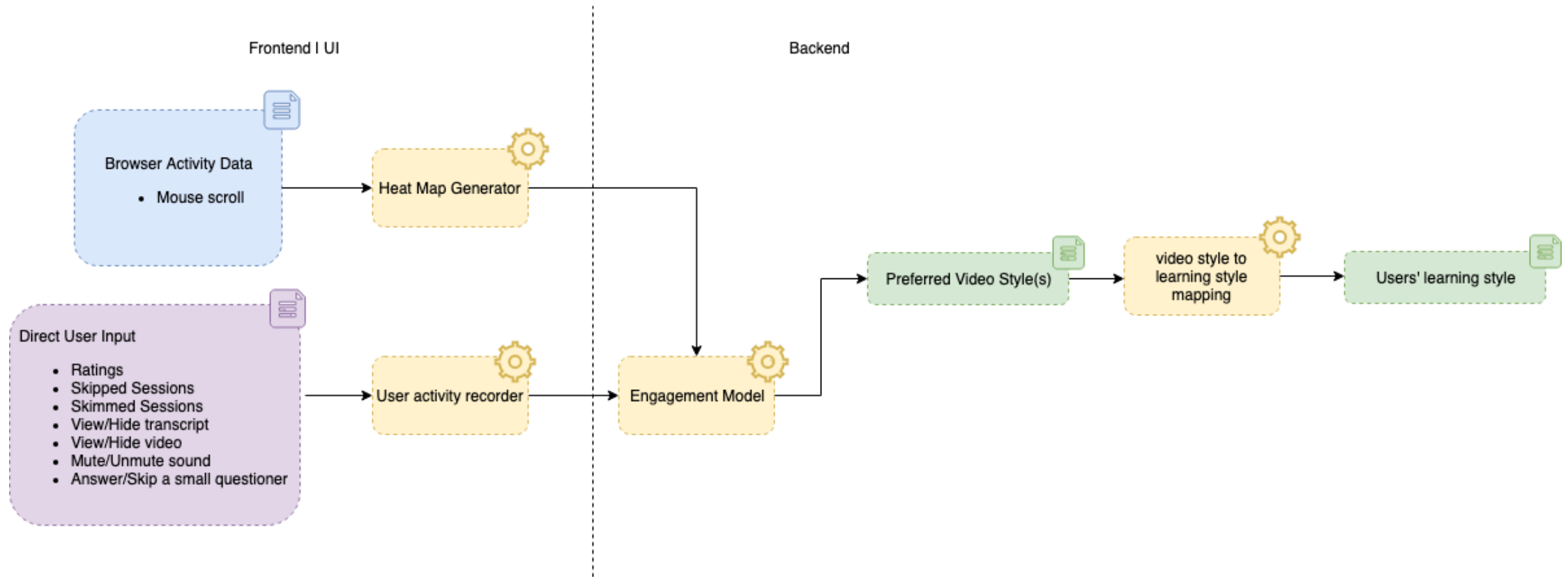
Functional Requirements

- Record user activity and interactions.

  Active user interactions:
  - Skip each segment
  - Rate each segment
  - View/Hide transcript of each segment
  - View/Hide video of each segment
  - Mute/Unmute sound of each video segment
  - Answer/Skip a small questioner about each segment

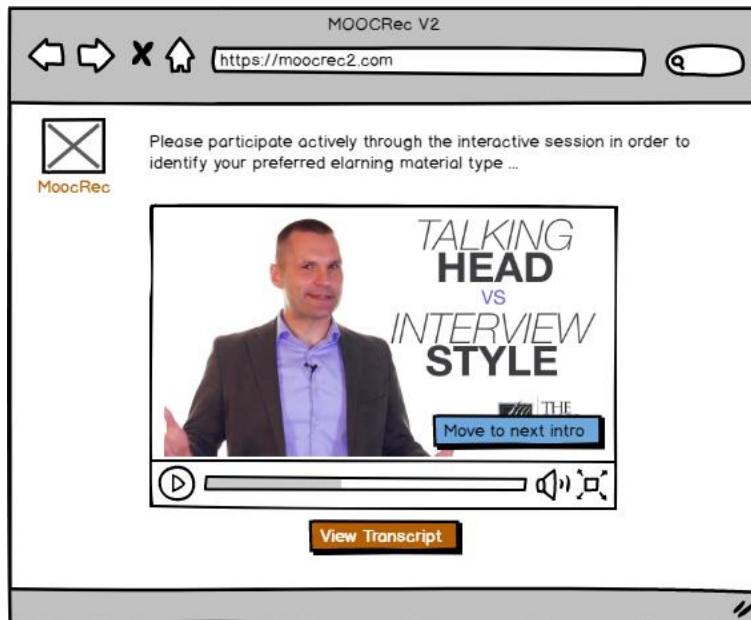 Passive user interactions:
  - Mouse scroll movements

- Analyze user engagement

- Map learner style and make MOOC recommendations
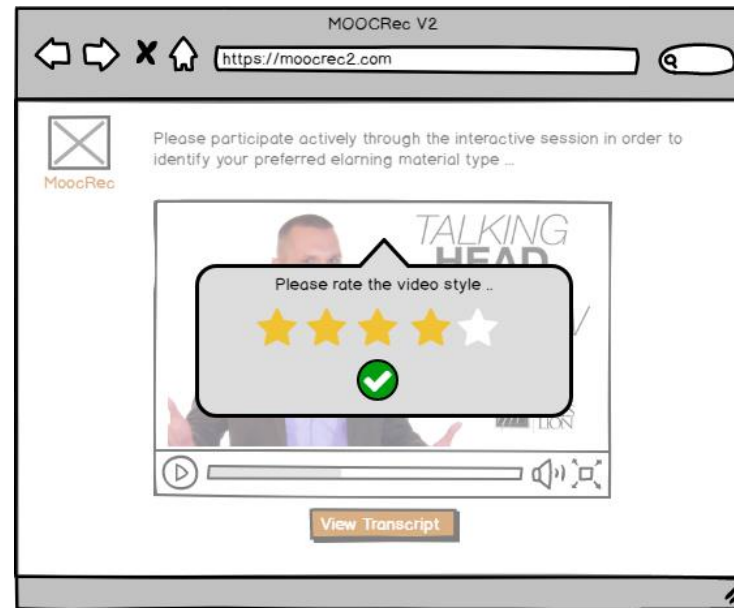
External Interfaces

- User Interfaces

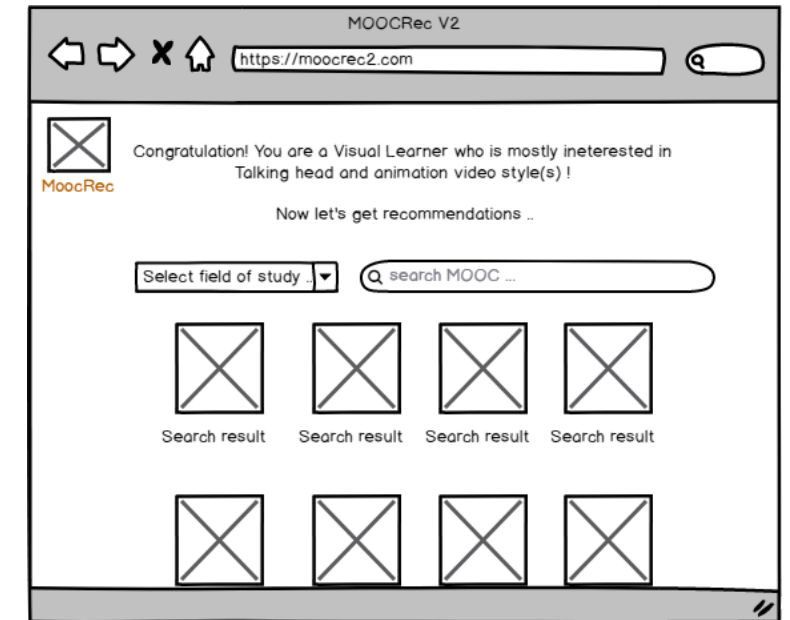### Anthropomorphic Approach

Affordance

Constraints

Cognitive Approach

Attention and Workload Models

External Interfaces

- Hardware interfaces
  - 100Mbit Network Interface
  - EC2 instance with below specifications.
    - 8GB RAM
    - 8GB internal storage for the operating system
    - 4 or more vCPUs

- Software interfaces
  - Frontend
    - Google chrome, Firefox, Microsoft Edge, Opera
  - Backend
    - Amazon Linux 2 operating system
    - Java Runtime Environment (JRE 8)
    - MongoDB
    - Node.js API of MoocRec V2

Limitations

- Memory constraints
  - Server-side RAM should be 8 GB or higher
  - Client-side RAM should be 4 GB or higher

- Performance constraints
  - Browser should not be tasked with heavy performance activities during system usage
  - Browser activity must be recorded with a minimum hit on browser performance.

- Design constraints
  - Intro session only consists of video styles which are recognized by MOOCRec 2

Testing proposed approach

HCI evaluation method	Technique used	Test carried out
Evaluating implementations	Experimental evaluation	• System is tested with real user participation
Query techniques	Questionnaire	• Real users fill ILS questionnaire
Observational methods	Think aloud	• User is asked to describe what he thinks about his preference of video segments
Evaluating implementations	Experimental evaluation	Test ; • if system result = ILS questionnaire result • if users actual preferred video style = video style identified by the system

MOOC Rec v2

ANALYZING AND CLASSIFYING COMPLEX MOOC VIDEO PRODUCTION STYLES

Knowledge Gap

Research problem

- There are many types of MOOC video production styles.
- People need to find their video of interest by going through many videos.
- MOOCREC V1 has classified only 3 types of styles.

•**Solution**

- Classification of newer and complex video production styles.
- Analyze MOOC videos with multiple production styles and get the composition.

Functional Requirements

1) Extracting videos from the MOOC sources using web crawler.

2) Splitting a video into Image Frames.

3) Classification of fragmented Image into a production style

4) Determine the composition of a video by calculating the composition of each production style.

External Interfaces

1) **Hardware Interfaces**
   - ➤ 6GB of RAM.
   - ➤ Internet connection with more than 60 Mb/s speed.
   - ➤ GPU with 2GB memory.
2) **Software Interfaces**
   - ➤ TensorFlow
   - ➤ Python 3.7
   - ➤ Keras
3) **Communication Interfaces**
   - ➤ A network adaptor which support at least 60 Mb/s network speed.

Limitations

1) 6GB of RAM
2) Internet connection of 60 Mb/s speed.
3) GPU

MOOC Rec v2

ANALYZING FORUMS TO AID IN MOOC RECOMMENDATION

Knowledge Gap

Problems/Limitations/Potential Improvements – In Mooc Rec v1

Reviews & Ratings are not considered

Learner's need to be able to find MOOCs which have high forum activity if they require

Solution

Both these limitations can be overcome by analyzing forums.

(Contd. on the next slide)

Solution Contd.

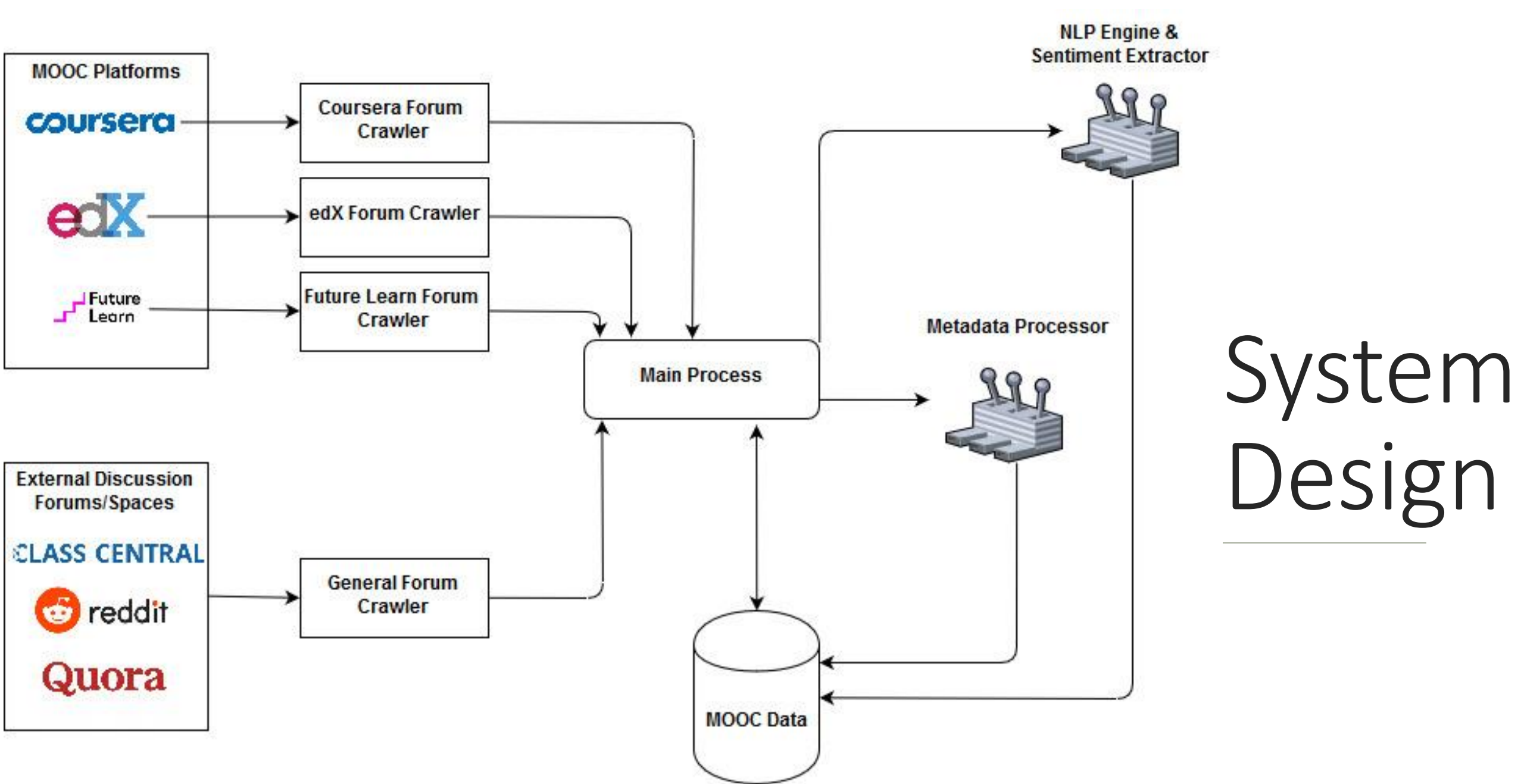There are 2 types of threads

1. Review Threads (General Threads)
   1. Sentiments can be used to get a rating
   2. Can be used along with normal ratings to get a new rating

2. Technical Threads
   1. Meta data can be analyzed to get a forum activity score
   2. Forum activity score can be used to recommend MOOCs to users who are interested in participating in forums

System Design

Functional Requirements

1. Gather online forum data from Coursera, FutureLearn and Edx
   1. Additionally external forum sites will also be analyzed to get additional information (Reddit, Quora)

2. Analyze Sentiments of Review-Type Forums
   1. Finding out how positve/negative a review-post is (Processed on GCP or locally)
   2. Normalize sentiment scores
   3. Use sentiment score along with normal rating to produce a new rating
   4. Use new rating when recommending MOOCs

3. Analyze Meta-Data of Technical Forums
   1. Based on certain attributes – Date Posted, No. Of unique users, Last active, …
   2. Normalize calculated scores
   3. Use forum activity score when recommending MOOCs to users who prefer it

External Interfaces

- Hardware Interfaces
  - A network adapter which supports at least 60Mb/s of data transfer

- Software Interfaces
  - Python 3.7
  - MongoDB
  - Google Cloud Platform

- Communication Interfaces
  - An internet connection of at least 60Mb/s for proper functionality

Limitations

1. A network adapter which supports at least 60Mb/s of data transfer

2. At least 250GB of storage – Hard disk or SSD

3. At least 8GB of memory (RAM)

Non-Functional Requirements

RELIABILITY   MAINTAINABILITY   SCALABILITY   AVAILABILITY

Thank You