



# **INVIDEO RECOMMENDATION**

## **VIDEO RECOMMENDATION BY CONTENT**

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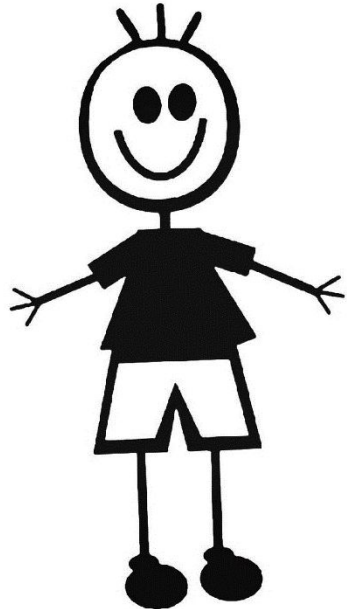
Supervisors:

Associate Professor: **Walaa Hassan**

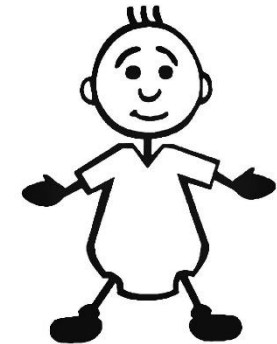
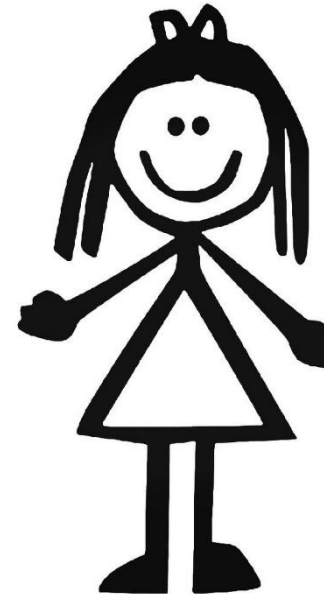
Teaching Assistant: **Menna Hassan**

# POTENTIAL USER

Hey, let's go  
watch some  
movies  
together!

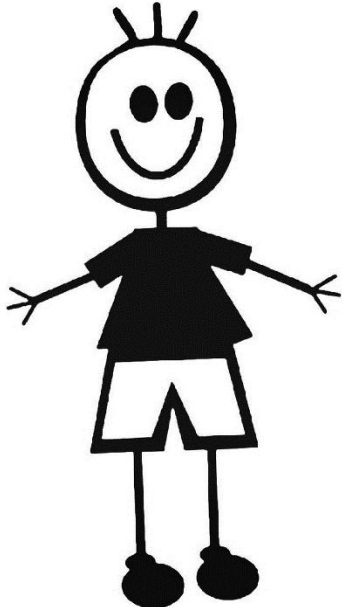


Sure! But I have  
my little brother  
with me. He gets  
scared easily.

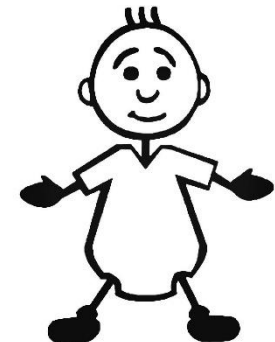
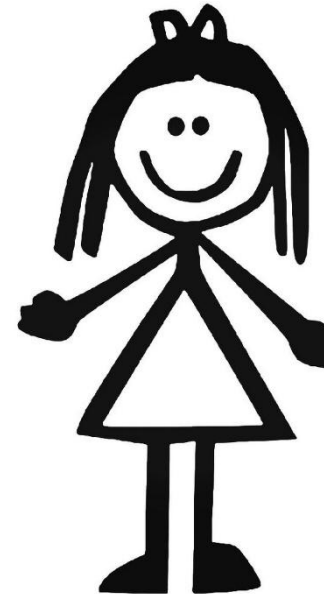


# POTENTIAL USER

In that case I will use this plugin to filter the bad scenes, and recommend another video for later.

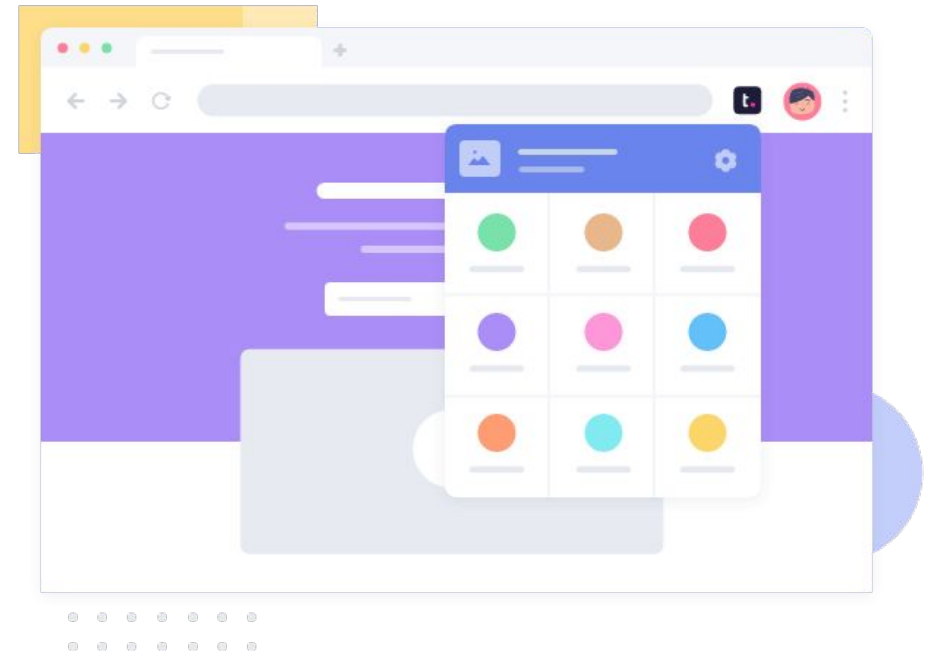


Okay, that works for me, lets go!



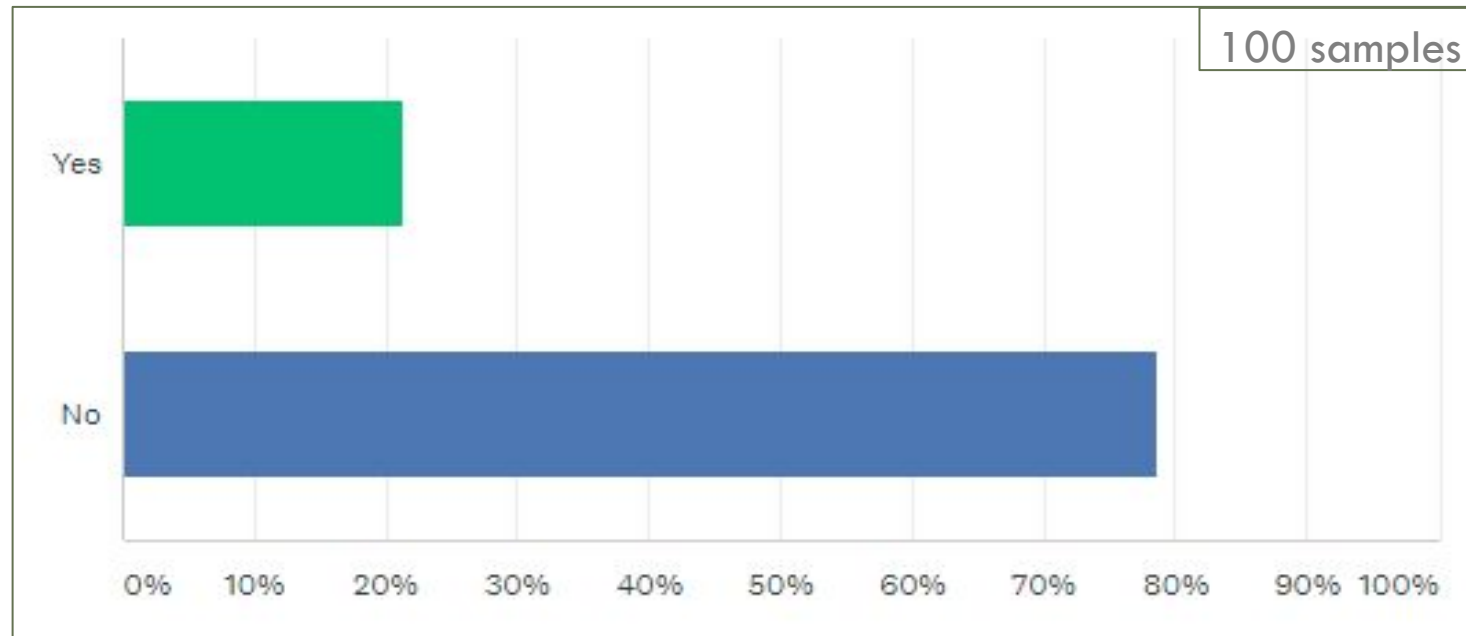
# WHY A PLUGIN ?

- Easier to use.
- More fit for the purpose of recommendation.
- Higher portability (web browsers)
- Can easily upload or insert the URL of the video



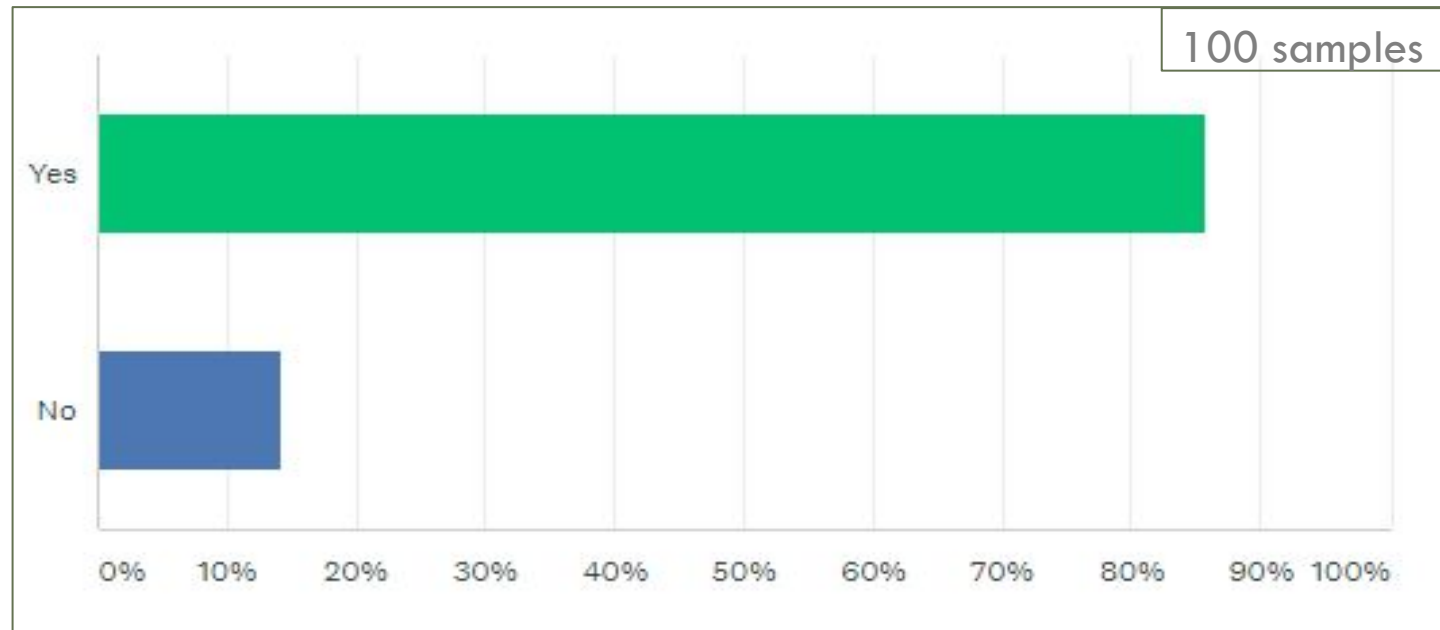
# OUR SURVEY

Would parents let their kids watch movies online without companionship?



# OUR SURVEY

If a tool for filtering and searching scenes in a video is introduced to the market, would you be interested?



# POTENTIAL CLIENT

WATCHiT! is an Egyptian based streaming platform which was founded to make users able to watch their favorite videos.

Hi Amr,

Kindly find my answers below in red.

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**From:** Amr Amr Sherif Ahmed Ibrahim <[amr1604642@miuegypt.edu.eg](mailto:amr1604642@miuegypt.edu.eg)>  
**Sent:** Monday, October 7, 2019 3:04 PM  
**To:** Mohamed Raafat <[mohamed.raafat@watchit.com](mailto:mohamed.raafat@watchit.com)>  
**Subject:** Graduation Project Meeting

Dear Mr. Mohamed,

As we discussed in our meeting about the idea of the project we have,

Does the new feature we want to add to recommend videos to the users will improve the system of video recommendation?

**Yes, but you need to work on important elements in the video beside persons in the video.**

Does the new feature we want to add to recommend videos to the users meet the market needs?

**Yes, it is very useful for Advertisement Companies and Video Owners.**

Does the new feature we want to add to recommend videos to the users Could be used in the near future and become more accurate than other features?

**Yes, if it is implemented well then it can be very useful.**

Do you accept cooperation with us to provide something good and sophisticated?

**Yes.**

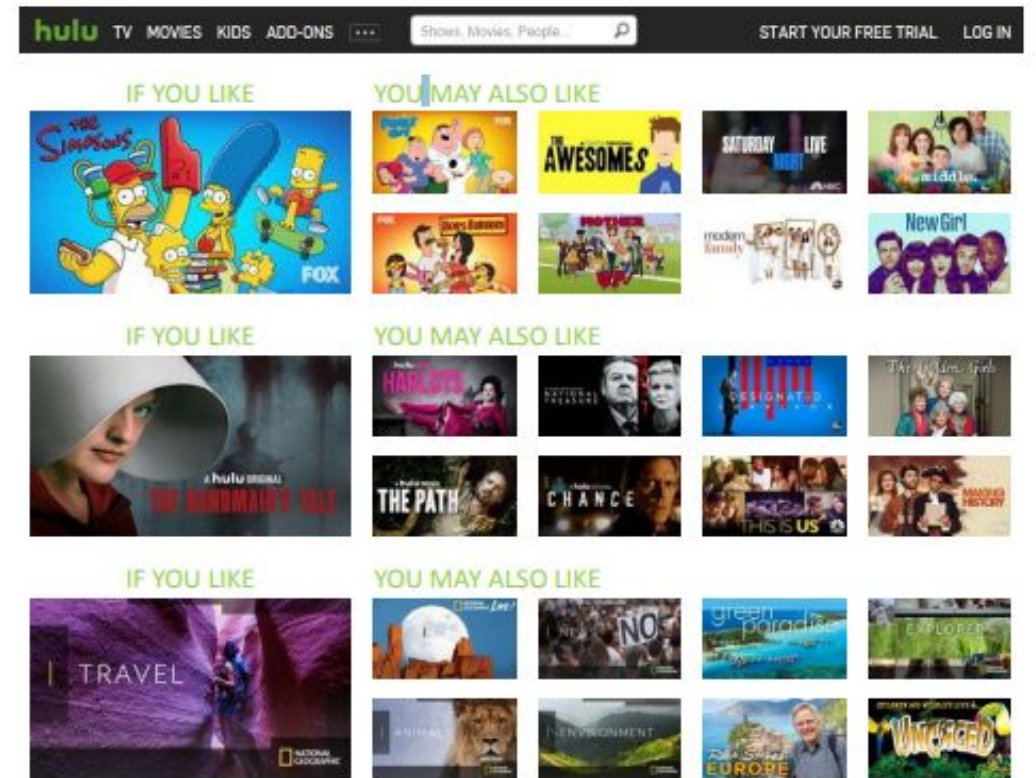
Thanks a lot..  
Regards.



# INTRODUCTION

**Videos** are highly consumed media online mainly for **entertainment**.

These available **recommendations** for these platforms are mainly based on maximizing the watched time for more revenue.





# EXISTING SOLUTIONS

On most video streaming platform, users get their recommended videos based on some algorithms, calculations, implicit feedbacks, watch and search behaviors.

Also new videos suffer from **cold-start** problem in which they have no data or reviews, so it's harder to deal with.



# THINK OF IT LIKE

Video search like Google Image Search.

Imagine inserting a small clip or a scene instead of text.

New creative tools for developers, content creators thus the possibilities are infinite.

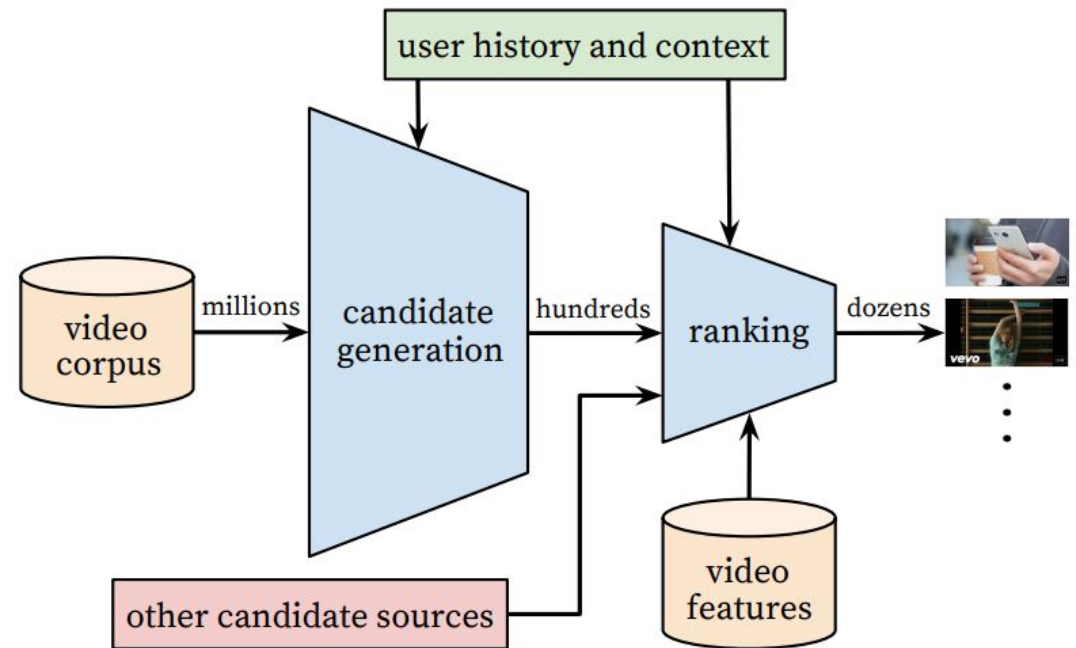
**Nowadays, the only available technology is to search by image.**



# MOST RELATED WORK

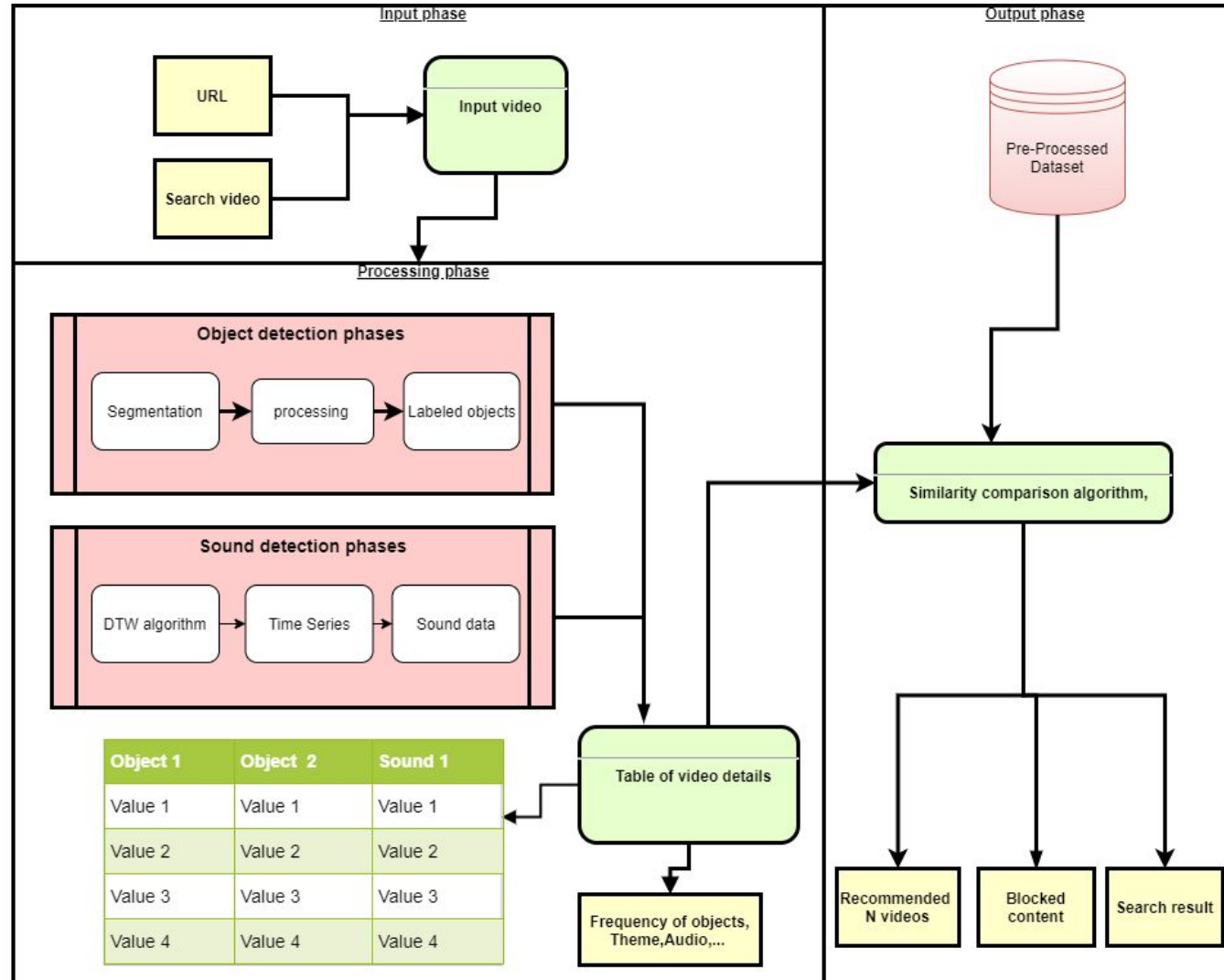
## Recommendation by Attributes:

- Location
- Search history
- Watch history
- Implicit feedback
- Age
- ...



Typical Video Recommendation System

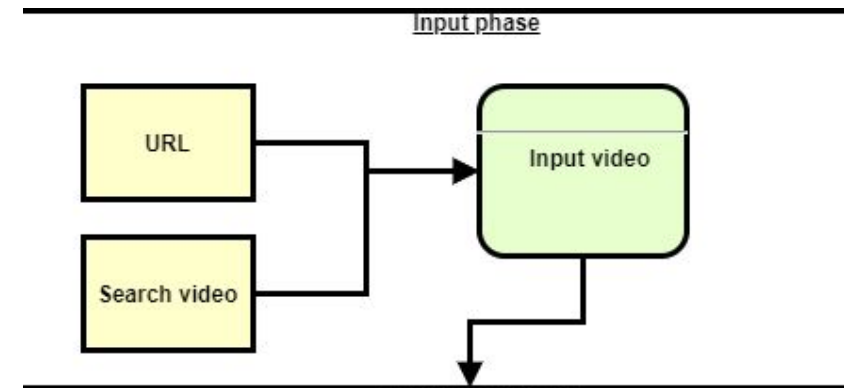
# SYSTEM OVERVIEW



# PHASE ONE

## Capturing the input video

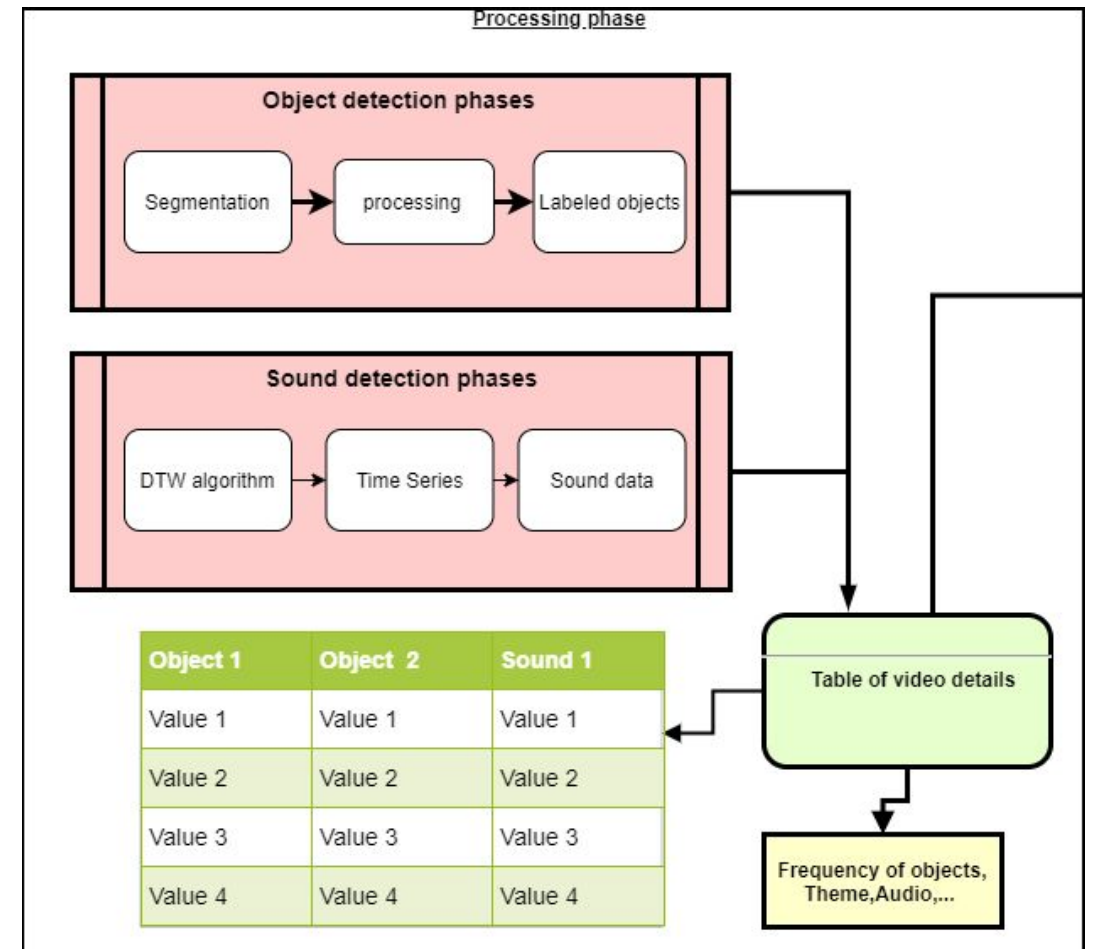
- URL Online
- From search query (clip as input)



# PHASE TWO

## Object detection

- Objects are **detected** and **labeled**
- Sound data are **detected** and **valued**
- Labels are used to create **table of data**



# PHASE TWO

## Object detection

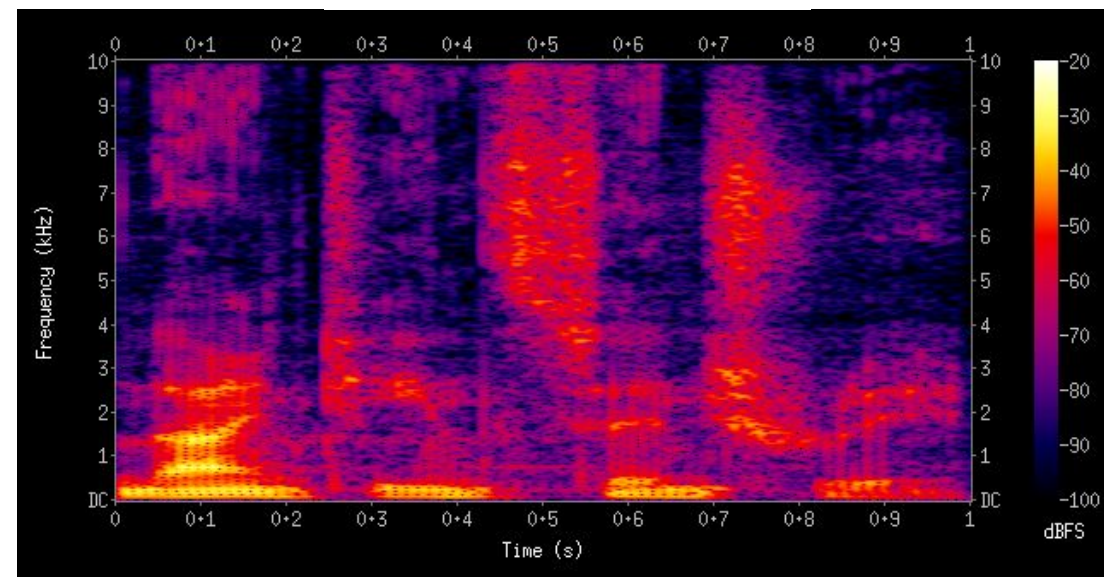
- Objects are detected and labeled
- Labels are used to create table of data

## Sound data

- Sound is detected and formed by DTW algorithm to be converted into numpy array to give meaningful relevancy data

TABLE II  
OBJECT-FREQUENCY TABLE

Object	Frequency	sound data
Car	1295	0.9
Person	667	0.8
Clock	239	0.67
Cell Phone	2	0.24
Bus	63	0.374
Chair	1	0.676
Umbrella	3	0.6667
Glass	13	0.874
Fork	7	0.23

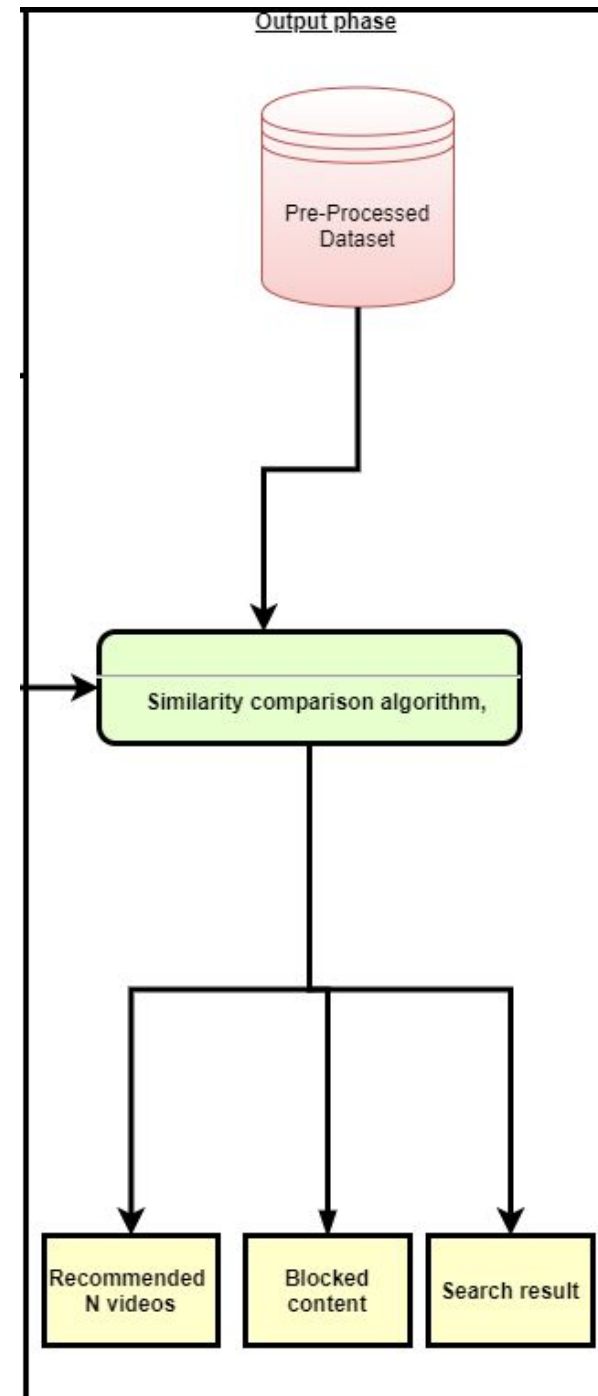


# PHASE THREE

Similarity measurement takes place comparing the **relevance**.

The output in form of:

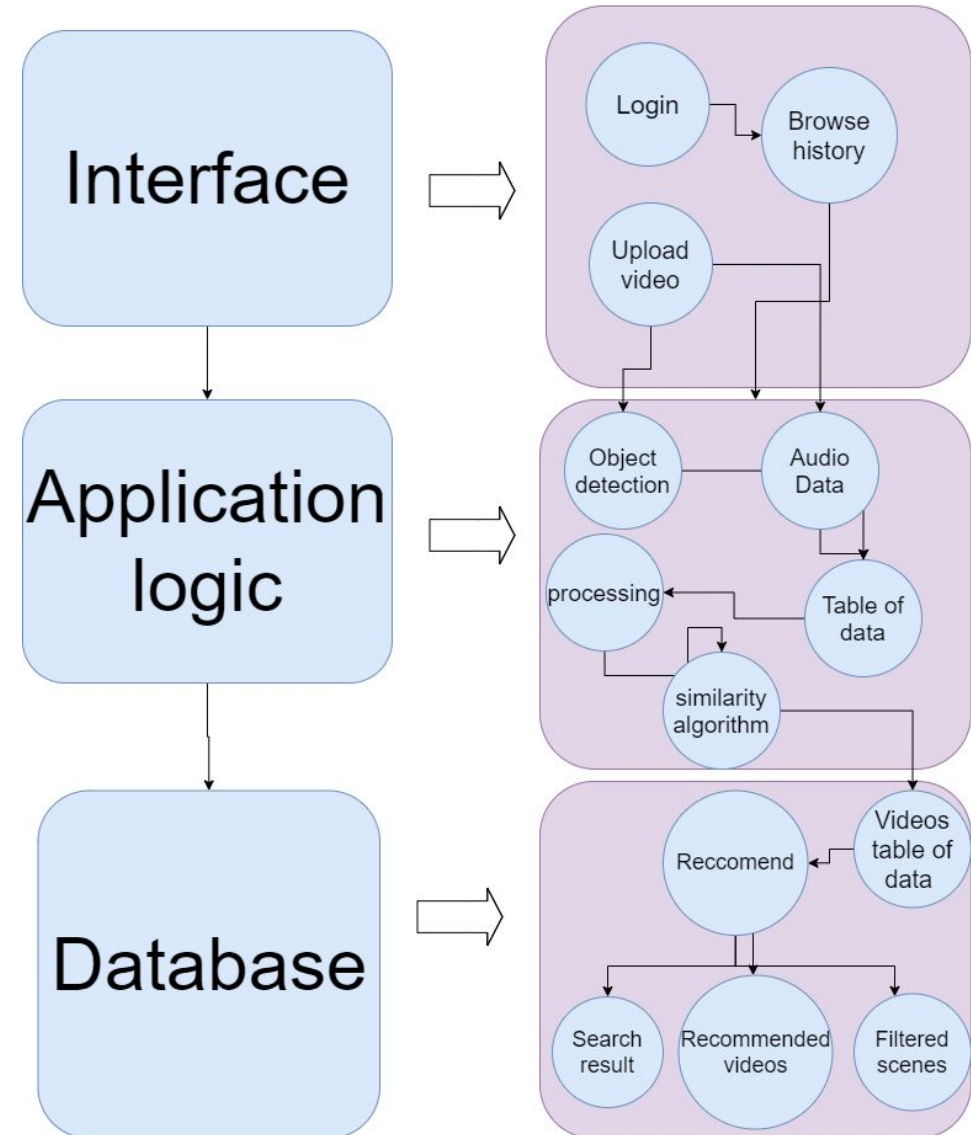
- Search result
- Recommended videos
- Blocked scenes



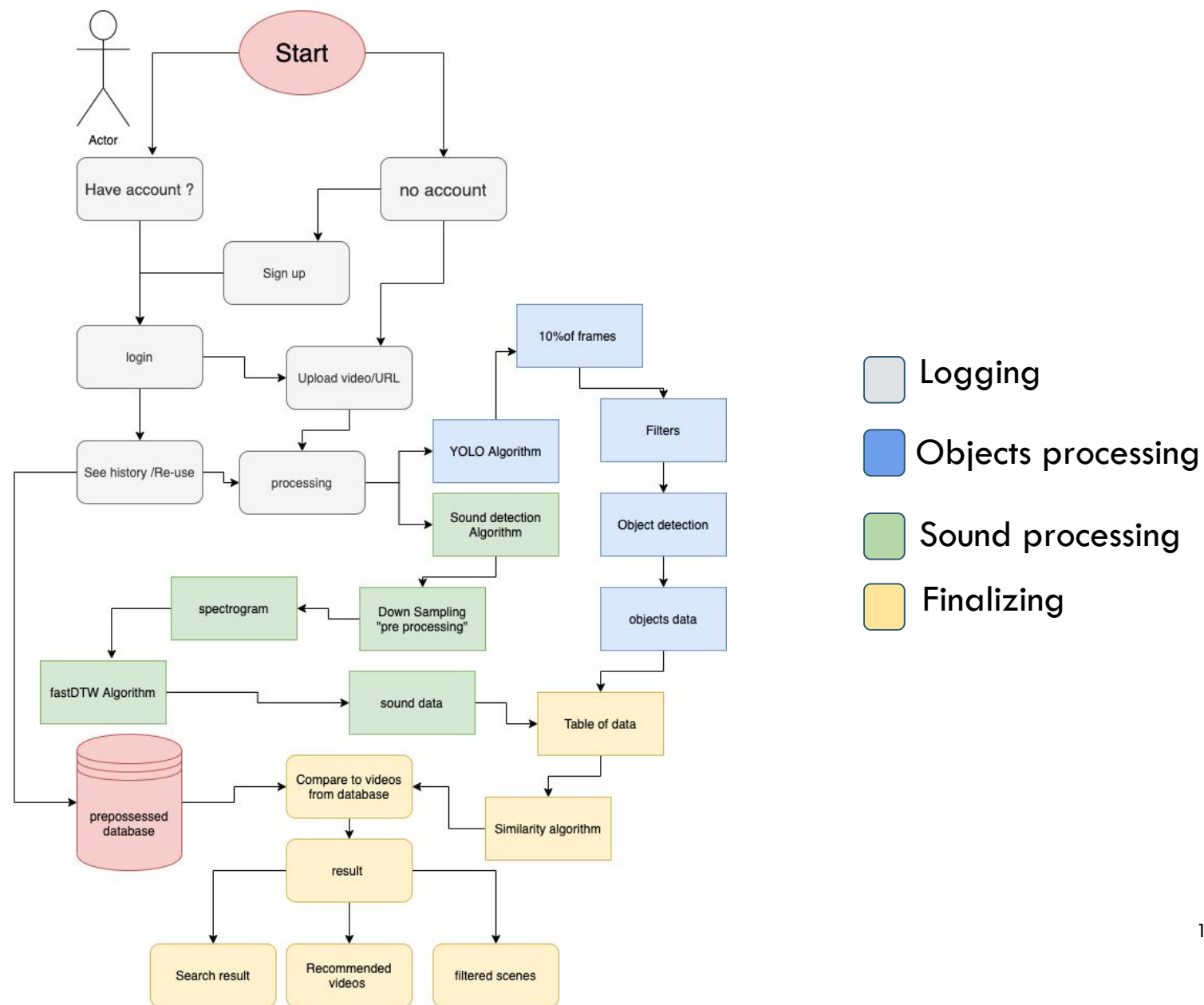


# SYSTEM ARCHITECTURE

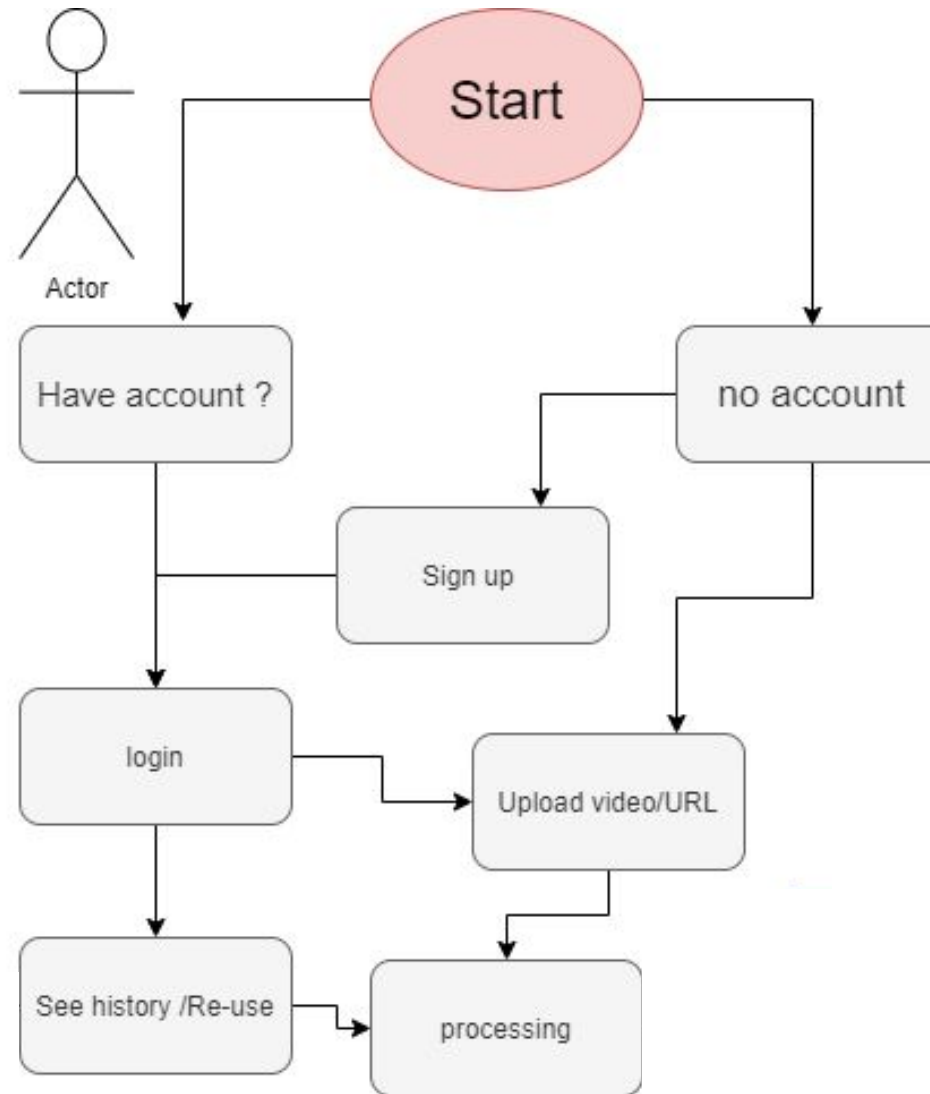
This system is based on **3-tier** architecture for maximum efficiency while moving between phases.



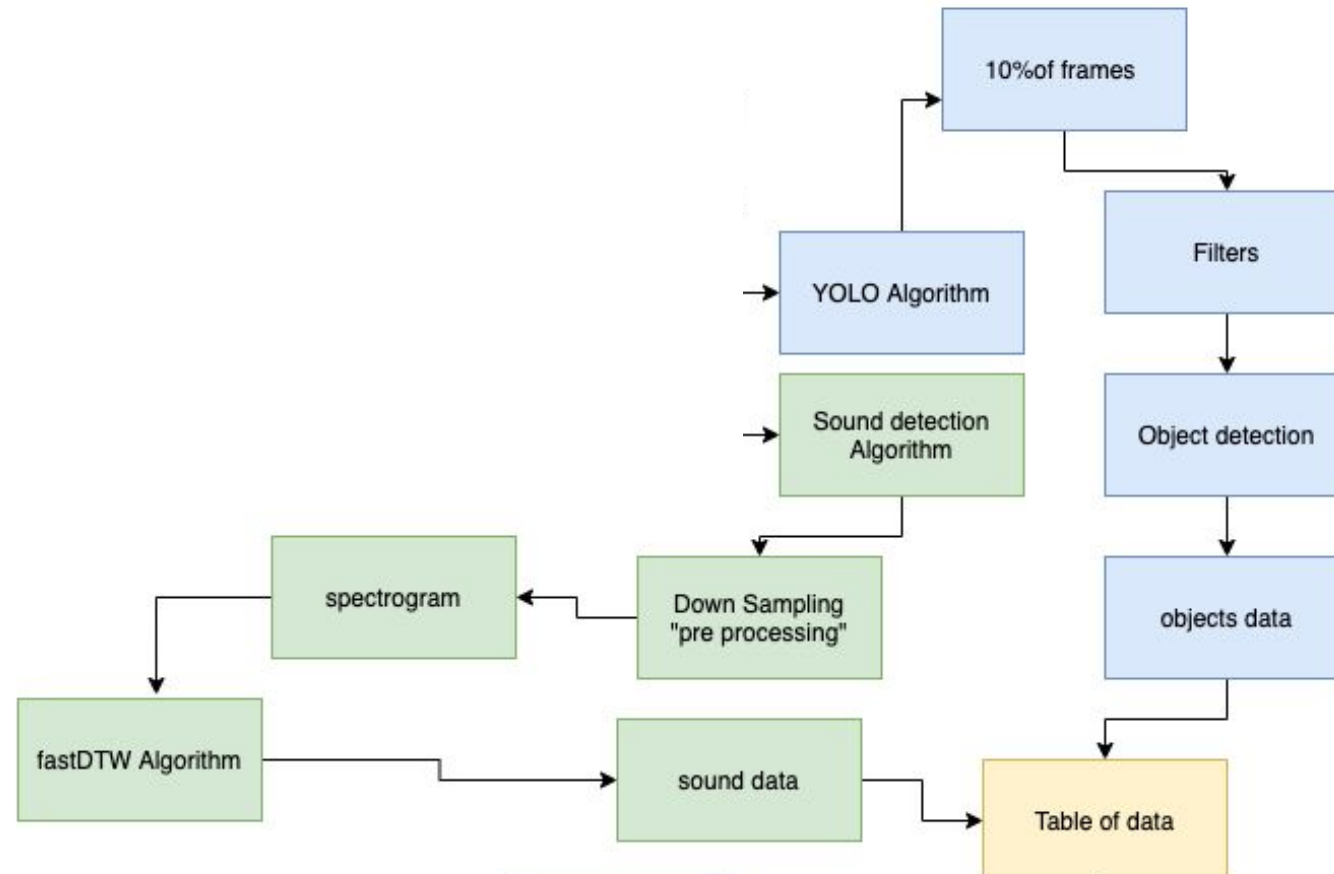
# PROCESS



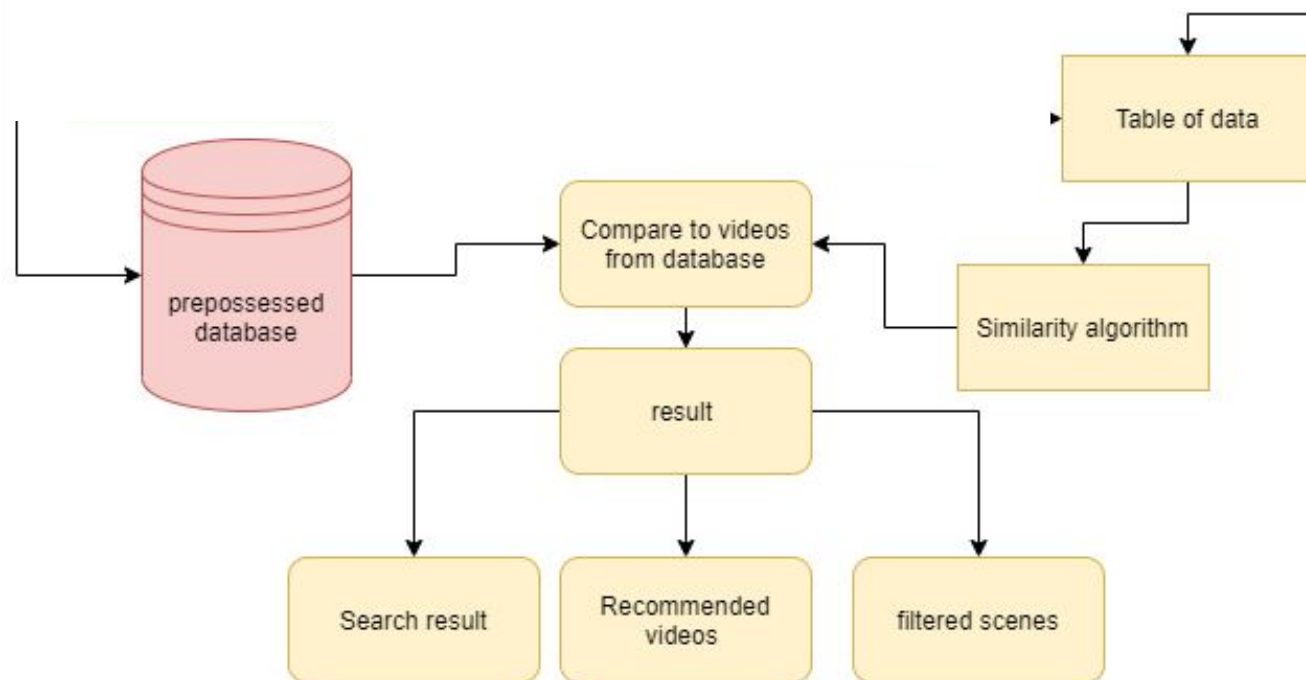
# PROCESS



# PROCESS



# PROCESS



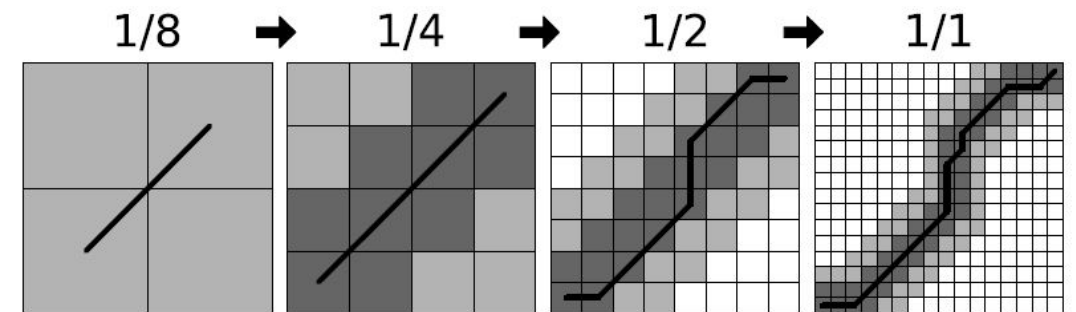
# TECHNIQUES & ALGORITHMS USED

- **Dark Net** ( for training)
- **YOLO v3.0** ( for object detection )
- **Flask Framework** ( to operate python codes on web )
- **fastDTW Algorithm** (for analyzing sound data)



# fastDTW ALGORITHM

- Used to find the optimal alignment between two warped time series.
- Uses multilevel approach.
- Often used in speech recognition by comparing waveforms together.



# OBJECT PRE-PROCESSING

YOLO library takes a **part** of the frames inserted from the **video 5 to 10 %** to save **processing time and power..**

Usually, no filters or enhancements are used as the frame is visible to the algorithm.



# CLASSIFICATION & DETECTION

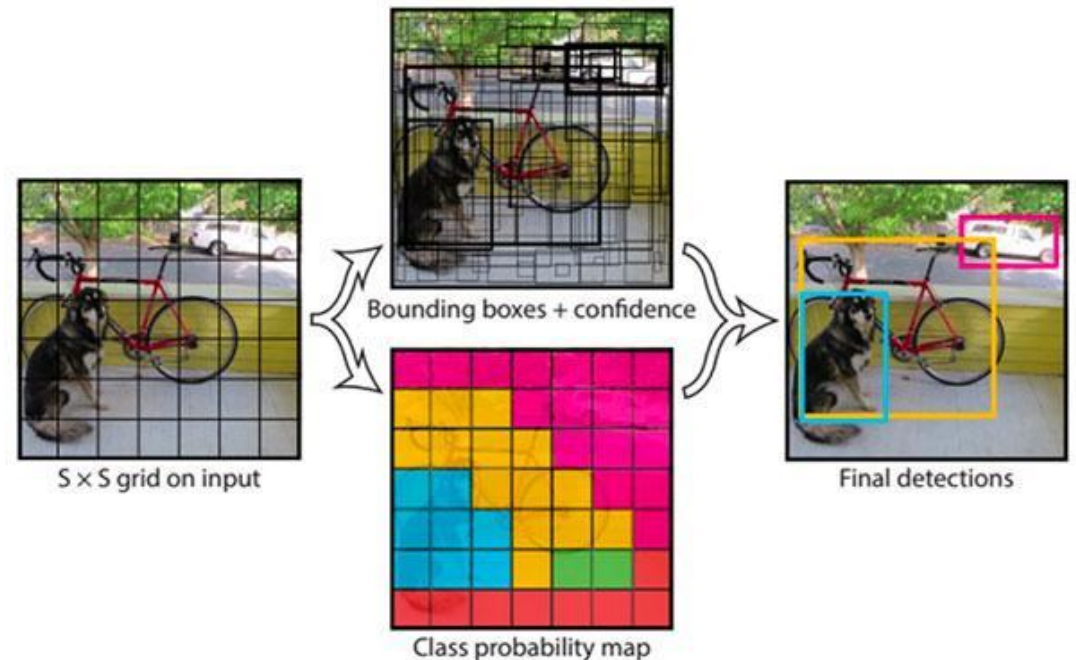
Use YOLO Library

Automatic Object Detection

- Identifying the object features.

Object Classification

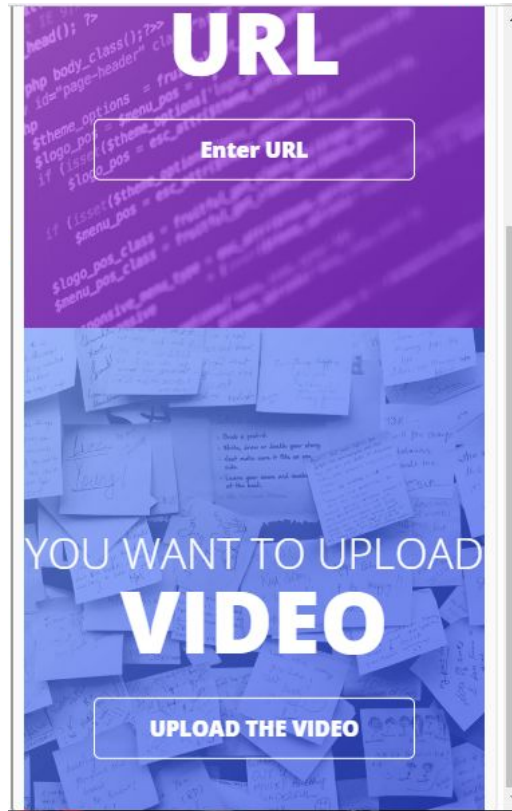
- Compare the object's features with other objects' features already identified.
- Classify the object with the nearest objects to it in terms of features.



# EXPECTED RESULTS & OUTPUT

- From a scene **imported from the user** another similar scene is **recommended to the user**.
- Getting **more accurate** results not just based on given values for a video.
- **Filtering specific scenes** to ensure content is suitable for all ages.
- Enhancing **accuracy and user satisfaction**.

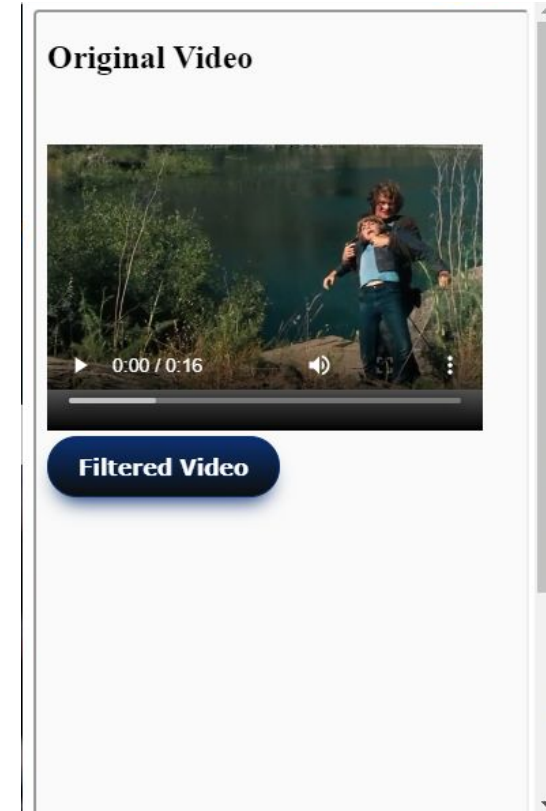
# EXPECTED RESULTS & OUTPUT



Insert video / URL



See recommendation



Filter video

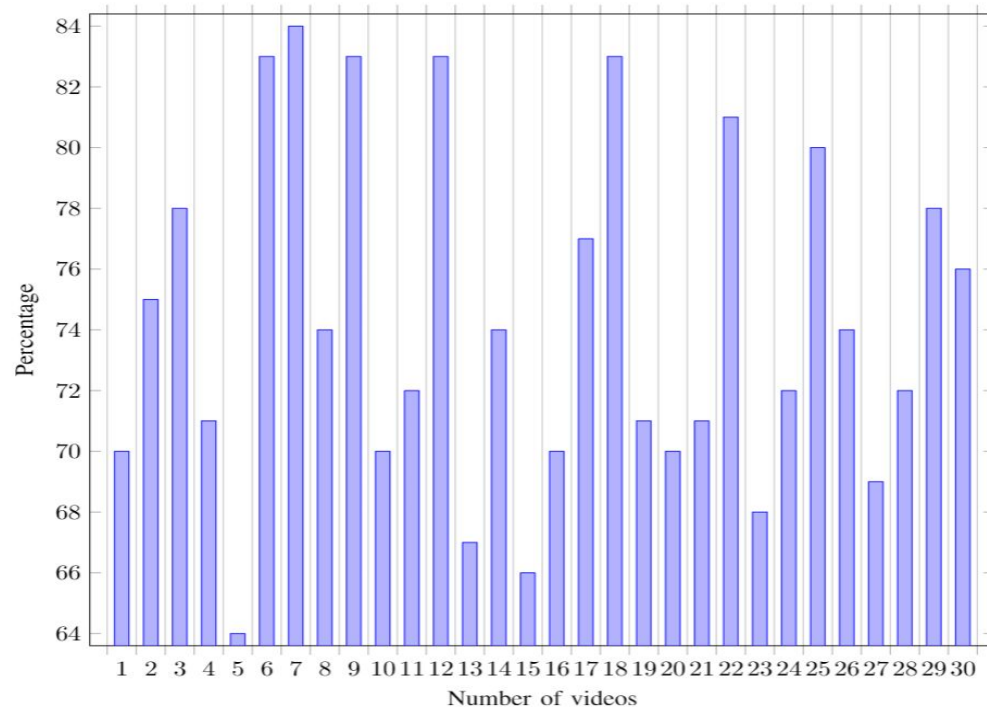
# TESTING SAMPLE

- Testing was made along a sample of **videos** from **YouTube 8 Million Dataset**.
- Videos were stored in the database with their **ID** respectively.
- Input video was inserted to the system and steps took place normally.
- The top 3 recommendations are displayed based on similarity measurements.
- The relevancy of our proposed system is computed according to the following equation:

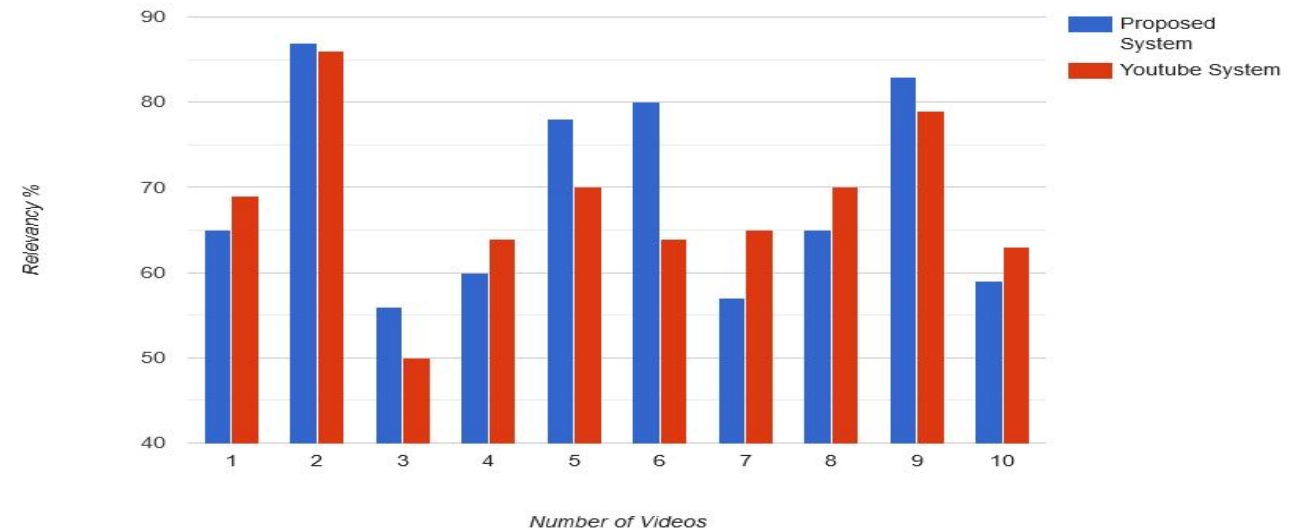
$$Relevancy(\%) = \frac{\sum_{i=1}^n ((O(i) * f(i)) + SV(i))}{\sum_{j=1}^x \sum_{k=1}^m ((O_j(k) * f_j(k)) + SV_j(k))}$$

# TESTING RESULTS

30 videos are tested by the system with **average relevancy 75%**.



10 tested videos are compared with YouTube, our proposed system's average accuracy is **69.4%**, while the YouTube's is **62%**.



# OBJECTIVES ACHIEVED

- Enhancing recommendation accuracy
- Adding video searching feature
- Adding Filtering to scenes

# CONCLUSION

- Cold start solved
- Lack of age rating accuracy
- Unseen videos (with no implicit feedback)

# ACHIEVEMENTS

- Titled: “*A new challenge on video recommendation by content*”.  
Published in: 2019 14th International Conference on Computer Engineering and Systems (ICCES).
- Titled: “*An Efficient Content-Based Video Recommendation*”.  
Under review: *Multimedia Tools and Applications Journal*.
- Shortlisted at *Dell Technologies Graduation Project Competition* for Turkey, Middle East, and Africa.







# Demo

**QUESTIONS ?**

**THANK YOU**