MediaEval Benchmark

University Toulouse III - Paul Sabatier

MediaEval Challenge

Team Karadoc

[M2 CMI SID]

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General contents

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The MediaEval challenge?

- Evaluation of Multimedia Access and Recovery **Algorithms**
- Predicting the main **theme** of a video
- 3 weeks work, 20 hours per week

Team coordination

- Each member mostly worked on a **single media**
- We all **wrote** the report and we **organised** tasks as a group

Organisation and tools

- **Python** - Programming language
- **GitHub** - Git repository hosting service
- **Travis** - Continuous integration tool
- **Slack** - Real-time messaging and task-planning for teams
- **ShareLaTeX** - Real-time collaborative redaction tool

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Text

- Metadata
  - `duration`
  - `licence`
  - `size`
  - `title`
  - `uploader_id`
  - `uploader_login`
- Instance Matrices
  - Terms in the description
  - Terms in the title
  - Assigned tags

Audio

- Transcript
  - Speakers and their attributes per file (`time, gender`)
    - «Features» extraction (`entropy, number of male, number of female, frequency`)
  - Transcript instance matrix (with confidence percentage)

Audio (2)

- Audio Signal : video to audio conversion made with `ffmpeg`
  - Mel Frequency Cepstral Coefficients (MFCCs)
  - Energy vectors

Video

Figure: Sample keyframe (or shot)

- Shots
  - Number of keyframes per video
  - Color histograms
  - Image segmentation block by block followed by averaging
  - Facial recognition
  - Optical Character Recognition (OCR)

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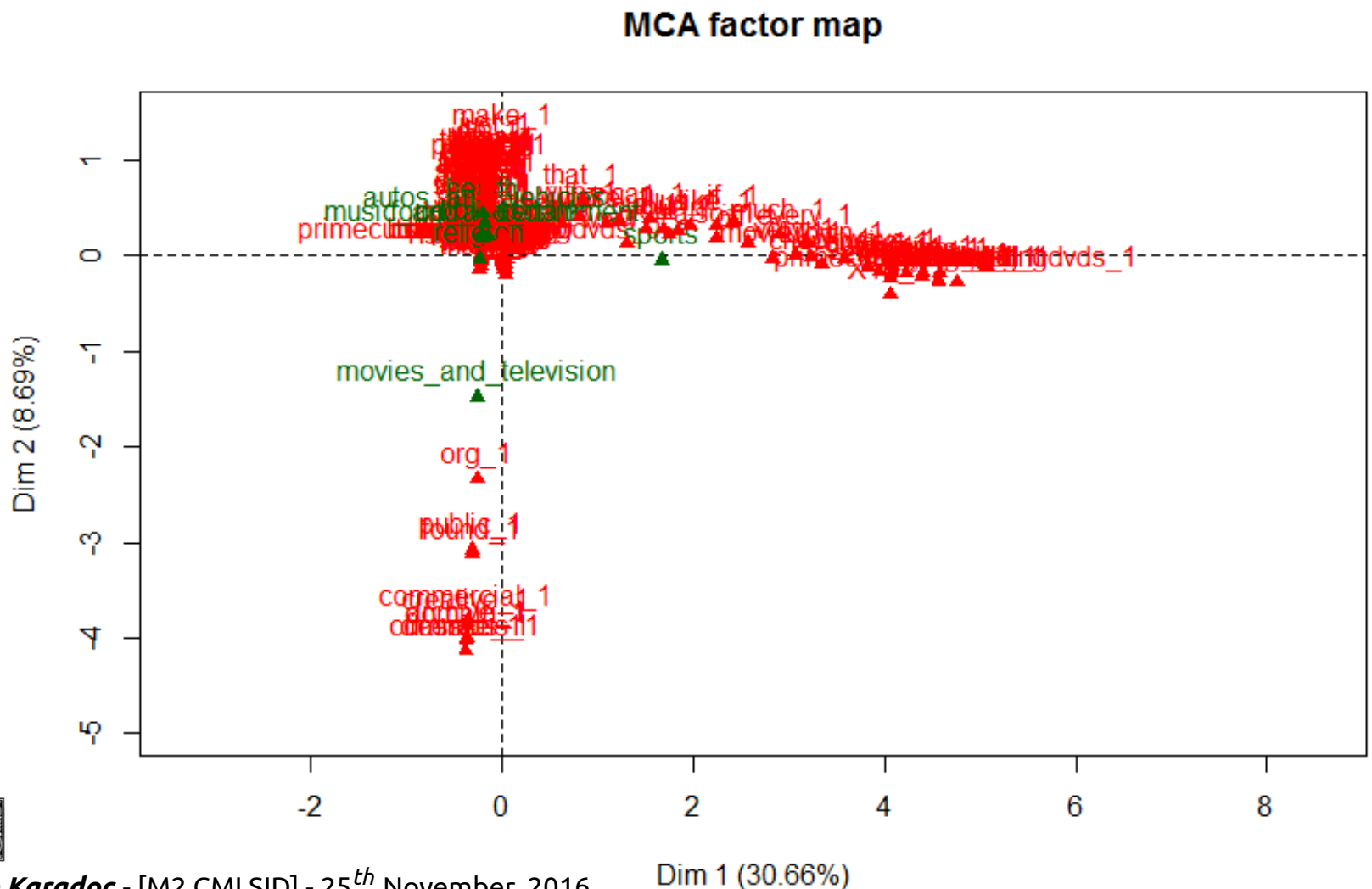
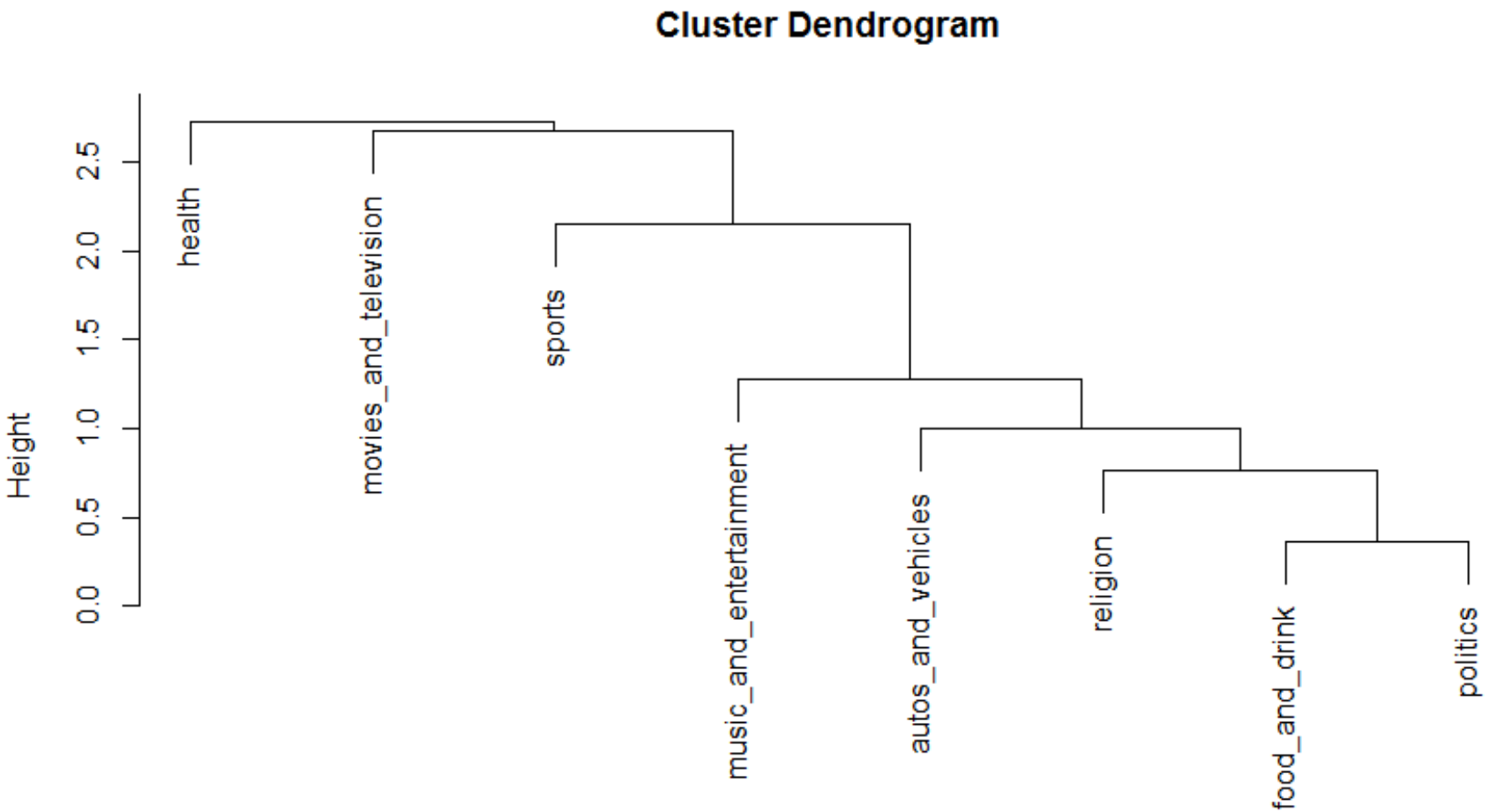
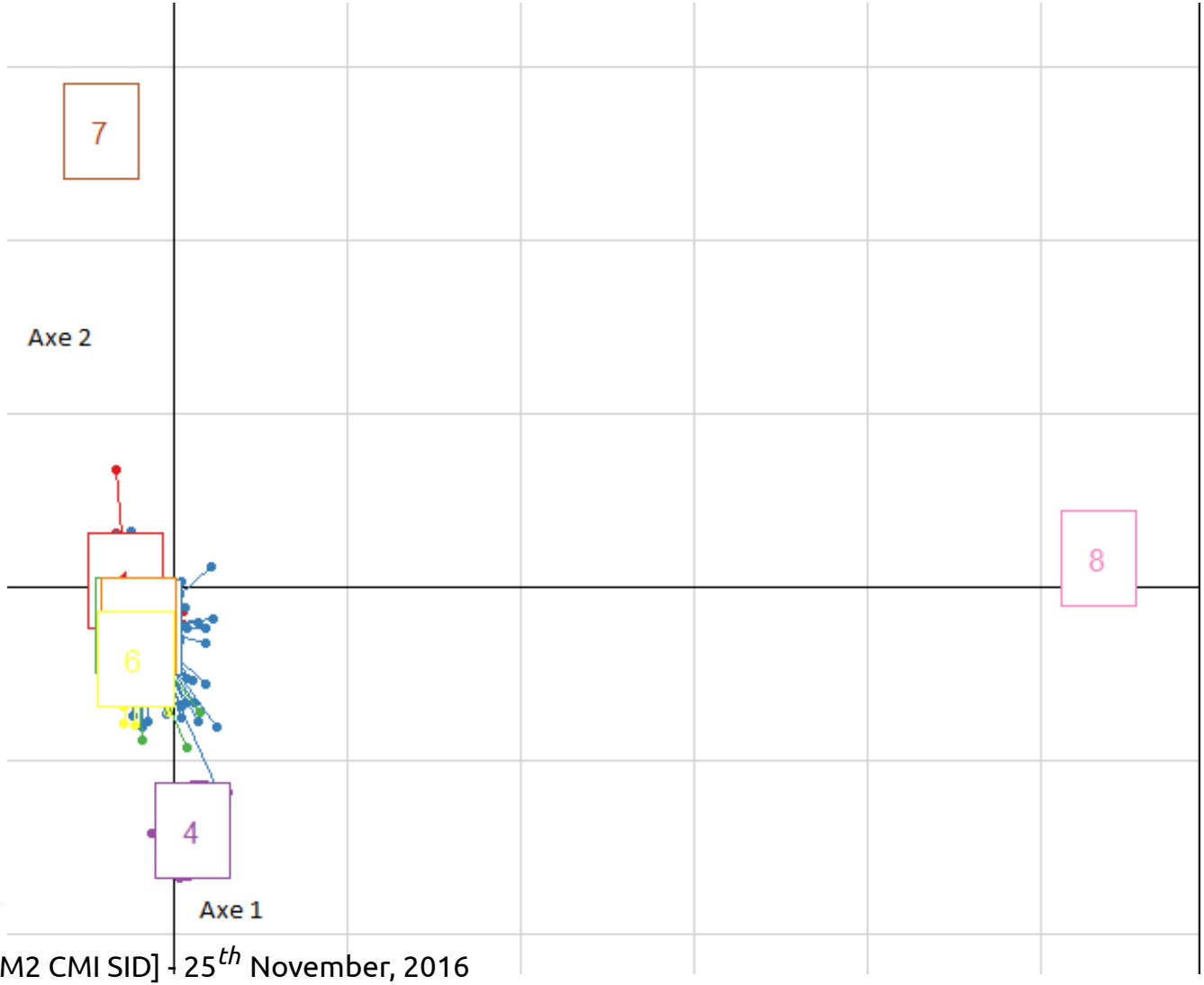
ACM


MCA factor map
make_1
that_1
movies_and_television
org_1
public_1
found_1
sports
dvds_1
Dim 2 (8.69%)
Dim 1 (30.66%)
1
0
-1
-2
-3
-4
-5
-2
0
2
4
6
8

ACM


Cluster Dendrogram
Height
0.0
0.5
1.0
1.5
2.0
2.5
health
movies_and_television
sports
music_and_entertainment
autos_and_vehicles
religion
food_and_drink
politics

ACM



Summary

	key	descri	titre	initiale
sports	23	25	29	63
food_and_drink	404	244	415	46
music_and_entertainment	41	7	33	135
health	12	186	15	73
politics	15	24	6	141
autos_and_vehicles	8	8	34	8
religion	47	42	29	45
movies_and_television	25	39	14	64

Figure: Number of documents assignated to each category

Other clustering methods

- K-means clustering
- Multidimensional scaling (MDS)
- Hierarchical document clustering
- Latent Dirichlet Allocation
- Non-negative Matrix Factorization

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Main idea

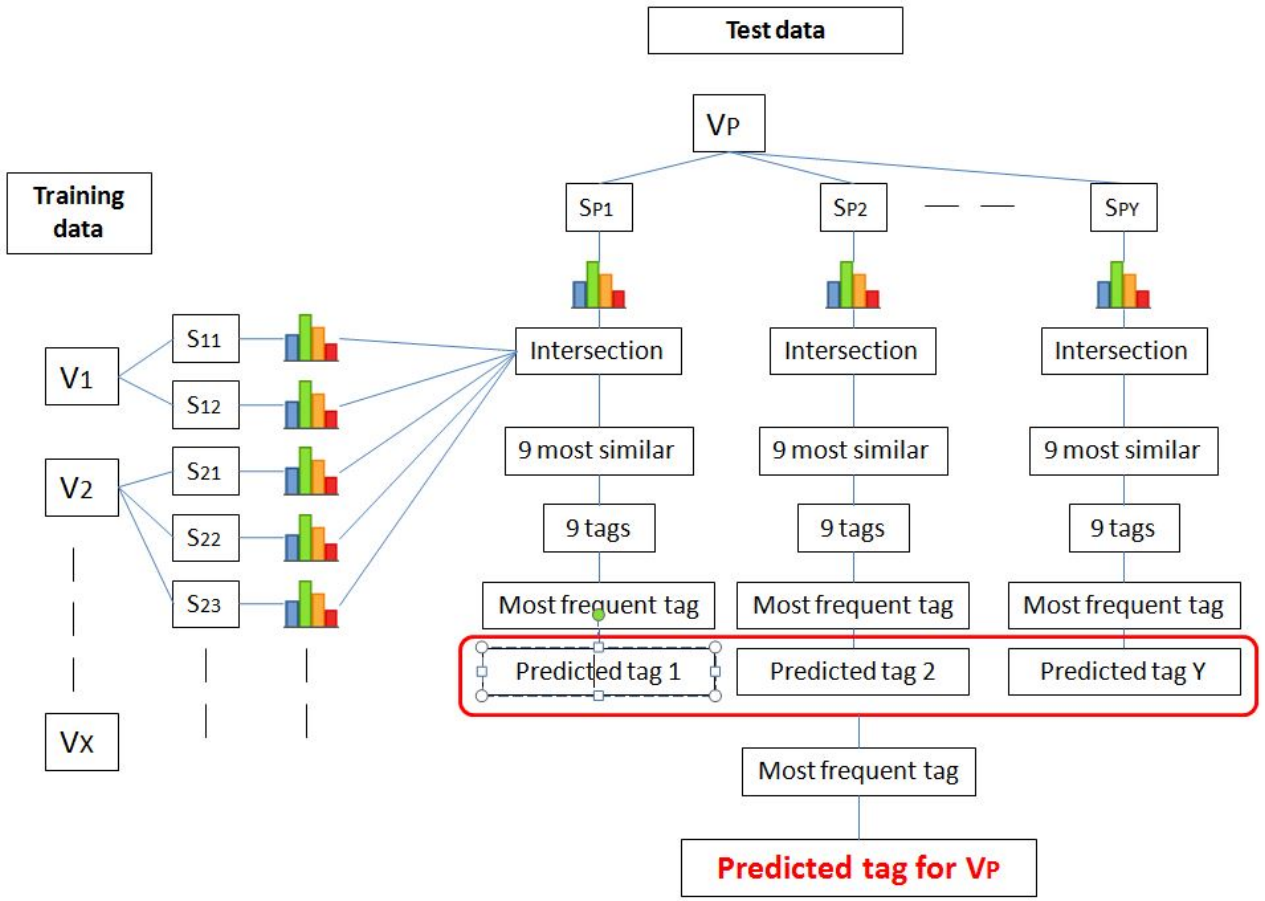
- We wanted to use independent classifiers right from the start
- We had experience working on different themes from our lab exercices
- We thought we could “merge” them in the end with a “metaclassifier”

Intuitions

- Tags and description seem to be quite general
- More features than documents: linearly separable space
- Some videos don't have a lot of action: shot analysis
- Some videos only have a single speaker

KNN on color histograms

- Use the algorithm built in class

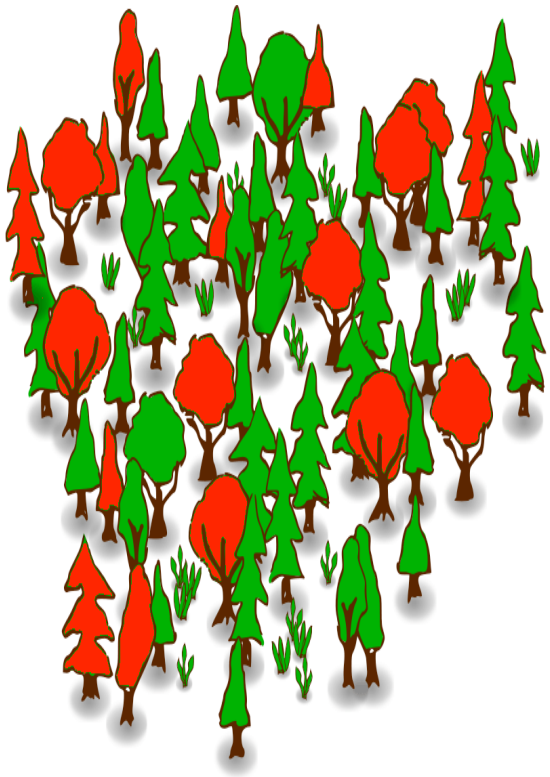


Text classification

- SVM works very well on a linearly separable space
- Naïve Bayes not as good even through bagging
- Lemming and stemming help a lot to generalize
- We could have went further by using a thesaurus

Random Forest classification

Applied to global features



- Shots
  - has_text
  - nb_faces_max
  - nb_shot
- Speakers
  - entropy
  - nb_M
  - nb_F
  - Freq_M/F
- Metadata
  - duration
  - size
  - uploader_id

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Scoring

	Precision	Mean training time
Naïve Bayes on metadata TF	0.839	0.697
Top terms on metadata TF	0.682	0.356
KNN on metadata TF	0.822	0.285
Linear SVM on metadata TF-IDF	0.879	0.287
Naïve Bayes on transcription TF	0.548	0.372
Top terms on transcription TF	0.354	0.313
KNN on trans TF	0.654	0.294
Linear SVM on trans TF-IDF	0.665	0.269
Random Forest on speakers and shots features	0.661	0.241
Neural network on signal energy	0.249	0.231

Table: Classifiers score

Metaclassification

- Store the predictions for each classifier
- Matrix with as many rows as documents and as many columns as classifiers
- Run a Random Forest on this matrix hoping to gain accuracy

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Difficulties

Technical difficulties

- Library dependencies under Windows OS:
  - `scikit-learn` (machine-learning library)
  - `opencv3` (`python` wrapper of `opencv` library)
- Hard to stay focused and creative for 3 weeks :)

Personal gain

- We learned how to code with `python`
- We perfected our **team working** skills
- We used new tools
- We used and developped our **statistical** skills

Thanks for listening