UNIVERSITÉ
CAEN
NORMANDIE

DEEPFAKE DETECTION TECHNIQUES

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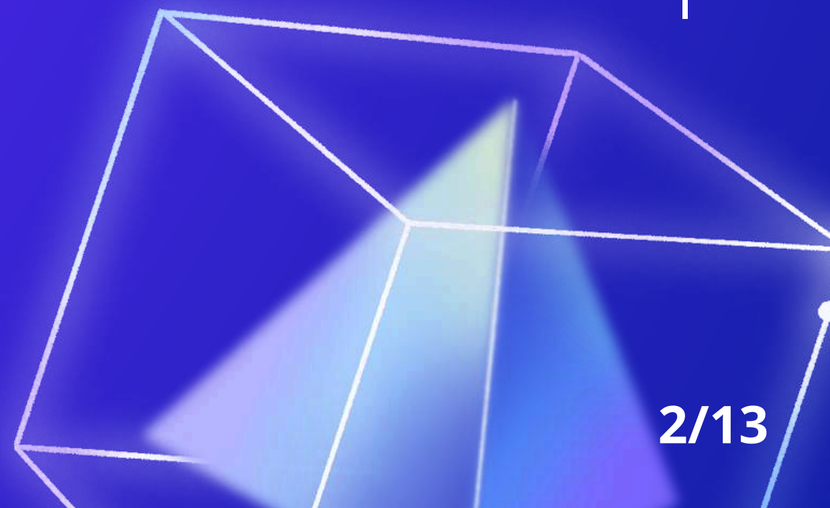
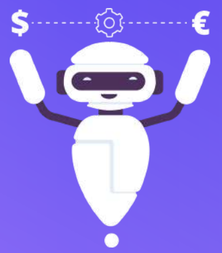


INTRODUCTION

DEEPFAKES



HOW TO DETECT?

GENERATED IMAGES

S1 RECAP

Research

Articles, projects, lectures...

Learning

what is a deepfake? how do they work?
what are generated images ? why do we need to detect them...

GOALS

01

Find projects to implement

02

Understand their code and usage

03

Implement these projects while adding our own code if neccesary

04

Evaluate the models with evaluation methods like accuracy, F1, roc curve...

STRUCTURE

2 projects to evaluate using various datasets.

By counting all the true positives / false positives /true negatives / false negatives.

True positives and true negatives **as much as possible** for the bests results.

PROJECT 1 : RESNET50 NODOWN

FOCUS

Detecting GAN-generated images

ARCHITECTURE

Modifies ResNet50 (NoDown) to maintain higher image resolution

PROJECT 2 : DCT + CNN

FOCUS

Identifying GAN artifacts.

ARCHITECTURE

Uses Discrete Cosine Transform to highlight anomalies and CNN for detection

TEST DATASET

Composition :

- Biggan
- Progan
- Gaugan
- CRN
- San
- Stargan
- IMLE
- Seeing-in-the-dark
- Deepfake
- Cyclegan
- Stylegan(2)
- Which-face-is-real

Characteristics :

- Balanced
- 1000 images max per subtype
- 2 labels : fake / real
- Focused on the ability to generalize

Fake

Real

TECHNICAL DIFFICULTIES

- INSUFFICIENT COMPUTING POWER
  - EXCESSIVELY LONG PROCESSING TIMES.
  - NEED TO OPTIMIZE ALGORITHMS AND DATASET.
- POORLY COMMENTED OR MINIMALLY COMMENTED CODE
- USE OF OUTDATED LIBRARIES
- DEPENDENCY AND VERSION CONFLICTS

RESULTS AND ACHIEVEMENTS

Project 1:

- **Strengths**: High performance metrics.
- **Weaknesses**: High computational resources needed.

Project 2:

- **Strengths**: High precision in some models.
- **Weaknesses**: Variable recall and lower overall accuracy

01

02

- **Project 1:** Higher accuracy, precision, and recall across most models.
- **Project 2:** Good precision in some models, but lower overall accuracy.
- **Accuracy:** Project 1 generally achieves higher accuracy.
- **Recall & Precision:** Project 1 shows better detection capabilities with fewer false positives and negatives.
- **F1-Score & AUC-ROC:** Higher values in Project 1 indicate robust performance.

CONCLUSION

Project 1 outperforms Project 2 in accuracy and precision.

The research highlights the importance of robust model design and resource optimization.

Future Work

- Explore advanced architectures.
- Investigate ethical implications.
- Validate models on diverse datasets

THANK YOU!