



**UNIVERSITEIT  
GENT**

# PROJECT MULTIMEDIA

## 2024 - 2025

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# RestoreVintageMedia

# ARCHIVAL FOOTAGE RESTORATION



- Badly degraded footage due to film deterioration, humidity, temperature, exposure to UV light, mold/fungus, dye degradation etc...
- Poor recording equipment at the time
- Image as well as sound artifacts

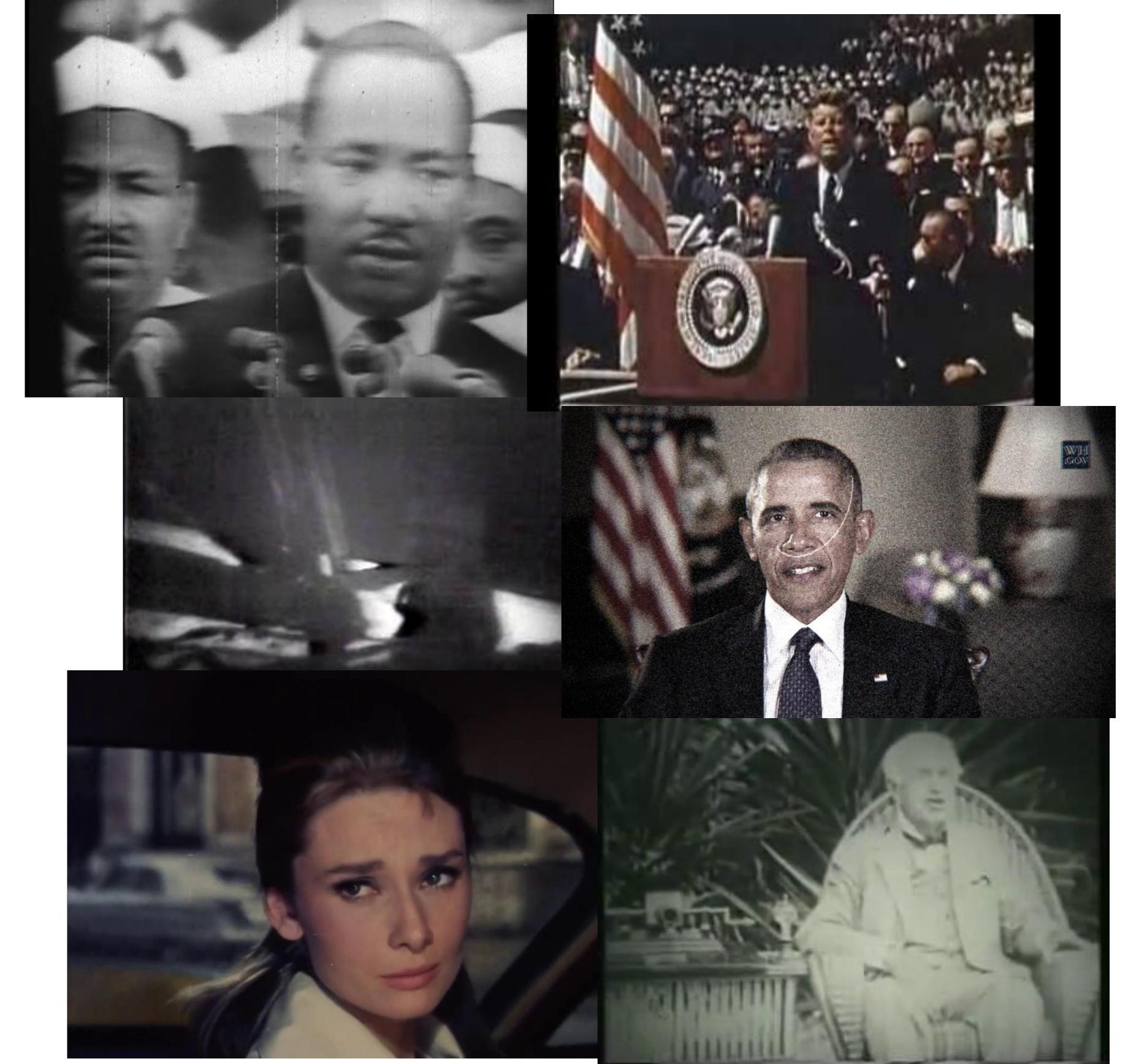
## GOAL:

Automatic restoration of the original footage  
by image and audio post-processing

# ARCHIVAL FOOTAGE RESTORATION

## Inputs:

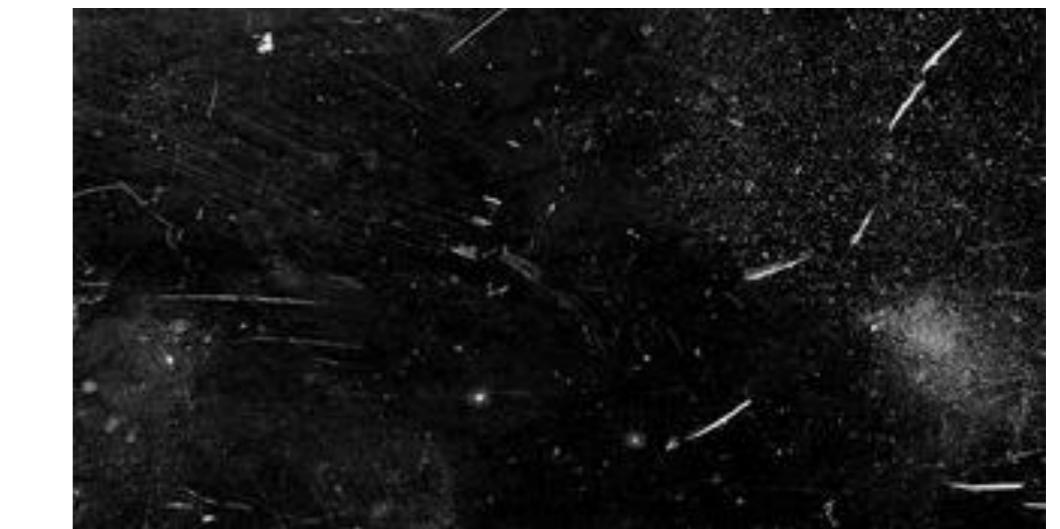
- 5 simulated recordings
  - Optical deformations
  - Sensor effects
  - Environmental effects
  - Sound deformations
- 5 archived recordings
  - Various real-world artifacts
  - Black and white and color



# ARCHIVAL FOOTAGE RESTORATION

## Image degradations:

- Noise
- Chromatic abberations
- Color and contrast loss
- Dust, hairs, speckles
- Vignette



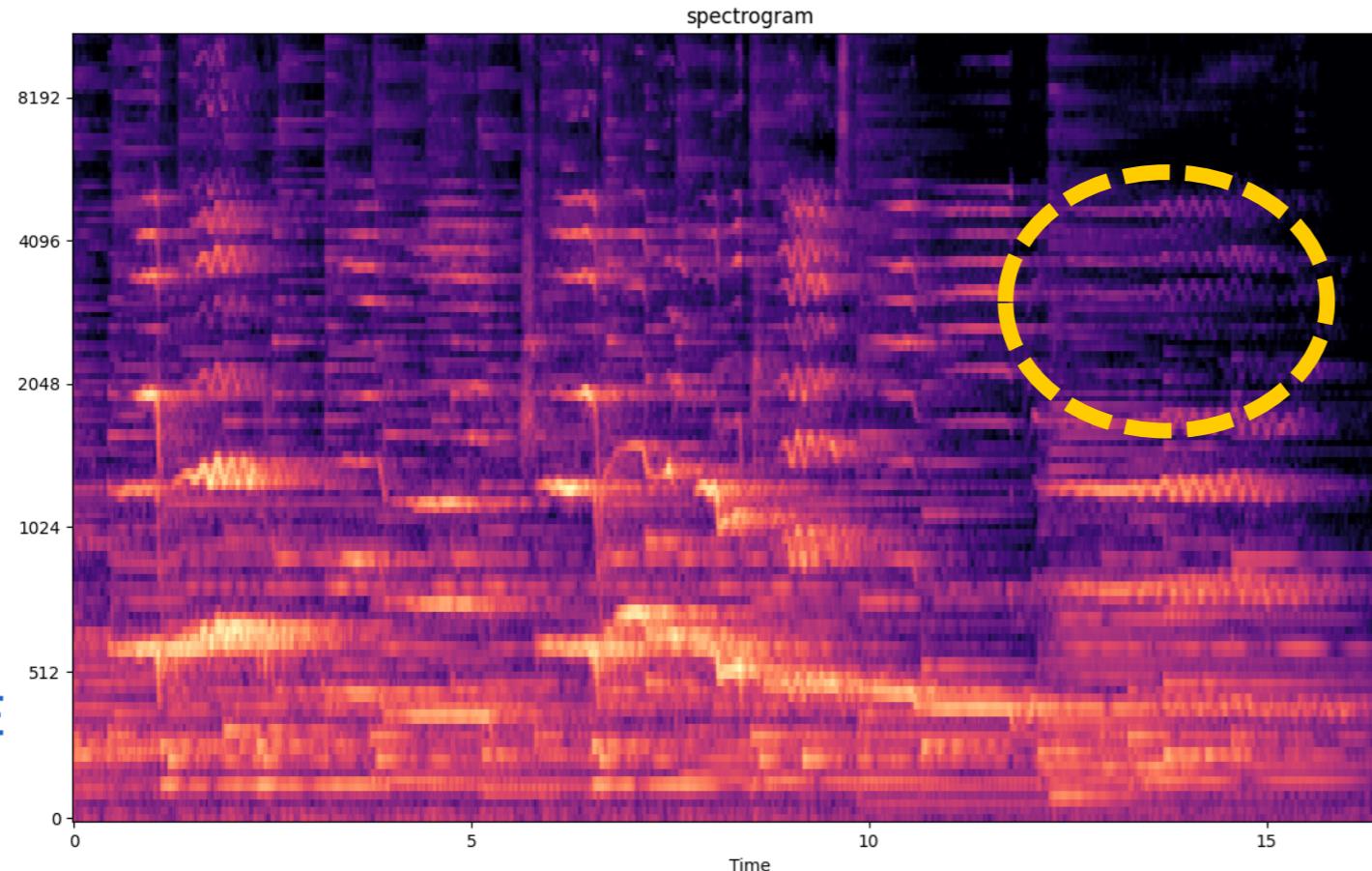
# ARCHIVAL FOOTAGE RESTORATION

## Audio degradations:

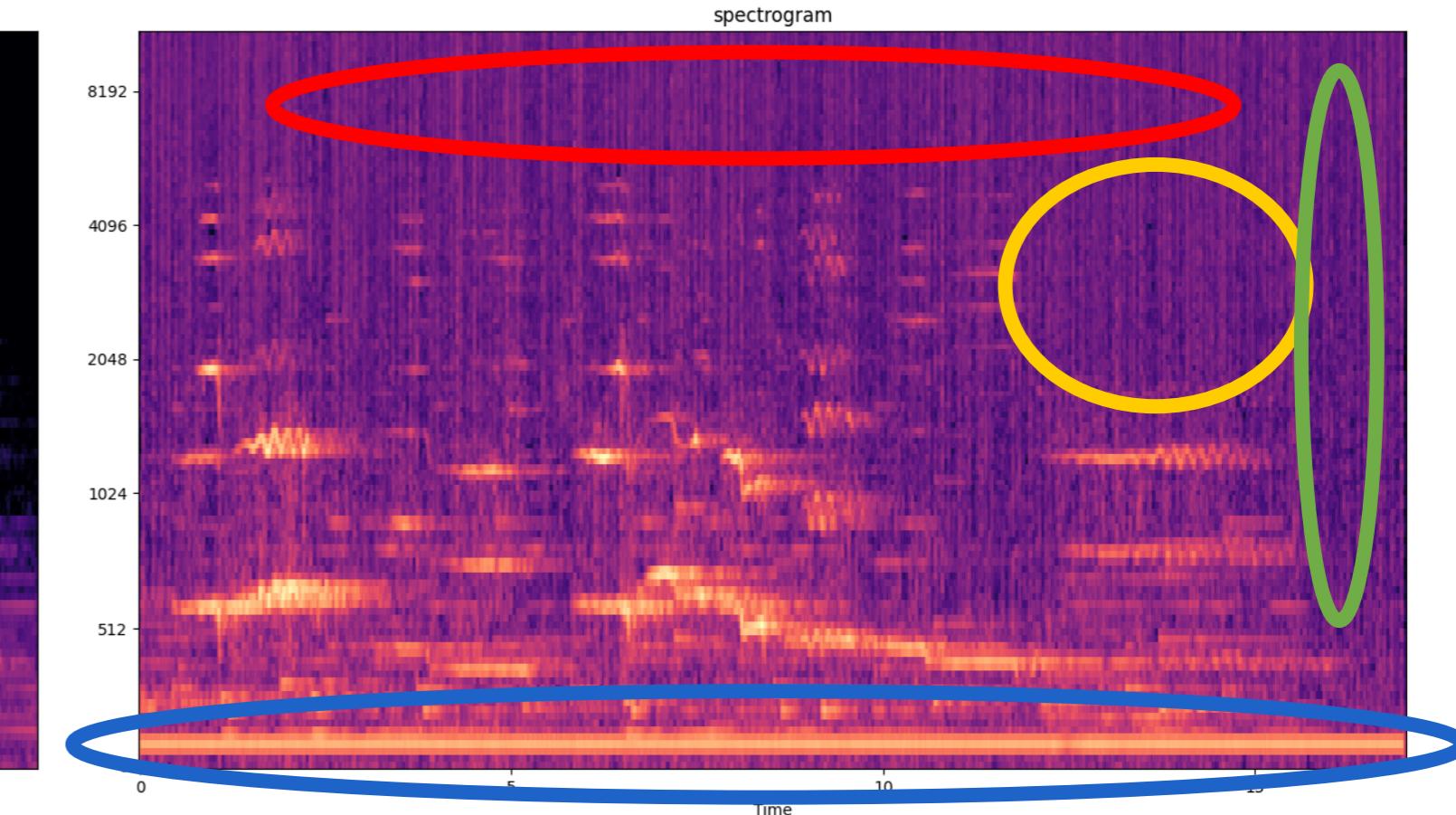
- Loss of detail
- Hissing
- Humming
- Crackles



Original audio spectrogram



Degraded audio spectrogram



# EXAMPLES

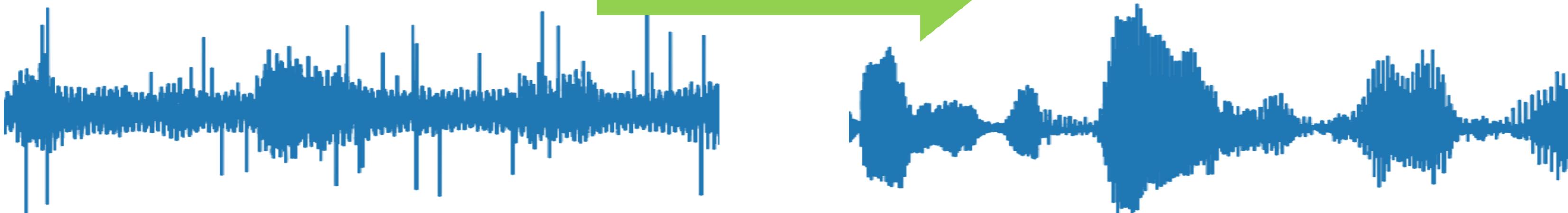
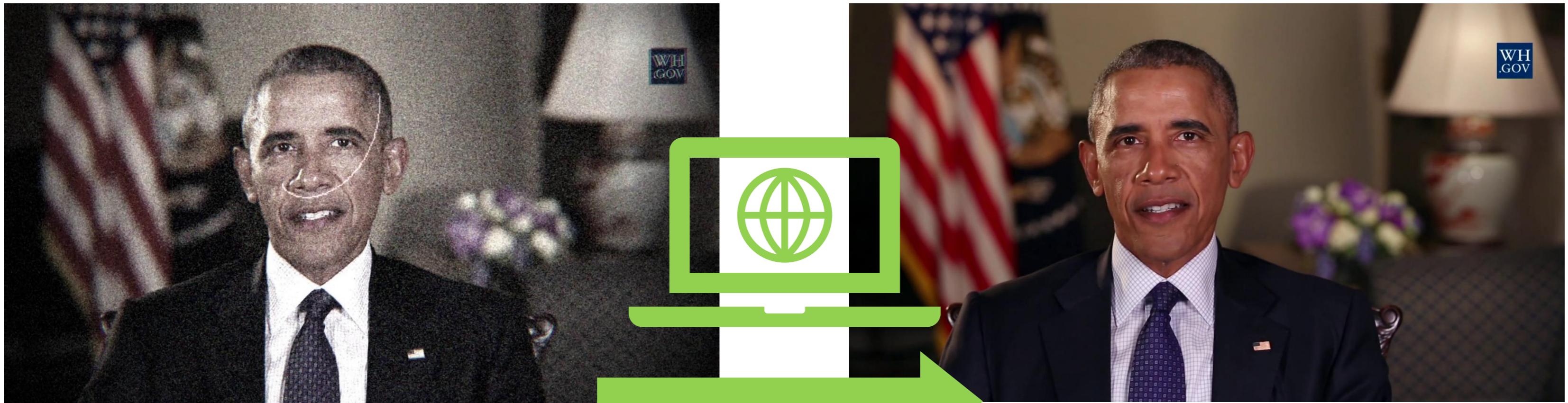


# CHALLENGES

- **Image restoration**
  - Detect the distortions which are present in the footage
  - How badly is the image affected?
  - Remove degradations without loss of the original image content
- **Audio restoration**
  - Detect the distortions audible in the footage
  - How strong is each degradation?
  - Filtering out degradations, preserving the original signal
- **Objective evaluation**
  - Compare with the original
  - Compute a perceptual metric of similarity

# OUTPUT

- Audio-visual reconstruction of each video
- How close can we get to the original?

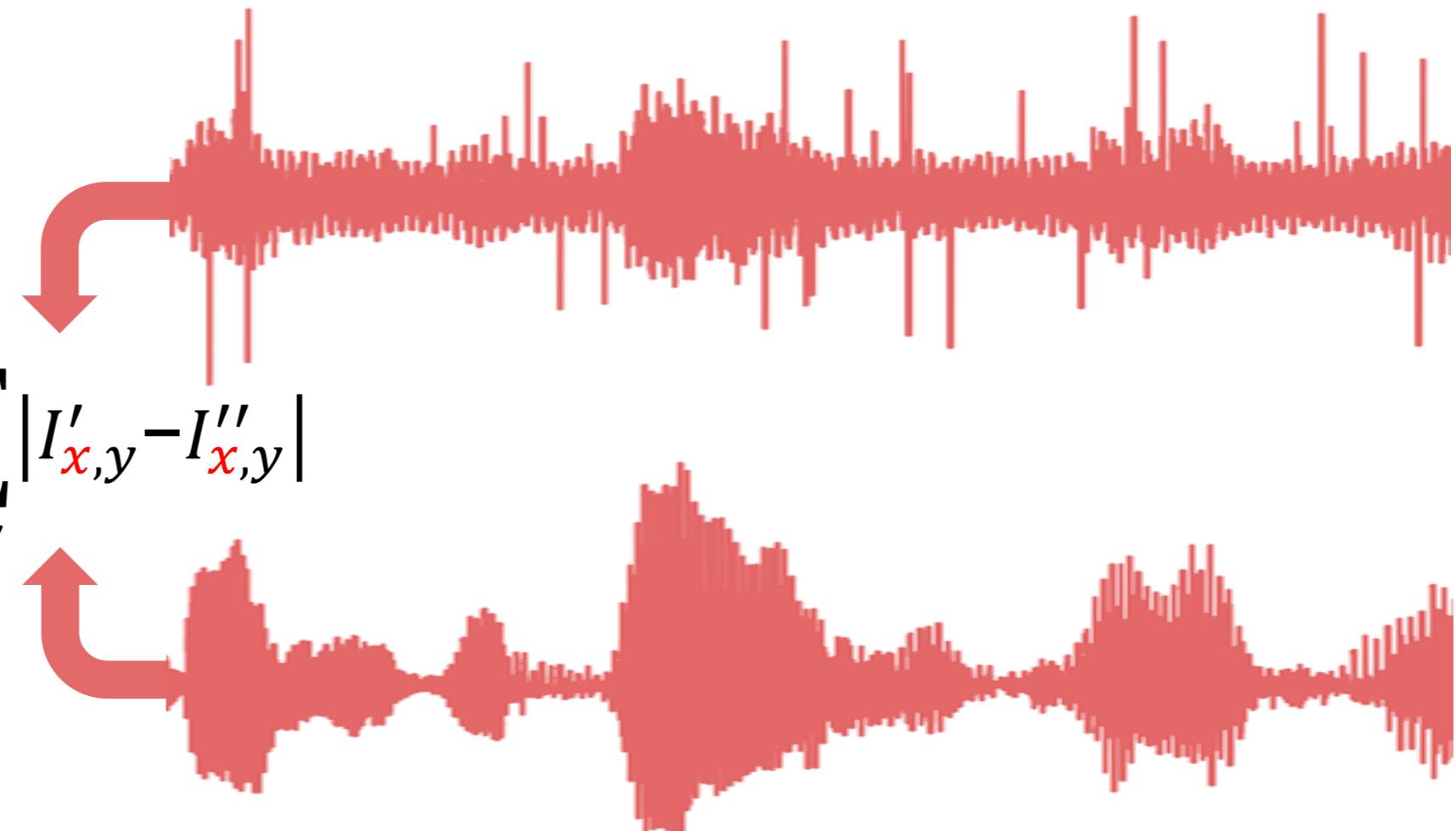


# EVALUATION

- Objective quality assessment metric (MAE? PSNR? SSIM? LPIPS?)



$$MAE = \frac{1}{N} \sum_{x,y} |I'_{x,y} - I''_{x,y}|$$

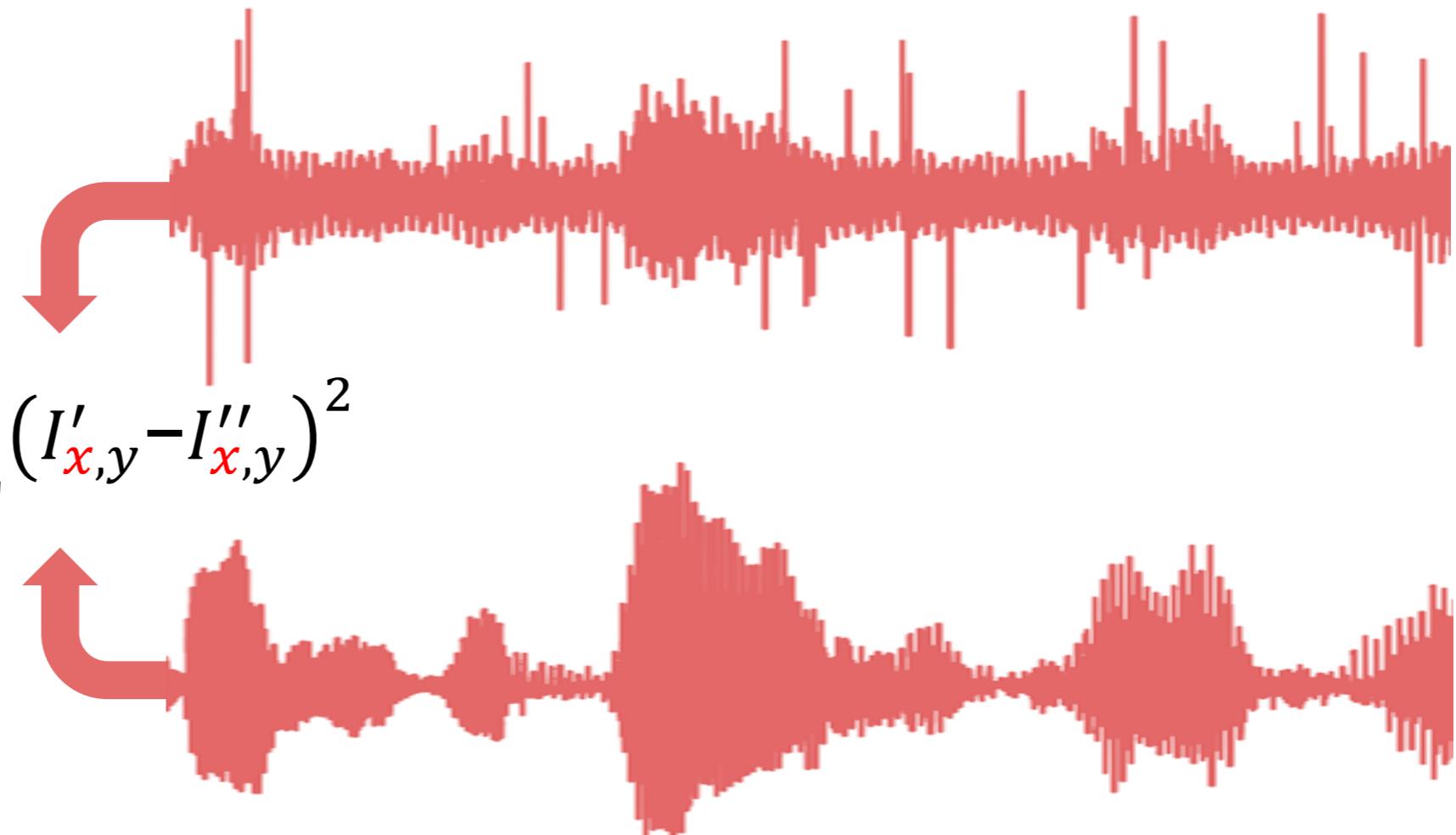


# EVALUATION

- Objective quality assessment metric (MAE? PSNR? SSIM? LPIPS?)



$$MSE = \frac{1}{N} \sum_{x,y} (I'_{x,y} - I''_{x,y})^2$$

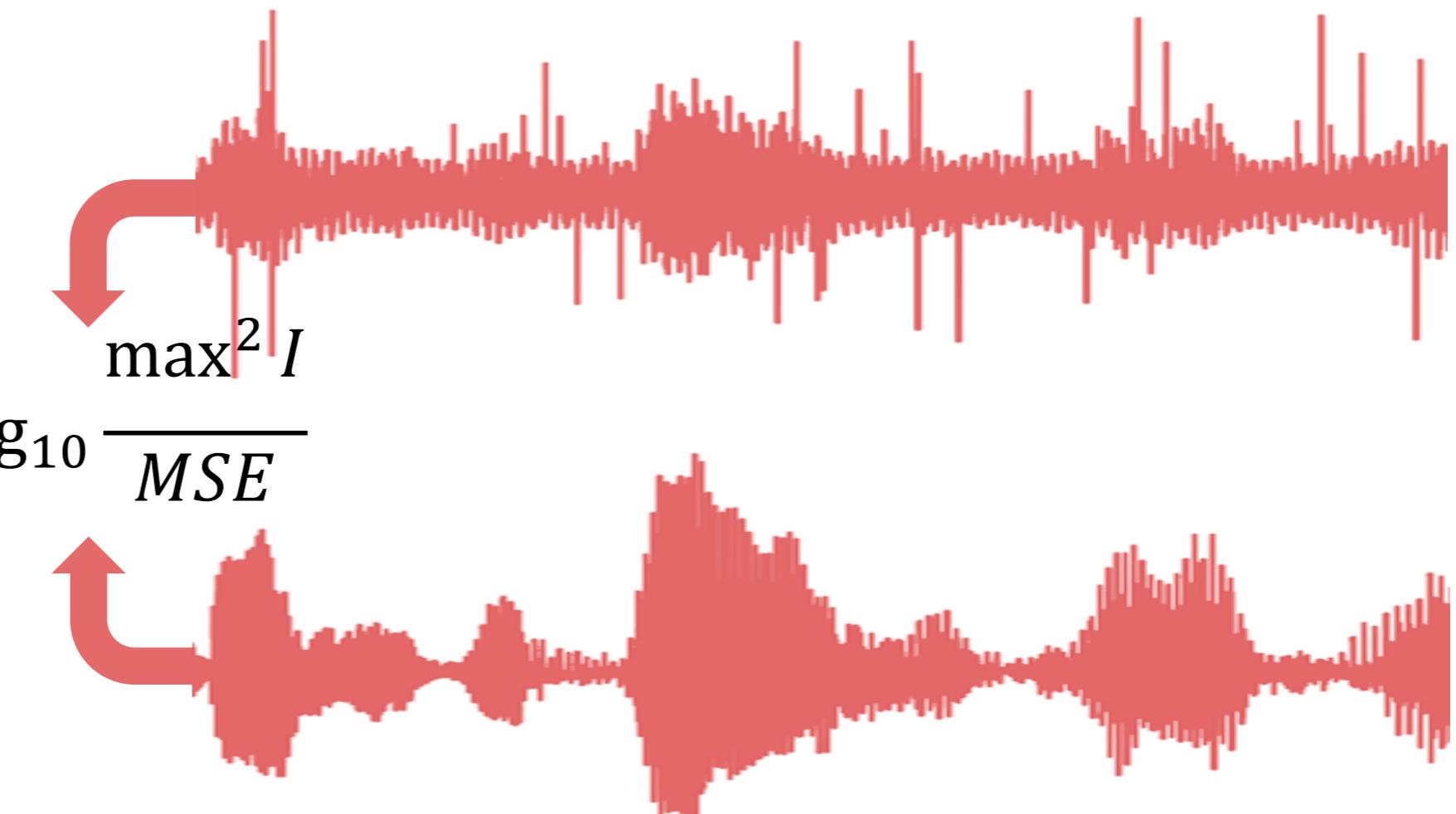


# EVALUATION

- Objective quality assessment metric (MAE? PSNR? SSIM? LPIPS?)



$$PSNR = 10 \log_{10} \frac{\max^2 I}{MSE}$$



# UITVOERING

- **Groepswerk**
  - Groepen van 2 of 3  
*(Ufora → Groepen → Projectgroepen\_Labo\_Multimedia)*
  - Verdeel het werk!
- **5 sessies (start op 15/11/24)**
  - Inleidingssessie (presentatie)
  - **Verplichte (!!!) voortgangsupdate / feedbackgesprek op ??/12/24**
- **Verdediging tijdens inhaalweek (16/12/24 – 20/12/24)**
  - 20 minuten presentatie + 10 minuten vragen
  - Elke groep apart

# VERDEDIGING

- **Presentatie** (20 minuten)
  - Opbouw van de oplossing (met visuele voorbeelden)
  - Kwalitatieve en kwantitatieve resultaten (opgesplitst in categorieën)
  - Demo (live + video als backup)
- **Q&A** (10 minuten)

# EVALUATIE

## Scoreberekening:

- 20% Creativiteit
- 10% Implementatie
- 25% Resultaten
- 20% Presentatie en demo
- 25% Q&A (individueel)

# INDIENEN

- Vóór de **eerste** verdediging via Ufora > Opdrachten
- Filename = **groepX\_project.zip**
- Uitvoerbaar Python script (1 main.py) + README (zie inleidende presentatie)
- Presentatie toevoegen aan zip!

# CONTACT

- Enkel via mail of tijdens de lessen
- Voor een sneller antwoord, **mail altijd naar beide begeleiders**

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**EN**

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# SUCCES!!!