

Efficient Photorealistic Avatars using ML/AI

Milestone 3

Group 1

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Agenda

- Problem Statement
- Old Solution
- Final Solution
- Improvements



Problem Statement

Goal: Rendering a photorealistic avatar with

- Monocular camera input ✓
- Using neural networks to render avatar ✓
- introducing neural heads as solution for facial expressions ✓
- running in a docker to avoid operating system problem ✓
- User interface to increase usability ✓

Old Solution (Nerf)



[Git: Source Code](#)

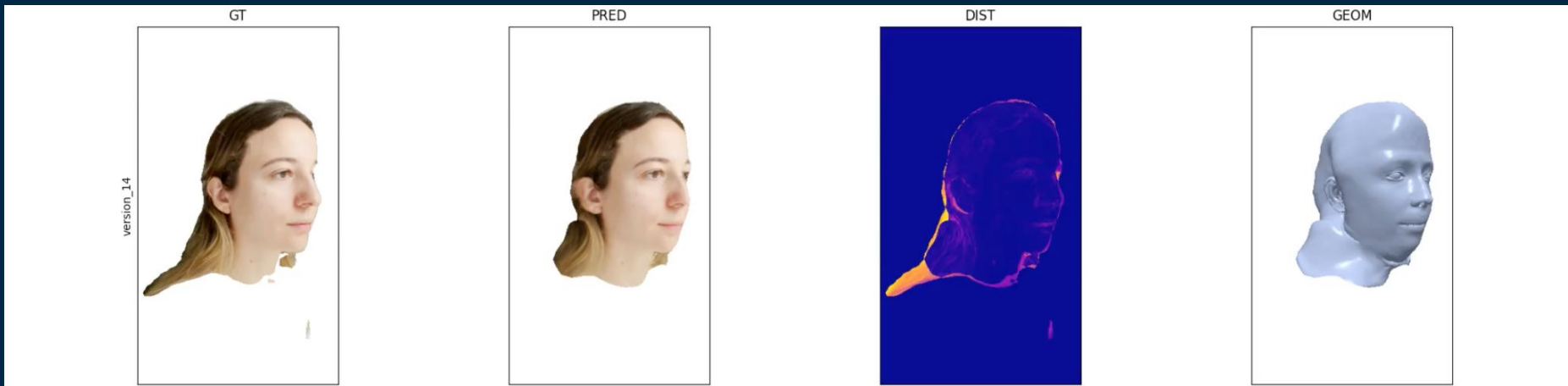


Input

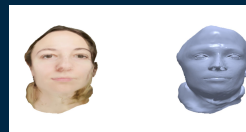
Output

BUT: Realisation of facial expression hard

Final Solution (Neural Head)



Final Solution (Neural Head)



Input
Video

Preprocessing

Render Avatar

Reenact Expressions

2D image
of rendered 3D
object with
facial
expression



- Frame Extraction through **OpenCV**
- Face and landmark detection with **face-detection-tflite**
- Annotation of the landmarks with **face_alignlib**

- **FLAME** head model as geometric backbone
- **Geometry Refinement Network** for facial details and hair
- **novel appearance model** which generates a photorealistic texture

- Loading avatar from ckpt file (binary results of training)
- Weighted with facial expression + viewing position + Neck position



User interface

[Preprocess](#) [Render Avatar](#) [Reenact](#)

Upload a video of yourself(.mp4)

Important: Make sure to crop the video tightly around the head as in the paper. Otherwise the generated ground truth is not as accurate and the optimization later on uses only a small part of each frame

Choose file

No file chosen

Upload



- To avoid issues with operating systems
- Github pages assume dependencies
- Increase usability

```
3.9-bul 1.3sw => [internal] load build context                                0.0s
> => transferring context: 308                                             0.0s
> CACHED [2/7] WORKDIR /neural-heads                                     0.0s
> CACHED [4/7] RUN apt-get update && apt-get install -y git               0.0s
> [6/7] RUN pip install -e .                                              9667.4s
> => # ts, jupyter-server, face-detection-tflite, notebook-shim, nbcl
> => # assic, notebook, jupyter, nna
> => # Attempting uninstall: torch
h-1.13.1: P => => # Found existing installation: torch 1.13.1          t => => # Uninstalling to
> => # Successfully uninstalled torch-1.13.1                             o[*] Building 9669.3s (9/11)
> [internal] load build definition from Dockerfile                       0.0s
> [internal] load .dockerignore                                           0.0s
> [internal] load build definition from Dockerfile                       0.0s
> [internal] load .dockerignore                                           0.0s
> [internal] load build definition from Dockerfile                       0.0s
> [internal] load .dockerignore                                           0.0s
> [internal] load build definition from Dockerfile                       0.0s
> [internal] load .dockerignore                                           0.0s
> [internal] load metadata for docker.io/library/python:3.9-bul 1.3s    0.0s
-> Building 9675.2s (9/11)                                                0.0s
> [internal] load build definition from Dockerfile                       0.0s
> => transferring dockerfile: 328                                         0.0s
> [internal] load .dockerignore                                           0.0s
> => transferring context: 28                                             0.0s
> [internal] load metadata for docker.io/library/python:3.9-bulseye 1.3s
> [internal] load build context                                           0.0s
> => transferring context: 308                                             0.0s
> [1/7] FROM docker.io/library/python:3.9-bulseye@sha256:8a1a6e57d1128005344083296c72f73110ba9ed090884494b5974421d43 0.0s
> CACHED [2/7] WORKDIR /neural-heads                                     0.0s
> CACHED [3/7] COPY setup.py ./                                           0.0s
> CACHED [4/7] RUN apt-get update && apt-get install -y git               0.0s
> CACHED [5/7] RUN pip install torchvision                               0.0s
> [6/7] RUN pip install -e .                                              9674.0s
> => # ts, jupyter-server, face-detection-tflite, notebook-shim, nbcl
> => # assic, notebook, jupyter, nna
> => # Attempting uninstall: torch
> => # Found existing installation: torch 1.13.1
> => # Uninstalling torch-1.13.1:
> => # Successfully uninstalled torch-1.13.1
requirement already satisfied: colorama in c:\users\bcyr1\anaconda3\envs\downgrade\lib\site-packages (from tqdm->torchtext) (0.4.6)
installing collected packages: torch, torchtext
```


Improvements

- Returning/rendering and Textures of an 3D model not just an image of the model
- Run emotion detection model to map the facial expression parameters correctly



Thank
You!

