



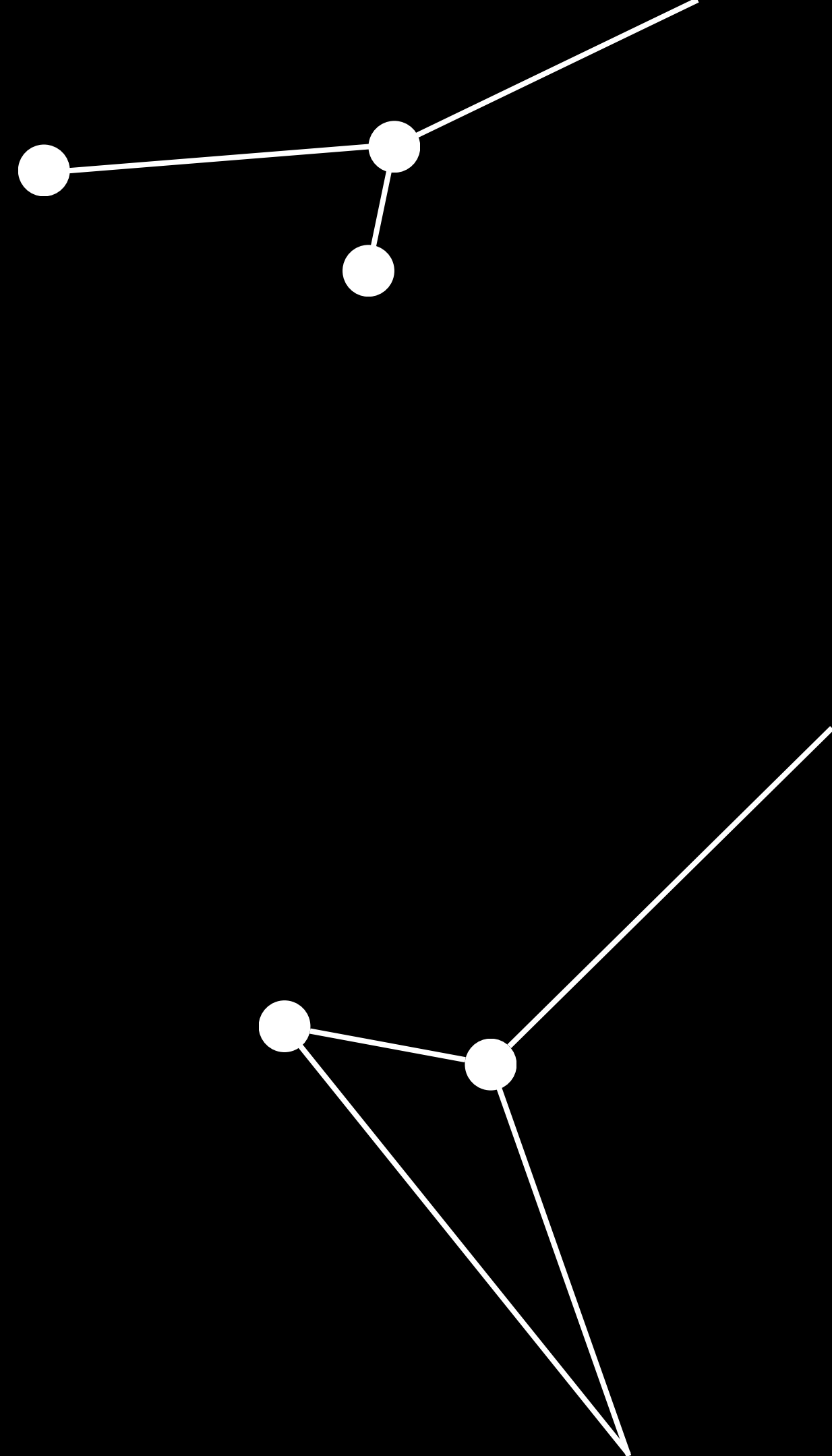
AI-Based Gesture Animation for Sign Language Avatars



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Introduction

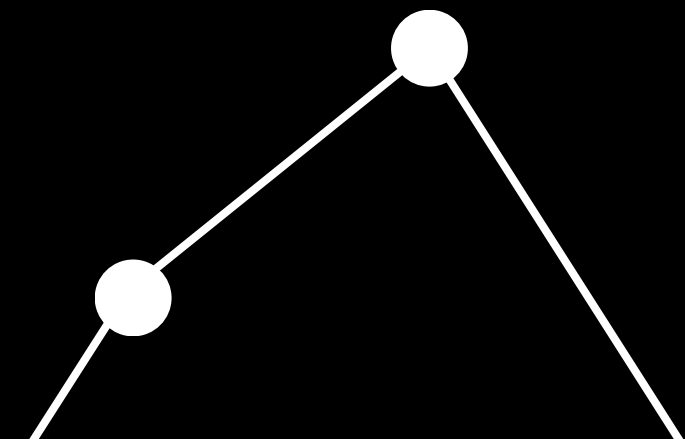
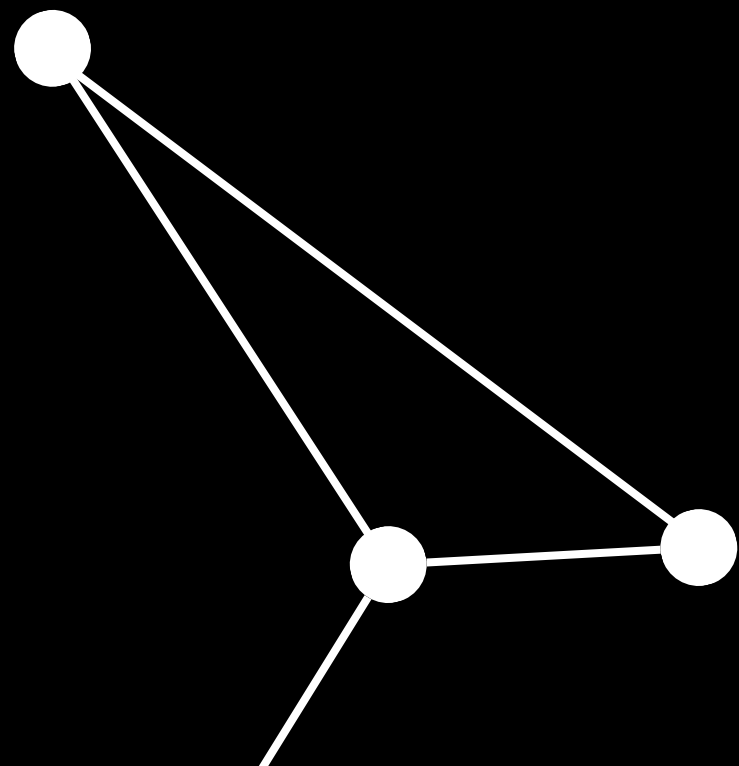
Goal : To develop a machine-learning model that can generate realistic hand gesture animations for sign language avatars

Motivation : Developed more realistic hand gesture for Avatars

Use of MediaPipe to capture Keypoint of the hands

Two Models implemented, one for prediction another for generation of sign gesture

The predictor model is a bidirectional LSTM, while the generator model is also an LSTM but train with force teaching.



Methodology

Own dataset

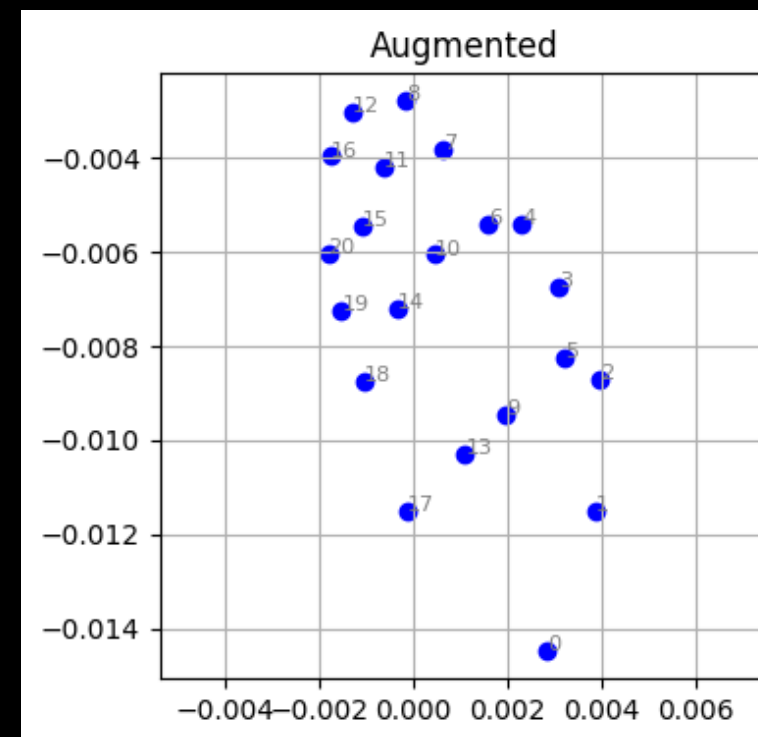
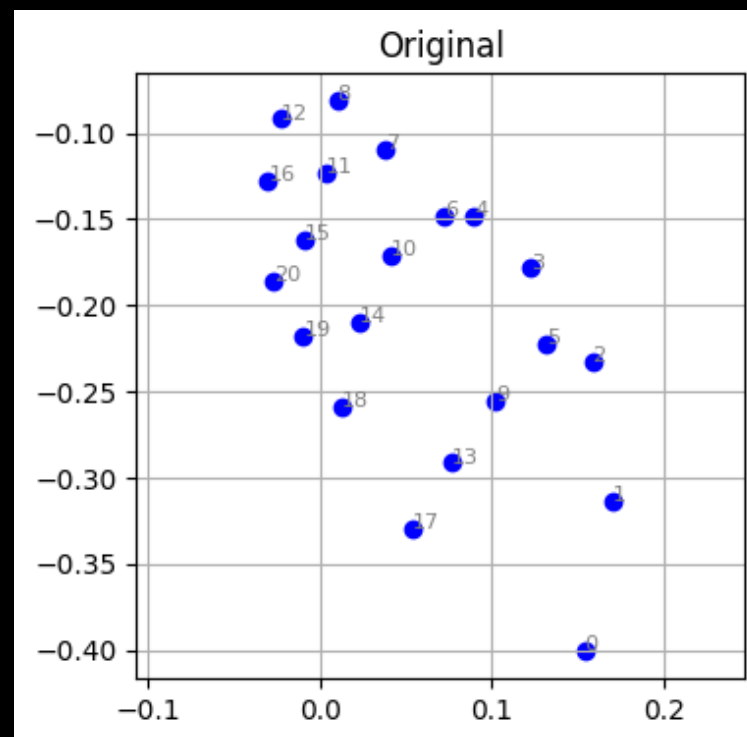
70 training, 20 validation samples captured

Then augmented (10 to 15 times) to have enough data for training

10 labels

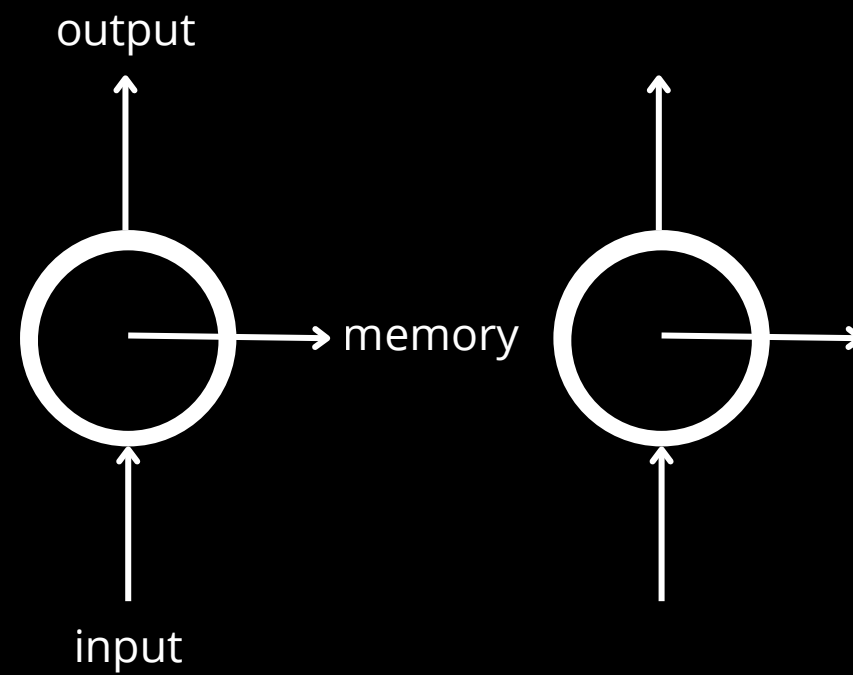


Screenshot of the program capture.py



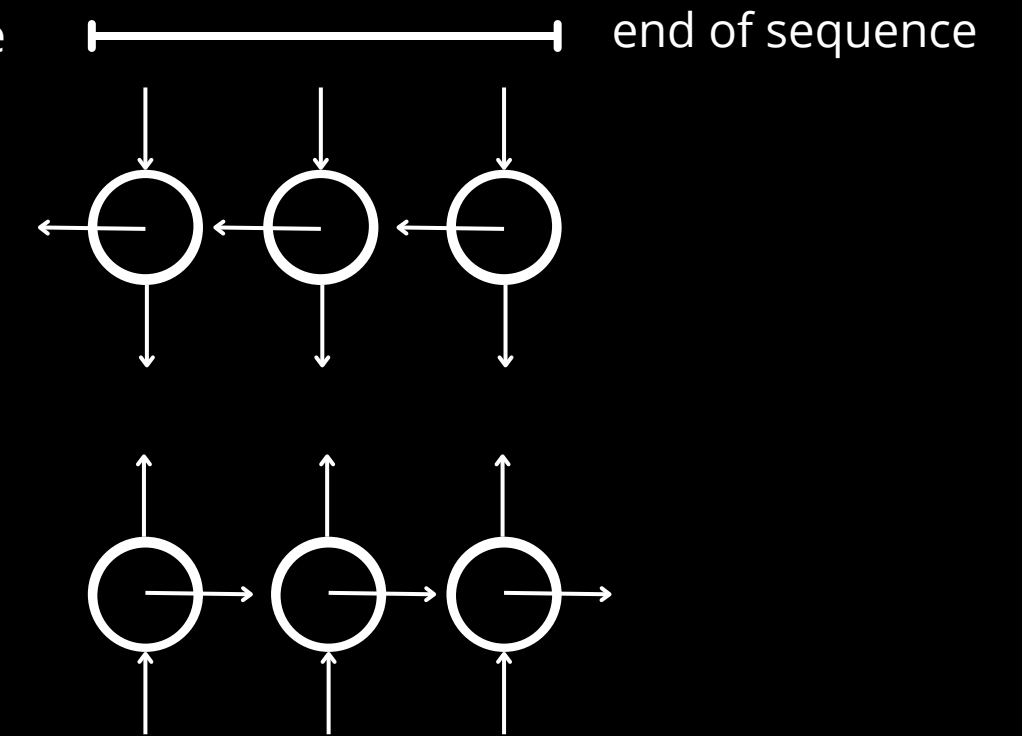
Original and augmented data
light rotation and noise

Methodology

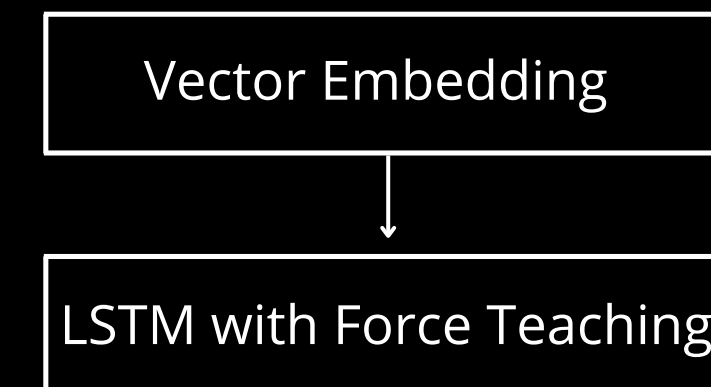


Recurrent Neural Network

● Bidirectional LSTM
Predictor Model



● LSTM generator with
force teaching for the training
Generator Model



Results

Poor result, some sign are recognize every time while other nearly nether

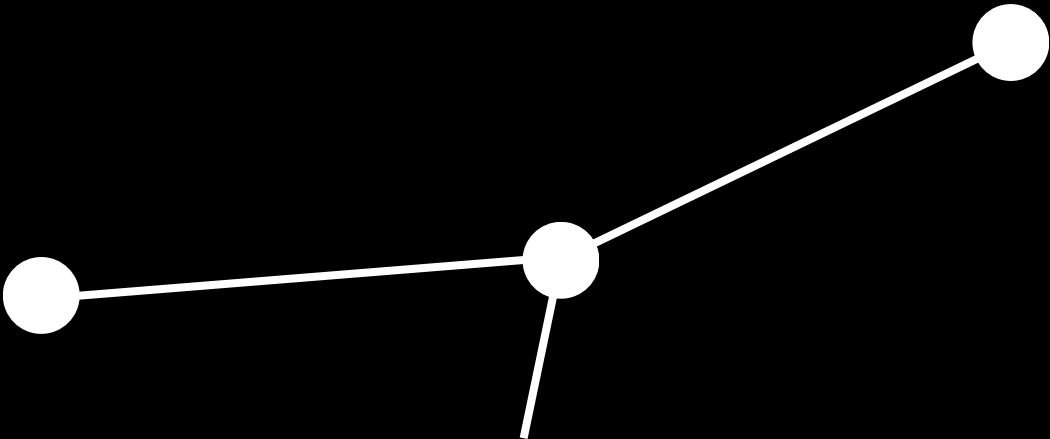
The accuracy is not homogenous through the sign

The small size of the dataset is certainly the reason for these results

	precision	recall	f1-score	support
hello	1.00	1.00	1.00	2
thanks	0.67	1.00	0.80	2
no	0.33	0.50	0.40	2
smart	1.00	1.00	1.00	2
need	0.50	0.50	0.50	2
find	1.00	0.50	0.67	2
fuck	1.00	1.00	1.00	2
me	1.00	0.50	0.67	2
home	0.67	1.00	0.80	2
yes	1.00	0.50	0.67	2
accuracy			0.75	20
macro avg	0.82	0.75	0.75	20
weighted avg	0.82	0.75	0.75	20

Accuracy result for each sign of the predictor model

Test of the model with runner_predictor.py



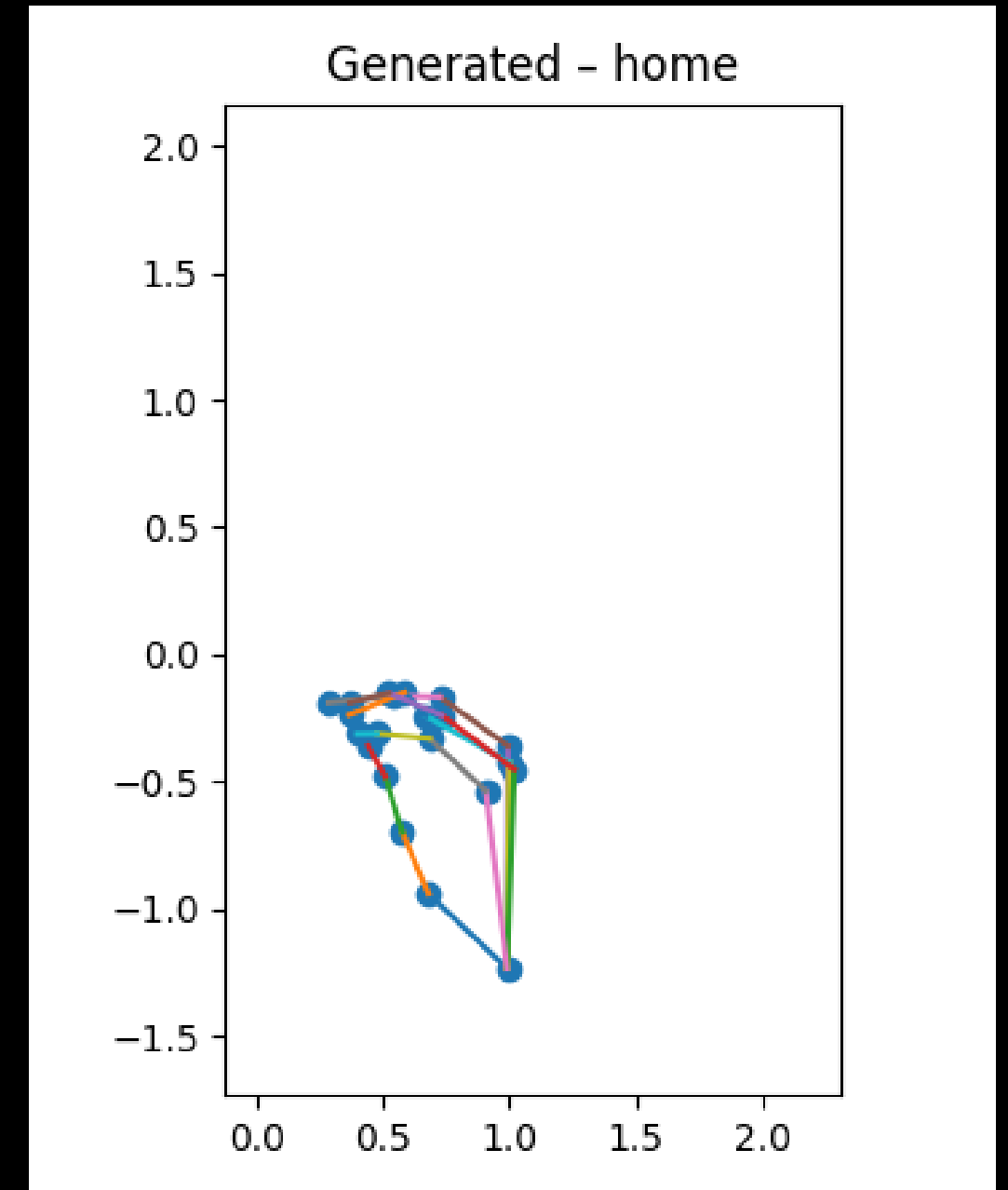
Results

The result are adequate
the model can proprely generate sign gesture
animation.
Losses are low for the training and validation set

The task ask for the generator model to execute,
animation generation, could also be done by
taking the data and building an animation directly

The purpose of this model is to shown the
efficiency to generate realistic gesture even if in
our case the task is simple

Test of the model with runner_generator.py

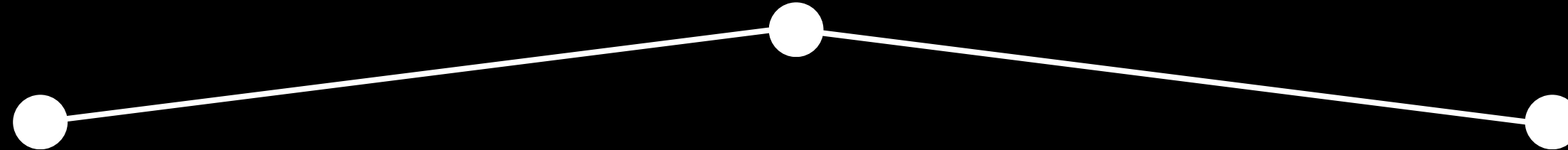


Extract from the animation of the sign home

Loss of the model in the last Epochs of the training

Epoch 060 | train 0.07081 | val 0.07614

Conclusion, Overview



Predictor model

Lack of uniform accuracy through the sign

Sometimes overconfident in his error

Small dataset limitation

Generator model

Smooth and good result

if the sign is know it will be understood

few labels and simple task, may question the relevance of a small model for animation



Proof of concept for larger model to generate realistic gesture applied to Avatars