Pyannote Tutorial

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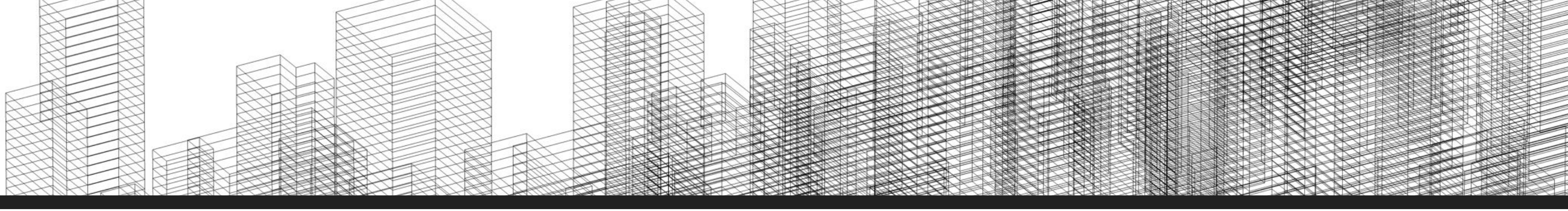
What is Pyannote?

1. Open Source toolkit for Speaker Diarization
2. Based on Pytorch

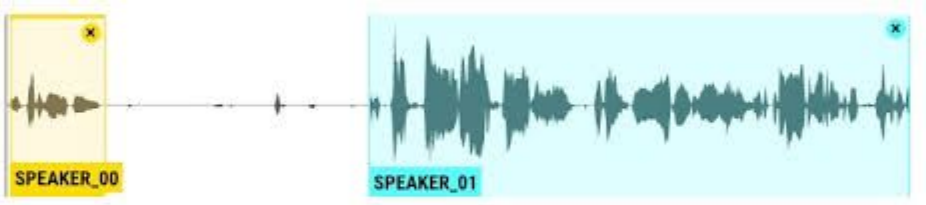


Tasks Available

1. Voice Activity Detection
2. Overlapped Speech Detection
3. Segmentation

Pyannote Pipelines

- Available Pipelines
    a. Voice Activity Detection
    b. Speaker Diarisation
    c. Overlapped Speech Detection
    d. Speaker Segmentation

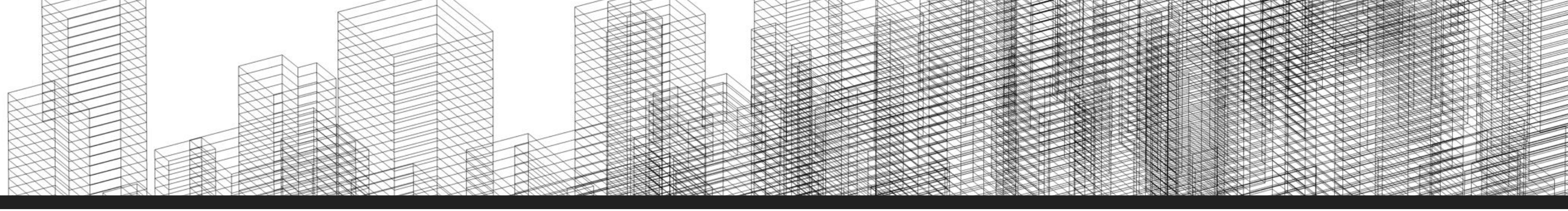


Installation

1. #Create a conda environment named pyannote
   a. conda create -n pyannote python=3.8
   b. conda activate pyannote
2. #Install other dependencies
   a. conda install pytorch==1.11.0 torchvision==0.12.0 torchaudio==0.11.0 -c pytorch
3. #Install pyannote.audio
   a. pip install pyannote.audio

Installing AMI-Diarisation setup

1. Clone AMI-Diarisation setup
   a. git clone https://github.com/pyannote/AMI-diarization-setup.git
2. Downloading dataset
   a. cd AMI-diarization-setup/pyannote
   b. sh download_ami.sh



Hugging Face

Setting Up Hugging Face Model Hub Access Token

1. Visit hf.co/pyannote/speaker-diarization and hf.co/pyannote/segmentation and accept user conditions
2. Visit hf.co/settings/tokens to create an access token

Pyannote Pipelines

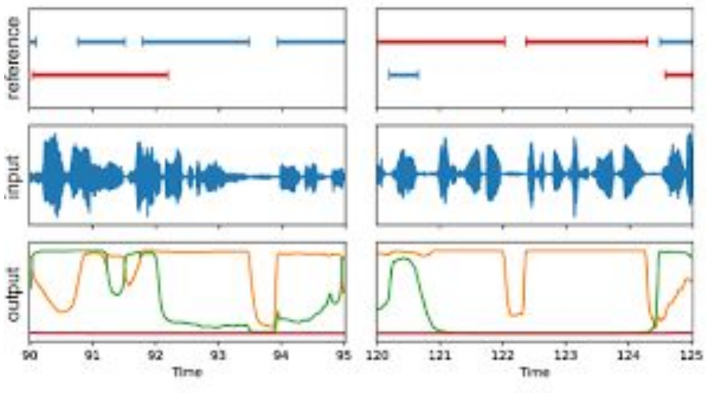
Data
Operation 1
Operation 2
Operation 3
Data
Pipeline

1. For applying a pre-trained pipeline, refer:
   a. https://github.com/pyannote/pyannote-audio/blob/develop/tutorials/applying_a_pipeline.ipynb

2. For playing around with pyannote pipelines, refer:
   a. https://github.com/AKSHAT2429/Pyannote-Tutorial/blob/main/Pyannote_Pipeline.ipynb

How to use pre trained pyannote models?

1. Please refer:
   a. https://github.com/pyannote/pyannote-audio/blob/develop/tutorials/applying_a_model.ipynb

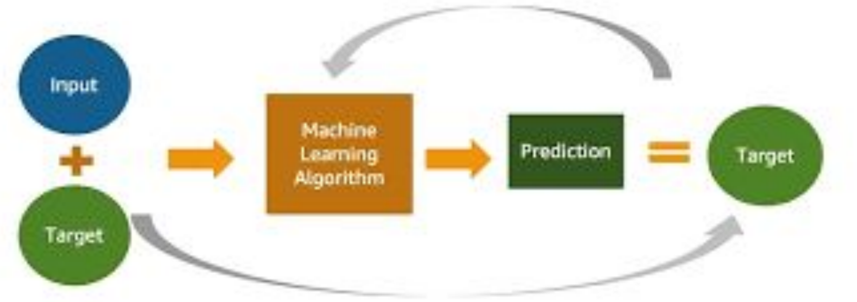


Pyannote Data-Loader

1. The details of the dataset should be included in a database.yml file, which contains:
    a. Name of all the audio files.
    b. RTTM files of the audio.
    c. UEM files of the audio: It is basically the duration of the audio for which you need to train/test your model.
    d. Keep in mind the protocol to be used (Important) (Check: pyannote/database/protocol)
2. You can find a sample database.yml file at:
    a. https://github.com/AKSHAT2429/Pyannote-Tutorial/blob/main/Creating_Database/database.yml
3. Files useful while creating a database.yml can be found at:
    a. https://github.com/AKSHAT2429/Pyannote-Tutorial/tree/main/Creating_Database

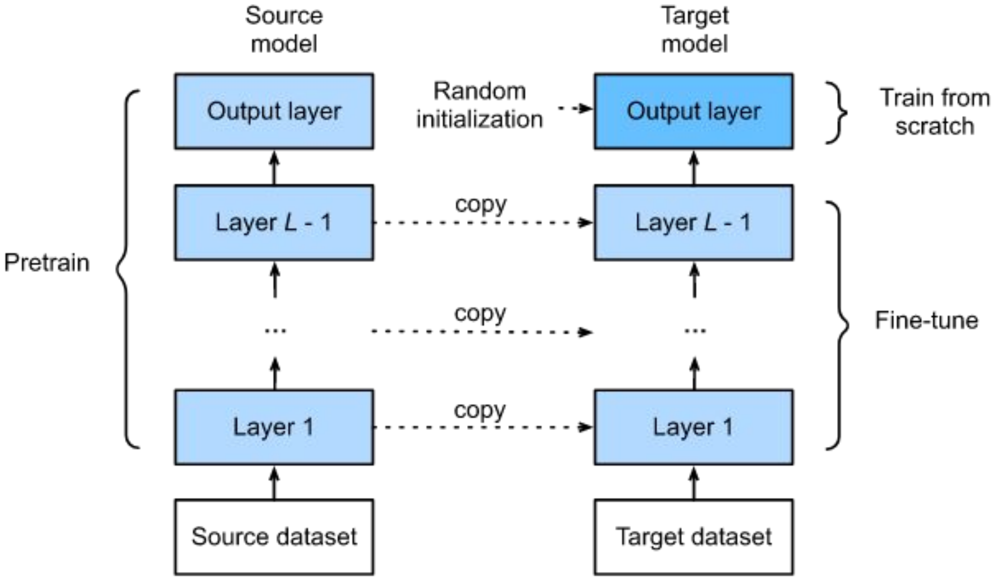
How to train a model on your dataset?

1. Please refer:
   a. https://github.com/AKSHAT2429/Pyannote-Tutorial/blob/main/Training_a_model_from_scratch.ipynb



Fine Tuning on your dataset

1. Please refer:
   a. https://github.com/AKSHAT2429/Pyannote-Tutorial/blob/main/Finetuning_a_model.ipynb



Playing around with pyannote

- To make custom changes:
  - Navigate to “anaconda3/envs/pyannote/lib/python3.8/site-packages/pyannote/audio” and make corresponding changes

    OR

  - Write custom function in the notebook itself

Custom Modification in Pyannote

1. How to define your own model?
    a. https://github.com/pyannote/pyannote-audio/blob/develop/tutorials/add_your_own_model.ipynb

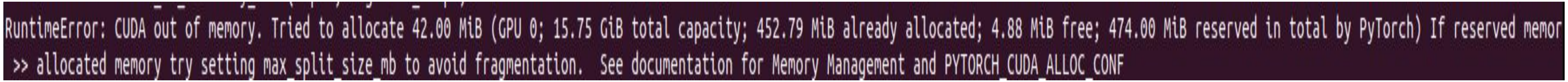
2. How to define your own task?
    a. https://github.com/pyannote/pyannote-audio/blob/develop/tutorials/add_your_own_task.ipynb

Tips for Training/ Fine Tuning/ Modifications

- Fine Tuning on new dataset
  - Always implement early stopping.
  - Try and compare different optimizers
  - Try learning rate scheduling
  - Try gradual unfreezing of layers
  - Try weight decay
  - Try data augmentation
  - Check if any kind of normalization (to any parameters or gradients is done) and take care of it while fine tuning.
  - Incorporate multiple evaluation methods (helps sometimes)
- When adding new feature/ modification:
  - Create a subset of full dataset (maybe 10 percent) to test if your approach is working well. If it works well then train whole model on full dataset to save time.
  - To test any new modifications, train on one epoch and explore the modification.

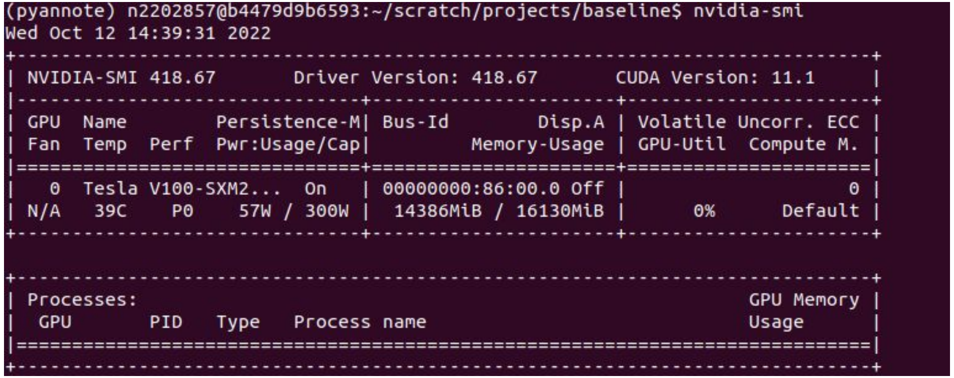
Tips for NSCC

- Sometimes you may need to decrease number of workers to fit it in NSCC GPU (To be done while initialising pyannote task).



```
RuntimeError: CUDA out of memory. Tried to allocate 42.00 MiB (GPU 0; 15.75 GiB total capacity; 452.79 MiB already allocated; 4.88 MiB free; 474.00 MiB reserved in total by PyTorch) If reserved memor
 >> allocated memory try setting max_split_size_mb to avoid fragmentation.  See documentation for Memory Management and PYTORCH_CUDA_ALLOC_CONF
```

- If you encounter the error above, check GPU memory (nvidia -smi)
    - If it is full - - -> Open a new terminal window and request qsub again (AND raise a ticket to NSCC).



```
(pyannote) n2202857@b4479d9b6593:~/scratch/projects/baseline$ nvidia-smi
Wed Oct 12 14:39:31 2022
+-----------------------------------------------------------------------------+
| NVIDIA-SMI 418.67       Driver Version: 418.67       CUDA Version: 11.1     |
|-------------------------------+----------------------+----------------------+
| GPU  Name        Persistence-M| Bus-Id        Disp.A | Volatile Uncorr. ECC |
| Fan  Temp  Perf  Pwr:Usage/Cap|         Memory-Usage | GPU-Util  Compute M. |
|===============================+======================+======================|
|   0  Tesla V100-SXM2...  On   | 00000000:86:00.0 Off |                    0 |
| N/A   39C    P0    57W / 300W |  14386MiB / 16130MiB |      0%      Default |
+-------------------------------+----------------------+----------------------+

+-----------------------------------------------------------------------------+
| Processes:                                                       GPU Memory |
|  GPU       PID   Type   Process name                             Usage      |
|=============================================================================|
+-----------------------------------------------------------------------------+
```

Contribution

- ➔ I would like to acknowledge with much appreciation
  - ◆ Prof. Chng Eng Siong
  - ◆ Lim Zhi Hao
  - ◆ Wong Chee Hoong Melvin
  - ◆ Liu Chenyu

Thank You!