ITUEvents

ITU-ML5G-PS-012: ML5G-PHY: Beam Selection (Universidade Federal do Pará, Brazil)

07 August 2020

ITU

AI/ML in 5G

Challenge

Applying machine learning in communication networks

ai5gchallenge@itu.int

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ITU Artificial Intelligence/Machine Learning in 5G Challenge

An Overview of the ITU-ML5G-PS-012 "ML5G-PHY [beam selection]"

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http://ai5gchallenge.ufpa.br

Joint work with Profs. Diego Gomes (UNIFESSPA), Francisco Müller (UFPA), Nuria González-Prelcic (NCSU), Robert Heath (UT) and several students

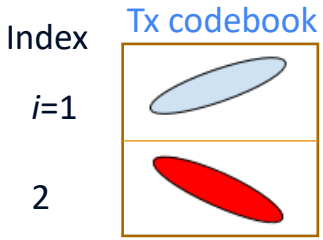
August 07, 2020

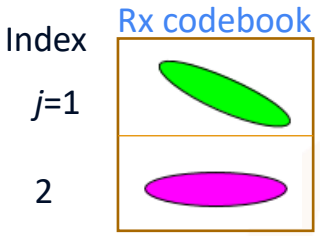
Hints

1. From our experiments: it is harder to work with “raw” data (Raymobtime), but a customized frontend can outperform the baseline frontend that we provided ➔ will release extra slides
2. We have better images: raw_data\images_data_s008_v2
   It outperformed the previous dataset at images_data_s008
3. Use Raymobtime_visualizer.py to understand your scenario and eventually “debug”: https://github.com/lasseufpa/ITU-Challenge-ML5G-PHY/blob/master/Visualizer/Raymobtime_visualizer.py specially to understand the bias that the scenario imposes (for example: unbalanced dataset)
4. We will provide extra data in September to help tuning the algorithms and checking the whole submission procedure

Example: Neural network for beam-selection

Example with $M_t = M_r = 2$ vectors per codebook

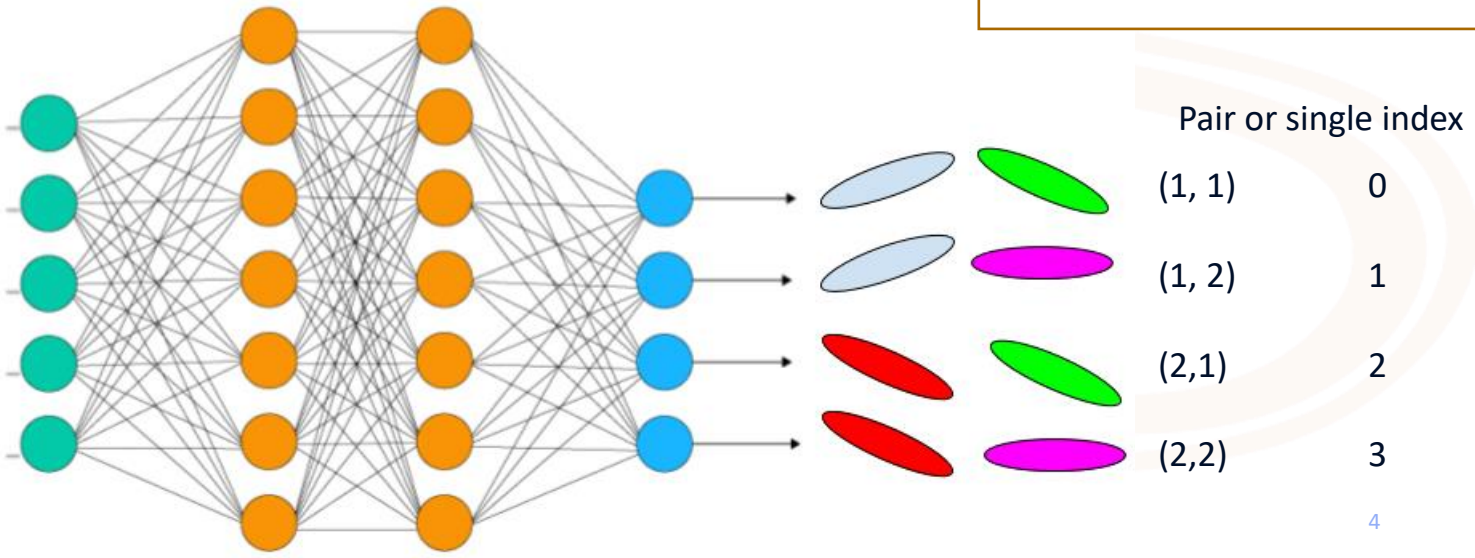




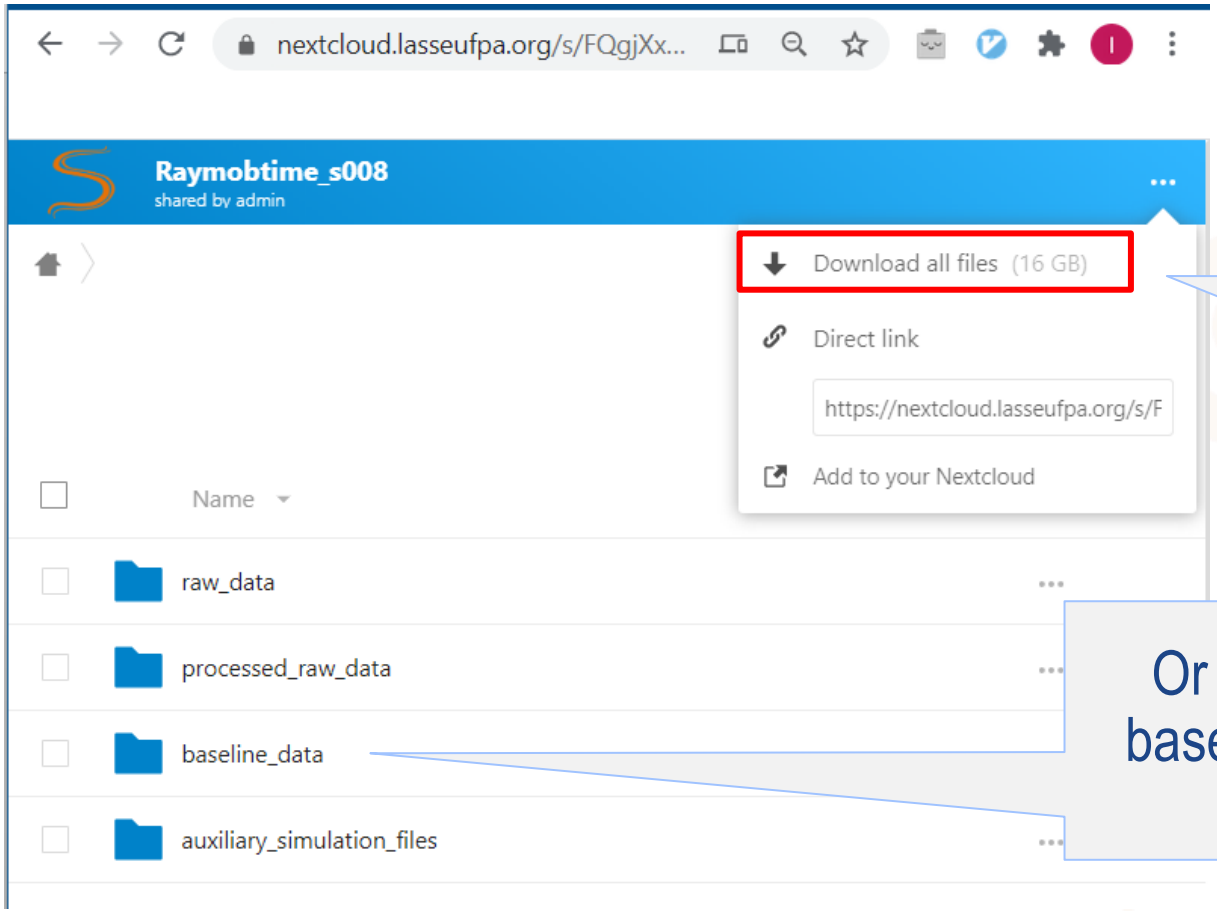
Goal: maximize magnitude of *combined channel*:

$$y(i,j) = |\boldsymbol{w}_j^H \boldsymbol{H} \boldsymbol{f}_i|$$

Features obtained from baseline **or** customized frontend



Two options: Work with baseline or raw data



Site: http://ai5gchallenge.ufpa.br/ or directly: https://www.lasse.ufpa.br/raymobtime/

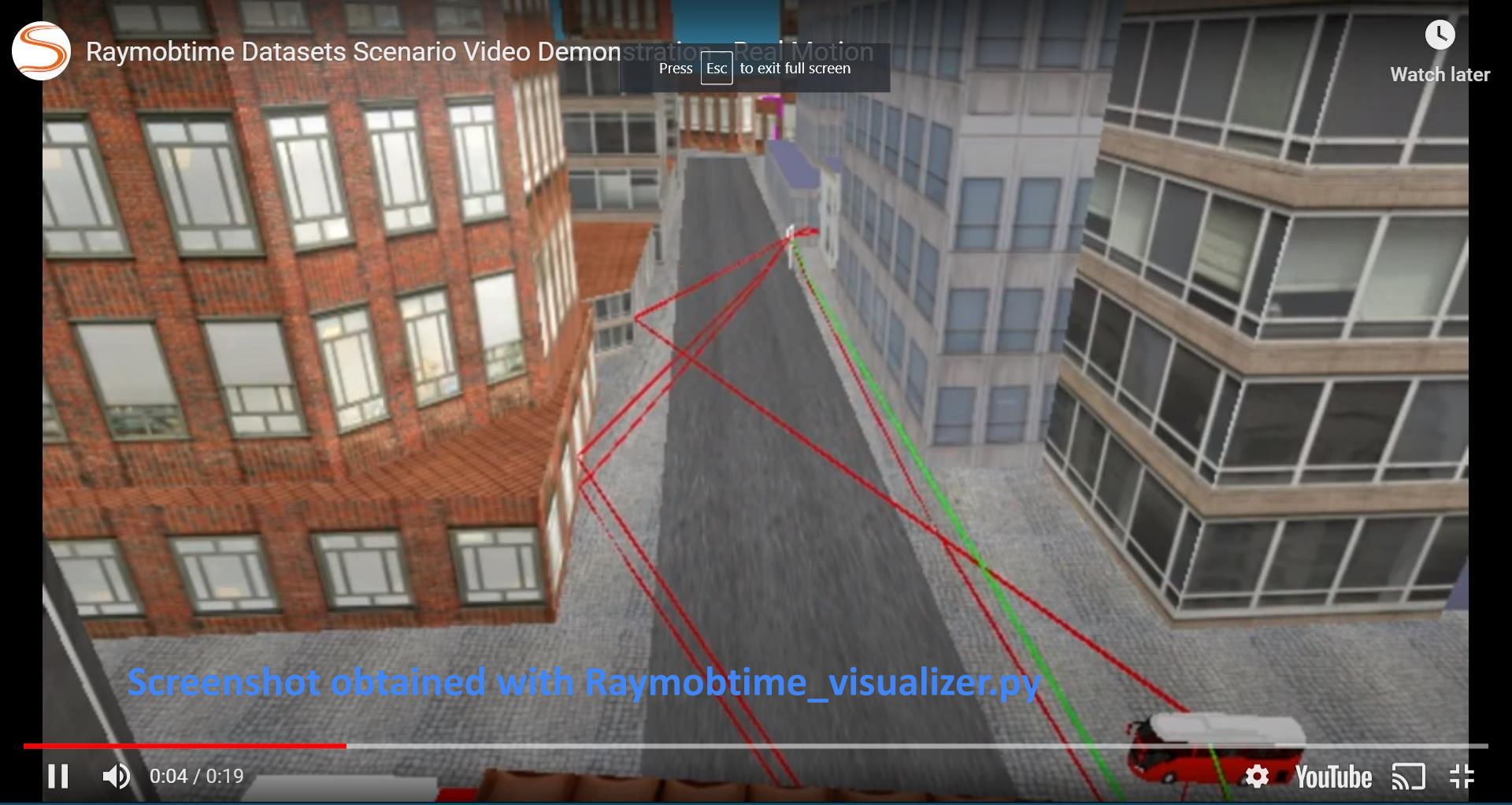
Download all data (including raw, ~16 GB)

Or download only baseline data (~512 MB)

Repository structure:

```
Dataset Home
├──auxiliary_simulation_files
│       s008_Rosslyn_10MobileRx_60GHz_2086episodes_1scenes_Ts1s_InSite3.2.zip
│       s008_SUMO_config_files.zip
│
├──baseline_data   Baseline
│   ├──beam_output
│   │       beams_output_train.npz          Combined channel for each pair of beams
│   │       beams_output_validation.npz
│   │
│   ├──coord_input
│   │       coord_train.npz                 Position features: (x,y) for receiver
│   │       coord_validation.npz
│   │
│   ├──image_input
│   │       img_input_train_20.npz          Resampled images
│   │       img_input_validation_20.npz
│   │
│   └──lidar_input
│           lidar_train.npz                 Quantized LIDAR PCDs
│           lidar_validation.npz
│
├──processed_raw_data
│       lidar_data_s008.zip
│
└──raw_data   Raw
    │   CoordVehiclesRxPerScene_s008.csv
    │   ray_tracing_data_s008_carrier60GHz.zip
    │   s008_Blensor_rosslyn_scans_lidar.zip
    │
    └──image_data_s008
            camera1.zip
            camera2.zip
            camera3.zip
```

← New version (v2)



Reviewing the hints

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Thanks to all Raymobtime team

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Ilan Correa

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