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The Second DiCOVA Challenge:

Dataset And Performance Analysis for Diagnosis of COVID-19 using Acoustics

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Sound based Diagnosis

COVID-19 diagnosis methods:

- RT-PCR testing
- RAT testing
- Point-of-care testing (POCT)
- Advantages of sound based diagnosis of COVID-19

Motivation

DiCOVA Challenge series

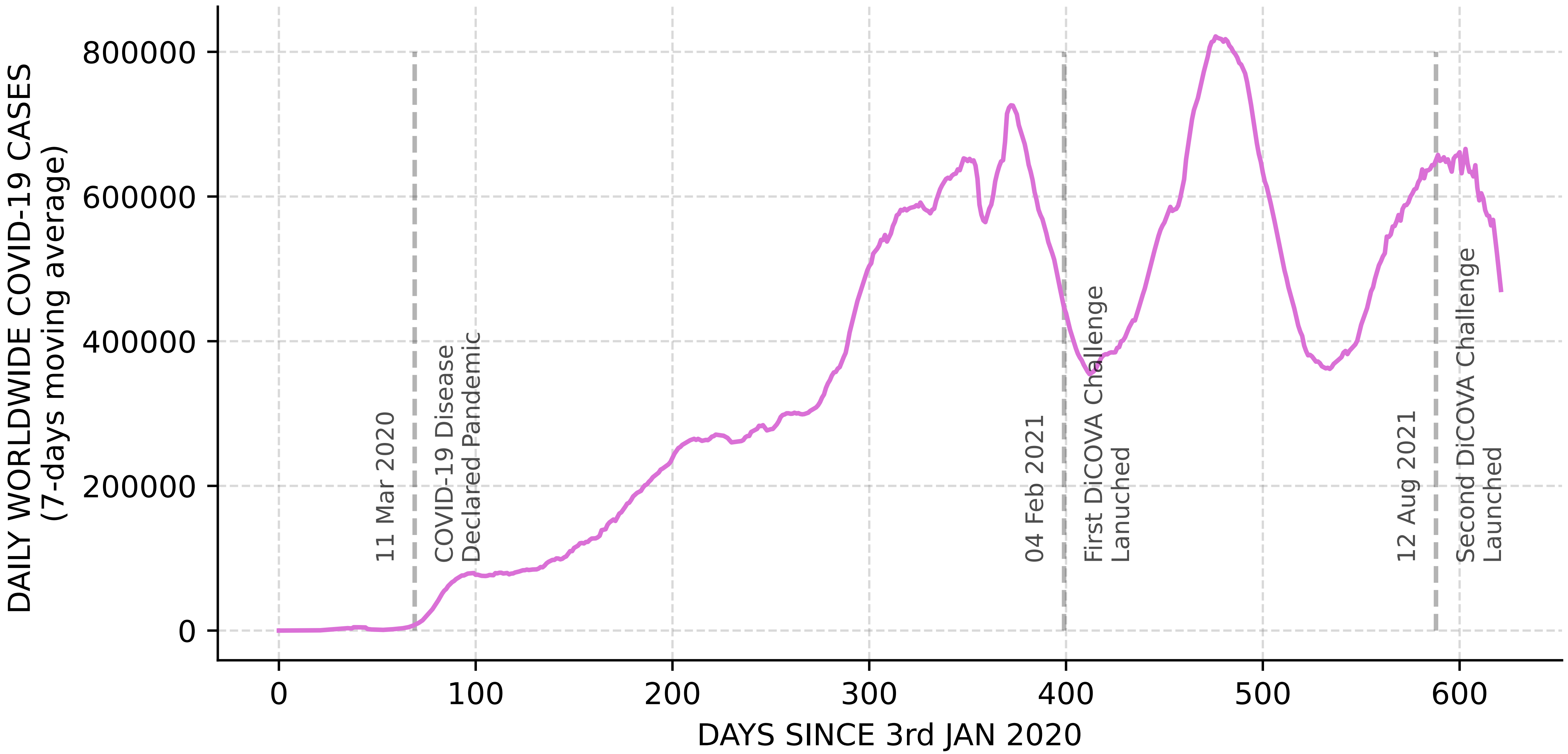
- Diagnosis of COVID-19 using acoustics
- COSWARA dataset [1]
- First DiCOVA Challenge [2]: 12 Feb - 23rd March, 2021
  - Focused on cough audio recordings
  - Special Session in Interspeech 2021
  - 29 teams from around the world
  - 19 outperformed baseline

1. Neeraj Sharma, Prashant Krishnan, Rohit Kumar, Shreyas Ramoji, Srikanth Raj Chetupalli, R Nirmala, Prasanta Kumar Ghosh, and Sriram Ganapathy, “Coswara – a database of breathing, cough, and voice sounds for COVID-19 diagnosis,” in Proc. Interspeech, 2020, pp. 4811–4815

2. Sharma, N. K., Muguli, A., Krishnan, P., Kumar, R., Chetupalli, S. R., & Ganapathy, S. (2022). Towards sound based testing of COVID-19—Summary of the first Diagnostics of COVID-19 using Acoustics (DiCOVA) Challenge. Computer Speech & Language, 73, 101320.

Motivation

Second DiCOVA Challenge:



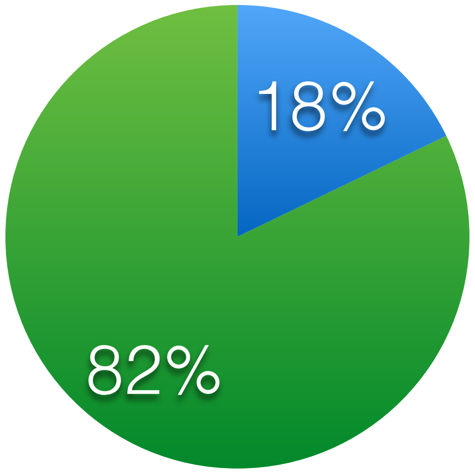
Second DiCOVA Challenge!

http://dicovachallenge.github.io/

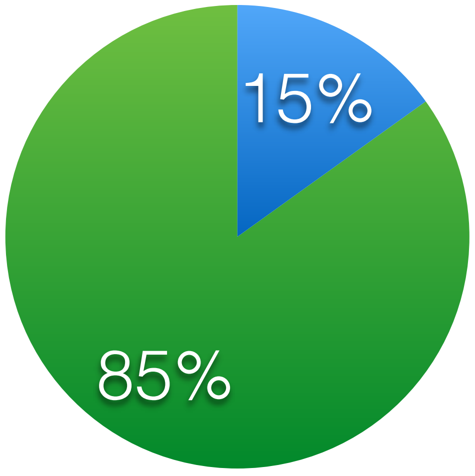
Dataset Description

- Development set: 965 individuals, 172 are COVID-19 positive
  - released as 5 train-val folds

- Evaluation set: 471 individuals, 71 are COVID-19 positive



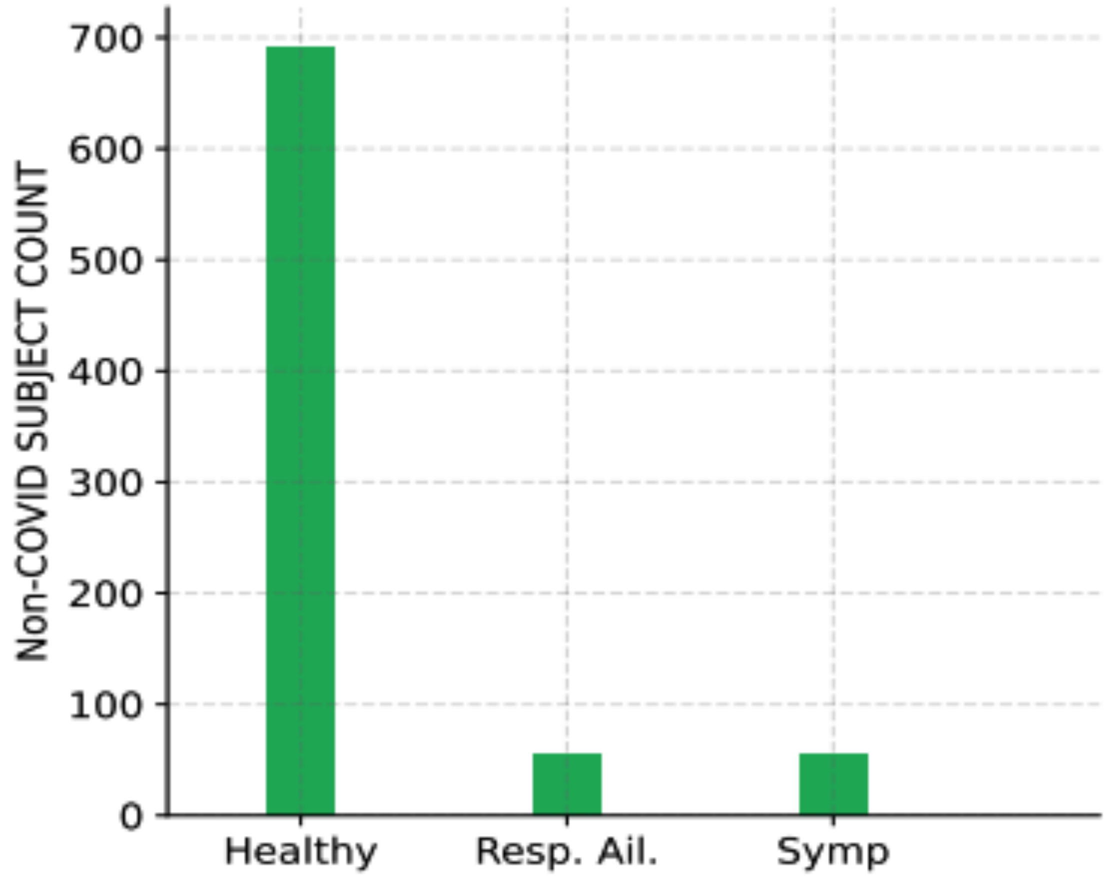
development set



evaluation set

Dataset Description

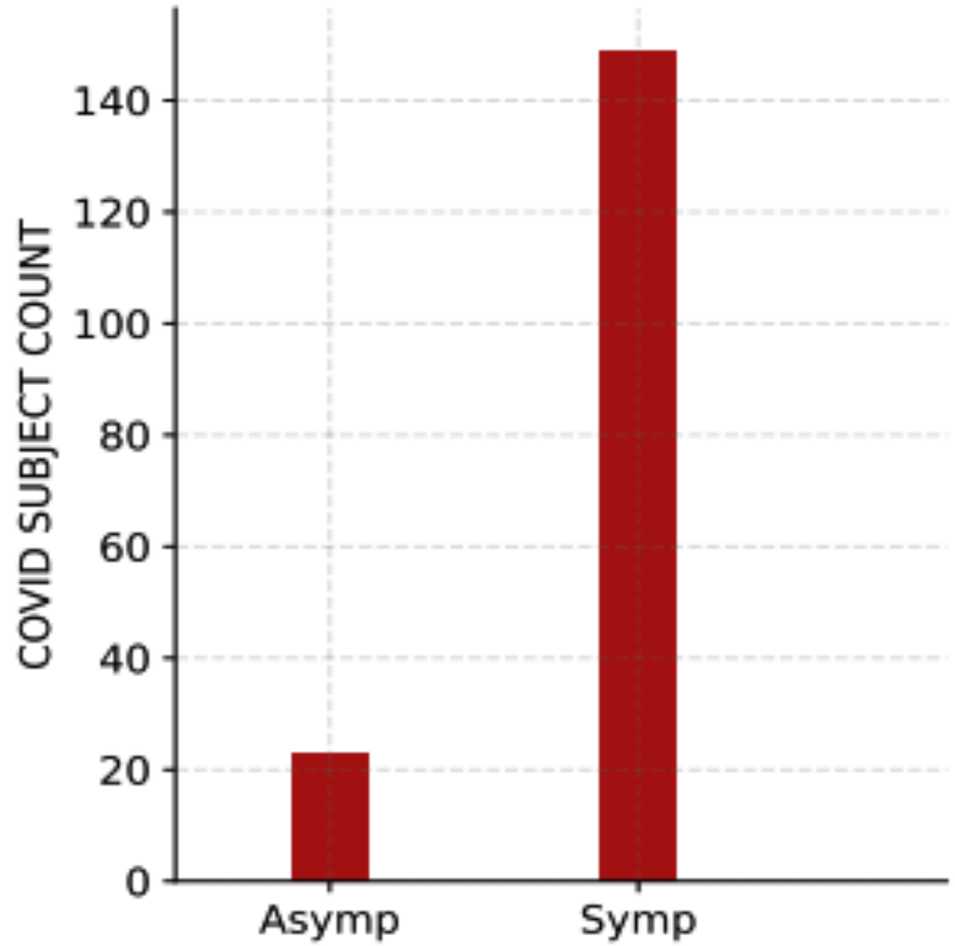
Non-COVID subject distribution



- healthy (no symptoms)
- resp. ail. (asthma, chronic lung disease, pneumonia)
- symptoms (cold, cough, fever, loss of taste or smell)

Dataset Description

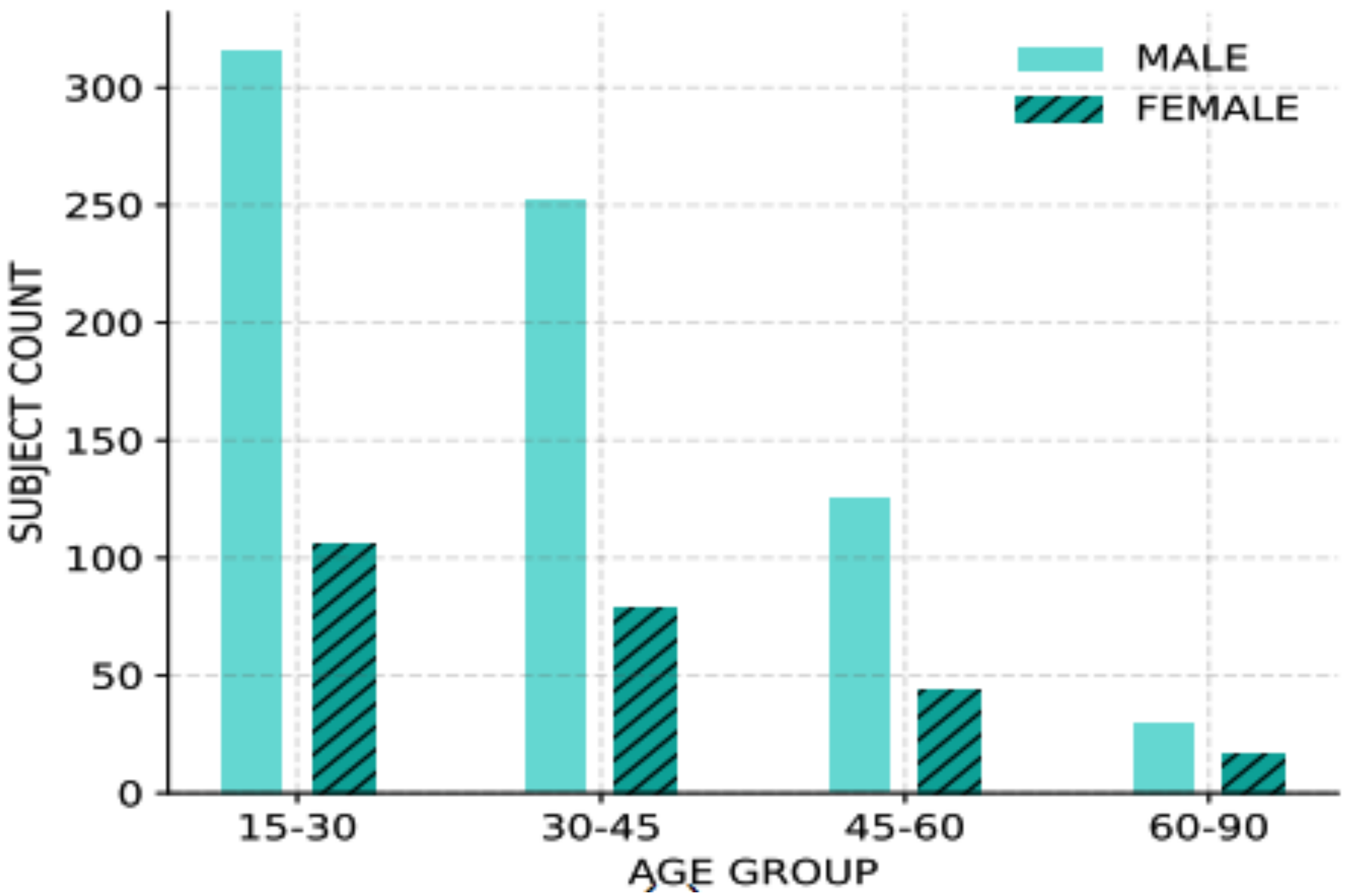
COVID subject distribution



- Asymp (COVID-19 positive without symptoms)
- Symp(COVID-19 positive with symptoms)

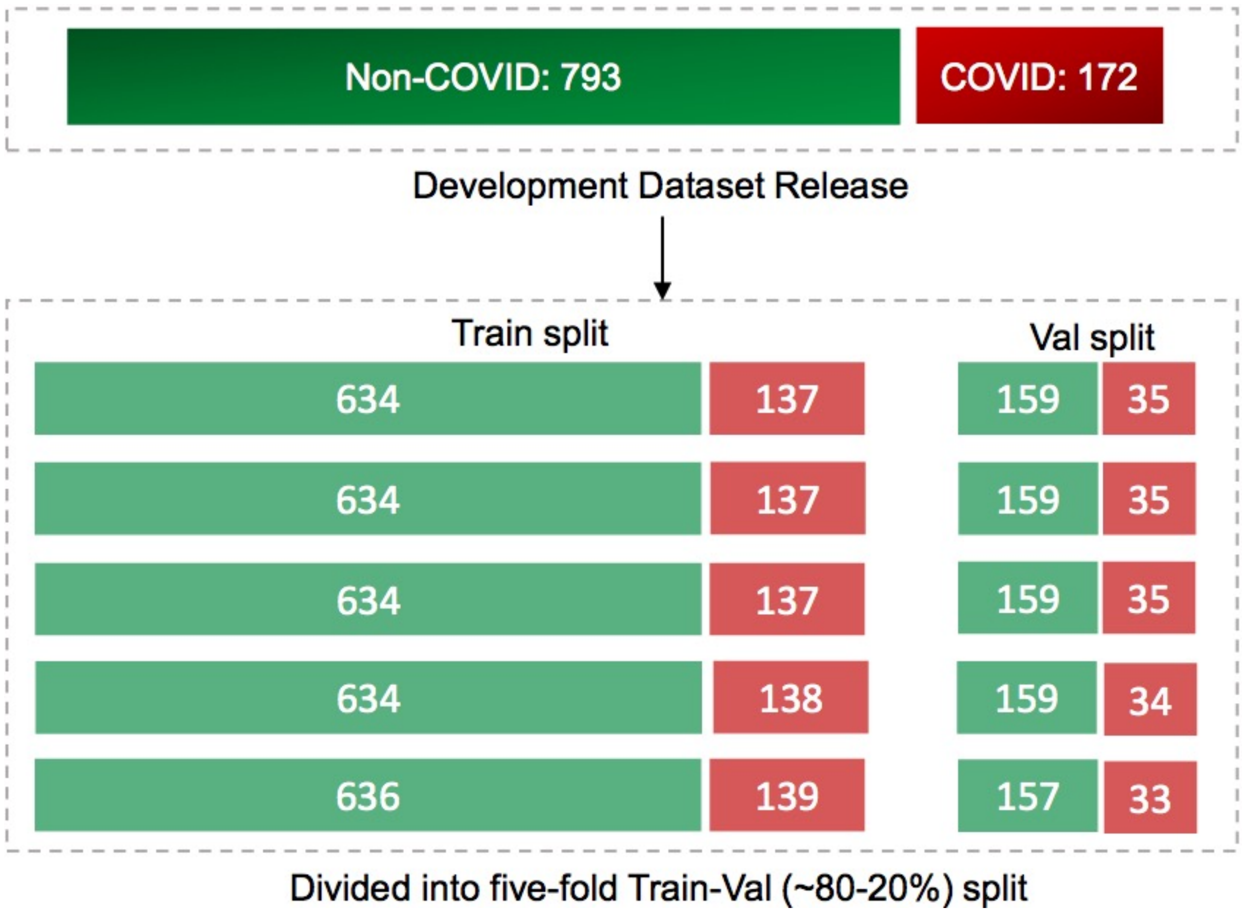
Dataset Description

Gender and age distribution



Dataset Description

- 5 fold cross-validation
- Tuned based on average validation performance
- Evaluation



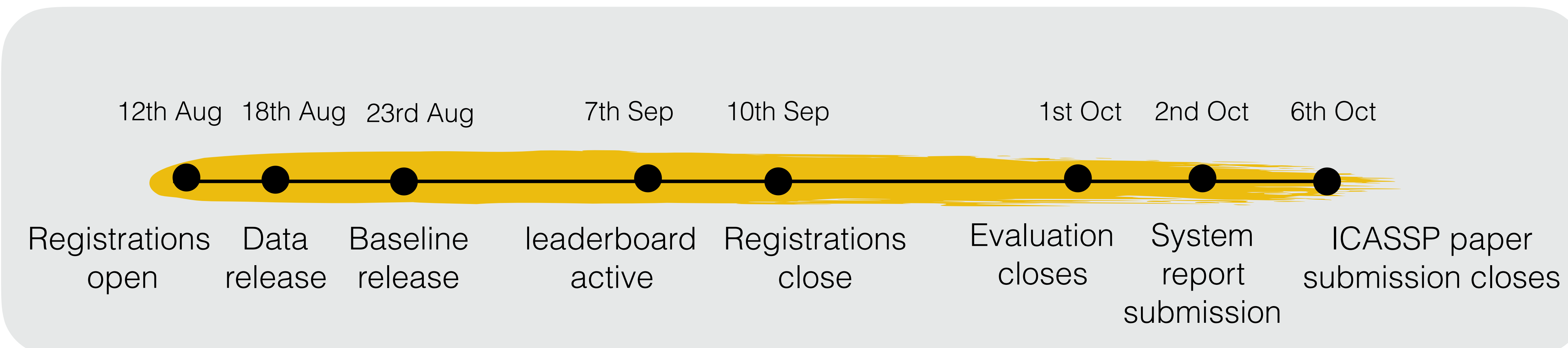
Track Details

4 tracks:

- Track 1, 2 and 3 on breathing, cough and speech sounds

- Track 4 fusion of the first 3 modalities

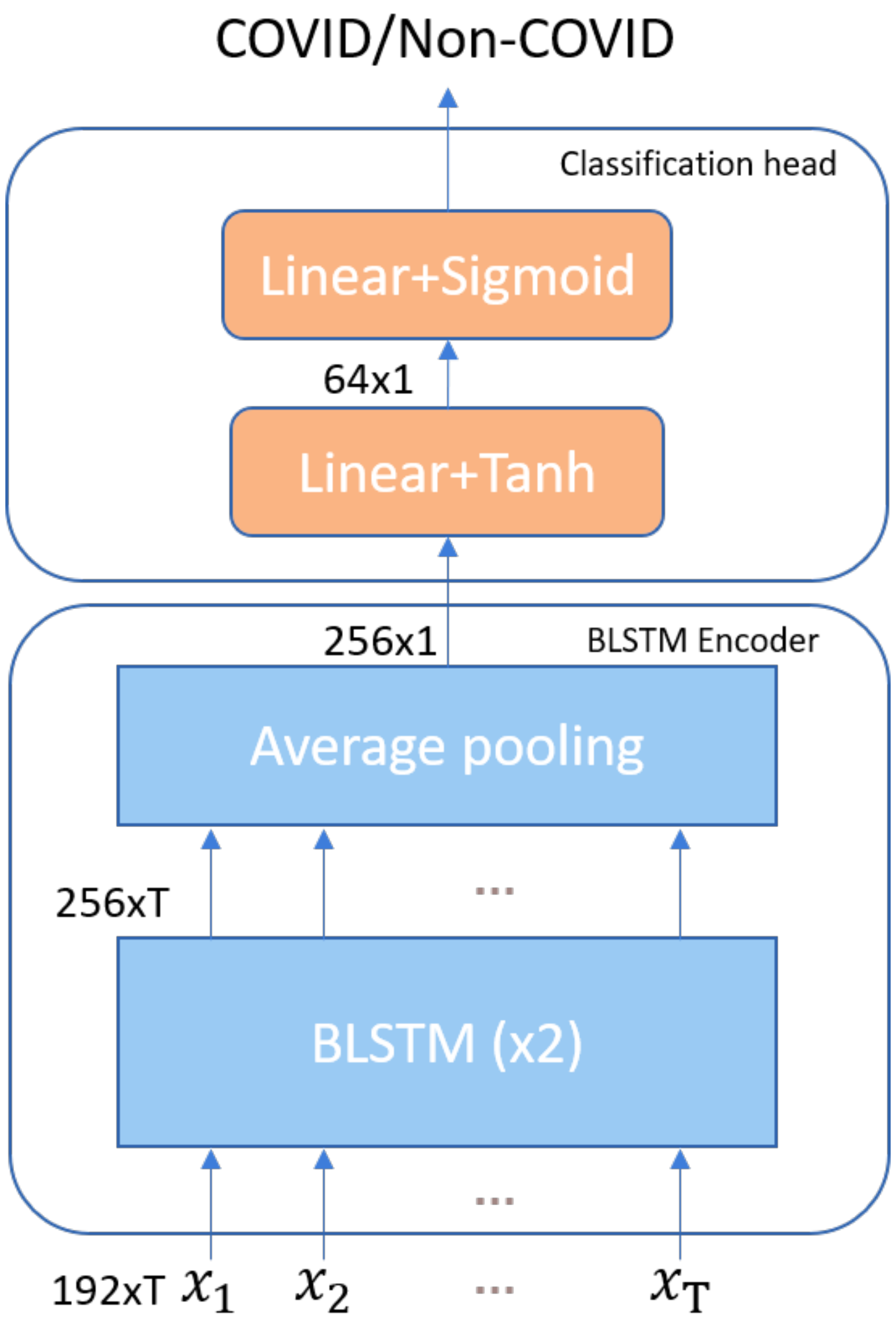
Timeline


12th Aug
18th Aug
23rd Aug
7th Sep
10th Sep
1st Oct
2nd Oct
6th Oct
Registrations open
Data release
Baseline release
leaderboard active
Registrations close
Evaluation closes
System report submission
ICASSP paper submission closes

Baseline System

- Bi-LSTM based baseline classifier
- *log mel-spectrogram* features
- Baseline codes are made open source to encourage further work on it.

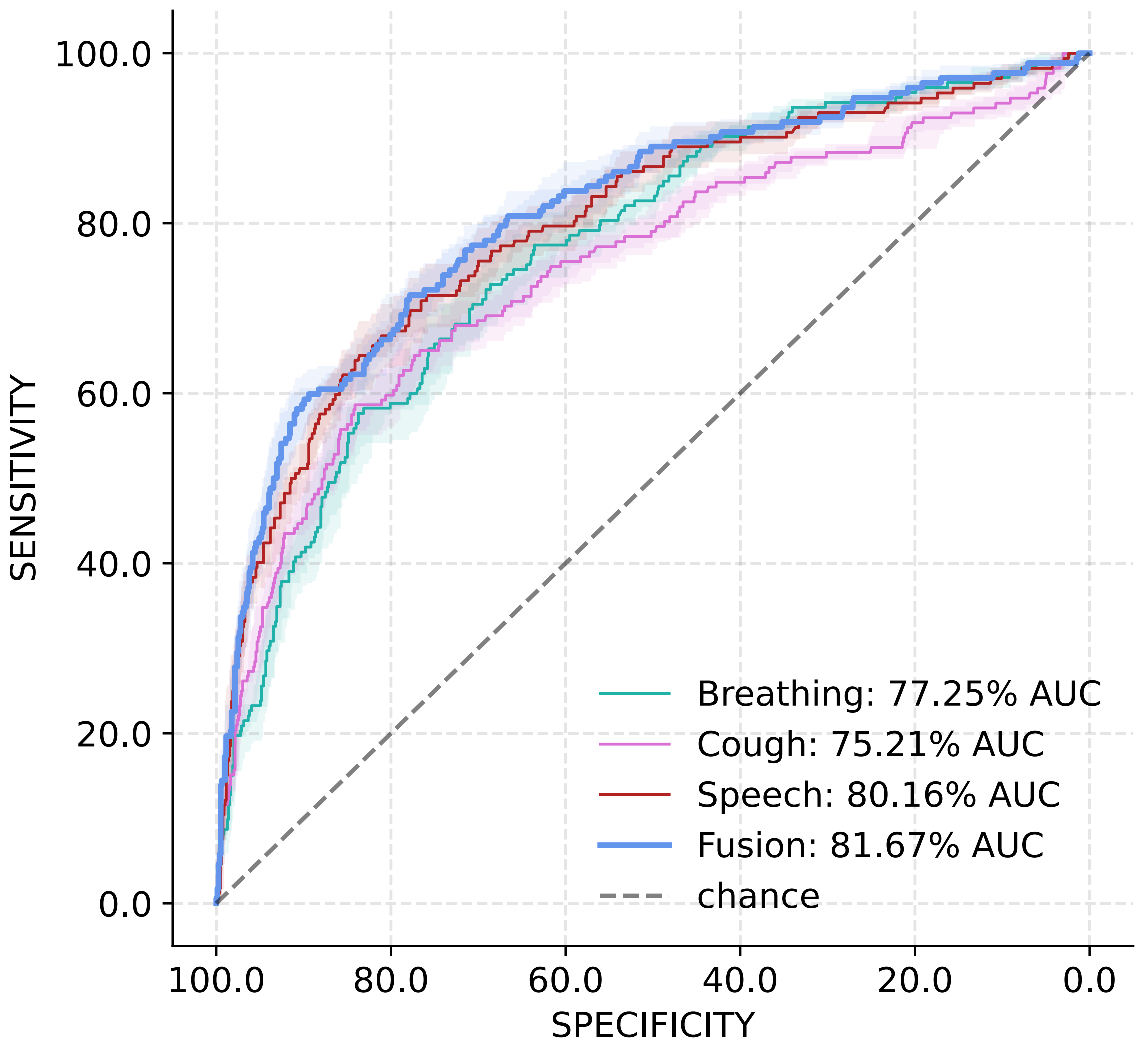
Baseline System



- Two bi-directional long-short term memory (BiLSTM) layers and a fully connected layer
- Trained on segments of utterances
- Inference based on average probability scores over segments

Baseline Results

- Receiver operating characteristics (ROC) curve
- AUC-ROC

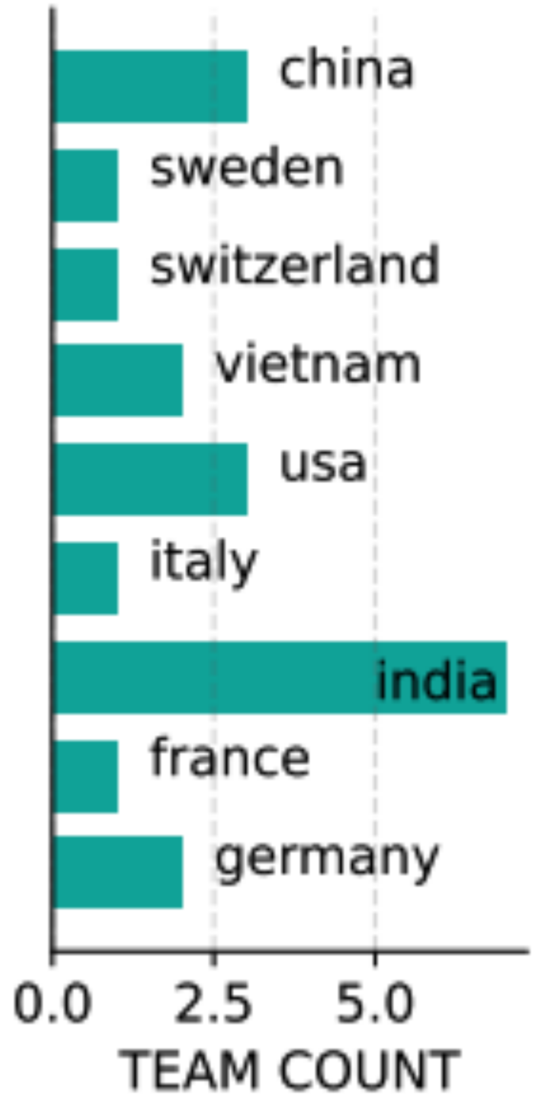


Validation	AUC-ROC Performance (in %)			
	Breathing	**Cough**	**Speech**	**Fusion**
fold-0	74.8	71.8	75.4	77.3
fold-1	73.9	78.2	87.2	82.4
fold-2	74.3	77.2	80.6	81.8
fold-3	80.0	74.0	78.2	80.3
fold-4	83.2	74.9	79.5	86.6
Avg. Validation	**77.3**	**75.2**	**80.2**	**81.7**
Test	**84.5**	**74.9**	**84.3**	**84.7**

Table 1. Baseline system performance on the validation folds in the development dataset, and the blind test dataset.

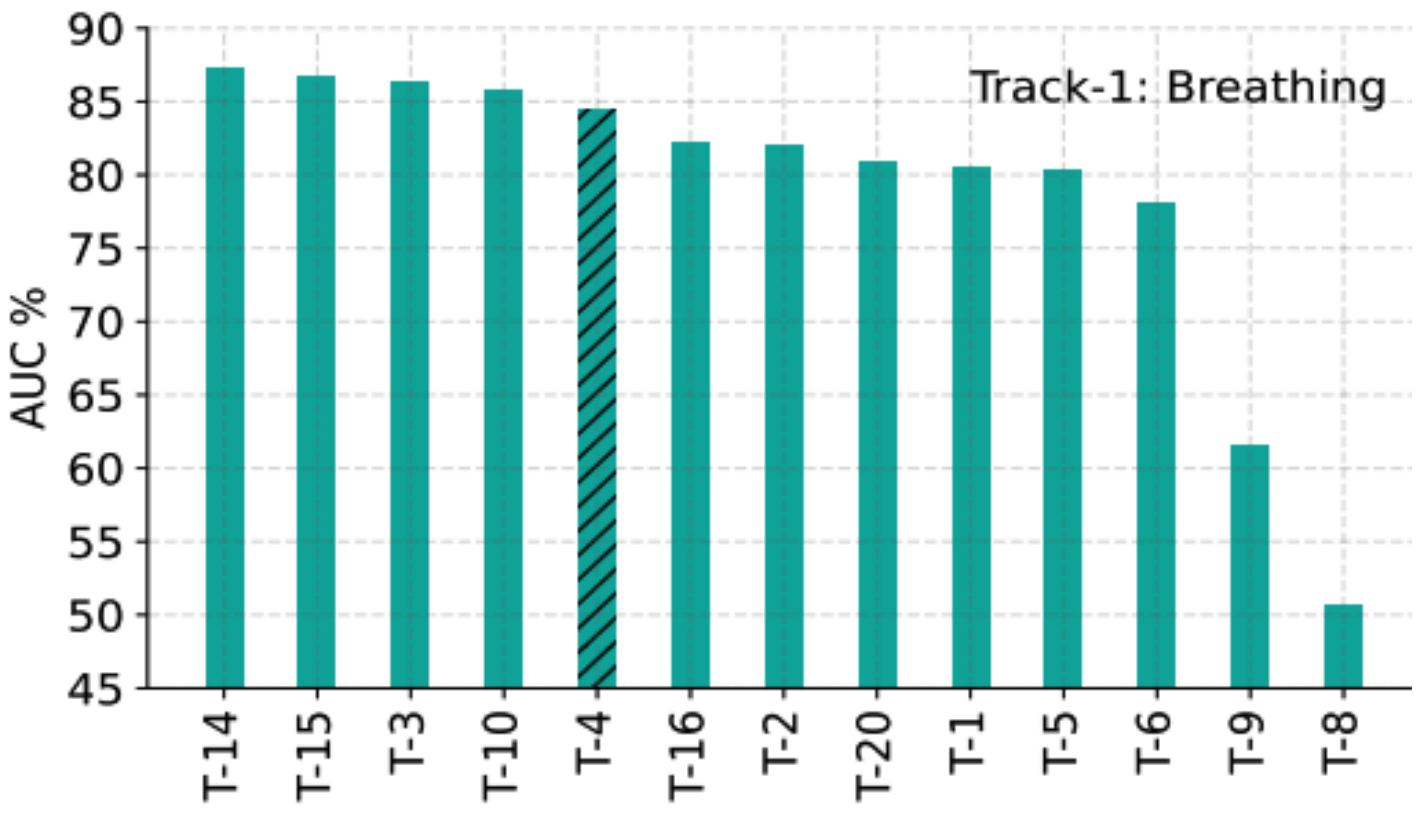
Challenge Results

Distribution based on country of origin



Challenge Results

Test AUC (under the ROC) % of different teams on leaderboard



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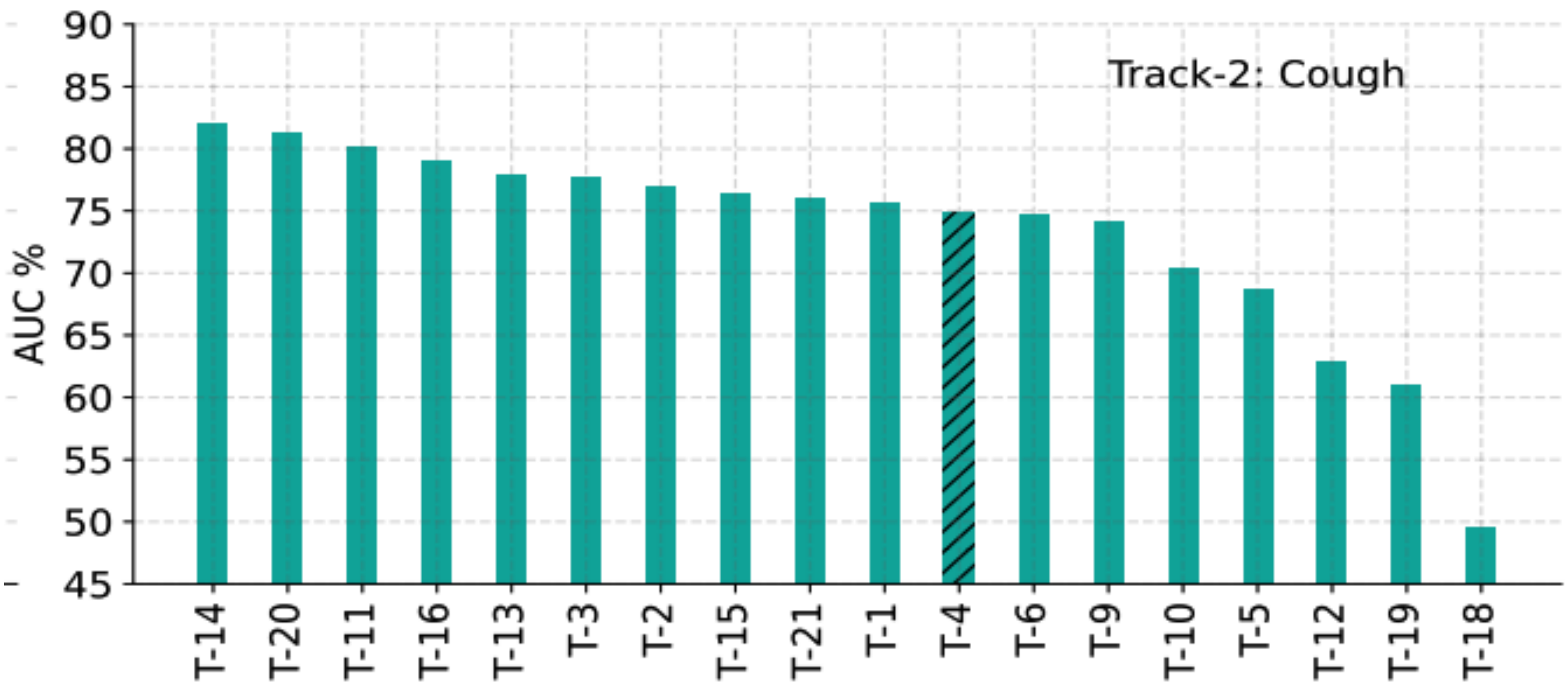

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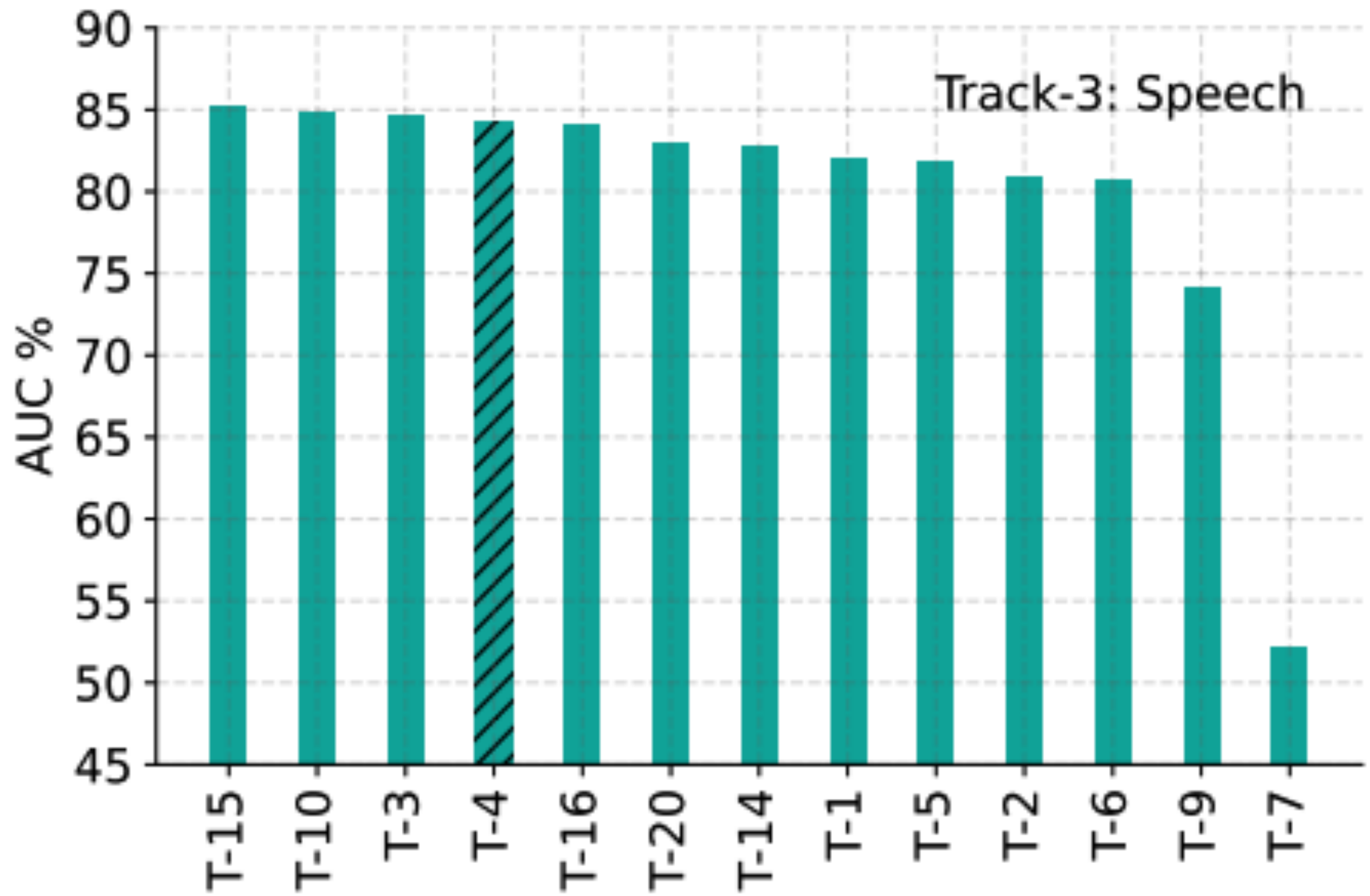

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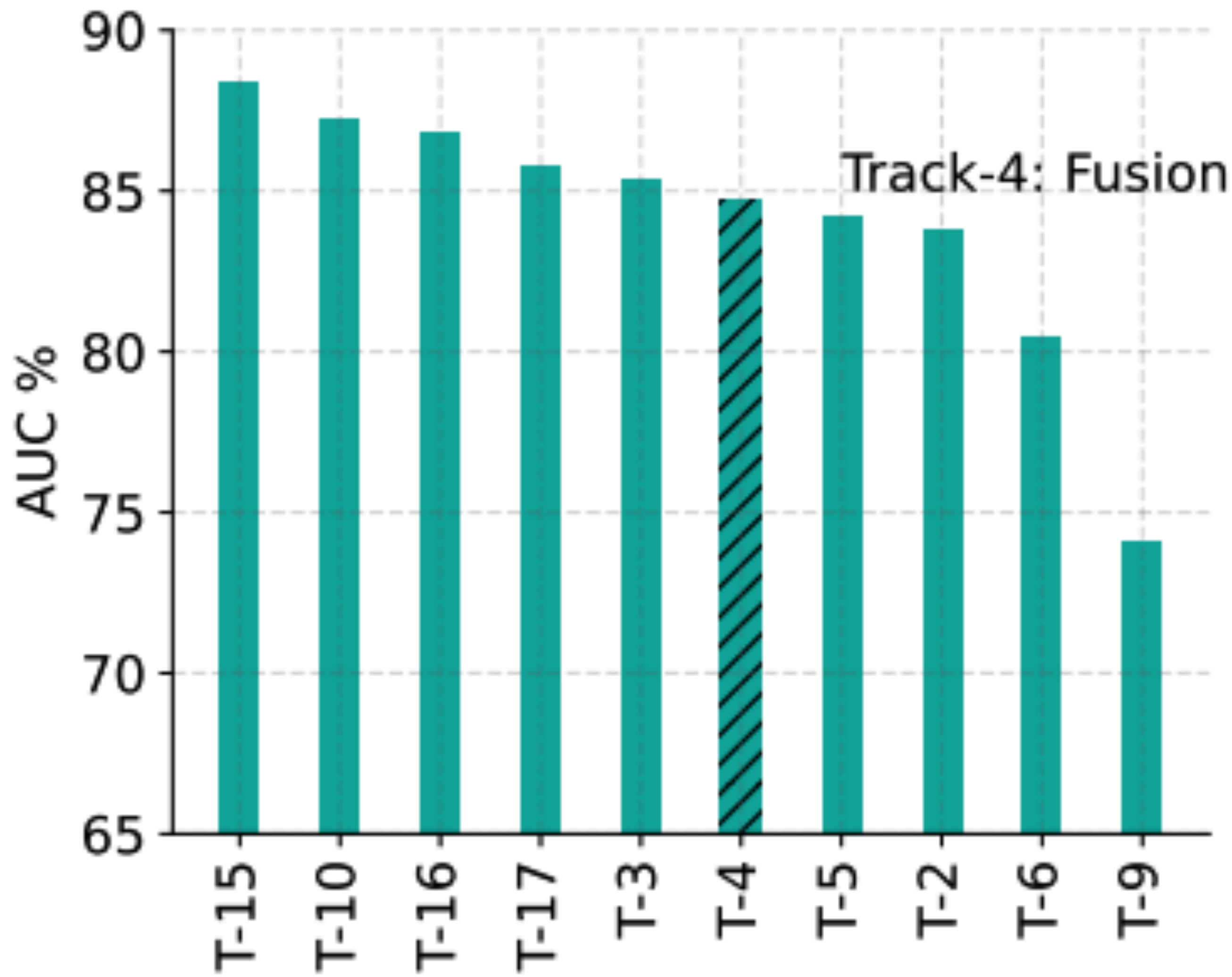
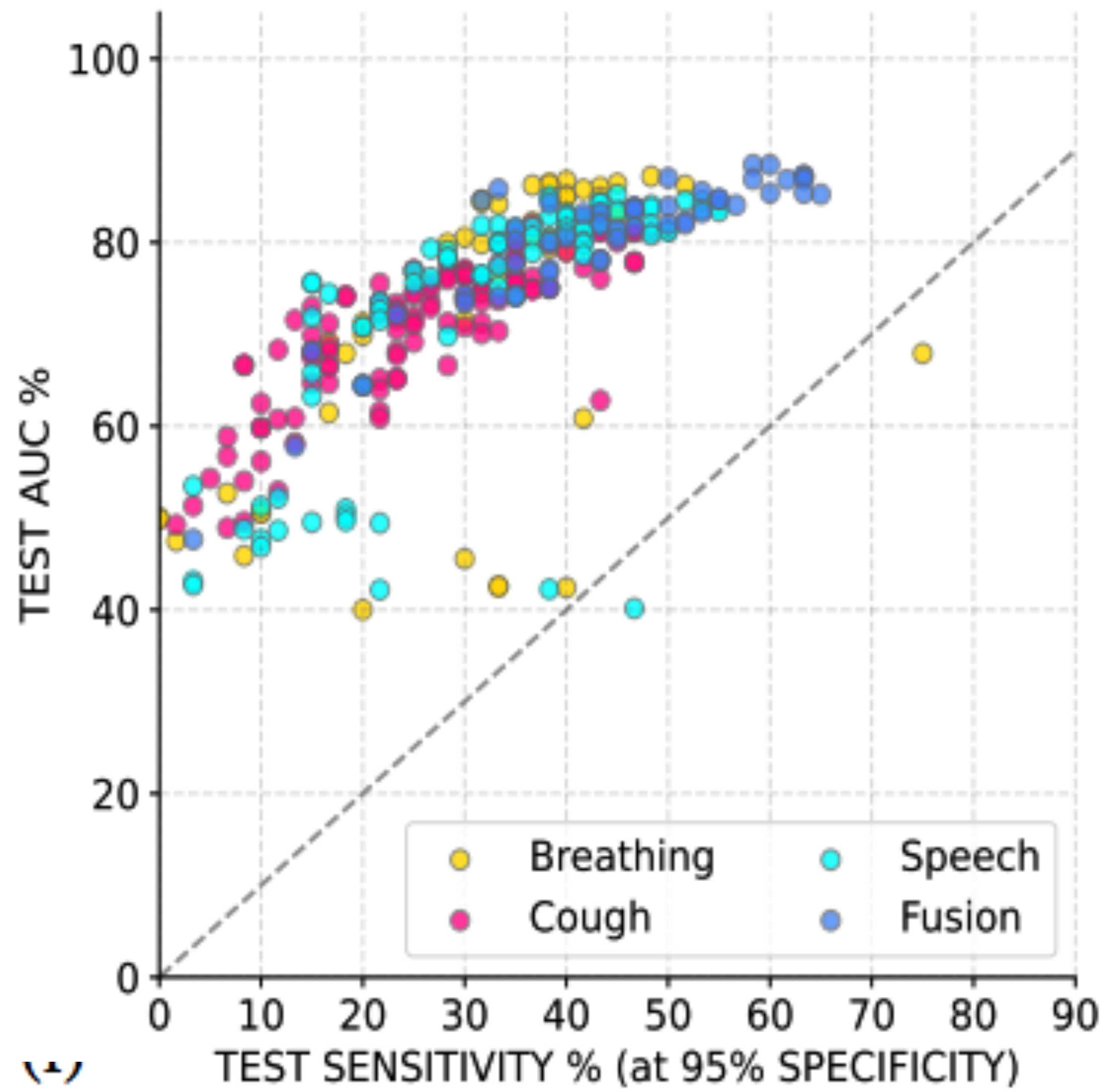


Challenge Results

Blind Test AUC versus Sensitivity



Conclusions

- Few teams surpassed the baseline
- Breathing and speech signals showed effectiveness
- Effectiveness of fusion strategy

Q&A