The Second DiCOVA Challenge
Dataset and performance analysis for Diagnosis of COVID-19 using acoustics

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What is the Second DiCOVA Challenge?

Launched as a part of the DiCOVA series of challenge to encourage design of "Diagnostics for COVID-19 using Acoustics" by analyzing an audio dataset collected from COVID and Non-COVID individuals.

- First Challenge was held during Feb-Mar 2021 and findings were presented as a Special Session in INTERSPEECH 2021. It targeted COVID-19 detection from cough sounds, only. (Details here: [2])
- Second Challenge was held during Aug-Sept 2021. The findings are presented here.
  - Breathing sounds (Track-1)
  - Cough sounds (Track-2)
  - Speech sounds (Track-3)
  - Fusing the results from above three sound categories (Track-4)
- Evaluation based on area under the ROC curve (AUC) for COVID vs Non-COVID classification

Dataset Description

- **Development Dataset:** Data from 965 Non-COVID and 172 COVID human subjects

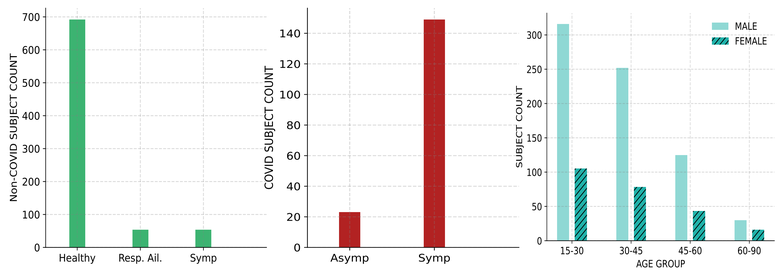


Figure 1: Development Dataset breakup.

- **Test Dataset:** Data from 471 Non-COVID, and 71 COVID human subjects
- About Data:
  - Every subject contributes 3 audio files: breathing, cough, and speech sound recordings
  - Class Imbalance: Challenging, and reflects the usual prevalence of COVID in public testing booths
  - Collected via crowdsourcing via devices connected from internet (`https://coswara.iisc.ac.in/` [1])
  - From around the world, primarily India.

Developed Systems

- **Baseline System (Team T-4)**: A BiLSTM model, takes input as mel-spectrogram features, and outputs segment level COVID probability scores. These scores are averaged across segments within the audio file to obtain a file level COVID probability score. The code script were released to the participants.
- **Participating teams**: Few teams used the baseline model with novel initialisation, and experimented with new features such as wave2vec2.0, MFCCs, RASTA-PLP. Other teams used models like random forests, NNs and ensemble models.

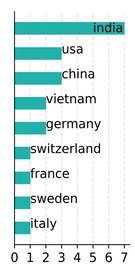
Acknowledgment

The funding support from the Department of Science and Technology, India helped in collecting the dataset used in the challenge. We would like to also thank all the participating teams.

Key Findings

COVID-19 can be detected just from the audio signals in the released dataset.

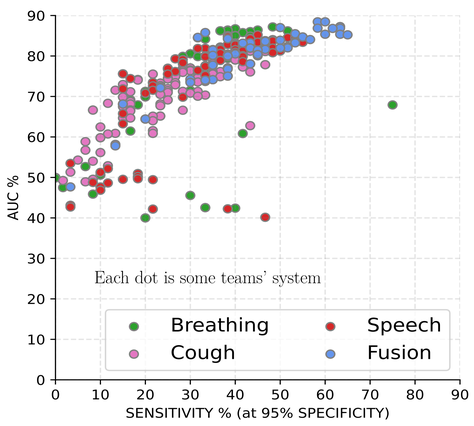
- Multiple teams outperformed the strong baseline system performance
- Detection performance was better than chance across breathing, cough and speech recordings
- Strengthens the hypothesis on presence of COVID-19 acoustic signature in respiratory sound signals
- Encouragement for developing acoustic based point-of-care testing tools



12 Aug' 21 — Registration Opens
18 Aug' 21 — Dev. Data Release
23 Aug' 21 — Baseline System Release
07 Sep' 21 — Test Data Release, Evaluation Begins
01 Oct' 21 — Evaluation Closes

Total Days: 51
Teams Registered: 63
Teams on Leaderboard: 21

Results



References

[1] Neeraj Sharma et al. "Coswara – A Database of Breathing, Cough, and Voice Sounds for COVID-19 Diagnosis". In: *Proc. Interspeech*. 2020, pp. 4811–4815.

[2] Neeraj Kumar Sharma et al. "Towards sound based testing of COVID-19—Summary of the first Diagnostics of COVID-19 using Acoustics (DiCOVA) Challenge". In: *Computer Speech Language* 73 (2022), p. 101320. ISSN: 0885-2308.

Results

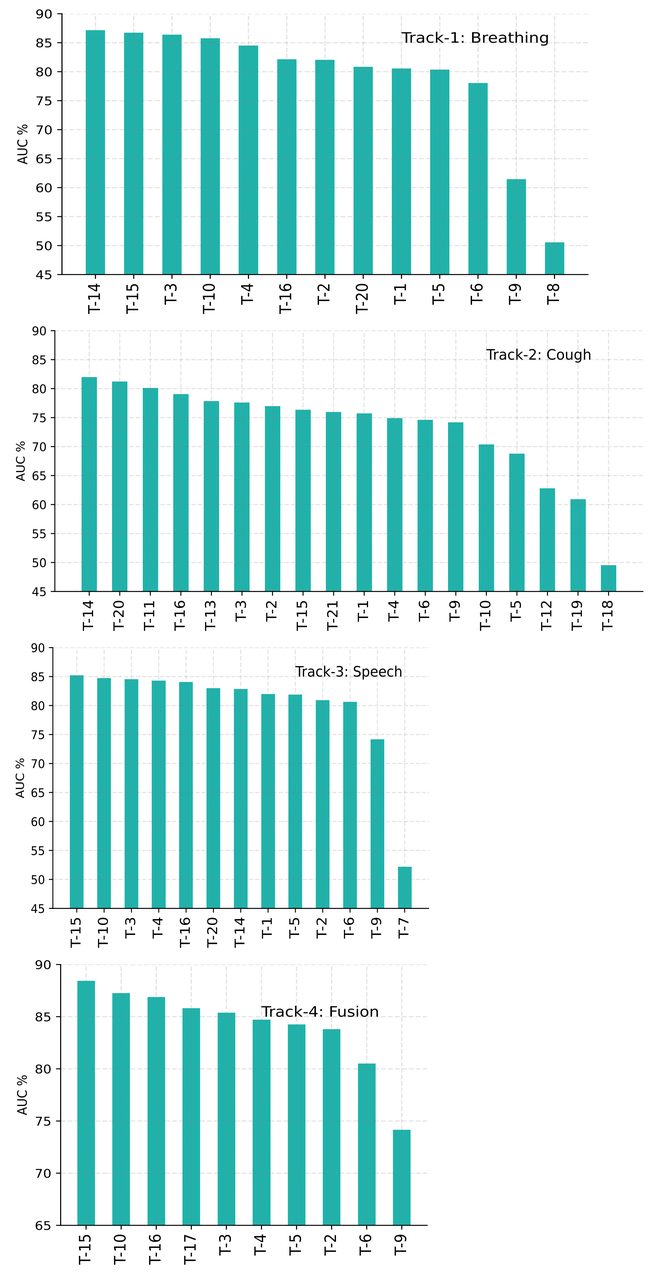


Figure 2: The AUCs across teams on the Test Dataset for COVID/Non-COVID detection. Here, teams are indicated by T-n where n is index after sorting the 21 teams by name. T-4 is the baseline system.