



# Challenge Task | Loop Q PRIZE 2022

Thank you for participating in the Challenge! Let's get started!

This year, the goal of the Loop Q PRIZE is to apply AI solutions to 2 globally significant problems. You will be asked to solve **one of the two challenges** described in the following sections.

The first is a **Speech Emotion Recognition** problem.

Emotion plays an important role in human interactions. It helps us understand the feelings of others and conveys information about the mental state of an individual. Expressing and/or understanding feelings can be difficult for some people. What if we could understand the emotion of people only by listening to the tone of their voice? What if we could improve medical treatments/psychological follow ups with a simple emotion recognition based on the voice? This is the problem that will be solved in the first challenge.

The second one is a **Crop Yield Prediction** problem.

Climate change has both direct and indirect effects on agricultural productivity, including changing rainfall patterns, droughts, flooding, and the geographical redistribution of pests and diseases (Food and Agricultural Organization of United Nations, 2020). From these facts, crop yield prediction is one of the most challenging problems in precision agriculture. What will be the crop production this year? Will we have shortages or are we expecting an over production? Those are the questions that we will answer in the second challenge.

Are you ready? Here we go!



## Evaluation Criteria of the Challenge Participants' Deliverables

The main evaluation criteria for the Challenge deliverables are:

<b>INNOVATION:</b>	The potential scientific contribution to the field: Is the proposed solution to the Machine Learning problem innovative?
<b>SOLUTION CORRECTNESS:</b>	The Judging Panel will verify that the proposed solution actually provides a good answer to the problem in scope.
<b>PREDICTION PERFORMANCE:</b>	The Judging Panel will evaluate the performance of the proposed model.
<b>SOLUTION COMPLETENESS:</b>	For each case, you will be asked to discuss the limits of the dataset provided and your solution.
<b>SCALABILITY POTENTIAL:</b>	How effective the proposed solution is from the standpoint of generalizability. Will the approach scale efficiently and cost-effectively? Is it replicable in other contexts and circumstances? Is the code easily understandable and well documented?

## Challenge Case Descriptions

To enable everyone to participate, we have selected the following two cases:

- Case A : Emotion Detection from speech
- Case B : Crop Yield Prediction from structured data

You shall address ONE of the two cases. **Case A has a higher complexity and therefore will have a higher maximum score.**



## Challenge A : Emotion Detection from speeches

### Description of the Problem to Solve (Challenge A)



Audio file

You will be asked to detect the emotion expressed by a person from an audio file, and without using a speech-to-text module. The 7 emotions possible as labels are: angry, disgust, fear, happy, sadness, surprise and neutral.

You will be provided with a training set where each audio record is assigned an emotion. You will also be provided with a testing set and your task is to assign an emotion to each record. Additionally, you will be asked to discuss the possible limits and bias of the dataset provided to you, and your solution.



## Dataset Description (Challenge A)

The data is available here: [click to access](#) (challengeA\_data.zip)

The training and testing sets consist of audio files that were merged from 4 distinct data sources (TESS<sup>1</sup>, SAVEE<sup>2</sup>, RAVDESS<sup>3</sup>, CREMA<sup>4</sup>). The training set contains 10111 labeled audio files, and the testing set contains only the audio files and your task is to label each file.

In more details:

The file **2022challengeA\_train.csv** contains two columns:

- *file\_id*: contains a string identifying the sound file
- *emotion*: contains a string representing the emotion of the person in the speech.
- *origin*: contains a string representing the origin dataset of the speeches.

The folder **train** contains all the audio files that are part of the training set.

The file **2022challengeA\_test.csv** contains only the *file\_id* and *origin* columns and your task is to predict the emotion in the *predicted\_emotion* column, categorizing each audio file into one of the seven emotions.

The folder **test** contains all the audio files that are part of the testing set.

## Objectives to be Achieved by Participants

These are the objectives that should be achieved:

- Create an explanatory analysis of the dataset

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<sup>1</sup> TESS: Toronto Emotional Speech Set. 2 female speakers (young and old), 2800 audio files, random words were spoken in 7 different emotions.

<sup>2</sup> SAVEE: Surrey Audio-Visual Expressed Emotion. 4 male speakers, 480 audio files, same sentences were spoken in 7 different emotions

<sup>3</sup> RAVDESS: 2452 audio files, with 12 male speakers and 12 Female speakers, the lexical features (vocabulary) of the utterances are kept constant by speaking only 2 statements of equal lengths in 8 different emotions by all speakers.

<sup>4</sup> CREMA: Crowd-Sourced Emotional Multimodal Actors Dataset. 7442 audio files, 91 different speakers (48 male and 43 female between the ages of 20 and 74) of different races and ethnicities, different statements are spoken in 6 different emotions and 4 emotional levels (low, mid, high and unspecified).



- Train and Compare at least 5 different models (open-source or written-from-scratch models are accepted)
- Select the best model to predict the emotion based on speech
- Discuss the possible bias and limits of the dataset and the model
- (BONUS): Doing a decomposition of the sound signal, explain what triggers a certain emotion and the differences between the emotions.

You should output in the *predicted\_emotion* column the emotion that your model outputs for each of the files in the test set. The performance metric that will be used for the evaluation is the **F1-Score**.

Because this task is easy for humans to do, we reserve the right to disqualify solutions that may involve any manual labeling of the test set. Moreover, your selected best model will be tested on a separate, held-out set of observations.



## Challenge B: Crop Yield Prediction

We would like to specify one more time that the maximum score can be reached with the challenge A, but choosing this challenge does not mean being prevented from winning the competition.

### Description of the Problem to Solve (Challenge B)

You will be asked to predict the crop yield, according to different parameters (geographical area, crop type, amount of rainfall, use of pesticide and average temperature). Additionally, you will be asked to discuss the possible limits and bias of the dataset provided to you, and your solution.

### Dataset Description (Challenge B)

**The data is available here:** [click to access](#) (challengeB\_data.zip)

The data made available to participants consists of a dataset with 6 features that can be used to predict the crop YIELD.

1. *country*: geographical area or country
2. *crop\_item*
3. *year*
4. *average\_rain\_fall\_mm\_per\_year*: average fall of rain in millimeters during the year
5. *pesticides\_tonnes*: use of pesticides in tonnes during the year
6. *avg\_temp*: average temperature during the year
7. *YIELD*: yield of the specific crop in hectograms per hectare

2022challengeB\_train.csv contains the training data with all 6 parameters and *YIELD*.

2022challengeB\_test.csv contains only the 6 parameters and your task is to predict the yield in the *predicted\_YIELD* column.

### Objectives to be Achieved for the Challenge B

These are the objectives that should be achieved:

- Create an explanatory analysis of the dataset



- Train and Compare at least 5 different models (open-source or written-from-scratch models are accepted)
- Select the best model to predict the crop yield
- Discuss the possible bias and limits of the dataset and the model

From the 2022challengeB\_test.csv file, you should output in the *predicted\_YIELD* column, the predicted yield by your best model. The performance metric that will be used is the **RMSE (Root-Mean Square Error)**. Moreover, your selected best model will be tested on a separate, held-out set of observations.



## Deliverables for both Challenge A and B

### Methodologies and Techniques that can be Used

Participants are free to decide the Machine Learning or Deep Learning design and implementation approach, methodology, and development techniques that best solve the problem described above. A comparison of at least 5 models is required.

### Deliverables in Scope for the Challenge, to be Provided by Participants

Participants will provide the following deliverables in English [via this web form](#) as a prerequisite to be evaluated for the competition:

ID	Deliverable Name	Deliverable Description	Format
1	Overview of the solution	A structured document in which the following items are described: 1) Overview of the solution (data flow, key components, models used) 2) Strengths of the solution 3) Limits and possible bias of the dataset/solution Exhibit with mention to authors and paper names of any articles used as an inspiration	PDF or PPT
2	Code	Folder containing the best model and well documented scripts* that implements the solution to the chosen challenge.	Archive in ZIP or TGZ format





3	Test Answers	A CSV file of the final test answers, with values for the missing column to predict determined by your solution.	CSV file
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(\*) Programming language(s) may be chosen by Participants

File names format:

Last Name, First Name\_DeliverableName

E.g.:

Smith,Chris\_Overview.ppt

Smith,Chris\_Code.zip

Smith,Chris\_Answers.csv

Submit the deliverables to the following address: [loopqteam@loop.ai](mailto:loopqteam@loop.ai)

## Challenge Task Deadline

Participants are requested to submit the deliverables in scope **by 11:59 p.m. CET on June 14, 2022.**

## Code of Conduct

All Participants must agree to abide by the following code of conduct:

- Every Participant will register for only one account.
- The deliverables provided throughout the Loop Q PRIZE contest will be the sole work of the submitting Participant.
- Deliverable solutions will not be made available to anyone else
- Participants will not engage in any activities that will dishonestly improve their results or hurt the results of other Participants.
- Participants will not share content that:

[www.loopqprize.ai](http://www.loopqprize.ai) | [#loopQprize](https://twitter.com/loopQprize)



- Contains illegal content or promotes illegal activities with the intent to commit such activities.
- Contains credible threats or organize acts of real-world violence. We don't allow content that creates a genuine risk of physical injury or property damage, credibly threatens people or public safety, or organizes or encourages harm.
- Violates intellectual property, privacy, or other rights. Do not share content that you do not have the right to share, claim content that you did not create as your own, or otherwise infringe or misappropriate someone else's intellectual property or other rights. Always attribute materials used or quoted by you to the original copyright owner.
- Spam others. Do not share irrelevant or inappropriate advertising, promotional, or solicitation content.
- Violates local, state, national or international law, or breaches any of your contractual obligations or fiduciary duties.
- Uses our Services to distribute malware.
- Encourages or helps anyone do any of the things on this list.

Good luck!

The Loop Q PRIZE Team

*PS - If you have any questions, issues, or concerns, please refer to the FAQ section of the Loop Q PRIZE Website. You may also contact us at <https://www.loopqprize.ai/contact>*