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**REAL-TIME RECOGNITION OF AFFECTIVE  
RESPONSES TO CLIMATE-CHANGE IMAGES: A  
DEEP-LEARNING MODEL A collaboration between  
the CREx and LPL engineer Gilles Pouchoulin (IR)**

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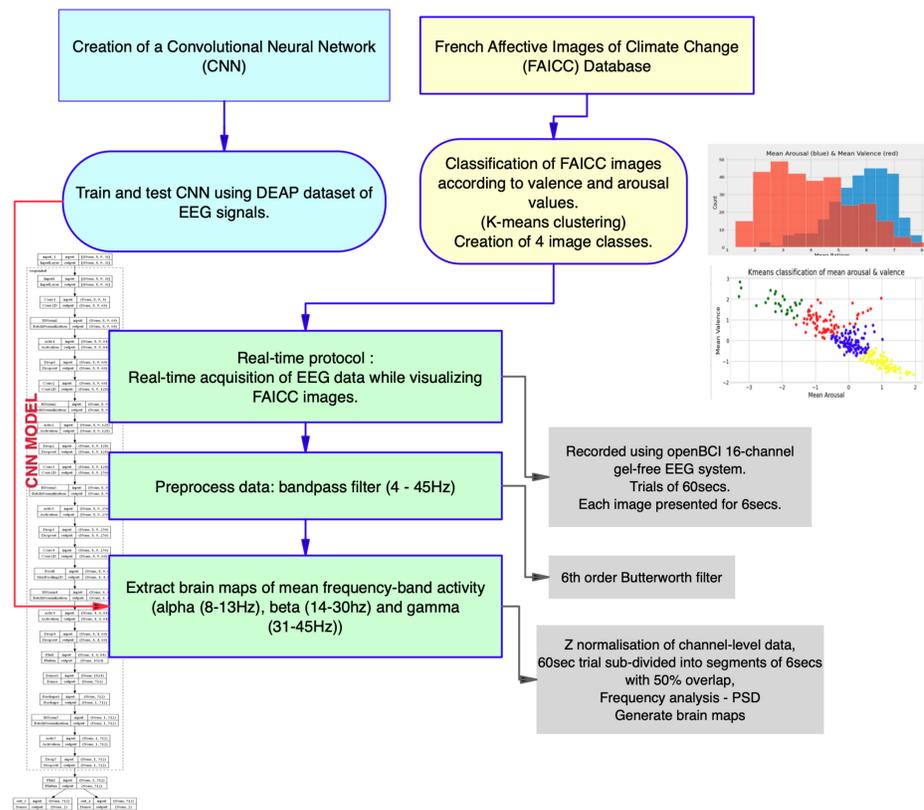
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## BACKGROUND

The urgency of the climate crisis is increasingly acknowledged at both the government and individual levels. But, this acknowledgement does not necessarily lead to positive and effective action. So, the question of how to incite people to act is an increasingly crucial one. Increasingly, research on communication of Climate Change (CC) is addressing the cognitive, affective and behavioral effects of images and databases of images related to CC in which images have been rated in terms of such measures as emotional valence and arousal have emerged. Such image databases can form a precious resource to test in an objective manner the effect of images and their power to encourage positive action.

## PROJECT OVERVIEW



## FAICC DATASET

A database of 301 images of CC rated, by non-experts. Images were rated on a 9-point Likert scale i.e. **Arousal scale**: 1 ⇒ calm and 9 ⇒ excited. **Valence**: 1. ⇒ negative and 9. ⇒ positive. Kmeans clustering was applied to generate 4 image classes based on Arousal and Valence ratings.

## REFERENCES

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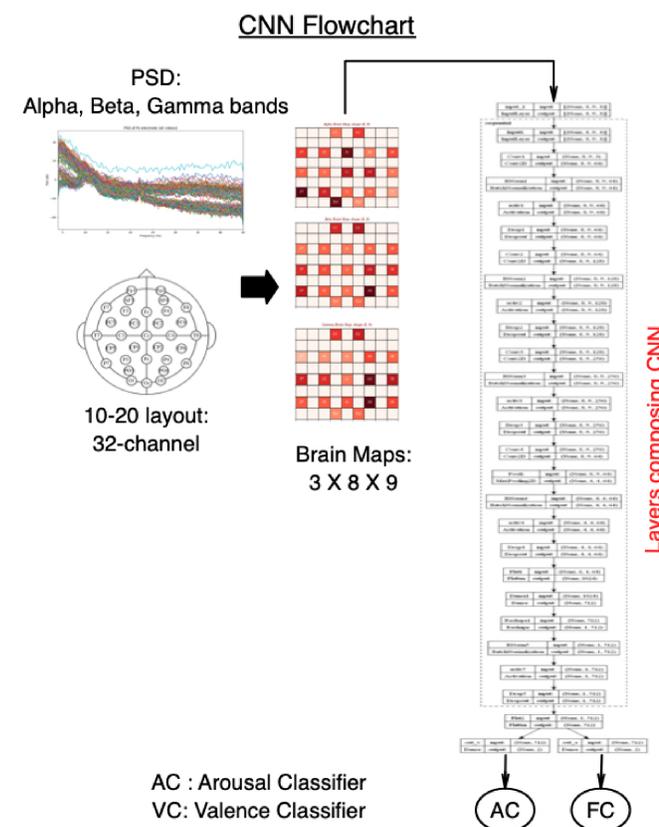
## AIMS

The aim of the present work is to test the images from the **French Affective Images of Climate Change (FAICC)** database (Ottavi, Roussel & Syssau, 2021) with a model of emotion recognition. Multichannel EEG is acquired while participants are presented with images from the FAICC and brain maps of the frequency-band features of the recorded EEG are presented to a Convolutional Neural Network (CNN). The CNN model was trained and tested on the **DEAP dataset** (Koelstra et al, 2012)

## DEAP DATASET

A multimodal (EEG, physiological signals) database destined for use in the analysis of human affective states. EEG and physiological measures of 32 participants recorded while they watched 40, 1-minute long excerpts of music videos. Video excerpts were rated for **Arousal, Emotional Valence, Dominance and Familiarity**. The ratings were given according to a 9-point Likert scale (as for the FAICC). Emotional states are divided into two levels of **Arousal and Valence**: High (H) and Low (L).

## CNN MODEL



To train and test the CNN model, EEG data from the DEAP model was used. Specifically, the model was trained on EEG features related to **Arousal and Valence**. CNN input is a 2-dimensional brain maps, generated as follows:

- Trial-level was decomposed into 6 second segments with 50% overlap to increase the quantity of data.
- The PSD was calculated for the frequency bands: **Alpha** (8-13Hz), **Beta** (14-30Hz) and **Gamma** (31-45Hz) and the mean power in each band was computed for each channel and participant.
- The PSD measures for each band were transformed into brain maps of dimension 8 X 9 yielding a spectral-spatial representation.
- Brain maps of dimension 3 X 8 X 9 were input into the CNN.