Automatic Detection of Mind Wandering Using Residual Network Generated Features

1. Background

- The definition of mind wandering used for this research is: "When mind wandering occurs, the executive components of attention appear to shift away from the primary task **[1]**, not due to external factors or the person interacting with the external environment".

- Growing interest in mind wandering to enable intelligent applications.
- This study is focused on automatic detection of mind wandering "In-the-wild", meaning in an uncontrolled environment with many varying factors.
- Other work is focused on specific features and is conducted in controlled environments **[2-5]**.

2. Research questions

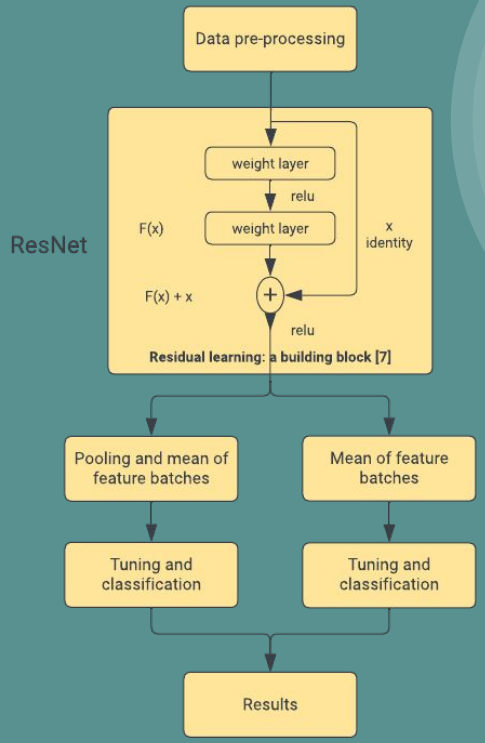
- **How to use the features generated by a residual network to detect mind wandering through supervised learning models?**
    - What is a good definition of mind wandering considering the context of the dataset?
    - Can the models using the generated features do better than a majority classifier?
    - What pre-processing operations can be applied to the input images to assist in generating more useful features?
    - Which of the models performs the best with classification?

3. Dataset and data annotation

- The dataset used for this study is called the Mementos dataset **[6]**. This dataset is comprised of 1995 individual responses from 297 unique participants reacting to 42 different segments of music videos. The task presented to them was to watch the videos.

- Data annotation was done in collaboration with a peer group. Only part of the dataset was annotated, and only 10% of those having at least one case of mind wandering. Some of the data was deemed inappropriate for the study.

4. Method and approach



5. Results

Classifier	Accuracy	F1-Score(macro)	MCC
Weighted SVM Pooling	0.8665	0.4642	-0.0397
Weighted SVM Non-Pooling	0.8150	0.4490	-0.0488
Majority	0.9887	0.4971	0

6. Conclusion

- The study shows that the extracted features could not be used to accurately detect mind wandering, based on the F1-Score (Macro) measure.
- The selected model did not perform better than a majority classifier.
- The Weighted SVM performed the best by a minor amount.

- The results can be attributed to data imbalance, low amount of data, indiscriminate features, lack of time and lack of dataset-tailored pre-processing operations.

- **Future work and improvements**
- More data collection, make use of methods like resampling and data augmentation to deal with data imbalance.
- Dataset-tailored pre-processing operations to maximize the information in the generated features.
- Experimentation with neural network training and transforming the data into a time series format to better represent the temporal information included in the data.

Arbër Demi
a.demi@student.tudelft.nl

Supervisors
Bernd Dudzik, Xucong Zhang, Hayley Hung

7. References

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