AUTOMATIC AND INTERPRETABLE DREAM REPORTS ANNOTATION WITH TEXT-GENERATION LARGE LANGUAGE MODEL

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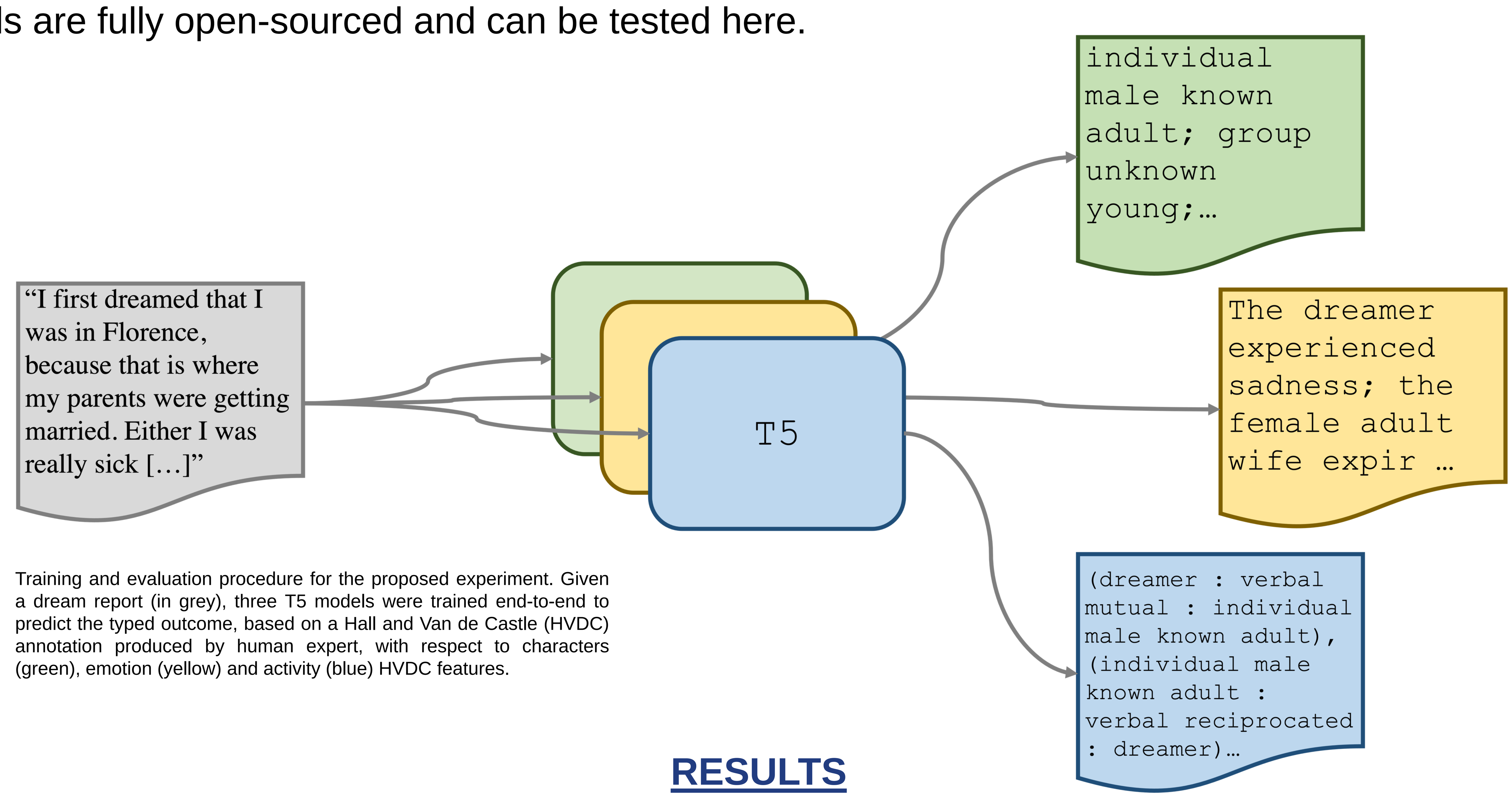
INTRODUCTION

Dream and sleep researchers have shown great interest in adopting **natural language processing (NLP)** tools **to automatically analyse and annotate dream reports** [1,3]. **However, current approaches are largely limited** to dictionary-based and distributional semantic models, unable to analyse the full context of a report, requiring considerable data pre-processing, and producing poorly grounded annotations. **These issues can be easily superseded by adopting pre-trained large language models (LLMs), like BERT and GPT**, capable of learning new tasks even with little-to-no supervision [1,2]. **In this work, I adopted** T5, **a text-to-text generation model, to** train a series of LLMs that produce fully-interpretable Hall and Van de Castle (HVCD) annotations.

METHOD

Approximately **1.8k reports annotated by experts according to the HVDC** system were **obtained from DreamBank**'s team. **Using 80% of the data, three T5 models were trained end-to-end** for up to 10 epochs – using training loss as a selection metric – to (re-)produce spelt-out HVDC annotations. Given a full report, LLMs were trained to (re-)produce three HVDC features, namely characters (e.g., (individual female known adult; individual male stranger adult;)), emotions (e.g., (sadness, apprehension)), and activity (e.g., (dreamer : towards verbal : individual male stranger adult)), as identified by expert annotators. **The remaining 20% of data was used to evaluate each model, via the Rouge-1 [0,1] metric**. Obtained models are fully open-sourced and can be tested here.



Training and evaluation procedure for the proposed experiment. Given a dream report (in grey), three T5 models were trained end-to-end to predict the typed outcome, based on a Hall and Van de Castle (HVDC) annotation produced by human expert, with respect to characters (green), emotion (yellow) and activity (blue) HVDC features.

RESULTS

All models easily learned to produce realistic and grammatically correct outputs. Out of the three tasks/features, the best performing one (in **Rouge-1 [0,1] scores**) was **emotions (.81)**, followed by **characters (.78)**, and **activity (.47)**. Interestingly, using the LLM trained on character as a base, instead of only using a pretrained T5, boosted the performance on the other two tasks.

CONCLUSIONS

In this work, I propose a solution to tune pre-trained state-of-the-art LLMs to produce robust and transparent HVDC features annotations. **LLMs represent a great opportunity for dream and sleep research, since they can require relatively little training to adapt to new tasks, need very little to-no data processing, and are widely available and open source, increasing replicability and usage**.

REFERENCES

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[3] Elce V, Handjaras G, Bernardi G. (2021) *The Language of Dreams: Application of Linguistics-Based Approaches for the Automated Analysis of Dream Experiences*. Clocks & Sleep; 3(3):495-514. https://doi.org/10.3390/clockssleep3030035

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