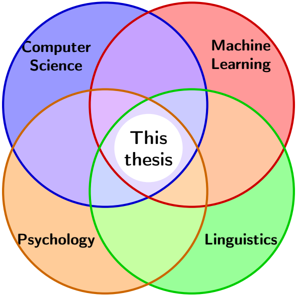
Natural language processing for subjectivity analysis in personal narratives

Gustave Cortal

Thesis director: Alain Finkel
Co-advisors: Patrick Paroubek and Lina Ye

Introduction

Context



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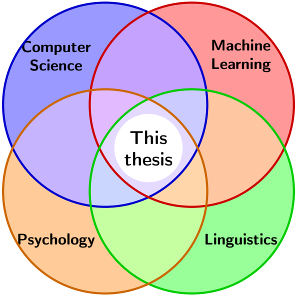

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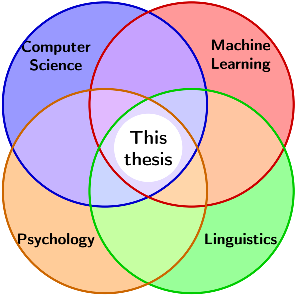

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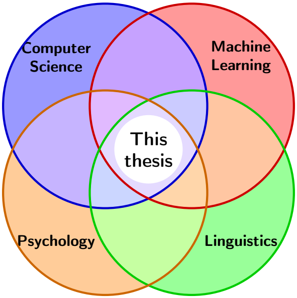

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- We study subjectivity (first-person perspective, meaning-making processes, and experiential content)
- We focus on personal narratives (emotional narratives, dream reports)

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- Cognitive science perspective on emotion analysis
- French corpus based on emotion components
- Emotion analysis in emotional and dream narratives
- Formalization of style in personal narratives

Contributions

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Open corpus and tools

Corpus:

French narratives based on emotion components

hf.co/gustavecortal

My research models are publicly hosted on Hugging Face and were trained using the Jean Zay supercomputer

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Corpus:

French narratives based on emotion components

Tools:

Language model for emotion and character prediction in dream narratives +400 downloads

French language models for emotion component prediction and discrete emotion prediction +1200 downloads

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Cognitive science perspective on emotion analysis

G. Cortal and C. Bonard. Improving Language Models for Emotion Analysis: Insights from Cognitive Science. *CMCL @ ACL 2024*.

Psychology and emotion annotation

Psychological theories	**In text, emotion is...**	**Example**
Basic emotions theory	a *category*	"I love philosophy." $\rightarrow$ `joy`

Darwin (1872), Tomkins (1962), Ekman (1999), and Plutchik (2001)
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Constructivist theories	a continuous value with an *affective* meaning	"His voice soothes me." → `valence` (4/5), `arousal` (1/5)
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Appraisal theory	a continuous value with a *cognitive* meaning	"I received a surprise gift." → `sudden` (4/5), `control` (0/5)
Arnold (1960) and Lazarus (1991) Troiano, Oberländer, and Klinger (2023)		

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	composed of *semantic roles*	"Louise (`experiencer`) was angry (`cue`) towards Paul (`target`), because he didn't inform her (`cause`)."

Campagnano, Conia, and Navigli (2022) and Klinger (2023)

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Similar to aspect-based sentiment analysis (W. Zhang, Li, et al., 2022): "The battery life is *amazing* (+), but its camera quality is *disappointing* (—)."

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  (Micheli, 2013b; Etienne, Battistelli, and Lecorvé, 2022)
- Benchmarks evaluate certain aspects of emotional understanding but do not consider its full complexity
  (Campagnano, Conia, and Navigli, 2022; W. Zhang, Deng, et al., 2023; Paech, 2024)

Linguistic and cognitive science theories

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→ Emotion expression modes vary in interpretive difficulty
(Nathalie Blanc, 2010; Creissen and N. Blanc, 2017; Foppolo and Mazzaggio, 2024)

→ There exist an annotation scheme for emotion expression modes
(Etienne, Battistelli, and Lecorvé, 2022; Dragos et al., 2022)

How to integrate psychological theories of emotion?

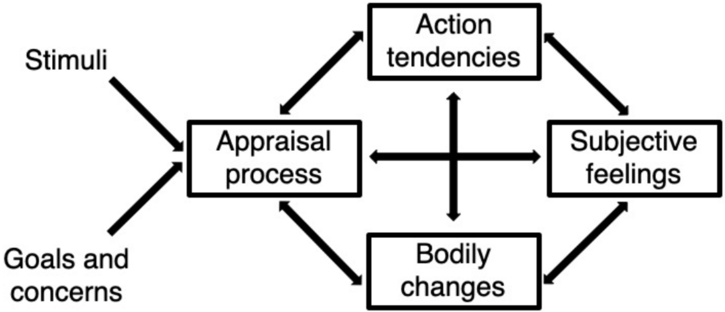

Figure: **The integrated framework for emotion theories** (Scherer, 2022b). Rectangles represents the components constituting an emotional episode, and arrows represent causation.

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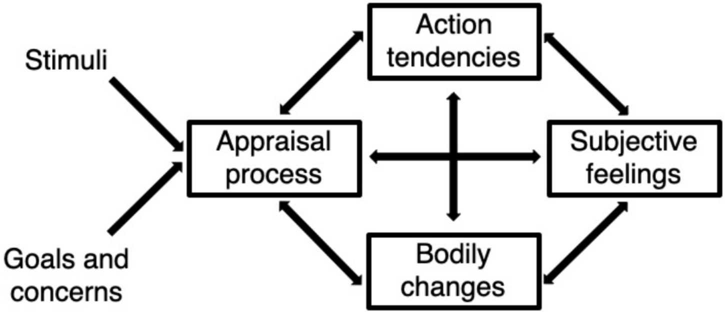

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→ We use this framework to construct a corpus based on components

French narratives based on emotion components

The corpus is available at hf.co/datasets/gustavecortal/FrenchEmotionalNarratives

G. Cortal, A. Finkel, P. Paroubek, L. Ye. Emotion Recognition based on Psychological Components in Guided Narratives for Emotion Regulation. *SIGHUM @ EACL 2023*.

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→ A new French corpus of emotional narratives structured by the authors according to their behaviors, thoughts, physical feelings, and reasons

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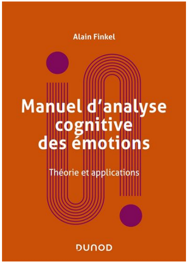

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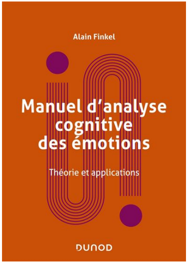

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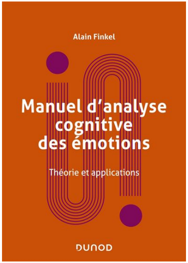
- uses emotion components to reorganize the narrative of experienced events
- helps individuals better regulate their emotions



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French narratives based on emotion components

Contribution: +1,000 narratives structured with emotion components by the writers themselves plus discrete emotion labels

Component	**Answer**
`Behavior`	I'm giving a lecture on a Friday morning at 8:30. A student goes out and comes back a few moments later with a coffee in his hand.
`Feeling`	My heart is beating fast, and I freeze, waiting to know how to act.
`Thinking`	I think this student is disrupting my class.
`Reason`	The student attacks my ability to be respected in class.

Chosen emotion: `anger` (possible choices: `anger`, `fear`, `joy`, `sadness`)

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→ A. Finkel has been collecting narratives since 2005 during emotion regulation sessions; I structured them to build a corpus for emotion classification

Language models for emotion analysis in emotional and dream narratives

Language models are available on hf.co/gustavecortal

G. Cortal, A. Finkel, P. Paroubek, L. Ye. Emotion Recognition based on Psychological Components in Guided Narratives for Emotion Regulation. *SIGHUM @ EACL 2023*

G. Cortal. Sequence-to-Sequence Language Models for Character and Emotion Detection in Dream Narratives. *LREC-COLING 2024*

Discrete emotion detection based on components

	Logistic Regression (tf-idf)			**CamemBERT**		
Component	Precision	Recall	F_1	Precision	Recall	F_1
All	71.2 (2.6)	69.1 (2.2)	67.8 (2.3)	**85.1**	**84.8**	**84.7**

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Without `feeling`	64.3 (1.9)	61.5 (1.2)	61.3 (2.2)	81.6	79.8	79.9
Without `thinking`	70.9 (1.8)	69.1 (2.0)	68.3 (2.2)	79.6	78.5	78.7
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→ Some components benefit from contextual understanding and world knowledge; need to study static *vs.* contextual semantics

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→ Dream narratives possess a narrative structure and represent attempts to communicate subjective experience

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The annotation process is complex and costly

→ How to automate the annotation process using language models?

Example of an annotated dream with HVdC

Series: **Girls (tutorial)** Number: **0039**

<table>
<tr><th>CHAR.</th><th colspan="2">AGGRESSION</th><th colspan="2">FRIENDLINESS</th><th>SEXUALITY</th><th>SET.</th><th>OBJ.</th></tr>
<tr><td rowspan="5">2MUT
1MUT
1FKT</td><td colspan="2">1MUT 3> 1FKT
D 2= 1MUT</td><td colspan="2">D 5= 1MUT</td><td></td><td>OU</td><td rowspan="5">[not coded]</td></tr>
<tr><th colspan="5">ACTIVITIES</th><th>MOD.</th></tr>
<tr><td colspan="5">[not coded]</td><td rowspan="3">[not coded]</td></tr>
<tr><th>FAILURE</th><th>SUCCESS</th><th>MISFORTUNE</th><th>GOOD FORT.</th><th>EMOTIONS</th></tr>
<tr><td></td><td></td><td></td><td></td><td>AP, D</td></tr>
</table>

Character:

- **Status**: individual alive (**1**), group alive (**2**), dead individual (**3**), dead group (**4**), imaginary individual (**5**), imaginary group (**6**), original form (**7**), changed form (**8**)
- **Gender**: male (**M**), female (**F**), joint (**J**), indefinite (**I**)
- **Identity**: known (**K**), prominent (**P**), occupational (**O**), ethnic (**E**), unknown (**U**)
- **Age**: adult (**A**), teen (**T**), child (**C**)

Emotion: anger (**AN**), apprehension (**AP**), sadness (**SD**), confusion (**CO**), and happiness (**HA**)

Existing research on computational dream analysis

Lexical-based approaches associate text spans with specific categories (*e.g.*, type of interactions) (Miller, 1994; Fogli, Aiello, and Quercia, 2020)

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McNamara et al. (2019) and Yu (2022) combine the lexical-based and distributional semantic-based approaches with machine learning

Existing research on computational dream analysis

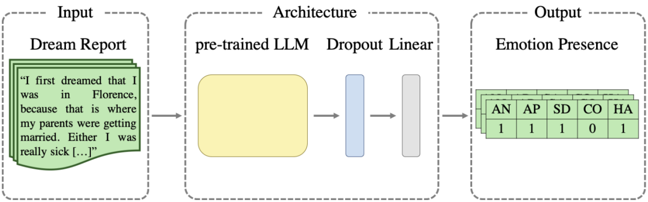
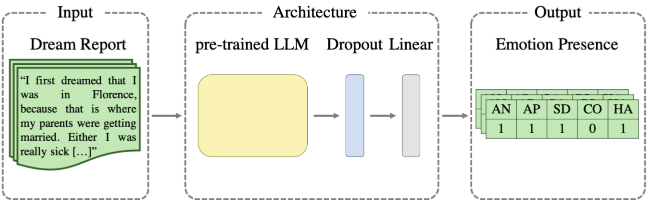


Figure: **Architecture for multi-label emotion detection** (Bertolini et al., 2023).

Existing research on computational dream analysis



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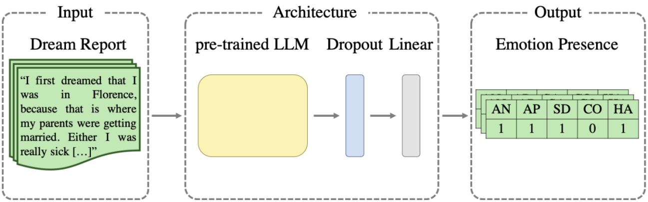

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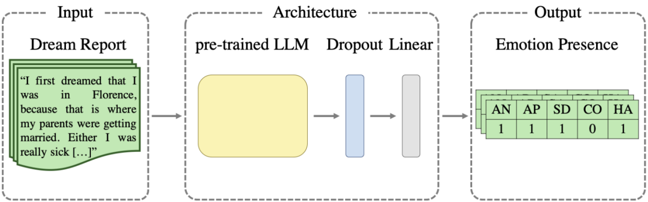

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→ We address this by identifying characters and their emotions with transformer-based sequence-to-sequence models

T5 language models

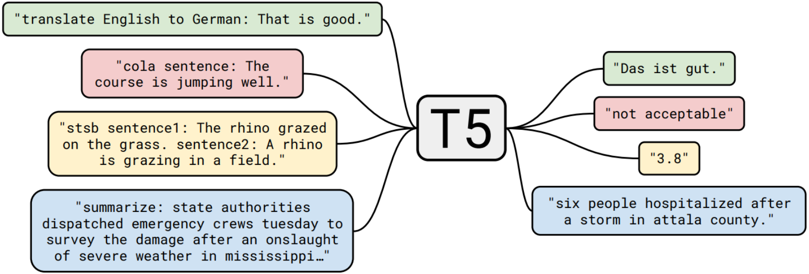

Figure: **Text-to-text framework** (Raffel et al., 2020). One model maps input text to target text for tasks such as translation, QA, and classification.

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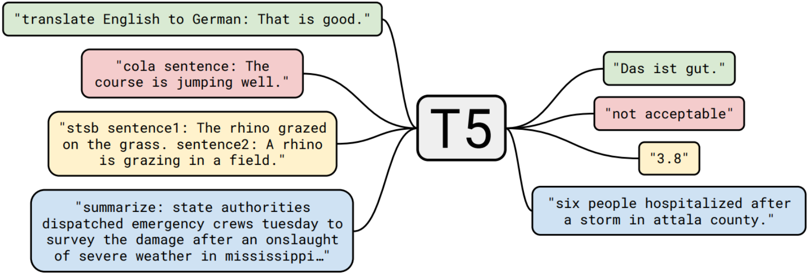

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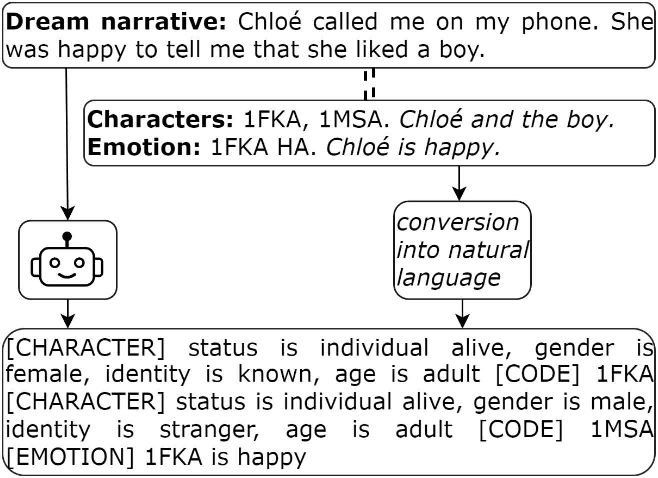
→ 248M-parameter LaMini-Flan-T5 encoder-decoder transformer, pre-trained on 2.58M instructions across 15 tasks (Wu et al., 2023)

Character and emotion detection in dream narratives



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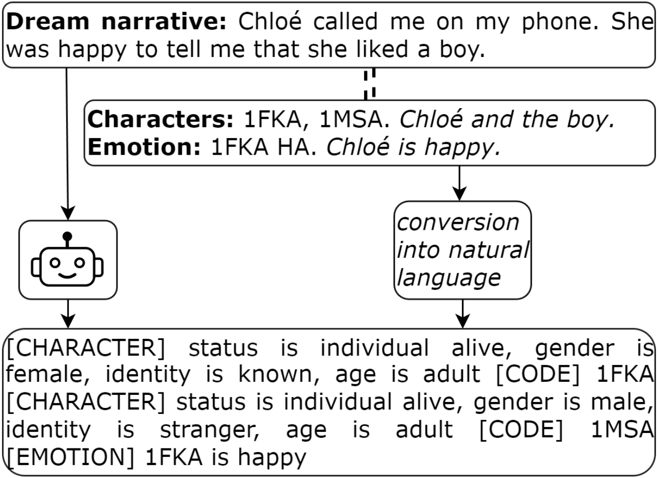

→ Our framework can be extended to include other HVdC categories

Results

`Baseline` is LaMini-Flan-T5 finetuned on 1823 dream narratives

Table: **Character and emotion detection**. $p < 0.05$.

Model	Status	Gender	Identity	Age	Character	Emotion
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→ Our models can address this task; there is room for improvement

58 F_1-score for gender prediction using lexical approaches (Fogli, Aiello, and Quercia, 2020)

86 F_1-score for emotion presence detection using transformers (Bertolini et al., 2023)

Case study on the war veteran

Group	Category	% Vet	% Total	Δ
Identity	known	24.9	51.6	-26.7
	prominent	1.9	2.5	-0.6
	occupational	22.4	8.0	14.4
	ethnic	4.1	0.9	3.1
	unknown	46.8	37.0	9.8
Gender	male	56.2	43.0	13.1
	female	24.1	33.1	-9.0
	joint	10.9	12.2	-1.3
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Table: **Identity and gender proportions for the veteran** (n=566 narratives) versus other dreamers. Δ shows the difference in percentage points; $p < 0.05$.

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→ The veteran dreams more about *occupational*, *ethnic*, and *unknown* identities compared to other dreamers

Generated annotations for DreamBank are available on hf.co/gustavecortal

Formalization of style in personal narratives

G. Cortal and A. Finkel. Formalizing Style in Personal Narratives. *EMNLP 2025*.

Motivation

Limitation: A formalization of style that captures how subjective experience is linguistically communicated is lacking

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Formalization could enable more precise identification of linguistic patterns associated with psychological states and may support interventions (White and Epston, 1990)

→ We aim to create a accessible framework that researchers can build upon in future studies

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Scholarly work has examined personal modes of reasoning and expression (Hadamard, 1945; Granger, 1968; Husserl, 1982; Dilts, 1994)

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In NLP, style transfer aims to control linguistic attributes while preserving semantic content (Jin et al., 2022; Troiano, Velutharambath, and Klinger, 2023)

→ They provide operational tools to capture or control linguistic form, but do not focus on how such forms encode subjective experience

How to give an operational definition of style?

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Goal: Map narratives to sequences based on extracted linguistic features:

"I wake in a dark room. I feel a cold wind. I tell myself to move." $\rightarrow$ *amv*

Contributions

- A sequence-based framework defining style as *patterns in sequences of linguistic choices that encode subjective experience*

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- A case study on dream narratives

What linguistic features encode subjective experience?

We ground our framework in *systemic functional linguistics* (Halliday et al., 2014)

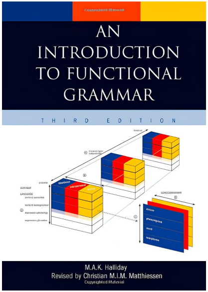

Figure: Halliday et al. (2014). $+57,000$ citations.

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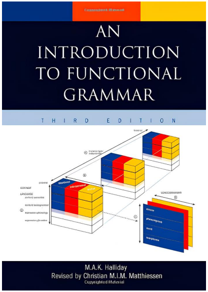
Meaning emerges through choices in systems of linguistic features to achieve communicative goals



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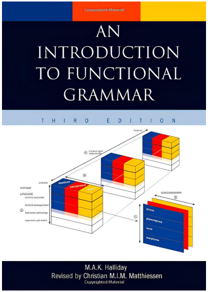
Language achieves three functions:

- Interpersonal: language builds social relationships
- Textual: information is organized to create coherent messages
- *Ideational*: language represents experience



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What linguistic features encode subjective experience?

According to the *ideational function*, language represents experience through **processes** and participants

Processes	**Examples**
`Action`: actions and events in the physical world.	He$_{\texttt{Actor}}$ **takes**$_{\texttt{Action}}$ the valuable$_{\texttt{Affected}}$ I$_{\texttt{Actor}}$ **give**$_{\texttt{Action}}$ her$_{\texttt{Recipient}}$ a chance$_{\texttt{Range}}$
`Mental`: internal experiences such as thoughts, perceptions, and feelings.	The moon$_{\texttt{Senser}}$ **sees**$_{\texttt{Mental}}$ the earth$_{\texttt{Phenomenon}}$ He$_{\texttt{Senser}}$ **disliked**$_{\texttt{Mental}}$ Gilbert's writing$_{\texttt{Phenomenon}}$
`Verbal`: acts of communication.	David$_{\texttt{Sayer}}$ **said**$_{\texttt{Verbal}}$ "the corrupt, [...]"$_{\texttt{Verbiage}}$
`State`: states of being, having, or existence.	Clément$_{\texttt{Carrier}}$ **is**$_{\texttt{State}}$ a teacher$_{\texttt{Attribute}}$ Arthur$_{\texttt{Possessor}}$ **has**$_{\texttt{State}}$ a cat$_{\texttt{Possessed}}$

Formal definition of style

Alphabet: Let Σ be the set of process types

$$\Sigma = \{\texttt{Action}, \texttt{Mental}, \texttt{Verbal}, \texttt{State}\}$$

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$$T = (c_1, c_2, \ldots, c_n) \in \mathcal{C}^n$$

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$\rightarrow$ We implement ϕ using a language model with in-context learning

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Style: We define the style of text T as the set of patterns contained in its sequence $\phi(T)$

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where $w \subseteq \phi(T)$ denotes a substring (contiguous symbols)

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Definition: The style of author A, denoted $\mathcal{S}(A)$, is the union of the sets of patterns contained in each text $T \in \mathcal{C}_A$

$$\mathcal{S}(A) = \bigcup_{T \in \mathcal{C}_A} \mathcal{S}(T)$$

Methodology for our sequence-based framework

Narrative: "I wake in a dark room. I feel a cold wind. I tell myself to move."

Clause	**Process (symbol)**	**Participants**
I wake in a dark room	`Action` (**a**)	`Actor`
I feel a cold wind	`Mental` (**m**)	`Senser`, `Phenomenon`
I tell myself to move	`Verbal` (**v**)	`Sayer`, `Recipient`

Sequence: *amv* | **Substrings:** {am, mv}

Results on the war veteran

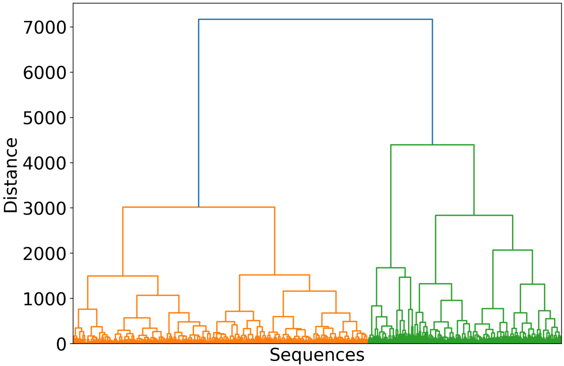

Figure: Dendrogram with Ward linkage and cosine similarity

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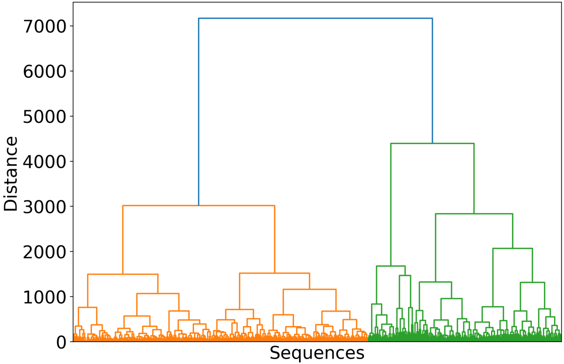

Figure: Dendrogram with Ward linkage and cosine similarity

Representative sequences: *savamasasaaamaaasavvvaaaaaaavssaaaaa* and *ssssssavaavssvsavvvvsmasasaasasaamaamvmsss*

with a = action, m = mental, s = state, v = verbal

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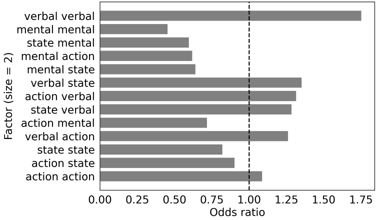
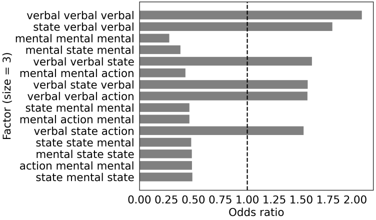


(a) Size 2.



(b) Size 3.

Figure: Top substring odds ratio between the veteran and the norm

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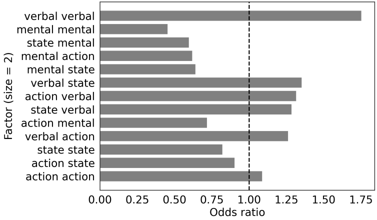

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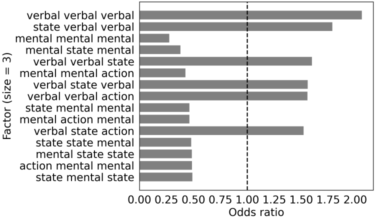

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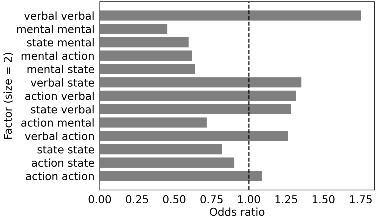

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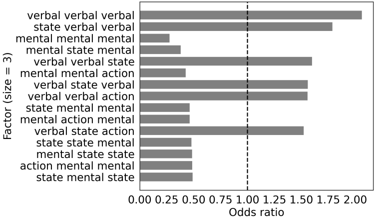

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Figure: Top substring odds ratio between the veteran and the norm

→ The veteran favors verbal processes over mental ones

→ Our results can inform psychological interpretations; need more individuals to generalize findings

How can this framework be extended?

- **Incorporating additional linguistic features**: duration of processes, concreteness of participants

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- **Authorship profiling**: classifying authors based on their sequences (Ferrara et al., 2016)

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- **Applying methods from complexity science** (Lempel and Ziv, 1976; Hipólito et al., 2023)

Conclusion and perspectives

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Perspectives

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- **Psychology of language models**: sycophancy, thought operations
  (Didolkar et al., 2025; M. Sharma et al., 2025)

Impact

Ongoing PhD thesis related to my works

(a) A. Haddou on cognitive distortions
(2025, ENS Paris-Saclay).

(b) R. Faure on style analysis
(2025, ENS Paris-Saclay).

(c) N. Richet on multimodal emotion
(2024, ETS Montréal).

NLP for psychiatry (industry)

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6-month PhD internship at Callyope on *NLP for quantifying memory, future thinking, and the self in mental health narratives*

Automatic thematic analysis in mental health narratives using language models

G. Cortal, S. Guessoum, X. Cao, R. Riad. *Fine-grained mental health topic modeling in different cohorts using large language models* (preprint). 2025.

Motivation

- Qualitative analysis of speech content is central to clinical practice

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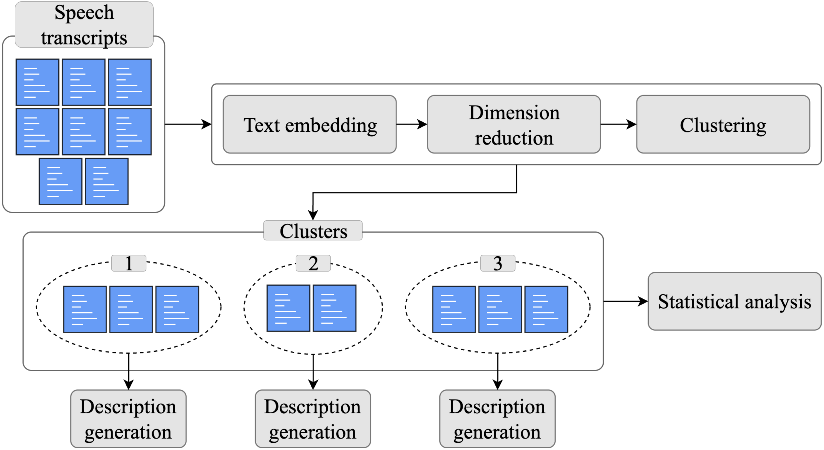
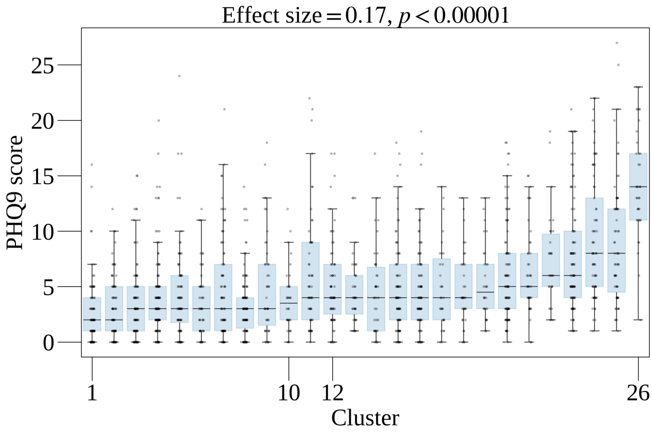
Open-ended questions involving last 24h, positive future event, current feelings and sleep, etc.

Semantic clustering and description generation



Distribution of depression scores across clusters

Current feelings and sleep (n=1,786)



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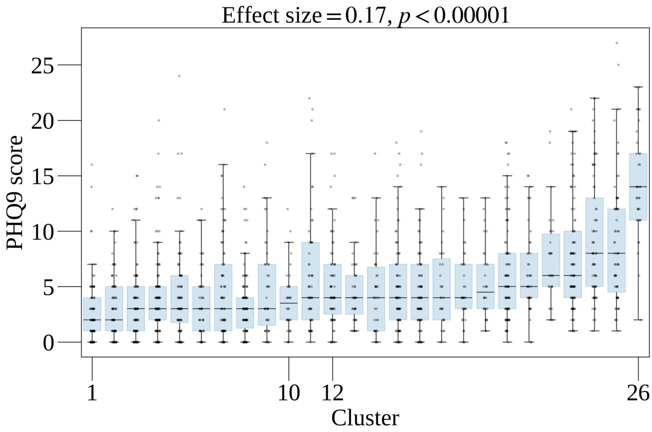

→ Depression scores vary significantly: cluster 26 highest (13.4±5.4), cluster 1 lowest (2.6±2.2)

Generated cluster descriptions

Cluster 1 description: The individuals express consistent satisfaction with their current well-being, emphasizing good sleep quality, restful or pleasant nights, and a general sense of relaxation, even when noting variations in sleep duration or occasional fatigue. (age=39±19, n=92)

Cluster 10 description: The individuals express frequent nighttime urinary interruptions disrupting sleep, often attributed to age-related conditions like prostate issues or overactive bladder, alongside mixed reports of physical well-being, mental resilience, and lifestyle factors such as retirement or exercise influencing their overall health and sleep patterns. (age=69±15, n=34)

Cluster 12 description: The individuals express stress related to academic exams, significant life decisions, and workloads, alongside sleep disturbances caused by lifestyle changes, increased responsibilities, or environmental adjustments, while some also highlight temporary relief from pressures through personal achievements or upcoming positive events. (age=24±9, n=67)

Cluster 26 description: The individuals express sleep disturbances characterized by insomnia, frequent awakenings, and restless sleep, alongside pervasive anxiety, emotional instability, and self-esteem issues, which collectively contribute to persistent fatigue, impaired daily functioning, and a diminished sense of well-being. (age=25±9, n=37)

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→ Clustering captures symptom severity and age-related circumstances

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Papers: 2 int. conferences, 3 int. workshops, 2 national venues

Open corpus and tools: French corpus based on emotion components; language models for emotion analysis in emotional and dream narratives

Selected research papers

Constant Bonard and Gustave Cortal (2024). "Improving Language Models for Emotion Analysis: Insights from Cognitive Science". In: *Proceedings of the Workshop on Cognitive Modeling and Computational Linguistics*. Ed. by Tatsuki Kuribayashi et al. Bangkok, Thailand: Association for Computational Linguistics, pp. 264–277. DOI: 10.18653/v1/2024.cmcl-1.23

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Gustave Cortal (2024). "Sequence-to-Sequence Language Models for Character and Emotion Detection in Dream Narratives". In: *Proceedings of the 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation (LREC-COLING 2024)*. Ed. by Nicoletta Calzolari et al. Torino, Italia: ELRA and ICCL, pp. 14717–14728

Gustave Cortal and Alain Finkel (2025). "Formalizing Style in Personal Narratives". In: *Proceedings of the 2025 Conference on Empirical Methods in Natural Language Processing*. Ed. by Christos Christodoulopoulos et al. Suzhou, China: Association for Computational Linguistics, pp. 7322–7337. ISBN: 979-8-89176-332-6

Appendix

What are the psychological mechanisms used to infer what is communicated?

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The formal semantics of a language is made of syntactical and lexical rules that pairs <strings of words> with [sentential meanings]

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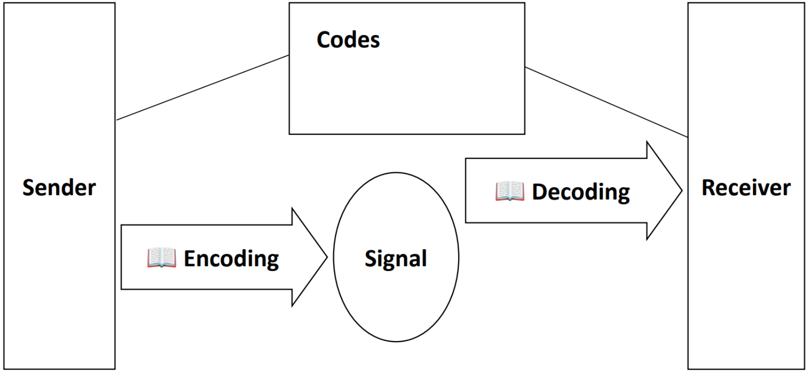

Figure: Dictionary analysis in cognitive pragmatics.

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→ We rely on other sources of evidence to infer what is communicated

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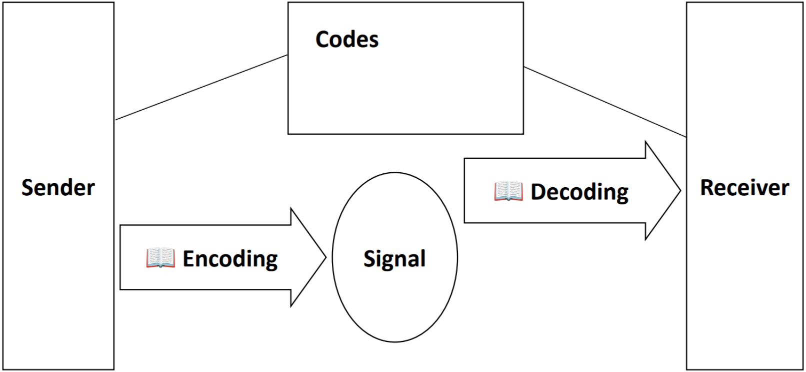

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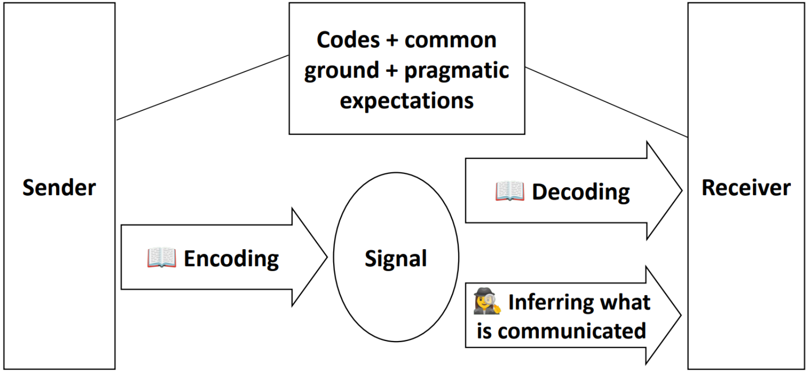

Figure: Detective analysis in cognitive pragmatics.

Component classification in emotional narratives

Model	Precision	Recall	F_1
Logistic Regression	84.9 (0.3)	84.3 (0.3)	84.4 (0.3)
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$\rightarrow$ Models can be used to automatically classify unstructured narratives

Results

StableBeluga$_i$ is a 7B model with in-context learning using i examples

Model	**Status**	**Gender**	**Identity**	**Age**	**Character**	**Emotion**
Baseline	82.87	78.02	76.17	86.21	64.74	75.13
StableBeluga$_1$	43.95**	39.76**	31.25**	56.16**	15.65**	-
StableBeluga$_3$	52.44**	46.49**	38.46**	63.88**	21.06**	-
StableBeluga$_5$	55.89**	46.29**	42.61**	63.73**	24.86**	-

Table: F_1-scores for character and emotion detection. Significant differences from baseline: ** ($p < 0.01$), * ($p < 0.05$).

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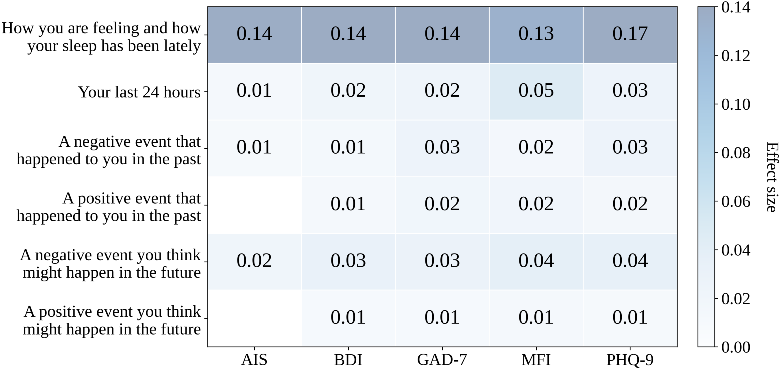
→ Compared to StableBeluga, our supervised models perform better while having 28 times fewer parameters (248M *vs.* 7B)

Effect size across questions and clinical scores



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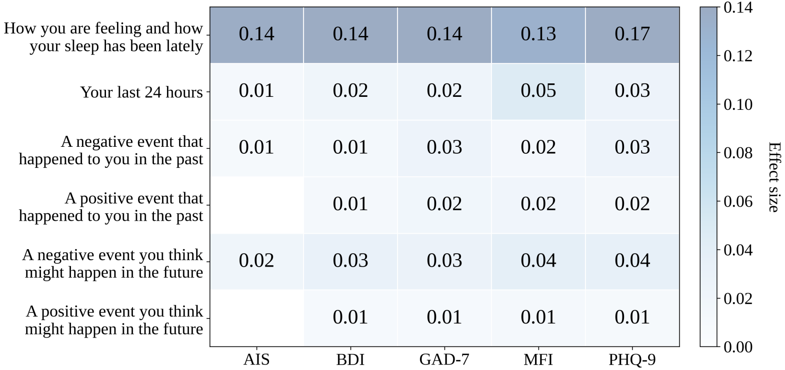
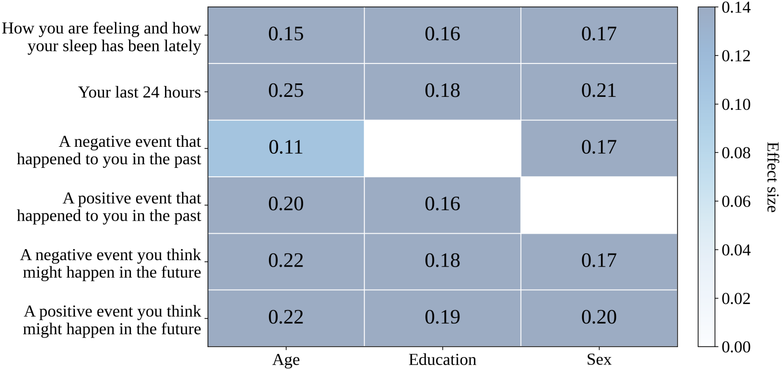


→ Certain questions better discriminate clinical scores

Effect size across questions and sociodemographics



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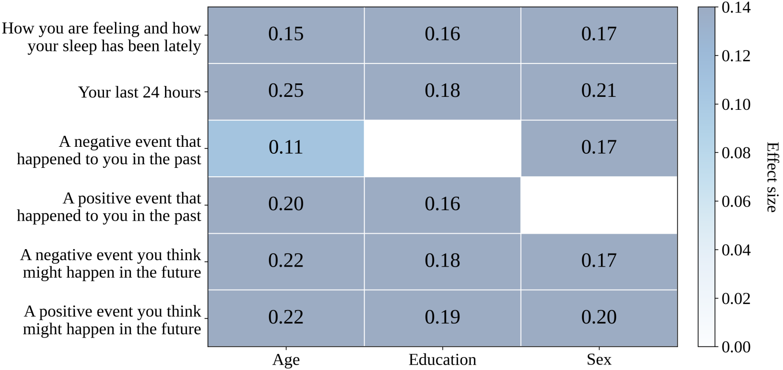

→ Nearly all questions discriminate sociodemographics

Demographics

	General Population n=1809	Androids n=116	MODMA n=52	VOCES n=90
Demographics				
Language	French	Italian	Chinese	Spanish
Age	***	*n.s.*	*n.s.*	***
Mean (SD)	37.8 (18.2)	37.4 (12.0)	31.3 (9.2)	38.6 (14.9)
Range	18–91	19–71	18–52	21–76
Sex, n (%)	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Female	1187 (66.2)	84 (72.4)	16 (30.8)	39 (43.3)
Male	595 (33.2)	32 (27.6)	36 (69.2)	48 (53.3)
Other	11 (0.6)	0 (0.0)	0 (0.0)	3 (3.3)
Education, n (%)	*n.s.*	*n.s.*	*n.s.*	*n.s.*
No diploma	52 (2.9)	11 (9.5)	7 (13.5)	-
Secondary	291 (16.2)	37 (31.9)	8 (15.4)	-
Higher short	213 (11.9)	52 (44.8)	0 (0.0)	-
Higher long	1236 (69.0)	16 (13.8)	37 (71.2)	-

Clinical evaluation

	General Population n=1809	Androids n=116	MODMA n=52	VOCES n=90
C-SSRS	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Suicidal risk, n (%)	-	-	-	60 (66.7)
No suicidal risk, n (%)	-	-	-	30 (33.3)
MADRS / MDD	*n.s.*	*n.s.*	*n.s.*	*n.s.*
Depression, n (%)	-	64 (55.2)	23 (44.2)	-
No depression, n (%)	-	52 (44.8)	29 (55.8)	-
PHQ-9	*n.s.*	*n.s.*	***	***
Mean (SD)	5.2 (4.6)	-	9.4 (8.5)	10.5 (6.8)
Range	0–27	-	0–25	0.0–26.0

References

References I

Alhafni, Bashar et al. (2024). "Personalized Text Generation with Fine-Grained Linguistic Control". In: *Proceedings of the 1st Workshop on Personalization of Generative AI Systems (PERSONALIZE 2024)*. Ed. by Ameet Deshpande et al. St. Julians, Malta: Association for Computational Linguistics, pp. 88–101.

Arnold, Magda B. (1960). *Emotion and Personality*. New York: Columbia University Press.

Barbieri, Gabriele et al. (2012). "Markov constraints for generating lyrics with style". In: *Proceedings of the 20th European Conference on Artificial Intelligence*. ECAI'12. Montpellier, France: IOS Press, pp. 115–120. ISBN: 9781614990970.

Bertolini, Lorenzo et al. (2023). *Automatic scoring of dream reports' emotional content with large language models*. arXiv: `2302.14828[cs.CL]`.

References II

Blanc, Nathalie (2010). "La Compréhension Des Contes Entre 5 et 7 Ans: Quelle Représentation Des Informations Émotionnelles? [The Comprehension of the Tales between 5 and 7 Year-Olds: Which Representation of Emotional Information?]" In: *Canadian Journal of Experimental Psychology / Revue canadienne de psychologie expérimentale* 64.4, pp. 256–265. ISSN: 1878-7290. DOI: 10.1037/a0021283.

Bonard, Constant and Gustave Cortal (2024). "Improving Language Models for Emotion Analysis: Insights from Cognitive Science". In: *Proceedings of the Workshop on Cognitive Modeling and Computational Linguistics*. Ed. by Tatsuki Kuribayashi et al. Bangkok, Thailand: Association for Computational Linguistics, pp. 264–277. DOI: 10.18653/v1/2024.cmcl-1.23.

References III

Buechel, Sven and Udo Hahn (2017). "EmoBank: Studying the Impact of Annotation Perspective and Representation Format on Dimensional Emotion Analysis". In: *Proceedings of the 15th Conference of the European Chapter of the Association for Computational Linguistics: Volume 2, Short Papers*. Valencia, Spain: Association for Computational Linguistics, pp. 578–585. URL: https://aclanthology.org/E17-2092.

Campagnano, Cesare, Simone Conia, and Roberto Navigli (2022). "SRL4E – Semantic Role Labeling for Emotions: A Unified Evaluation Framework". In: *Proceedings of the 60th Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*. Dublin, Ireland: Association for Computational Linguistics, pp. 4586–4601. DOI: 10.18653/v1/2022.acl-long.314. URL: https://aclanthology.org/2022.acl-long.314.

References IV

Casel, Felix, Amelie Heindl, and Roman Klinger (2021). "Emotion Recognition under Consideration of the Emotion Component Process Model". In: *Proceedings of the 17th Conference on Natural Language Processing (KONVENS 2021)*. Düsseldorf, Germany: KONVENS 2021 Organizers, pp. 49–61. URL: https://aclanthology.org/2021.konvens-1.5.

Cortal, Gustave (2024). "Sequence-to-Sequence Language Models for Character and Emotion Detection in Dream Narratives". In: *Proceedings of the 2024 Joint International Conference on Computational Linguistics, Language Resources and Evaluation (LREC-COLING 2024)*. Ed. by Nicoletta Calzolari et al. Torino, Italia: ELRA and ICCL, pp. 14717–14728.

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References V

Cortal, Gustave, Alain Finkel, et al. (2023). "Emotion Recognition Based on Psychological Components in Guided Narratives for Emotion Regulation". In: *Proceedings of the 7th Joint SIGHUM Workshop on Computational Linguistics for Cultural Heritage, Social Sciences, Humanities and Literature*. Ed. by Stefania Degaetano-Ortlieb et al. Dubrovnik, Croatia: Association for Computational Linguistics, pp. 72–81. DOI: `10.18653/v1/2023.latechclfl-1.8`.

Creissen, S. and N. Blanc (2017). "Quelle Représentation Des Différentes Facettes de La Dimension Émotionnelle d'une Histoire Entre l'âge de 6 et 10 Ans ? Apports d'une Étude Multimédia". In: *Psychologie Française*. Cognition et Multimédia : Les Atouts Du Numérique En Situation d'apprentissage 62.3, pp. 263–277. ISSN: 0033-2984. DOI: `10.1016/j.psfr.2015.07.006`.

Darwin, Charles (1872). *The expression of the emotions in man and animals*. London: John Murray.

References VI

- Demszky, Dorottya et al. (2020). "GoEmotions: a dataset of fine-grained emotions". In: *Proceedings of the 58th annual meeting of the association for computational linguistics*. Online: Association for Computational Linguistics, pp. 4040–4054. DOI: 10.18653/v1/2020.acl-main.372. URL: https://aclanthology.org/2020.acl-main.372.
- Didolkar, Aniket et al. (2025). *Metacognitive Reuse: Turning Recurring LLM Reasoning Into Concise Behaviors*. arXiv: 2509.13237 [cs.LG]. URL: https://arxiv.org/abs/2509.13237.
- Dilts, Robert (1994). *Strategies of Genius, Volume 1: Aristotle, Sherlock Holmes, Walt Disney, Wolfgang Amadeus Mozart*. Capitola, CA: Meta Publications. ISBN: 0-916990-32-X. URL: https://books.google.com/books/about/Strategies_of_Genius_Aristotle_Sherlock.html?id=jAQRAQAAIAAJ.

References VII

Domhoff, G. William and Adam Schneider (2008). "Studying dream content using the archive and search engine on DreamBank.net". In: *Consciousness and Cognition* 17.4. Publisher: Elsevier BV, pp. 1238–1247. DOI: 10.1016/j.concog.2008.06.010. URL: https://doi.org/10.1016/j.concog.2008.06.010.

Dragos, Valentina et al. (2022). "Angry or sad ? Emotion annotation for extremist content characterisation". In: *Proceedings of the thirteenth language resources and evaluation conference*. Marseille, France: European Language Resources Association, pp. 193–201. URL: https://aclanthology.org/2022.lrec-1.21.

Ekman, Paul (1999). "Basic emotions". In: *Handbook of cognition and emotion*. Ed. by Tim Dalgleish and Mike J. Power. Chichester: John Wiley & Sons Ltd, pp. 45–60. (Visited on Feb. 12, 2024).

References VIII

Etienne, Aline, Delphine Battistelli, and Gwénolé Lecorvé (2022). "A (psycho-)linguistically motivated scheme for annotating and exploring emotions in a genre-diverse corpus". In: *Proceedings of the thirteenth language resources and evaluation conference*. Marseille, France: European Language Resources Association, pp. 603–612. URL: https://aclanthology.org/2022.lrec-1.64.

Ferrara, Emilio et al. (2016). "Detection of Promoted Social Media Campaigns". In: *Proceedings of the International AAAI Conference on Web and Social Media* 10.1, pp. 563–566. ISSN: 2334-0770.

Finkel, Alain (2022). *Manuel d'analyse cognitive des émotions: Théorie et applications*. Paris: Dunod.

Flanagan, H. M. (1966). "The content analysis of dreams. By calvin S. Hall and robert L. Van de castle new york: The century psychology series. 1966. Pp. 320. Price not given.". In: *The British Journal of Psychiatry* 112.490. Publisher: Cambridge University Press, pp. 963–964. DOI: 10.1192/bjp.112.490.963.

References IX

Fogli, Alessandro, Luca Maria Aiello, and Daniele Quercia (2020). "Our dreams, our selves: automatic analysis of dream reports". In: *Royal Society Open Science* 7.8. Publisher: The Royal Society, p. 192080. DOI: 10.1098/rsos.192080. URL: https://doi.org/10.1098/rsos.192080.

Foppolo, Francesca and Greta Mazzaggio (2024). "Conversational Implicature and Communication Disorders". en. In: *The Handbook of Clinical Linguistics, Second Edition*. Ed. by Martin J. Ball, Nicole Müller, and Elizabeth Spencer. 1st ed. Wiley, pp. 15–27. ISBN: 978-1-119-87590-1 978-1-119-87594-9. DOI: 10.1002/9781119875949.ch2. URL: https://onlinelibrary.wiley.com/doi/10.1002/9781119875949.ch2 (visited on Feb. 13, 2024).

Gandhi, Kanishk et al. (2023). *Understanding Social Reasoning in Language Models with Language Models*. arXiv. DOI: 10.48550/arXiv.2306.15448. arXiv: 2306.15448 [cs].

References X

Granger, Gilles-Gaston (1968). *Essai d'une Philosophie Du Style*. Paris: A. Colin.

Greschner, Lynn et al. (2025). *Categorical Emotions or Appraisals - Which Emotion Model Explains Argument Convincingness Better?* arXiv: 2511.07162 [cs.CL]. URL: https://arxiv.org/abs/2511.07162.

Gutman Music, Maja, Pavan Holur, and Kelly Bulkeley (2022). "Mapping dreams in a computational space: A phrase-level model for analyzing Fight/Flight and other typical situations in dream reports". In: *Consciousness and Cognition* 106, p. 103428. ISSN: 1053-8100. DOI: https://doi.org/10.1016/j.concog.2022.103428. URL: https://www.sciencedirect.com/science/article/pii/S105381002200160X.

References XI

Hadamard, Jacques (1945). *An Essay on the Psychology of Invention in the Mathematical Field*. Princeton, N.J.: Princeton University Press. URL: https://books.google.com/books?id=W2U4AAAAMAAJ.

Halliday, M.A.K. et al. (2014). *An Introduction to Functional Grammar*. 0th ed. Routledge. ISBN: 978-1-4441-1908-4. DOI: 10.4324/9780203783771.

Hipólito, Inês et al. (2023). "Pattern Breaking: A Complex Systems Approach to Psychedelic Medicine". In: *Neuroscience of Consciousness* 2023.1, niad017. ISSN: 2057-2107.

Husserl, Edmund (1982). *Ideas Pertaining to a Pure Phenomenology and to a Phenomenological Philosophy: First Book: General Introduction to a Pure Phenomenology*. illustrated. Dordrecht: Springer Science & Business Media. ISBN: 978-94-009-7445-6. URL: https://books.google.com/books/about/Ideas_Pertaining_to_a_Pure_Phenomenology.html?id=geEsBAAAQBAJ.

References XII

Jin, Di et al. (2022). "Deep Learning for Text Style Transfer: A Survey". In: *Computational Linguistics* 48.1, pp. 155–205. ISSN: 0891-2017.

Kim, Evgeny and Roman Klinger (2019). "An Analysis of Emotion Communication Channels in Fan-Fiction: Towards Emotional Storytelling". In: *Proceedings of the Second Workshop on Storytelling*. Florence, Italy: Association for Computational Linguistics, pp. 56–64. DOI: 10.18653/v1/W19-3406. URL: https://aclanthology.org/W19-3406.

Klinger, Roman (2023). "Where Are We in Event-centric Emotion Analysis? Bridging Emotion Role Labeling and Appraisal-based Approaches". In: *Proceedings of the Big Picture Workshop*. Ed. by Yanai Elazar et al. Singapore: Association for Computational Linguistics, pp. 1–17. DOI: 10.18653/v1/2023.bigpicture-1.1.

References XIII

Lazarus, Richard S. (1991). "Progress on a cognitive-motivational-relational theory of emotion.". In: *American psychologist* 46.8, p. 819.

Lee, Sophia Yat Mei, Ying Chen, and Chu-Ren Huang (2010). "A Text-driven Rule-based System for Emotion Cause Detection". In: *Proceedings of the NAACL HLT 2010 Workshop on Computational Approaches to Analysis and Generation of Emotion in Text*. Los Angeles, CA: Association for Computational Linguistics, pp. 45–53. URL: `https://aclanthology.org/W10-0206`.

Lempel, A. and J. Ziv (1976). "On the Complexity of Finite Sequences". In: *IEEE Transactions on Information Theory* 22.1, pp. 75–81. ISSN: 1557-9654.

Ma, Ziqiao et al. (2023). *Towards A Holistic Landscape of Situated Theory of Mind in Large Language Models*. arXiv. DOI: `10.48550/arXiv.2310.19619`. arXiv: `2310.19619 [cs]`.

References XIV

McNamara, Patrick et al. (2019). “Dream content analysis using Artificial Intelligence”. In: *International Journal of Dream Research* 12.1, pp. 42–52. DOI: 10.11588/ijodr.2019.1.48744. URL: https://journals.ub.uni-heidelberg.de/index.php/IJoDR/article/view/48744.

Micheli, Raphaël (2013a). “Esquisse d’une typologie des différents modes de sémiotisation verbale de l’émotion”. In: *Semen. Revue de sémio-linguistique des textes et discours* 35. ISSN: 0761-2990. DOI: 10.4000/semen.9795.

— (2013b). “Esquisse dune typologie des différents modes de sémiotisation verbale de lémotion”. In: *Semen* 35. DOI: 10.4000/semen.9795. URL: https://doi.org/10.4000/semen.9795.

References XV

Miller, George A. (1994). "WordNet: A Lexical Database for English". In: *Human Language Technology: Proceedings of a Workshop held at Plainsboro, New Jersey, March 8-11, 1994*. URL: https://aclanthology.org/H94-1111.

Neal, Tempestt et al. (2017). "Surveying Stylometry Techniques and Applications". In: *Acm Computing Surveys* 50.6, 86:1–86:36. ISSN: 0360-0300.

Paech, Samuel J. (2024). *EQ-Bench: An Emotional Intelligence Benchmark for Large Language Models*. arXiv. DOI: 10.48550/arXiv.2312.06281. arXiv: 2312.06281 [cs].

Plutchik, Robert (2001). "The Nature of Emotions: Human emotions have deep evolutionary roots, a fact that may explain their complexity and provide tools for clinical practice". In: *American Scientist* 89.4. Publisher: Sigma Xi, The Scientific Research Society, pp. 344–350. ISSN: 00030996. URL: http://www.jstor.org/stable/27857503 (visited on June 13, 2022).

References XVI

Raffel, Colin et al. (2020). "Exploring the limits of transfer learning with a unified text-to-text transformer". In: *Journal of Machine Learning Research* 21.140, pp. 1–67. URL: http://jmlr.org/papers/v21/20-074.html.

Rathner, Eva-Maria et al. (2018). "State of Mind: Classification through Self-reported Affect and Word Use in Speech.". In: *Interspeech 2018*, pp. 267–271. DOI: 10.21437/Interspeech.2018-2043.

Russell, James A. and Lisa Barrett (1999). "Core affect, prototypical emotional episodes, and other things called emotion: Dissecting the elephant". In: *Journal of personality and social psychology* 76, pp. 805–19. DOI: 10.1037//0022-3514.76.5.805.

Schachter, Stanley and Jerome Singer (1962). "Cognitive, social, and physiological determinants of emotional state.". In: *Psychological review* 69.5. Publisher: American Psychological Association, p. 379.

References XVII

Scherer, Klaus R. (2022a). "Theory Convergence in Emotion Science Is Timely and Realistic". In: *Cognition and Emotion* 36.2, pp. 154–170. ISSN: 0269-9931. DOI: 10.1080/02699931.2021.1973378. PMID: 35188091.

— (2022b). "Theory Convergence in Emotion Science Is Timely and Realistic". In: *Cognition and Emotion* 36.2, pp. 154–170. ISSN: 0269-9931. DOI: 10.1080/02699931.2021.1973378.

Schredl, Michael and Friedrich Hofmann (2003). "Continuity between waking activities and dream activities". In: *Consciousness and Cognition* 12.2. Publisher: Elsevier BV, pp. 298–308. DOI: 10.1016/s1053-8100(02)00072-7. URL: https://doi.org/10.1016/s1053-8100(02)00072-7.

References XVIII

Sharma, Ashish et al. (2023). "Cognitive Reframing of Negative Thoughts through Human-Language Model Interaction". In: *Proceedings of the 61st Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*. Ed. by Anna Rogers, Jordan Boyd-Graber, and Naoaki Okazaki. Toronto, Canada: Association for Computational Linguistics, pp. 9977–10000.

Sharma, Mrinank et al. (2025). *Towards Understanding Sycophancy in Language Models*. arXiv: `2310.13548 [cs.CL]`. URL: `https://arxiv.org/abs/2310.13548`.

Tammewar, Aniruddha et al. (2020). "Annotation of Emotion Carriers in Personal Narratives". eng. In: *Proceedings of the Twelfth Language Resources and Evaluation Conference*. Ed. by Nicoletta Calzolari et al. Marseille, France: European Language Resources Association, pp. 1517–1525. ISBN: 979-10-95546-34-4. URL: `https://aclanthology.org/2020.lrec-1.189/`.

References XIX

- Tomkins, Silvan (1962). *Affect imagery consciousness*. Vol. Volume I: The positive affects. New York: Springer. (Visited on Feb. 12, 2024).
- Troiano, Enrica, Laura Oberländer, and Roman Klinger (2023). "Dimensional Modeling of Emotions in Text with Appraisal Theories: Corpus Creation, Annotation Reliability, and Prediction". In: *Computational Linguistics* 49.1. DOI: `10.1162/coli_a_00461`. arXiv: `2206.05238`. URL: `https://doi.org/10.1162/coli_a_00461`.
- Troiano, Enrica, Aswathy Velutharambath, and Roman Klinger (2023). "From Theories on Styles to Their Transfer in Text: Bridging the Gap with a Hierarchical Survey". In: *Natural Language Engineering* 29.4, pp. 849–908. ISSN: 1351-3249, 1469-8110.
- Wales, Katie (2014). *A Dictionary of Stylistics*. Routledge. ISBN: 978-1-315-83350-7.

References XX

White, Michael and David Epston (1990). *Narrative Means to Therapeutic Ends*. WW Norton. ISBN: 978-0-393-70098-5.

Winget, Carolyn and Milton Kramer (1979). *Dimensions of dreams*. Gainesville: University of Florida Press.

Wu, Minghao et al. (2023). "LaMini-LM: a diverse herd of distilled models from large-scale instructions". In: *CoRR* abs/2304.14402.

Xia, Rui and Zixiang Ding (2019). "Emotion-Cause Pair Extraction: A New Task to Emotion Analysis in Texts". In: *Proceedings of the 57th Annual Meeting of the Association for Computational Linguistics*. Florence, Italy: Association for Computational Linguistics, pp. 1003–1012. DOI: `10.18653/v1/P19-1096`. URL: `https://aclanthology.org/P19-1096`.

References XXI

Yu, Calvin Kai-Ching (2022). "Automated analysis of dream sentiment—The royal road to dream dynamics?" In: *Dreaming : journal of the Association for the Study of Dreams* 32.1. Publisher: American Psychological Association (APA), pp. 33–51. DOI: 10.1037/drm0000189. URL: https://doi.org/10.1037/drm0000189.

Zhang, Mian, Shaun M. Eack, and Zhiyu Zoey Chen (2025). *Preference Learning Unlocks LLMs' Psycho-Counseling Skills*. arXiv: 2502.19731 [cs.CL]. URL: https://arxiv.org/abs/2502.19731.

Zhang, Wenxuan, Yue Deng, et al. (2023). *Sentiment Analysis in the Era of Large Language Models: A Reality Check*. arXiv. DOI: 10.48550/arXiv.2305.15005. arXiv: 2305.15005 [cs].

Zhang, Wenxuan, Xin Li, et al. (2022). "A Survey on Aspect-Based Sentiment Analysis: Tasks, Methods, and Challenges". arXiv: 2203.01054 [cs].