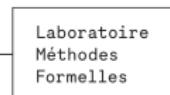


Natural language processing for subjectivity analysis in personal narratives

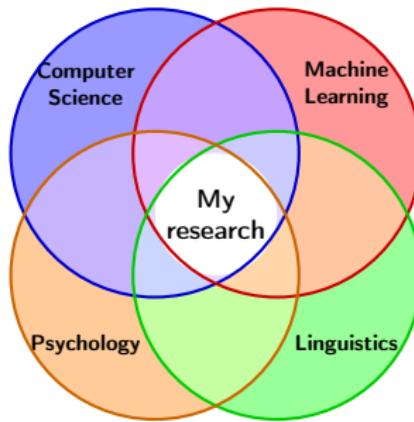
Gustave Cortal

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Introduction

Context



- ▶ Natural language processing for psychology is underexplored
- ▶ We build on an existing subfield: sentiment and emotion analysis
- ▶ We study subjectivity (first-person perspective, meaning-making processes, and experiential content)
- ▶ We focus on personal narratives (emotional narratives, dream reports)

Introduction

How to model subjective experience in personal narratives?

- ▶ Cognitive science perspective on emotion analysis
- ▶ French corpus based on emotion components
- ▶ Emotion analysis in real-life and oniric situations
- ▶ Automatic thematic analysis in mental health narratives

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 <i>category</i>	"I love philosophy." → joy
Darwin (1872), Tomkins (1962), Ekman (1999), and Plutchik (2001) Demszky et al. (2020) and Greschner et al. (2025)		
Constructivist theories	a continuous value with an <i>affective</i> meaning	"His voice soothes me." → valence (4/5), arousal (1/5)
Schachter and Singer (1962) and Russell and Barrett (1999) Buechel and Hahn (2017)		
Appraisal theory	a continuous value with a <i>cognitive</i> meaning	"I received a surprise gift." → sudden (4/5), control (0/5)
Arnold (1960) and Lazarus (1991) Troiano, Oberländer, and Klinger (2023)		

Psychology and emotion annotation

Psychological theories	In text, emotion is...	Example
	composed of <i>semantic roles</i>	"Louise (experiencer) was angry (cue) towards Paul (target), because he didn't inform her (cause)."

Campagnano, Conia, and Navigli (2022) and Klinger (2023)
Lee, Y. Chen, and Huang (2010), Xia and Ding (2019), and Tammewar et al. (2020)

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

Limitations in emotion analysis

- ▶ Though the theories reviewed are usually considered rivals, their integration is possible and desirable (Scherer, 2022a)
- ▶ Emotion verbalization is underexplored
(Micheli, 2013b; Etienne, Battistelli, and Lecorv , 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

Which verbal signs are used to infer expressed emotions?

Raphaël Micheli categorizes a range of linguistic markers into three *emotion expression modes* (Micheli, 2013a). The emotion can be:

- ▶ *labeled* explicitly with an emotional term ("I am sad")
- ▶ *shown* with utterance features such as interjections and punctuations ("Ah! That's great!")
- ▶ *suggested* with the description of a situation which generally, in a given sociocultural context, leads to an emotion ("She gave me a gift")

→ 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)

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

A *code* is a pre-established pairing between stimuli and sets of information

The Morse code is a pairing between <combination of short and long signals> and [letters]

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

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

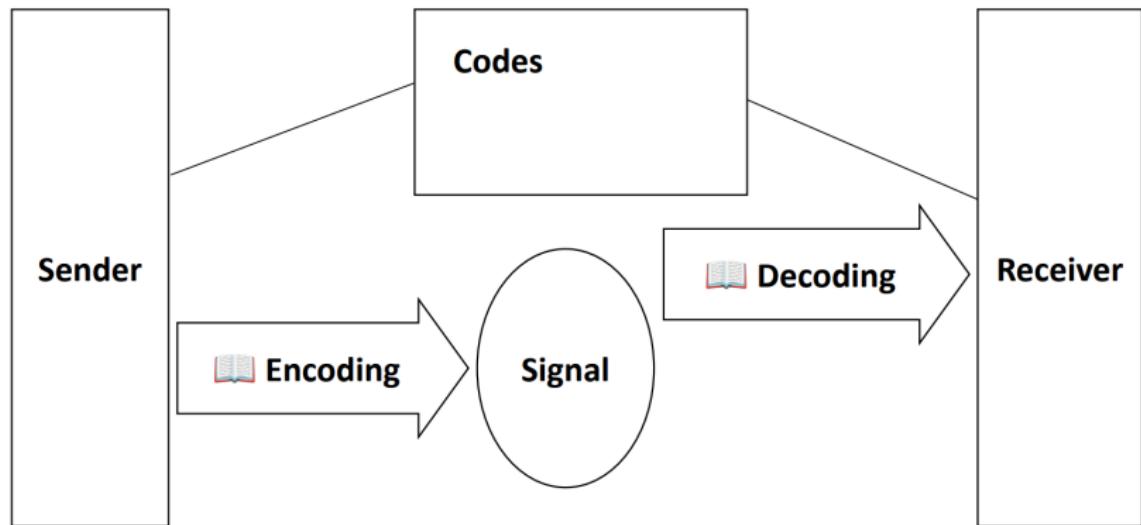


Figure: Dictionary analysis in cognitive pragmatics.

Codes underdetermine emotion meaning

Let's take emotion expression modes as an example:

- ▶ *Labeled*: “I am happy now” is explicit about the feeling but does not encode what the emotion is about
- ▶ *Displayed*: interjections (“Wow!”, “Ah!”, “Damn!”) show affect yet leave valence and focus unclear
- ▶ *Suggested*: “The ship has black sails.” can communicate any kind of emotion

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

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

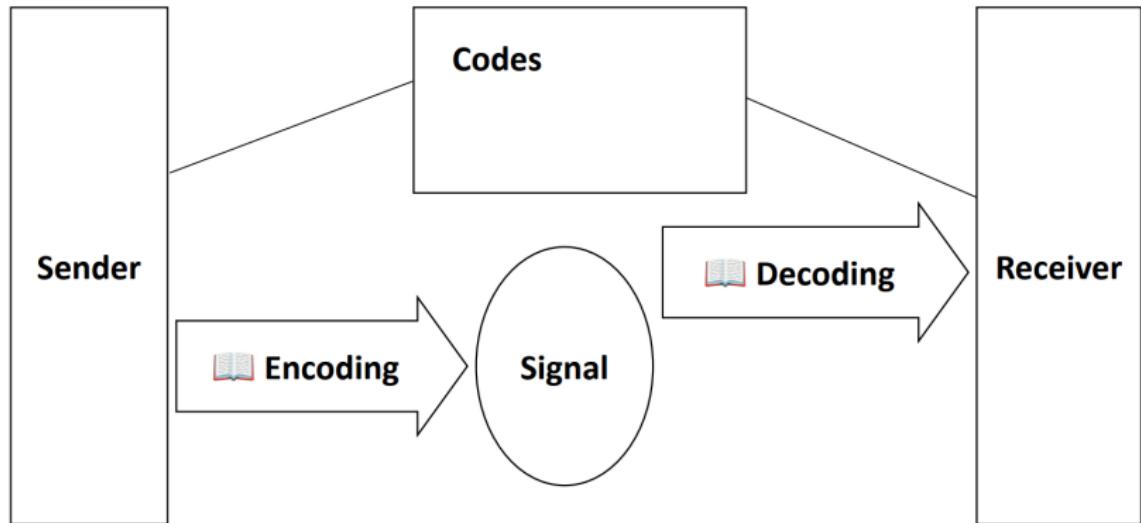


Figure: Dictionary analysis in cognitive pragmatics.

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

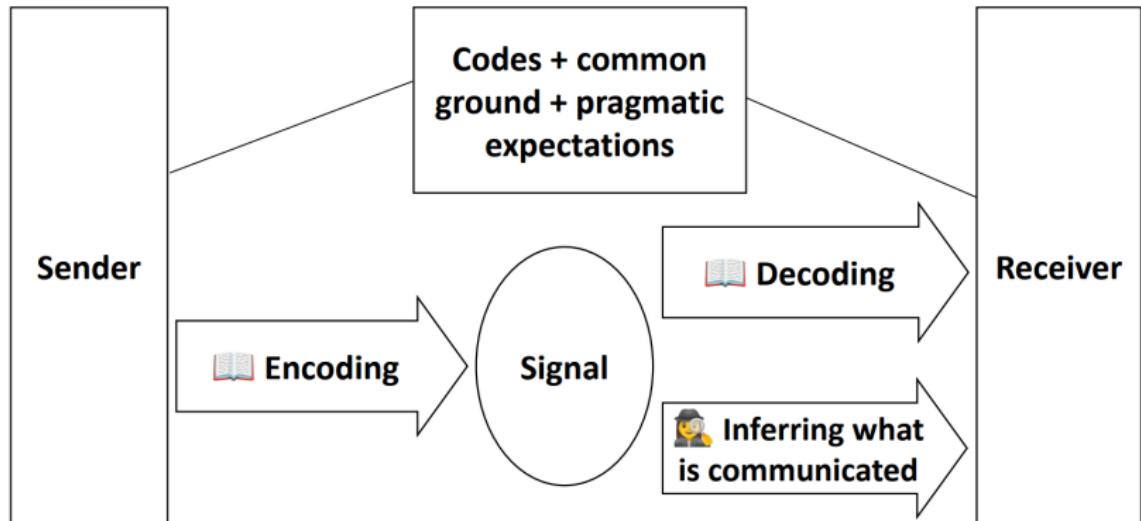


Figure: Detective analysis in cognitive pragmatics.

How to integrate psychological theories of emotion?

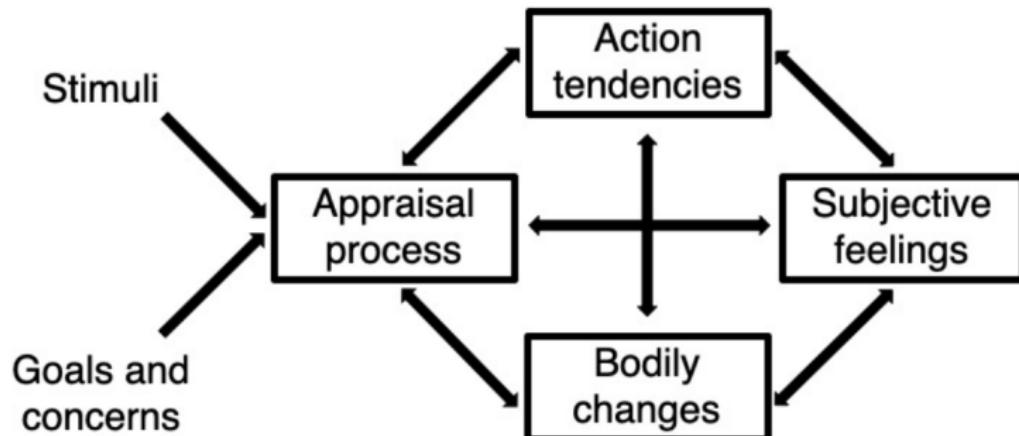


Figure: The integrated framework for emotion theories (Scherer, 2022b).

Rectangles represent the components constituting an emotional episode, and arrows represent causation.

→ 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*.

Motivation

Limitation: Existing datasets do not consider all emotion components

Kim and Klinger (2019) study emotion communication in fan-fiction via sensations, postures, and facial expressions

Tammewar et al. (2020) annotate emotion carriers (events, people, objects) in spoken personal narratives in German (Rathner et al., 2018)

Casel, Heindl, and Klinger (2021) associate text spans with Scherer's emotion components in literature and Twitter corpora

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

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)

→ 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 real-life and oniric situations

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

Component	Logistic Regression (tf-idf)			CamemBERT		
	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
Without behavior	77.4 (2.3)	75.8 (2.4)	74.5 (2.6)	80.3	79.8	79.7
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
Without reason	64.3 (4.1)	64.5 (2.4)	62.3 (2.8)	78.7	78.5	78.6
Only behavior	52.1 (3.5)	54.6 (2.9)	51.7 (2.9)	68.4	67.1	66.6
Only feeling	69.6 (1.5)	68.9 (2.1)	68.4 (2.0)	67.8	68.4	67.7
Only thinking	50.1 (3.4)	53.8 (2.3)	50.6 (2.7)	70.5	70.1	70.1
Only reason	68.2 (1.8)	66.8 (2.2)	66.6 (2.3)	71.4	68.4	68.9

→ All components help; best results come from using all, *supporting Scherer's hypothesis*

→ Some components benefit from contextual understanding and world knowledge

Motivation for dream analysis

We performed emotion analysis on concrete, real life situations

We now turn to oniric, fictional situations: dream narratives

According to the *continuity hypothesis*, dreams reflect waking-life concerns, emotions, and social contexts (Schredl and Hofmann, 2003)

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

Quantitative analysis of dream narratives

Quantitative dream analysis studies the continuity hypothesis, and relies on dream databases and annotation schemes

(Winget and Kramer, 1979; Domhoff and Schneider, 2008)

DreamBank contains 27,000 narratives, only 1823 annotated with the Hall and Van de Castle (HVdC) scheme

(Flanagan, 1966; Domhoff and Schneider, 2008)

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**

CHAR.	AGGRESSION		FRIENDLINESS		SEXUALITY	SET.	OBJ.		
2MUT	1MUT 3> 1FKT		D 5= 1MUT			OU	[not coded]		
1MUT	D 2= 1MUT								
1FKT	ACTIVITIES					MOD.			
	[not coded]					[not coded]			
	FAILURE	SUCCESS	MISFORTUNE	GOOD FORT.	EMOTIONS				
					AP, D				

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)

Distributional semantic-based approaches represent text spans in a vector space to identify prototypical situations
(Gutman Music, Holur, and Bulkeley, 2022)

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

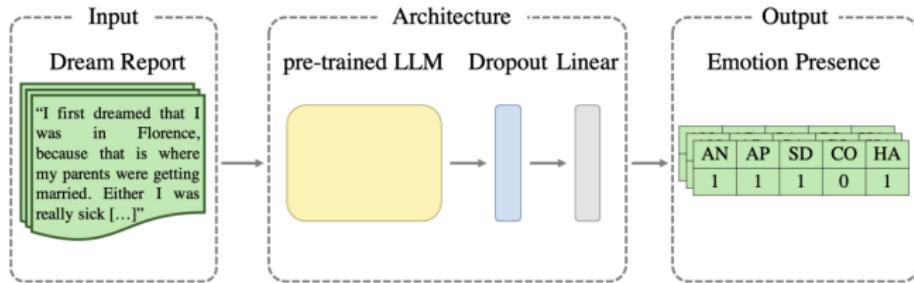


Figure: Architecture for multi-label emotion detection (Bertolini et al., 2023).

They use full context and compare predictions with gold annotations

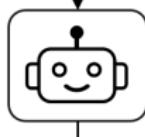
Limitations: emotions without characters; frequency not captured

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

Character and emotion detection in dream narratives

Dream narrative: Chloé called me on my phone. She was happy to tell me that she liked a boy.

Characters: 1FKA, 1MSA. *Chloé and the boy.*
Emotion: 1FKA HA. *Chloé is happy.*



*conversion
into natural
language*

[CHARACTER] status is individual alive, gender is female, identity is known, age is adult [CODE] 1FKA
[CHARACTER] status is individual alive, gender is male, identity is stranger, age is adult [CODE] 1MSA
[EMOTION] 1FKA is happy

→ 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
Baseline	82.9	78.0	76.2	86.2	64.7	75.1
No _{semantics}	71.4	56.5	61.0	90.5	41.8	75.8
No _{names}	80.7	74.3	74.2	84.0	60.9	73.0
Size _{small}	78.4	72.1	70.3	81.7	56.8	70.2
Size _{large}	84.5	80.3	78.6	87.3	67.6	74.7
First _{group}	82.3	77.7	74.9	85.6	63.7	71.9
First _{individual}	80.6	76.1	74.2	83.9	62.7	67.3
First _{emotion}	83.9	78.7	77.1	87.6	65.0	72.0
Conversion _{comma}	84.0	79.8	77.7	87.1	66.7	73.7
Conversion _{marker}	82.4	78.5	76.5	86.1	65.4	74.4

→ 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
	undefined	7.9	8.7	-0.9

Table: Identity and gender proportions for the veteran (n=566 narratives)
versus other dreamers. Δ shows the difference in percentage points; $p < 0.05$.

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

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

Automatic thematic analysis in mental health narratives using language models



callyope.com

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
- ▶ Thematic analysis studies how people construct meaning
- ▶ Thematic analysis is time-consuming, often constrained to small, monolingual corpora (Stanghellini et al., 2023)
- ▶ Computational approaches offers time savings, can analyze a larger amount of data

Methodology

We developed a pipeline that:

- ▶ clusters narratives across different cohorts by semantic content
- ▶ generates fine-grained natural language descriptions for each cluster
- ▶ links clusters to variation in clinical scores and sociodemographics

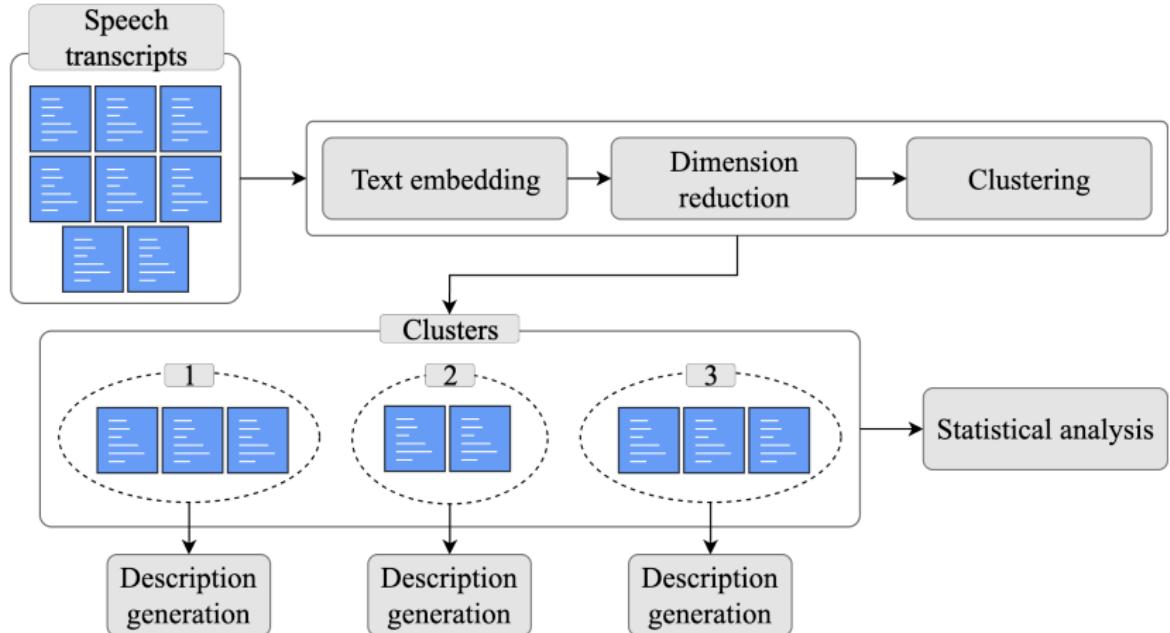
Data collection

Narratives and clinical scores from **four cohorts**: French general population (n=1809) and three clinical cohorts (Italian n=116, Chinese n=52, Spanish n=90)

Clinical scores for depression (BDI, PHQ9, MADRS), anxiety (GAD7), insomnia (AIS), and fatigue (MFI)

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

Semantic clustering and description generation

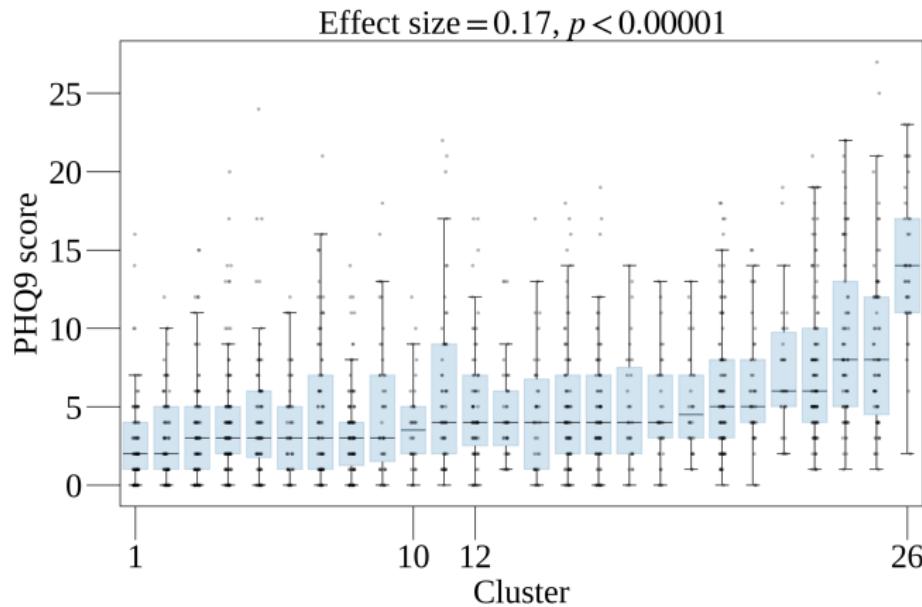


Contributions

- ▶ First topic modeling *across different languages and cohorts* using language models
- ▶ Replaced keywords ("family") with *context-rich descriptions* to capture symptom co-occurrence and clinical nuance ("family conflicts", "stress related to exam preparation")
- ▶ Identified *risk* ("sleep disturbance") and *protective* ("physical activity") topics for depression, consistent with psychiatric literature

Distribution of depression scores across clusters

Current feelings and sleep (n=1786)



→ 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)

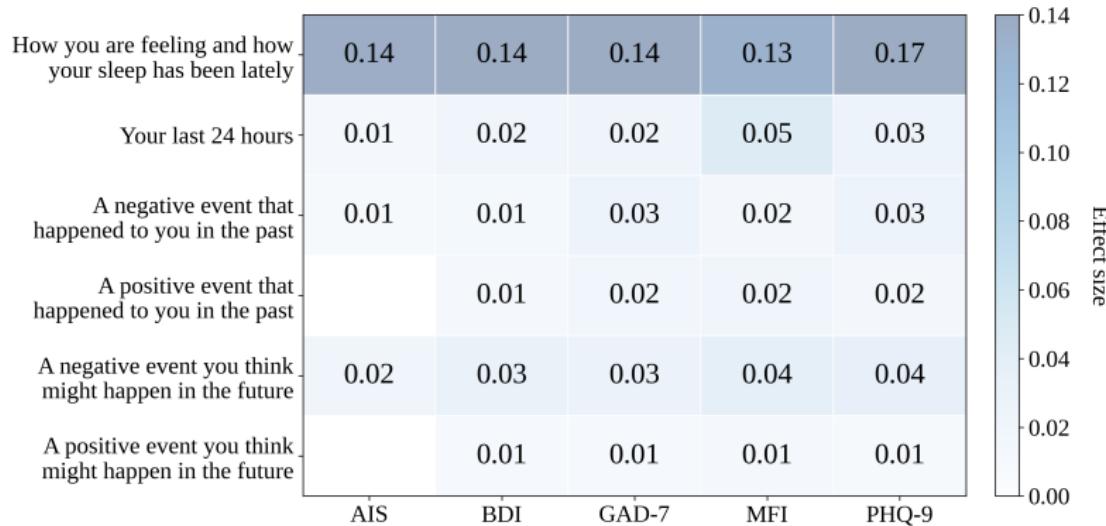
Cluster 10 description: The individuals express frequent nighttime urinary interruptions disrupting sleep, often attributed to age-related conditions like prostate issues or overactive bladder, alongside mixed reports of physical well-being, mental resilience, and lifestyle factors such as retirement 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)

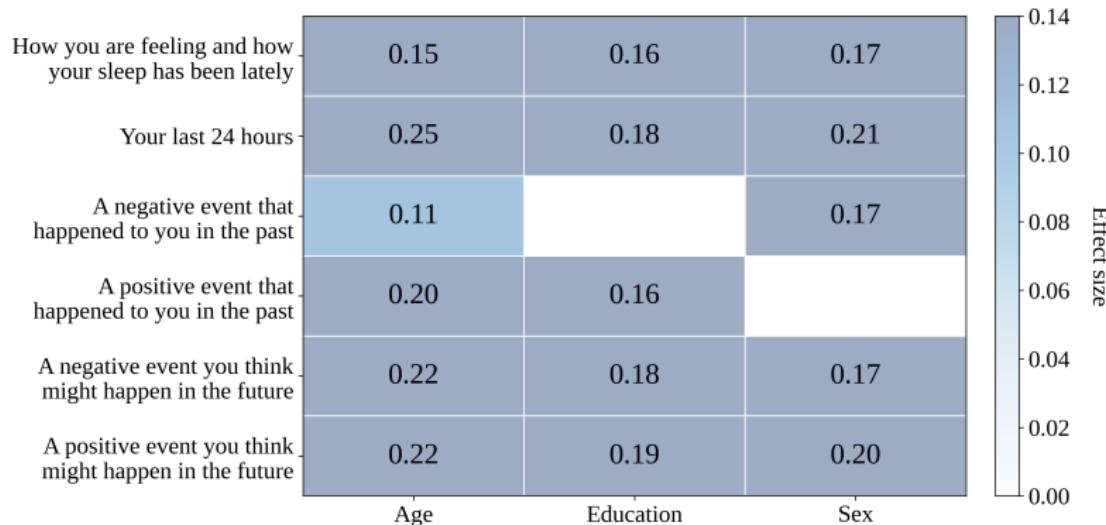
→ Clustering captures symptom severity and age-related circumstances

Effect size across questions and clinical scores



→ Certain questions better discriminate clinical scores

Effect size across questions and sociodemographics



→ Nearly all questions discriminate sociodemographics

Risk and protective topics for depression

NLP and psychiatry researchers reviewed generated cluster descriptions to identify risk and protective topics for depression

- ▶ **Risk topics:** sleep disturbance and fatigue (Yasugaki et al., 2025); unemployment and financial stress (Arena et al., 2023); exam pressure (Pérez-Jorge et al., 2025).
- ▶ **Protective topics:** arts and creative activity (Fancourt and Finn, 2019); gardening and nature (Soga, Gaston, and Yamaura, 2017); holidays and travel (Bloom, Geurts, and Kompier, 2013); physical activity (Pearce et al., 2022)

→ We found topics consistent with psychiatric literature, aligned with labor-intensive qualitative research (Stanghellini et al., 2023)

Conclusion and perspectives

Conclusion

How to model subjective experience in personal narratives?

- ▶ Cognitive science perspective on emotion analysis
 - ▶ Overview of psychological theories with emotion annotation schemes
 - ▶ Limitations and research directions for emotion analysis
- ▶ New French corpus of narratives based on emotion components
- ▶ Emotion analysis in emotional and dream narratives
 - ▶ First language model for emotion prediction based on components
 - ▶ First language model for character and emotion prediction in dreams
- ▶ Automatic thematic analysis in mental health narratives

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Perspectives

- ▶ **Emotion analysis for mental health:** empathic support, cognitive distortions, theory of mind
(Gandhi et al., 2023; Ma et al., 2023; A. Sharma et al., 2023)
- ▶ **Post-training for psychology:** preferences and reasoning data
(M. Zhang, Eack, and Z. Z. Chen, 2025)
- ▶ **Psychology of language models:** sycophancy, thought operations
(Didolkar et al., 2025; M. Sharma et al., 2025)

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 Kurabayashi et al. Bangkok, Thailand: Association for Computational Linguistics, pp. 264–277. DOI: [10.18653/v1/2024.cmcl-1.23](https://doi.org/10.18653/v1/2024.cmcl-1.23)

Gustave Cortal, 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.latechclf1-1.8](https://doi.org/10.18653/v1/2023.latechclf1-1.8)

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

Component classification in emotional narratives

Model	Precision	Recall	F_1
Logistic Regression	84.9 (0.3)	84.3 (0.3)	84.4 (0.3)
CamemBERT	93.2	93.0	93.1

Table: Scores (\pm std) for emotion component classification.

→ 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: ** ($p < 0.01$), * ($p < 0.05$).

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

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	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Suicidal risk, n (%)	-	-	-	60 (66.7)
No suicidal risk, n (%)	-	-	-	30 (33.3)
MADRS / MDD	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>	<i>n.s.</i>
Depression, n (%)	-	64 (55.2)	23 (44.2)	-
No depression, n (%)	-	52 (44.8)	29 (55.8)	-
PHQ-9	<i>n.s.</i>	<i>n.s.</i>	***	***
Mean (SD)	5.2 (4.6)	-	9.4 (8.5)	10.5 (6.8)
Range	0–27	-	0–25	0.0–26.0

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