

Ce document est copiable et distribuable librement et gratuitement à la condition expresse que son contenu ne soit modifié en aucune façon, et en particulier que le nom de son auteur et de son institution d'origine continuent à y figurer, de même que le présent texte.



**Attribution-NonCommercial-NoDerivatives 4.0  
International**

<https://creativecommons.org/licenses/by-nc-nd/4.0/legalcode>

# INFORMATIQUE ET SANTÉ : L'EXEMPLE DE LA PSYCHIATRIE NUMÉRIQUE

HISTOIRE D'UN RENDEZ-VOUS MANQUÉ

Vincent P. MARTIN

14 mars 2023

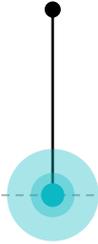
**LaBRI**

université  
de **BORDEAUX**

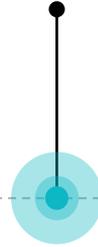
 **SANPSY**  
BORDEAUX  
neurocampus

# PLAN DE LA PRÉSENTATION

**Informatique et  
psychiatrie**



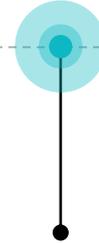
**Et les  
utilisateurs ?**



**Un outil  
objectif ?**



**Symptômes :  
perspectives**



1.

# Informatique et psychiatrie

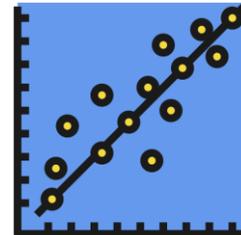
# AVANT DE COMMENCER

## PSYCHIATRIE : DE QUOI PARLE-T-ON ?

- ▶ “the branch of medicine concerned with the study, diagnosis, and treatment of mental illness.” Oxford dictionary
- ▶ Entretien clinique → Symptômes et syndromes → Diagnostic → Schéma thérapeutique
- ▶ Psychiatrie ≠ Psychologie ≠ Psychanalyse ≠ Psychothérapie

## AVANT DE COMMENCER INFORMATIQUE, STATISTIQUES, IA ?

- ▶ l'intelligence artificielle représente tout outil utilisé par une machine afin de « **reproduire des comportements liés aux humains**, tels que le raisonnement, la planification et la créativité » (CNIL)
- ▶ « Artificial Intelligence and Statistics: Just the Old Wine in New Wineskins? » Faes et al. 2022



# Un peu d'histoire



# INFORMATIQUE ET PSYCHIATRIE DE NOMBREUSES MODALITÉS

## ▸ Texte : Eliza (1966)

Welcome to

```

EEEEEE LL      IIII  ZZZZZZ  AAAAA
EE      LL      II    ZZ    AA  AA
EEEEEE LL      II    ZZ    AAAAAA
EE      LL      II    ZZ    AA  AA
EEEEEE LLLLLL  IIII  ZZZZZZ  AA  AA
  
```

Eliza is a mock Rogerian psychotherapist.  
The original program was described by Joseph Weizenbaum in 1966.  
This implementation by Norbert Landsteiner 2005.

```

ELIZA: Is something troubling you ?
YOU:   Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU:   They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU:   Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU:   He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU:   It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
  
```

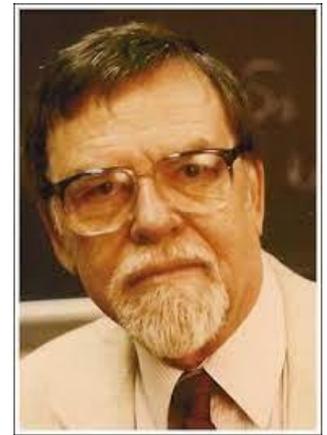
## INFORMATIQUE ET PSYCHIATRIE DE NOMBREUSES MODALITÉS

- ▶ Texte : Eliza (1966)
- ▶ Analyses biologiques (MRI, analyse sanguine)
- ▶ Analyses génétiques
- ▶ Prédiction et classification (1950's)
- ▶ ...

# INFORMATIQUE ET PSYCHIATRIE

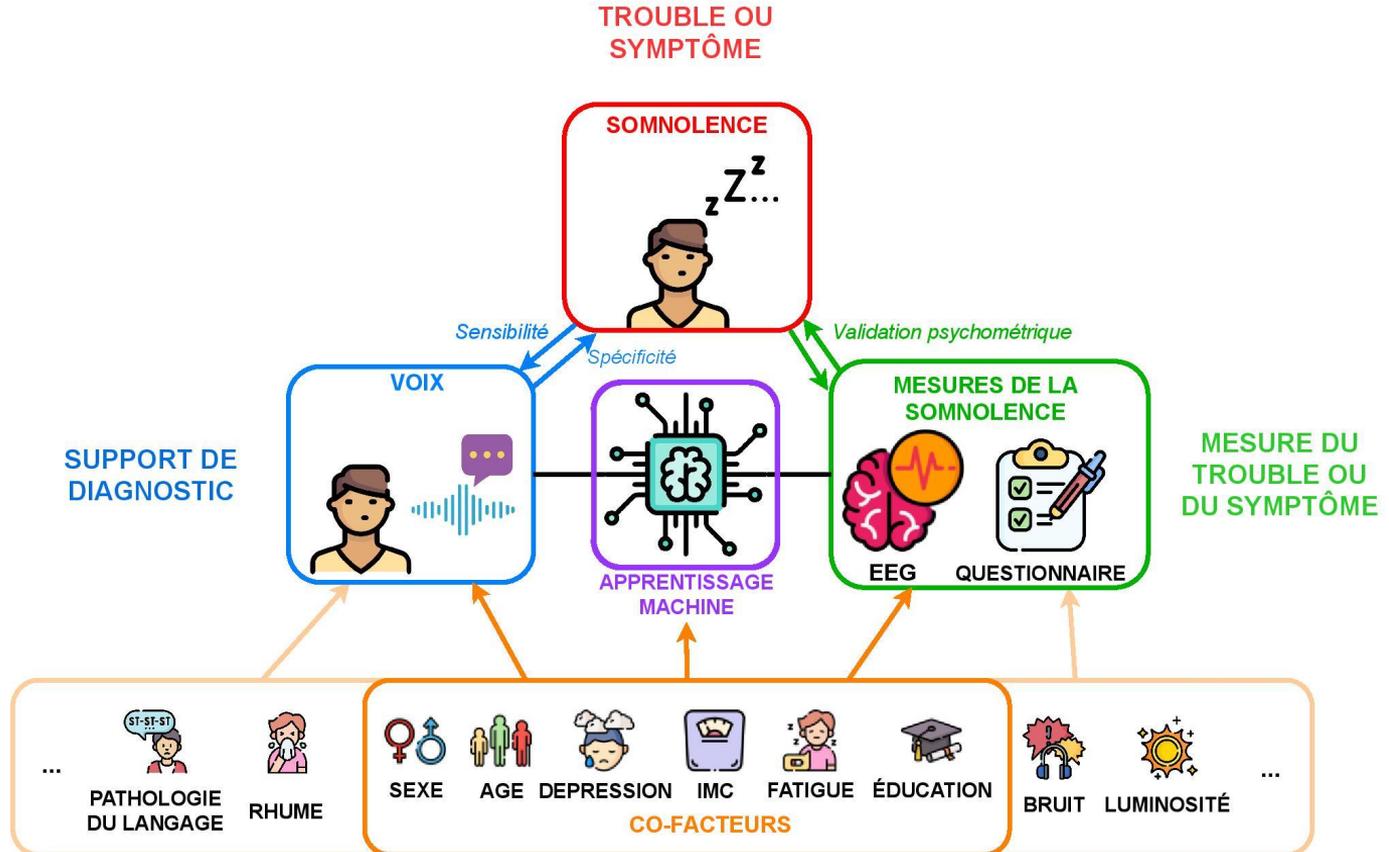
## ASPECTS HISTORIQUES

- ▶ Meehl (1920-2003)
- ▶ 1957 : Clinical vs. Statistical prediction
- ▶ 1964 « the clinician performs certain unique, important, and unduplicable functions, in some of which he has literally no competition »
- ▶ « A therapist cannot put his patient in cold storage while he, the therapist, runs off a P-technique factor analysis on a 28-variable correlation matrix derived from the patient's verbal productions during the preceding 30 minutes. [...] the time required for coding and feeding would make this science fiction fantasy an inadequate solution. »



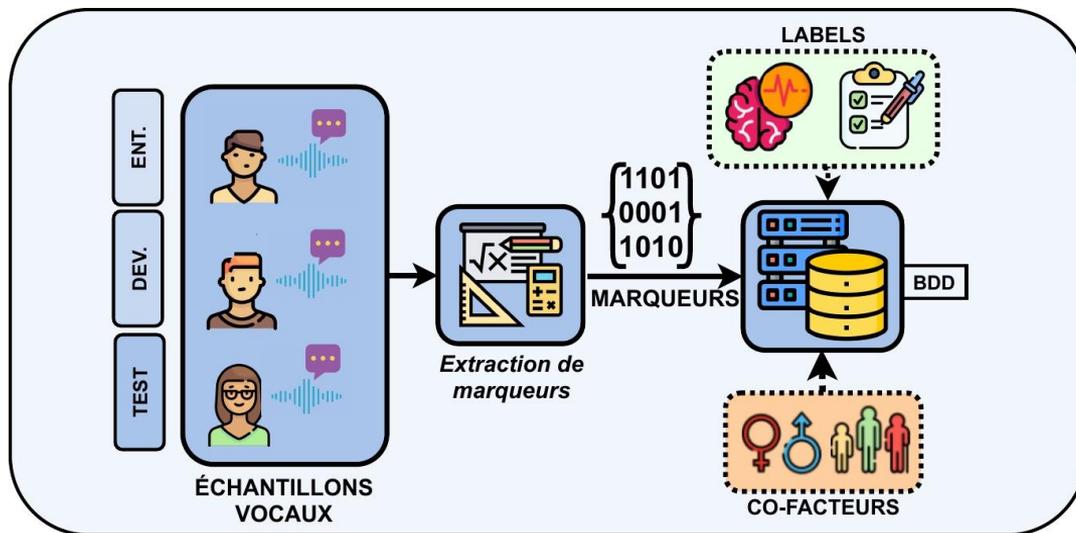
# INFORMATIQUE ET PSYCHIATRIE

## EX : LES BIOMARQUEURS VOCAUX



# INFORMATIQUE ET PSYCHIATRIE

## EX : LES BIOMARQUEURS VOCAUX

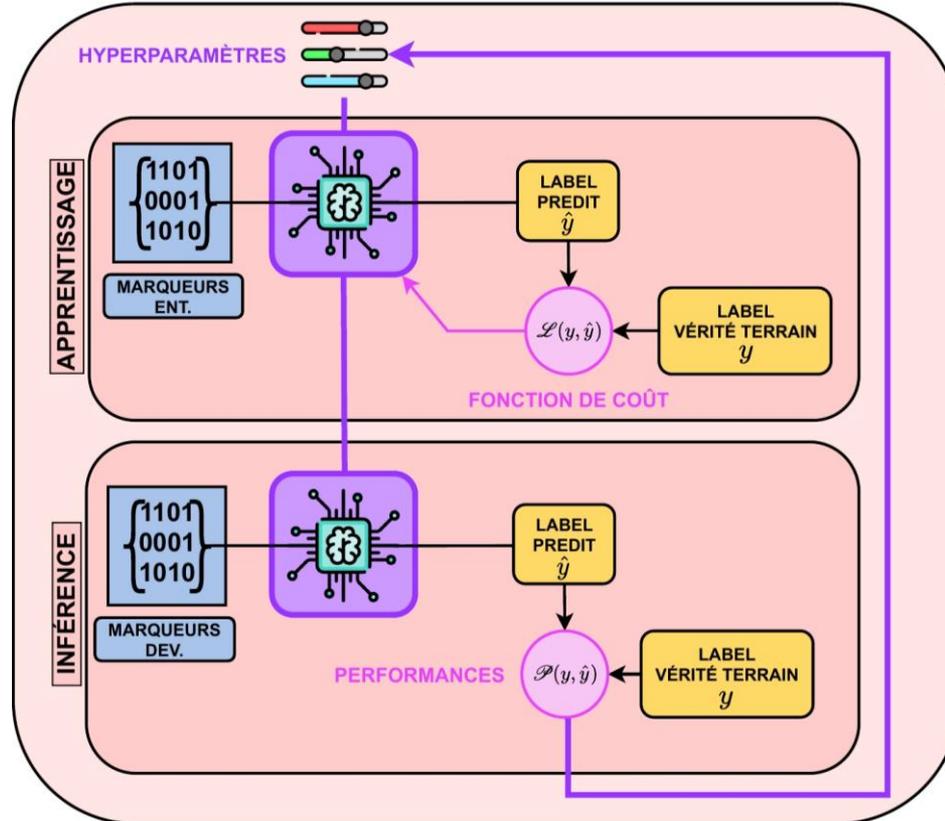


1

ÉLABORATION DE LA BASE DE DONNÉES

# INFORMATIQUE ET PSYCHIATRIE

## EX : LES BIOMARQUEURS VOCAUX

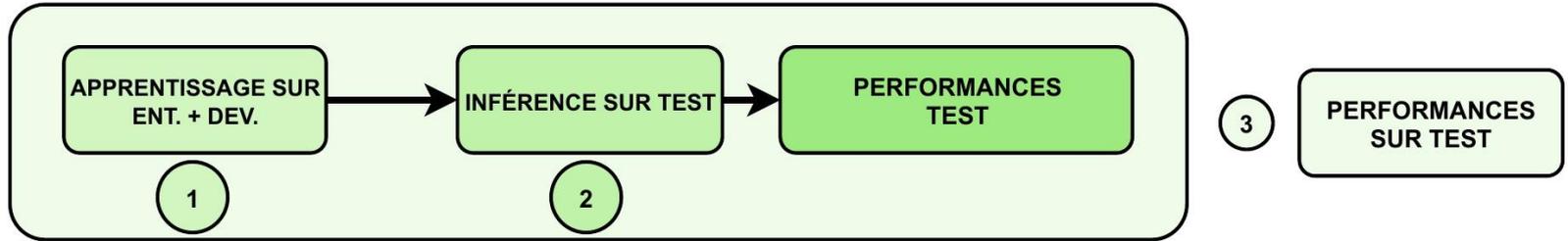


2

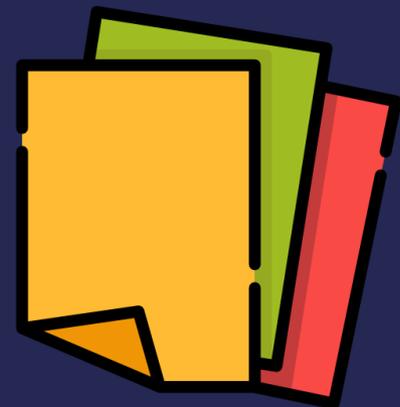
OPTIMISATION DES  
HYPERPARAMÈTRES

# INFORMATIQUE ET PSYCHIATRIE

## EX : LES BIOMARQUEURS VOCAUX



# État de l'art



# INFORMATIQUE ET PSYCHIATRIE

## BIOMARQUEURS VOCAUX : ÉTAT DE L'ART

- ▶ [Low et al. 2020](#),  
« Automated assessment of psychiatric disorders using speech: A systematic review », *Laryngoscope Investigative Otolaryngology*



# INFORMATIQUE ET PSYCHIATRIE

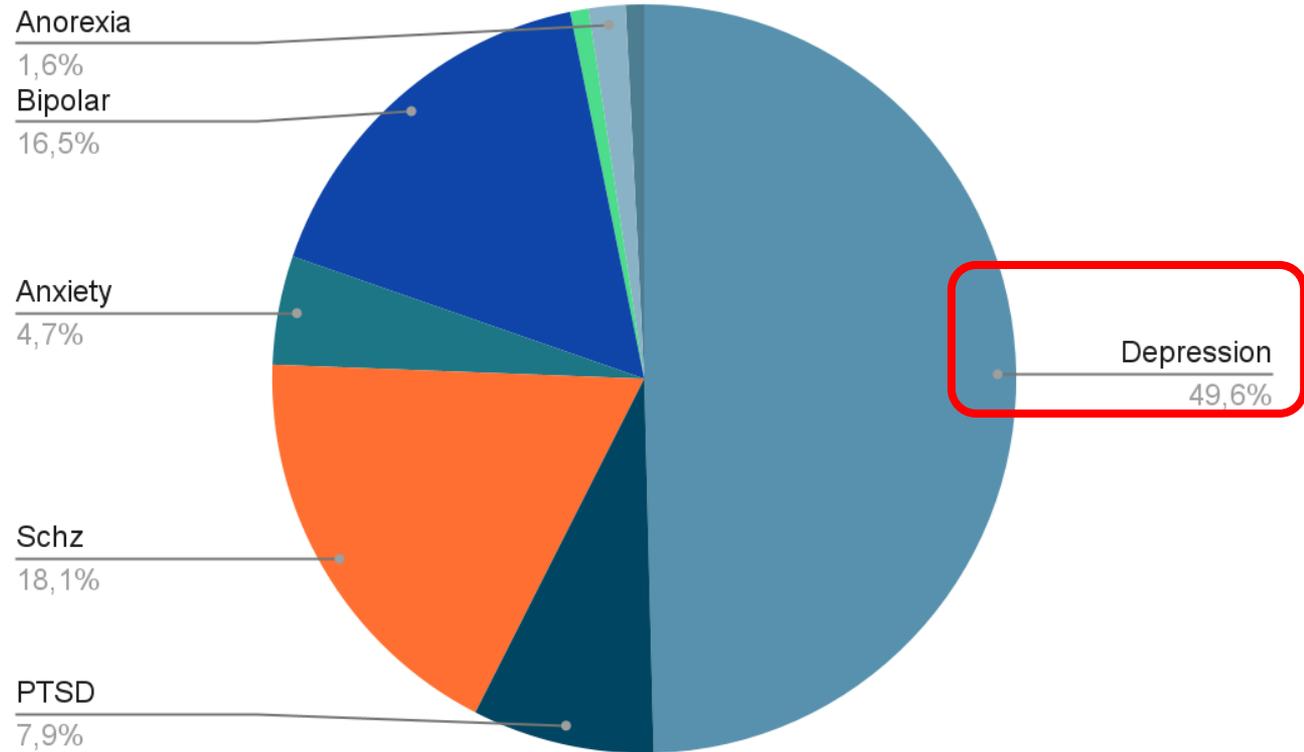
## BIOMARQUEURS VOCAUX : ÉTAT DE L'ART

- ▶ Google Scholar
- ▶ 2009-2019
- ▶ **127** études

Données supplémentaires  
en ligne

# INFORMATIQUE ET PSYCHIATRIE

## BIOMARQUEURS VOCAUX : ÉTAT DE L'ART



2.

Un outil objectif ?

# UN OUTIL OBJECTIF ?

## LE BESOIN DE DIAGNOSTICS OBJECTIFS

“There is an **urgency** to **objectively diagnose**, monitor over time, and provide evidence-based interventions for individuals with mental illnesses”

[Low et al. 2020](#)

“Gold-standard diagnostic and assessment tools for depression and suicidality remain rooted, almost exclusively, on the **opinion of individual clinicians** risking a range of **subjective biases**. [...] Currently there is no **objective measure**, with **clinical utility**, for either depression or suicidality”

[Cummins et al. 2015](#)

# UN OUTIL OBJECTIF ?

## LE BESOIN DE DIAGNOSTICS OBJECTIFS

Aboraya 2007

- ▶ 28 professionnels de santé
- ▶ La plupart d'entre eux/elles (87%) : leur diagnostic = pas fiable
- ▶ Pourquoi ?
  - ▶ Définition des maladies: **14.9%**
  - ▶ Caractéristiques des patients: **21.6%**
  - ▶ Facteurs liés aux cliniciens (éducation, biais, style) : **63.5%**

**1er facteur impliqué dans le diagnostic = clinicien**

# UN OUTIL OBJECTIF ?

## LE BESOIN DE DIAGNOSTICS OBJECTIFS

Kendell 1971

**Table 6.—Diagnoses Given to Patient F**

	American Psychiatrists (N = 133)	British Psychiatrists (N = 194)
<b>Schizophrenia</b>	<b>92 (69%)</b>	4 (2%)
Simple	0	1
Catatonic	1	0
Paranoid	27	1
Latent	8	0
Residual	3	0
Schizo-affective	33	1
Unspecified	20	1
<b>Personality Disorder</b>	10 (8%)	<b>146 (75%)</b>
Paranoid	1	2
Affective (cyclothymic)	1	8
Explosive	0	2
Hysterical	4	105
Asthenic	0	2
Antisocial	1	8
Unspecified	3	19
<b>Affective Psychosis</b>	10 (8%)	7 (4%)
<b>Neurosis</b>	19 (14%)	37 (19%)
<b>Alcoholism or Drug Dependence</b>	2	0

⇒ **Nous avons besoin de  
diagnostics **objectifs****

# Diagnostic : de quoi parle-t-on ?



# UN OUTIL OBJECTIF DIAGNOSTIC : DE QUOI PARLE-T-ON ?

## **Annotation des bases de données**

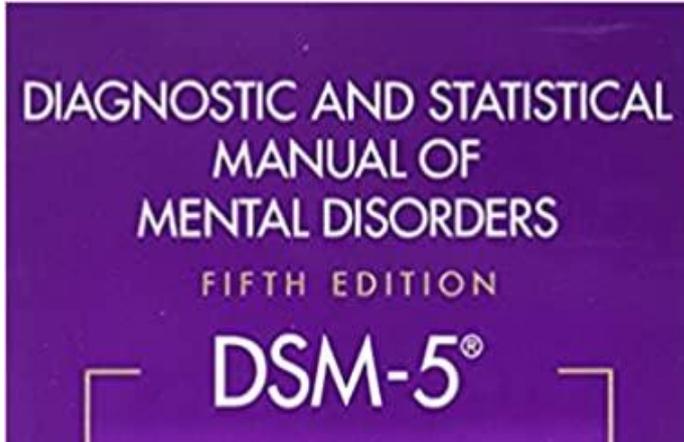
- ▶ Questionnaires (ex. PHQ9)

		Not at all	Several days	More than half the days	Nearly every day
1.	Little interest or pleasure in doing things	0	1	2	3
2.	Feeling down, depressed, or hopeless	0	1	2	3
3.	Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4.	Feeling tired or having little energy	0	1	2	3
5.	Poor appetite or overeating	0	1	2	3
6.	Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7.	Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8.	Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9.	Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

# UN OUTIL OBJECTIF DIAGNOSTIC : DE QUOI PARLE-T-ON ?

## Label

- ▶ Questionnaires (ex. PHQ9)
- ▶ Classifications de référence  
(par ex. DSM or ICD)



# Major Depressive Disorder

## Diagnostic Criteria

- A. Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure.

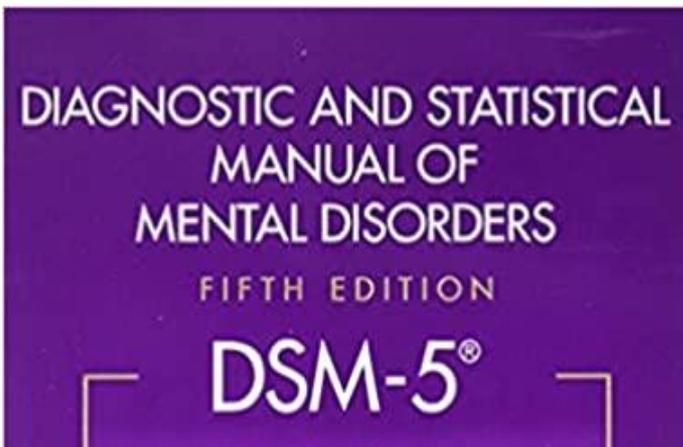
**Note:** Do not include symptoms that are clearly attributable to another medical condition.

1. Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad, empty, hopeless) or observation made by others (e.g., appears tearful). (**Note:** In children and adolescents, can be irritable mood.)
2. Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation).
3. Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. (**Note:** In children, consider failure to make expected weight gain.)
4. Insomnia or hypersomnia nearly every day.
5. Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down).
6. Fatigue or loss of energy nearly every day.
7. Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick).
8. Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others).
9. Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

# UN OUTIL OBJECTIF DIAGNOSTIC : DE QUOI PARLE-T-ON ?

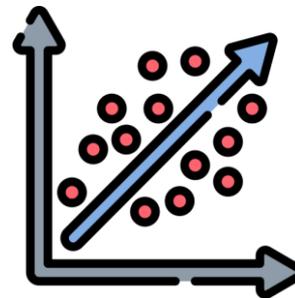
## Label

- ▶ Questionnaires (ex. PHQ9)
- ▶ Classifications de référence (par ex. DSM or ICD)



## Tâches d'apprentissage automatique

- ▶ **diagnostic**: classification binaire
- ▶ **estimation de la sévérité**: régression avec le score



Qu'est ce qu'un  
diagnostic « objectif » ?

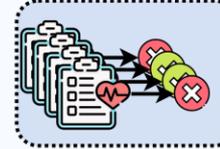
# UN OUTIL OBJECTIF

## QU'EST-CE QU'UN DIAGNOSTIC OBJECTIF ?

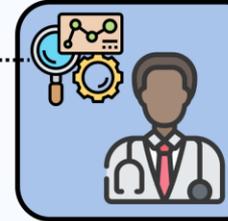


### FACTEURS SUBJECTIFS

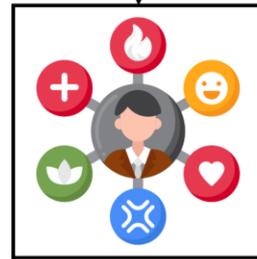
Qualité de la formation, état émotionnel,  
travail dans une équipe  
interdisciplinaire, café du matin, ...



Expérience des cas  
cliniques

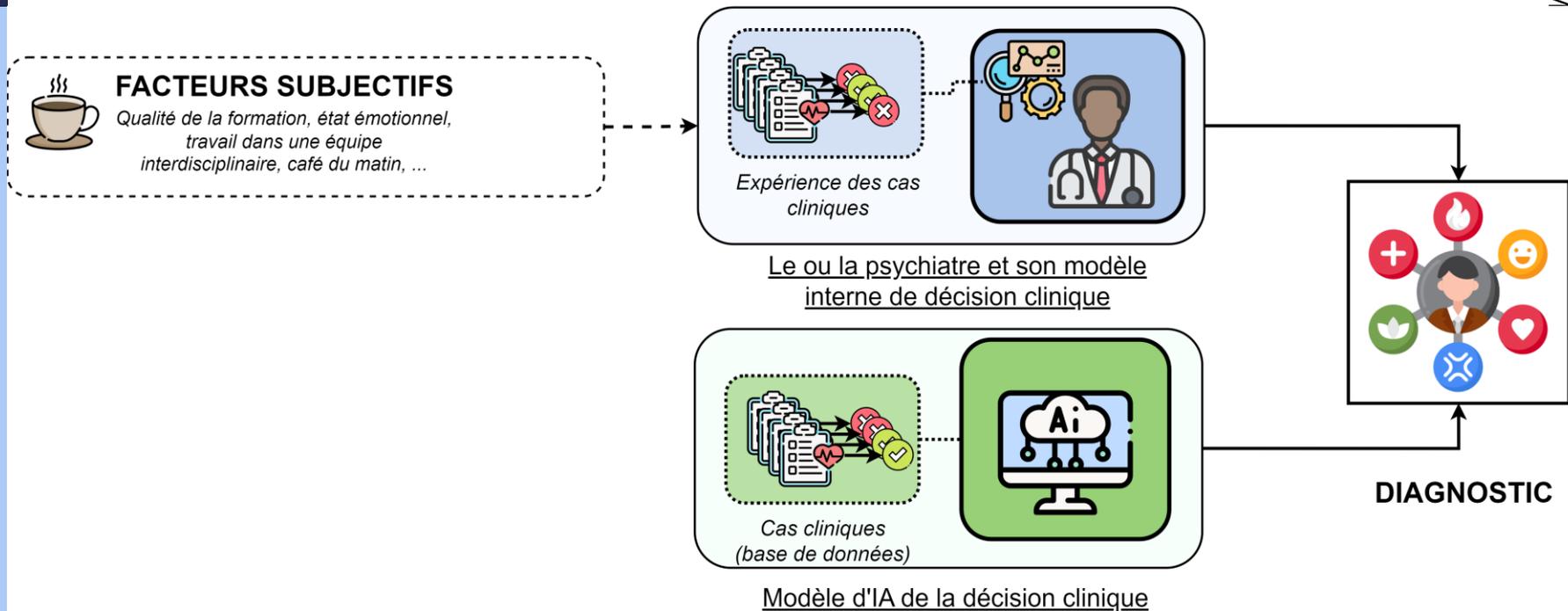


Le ou la psychiatre et son modèle  
interne de décision clinique

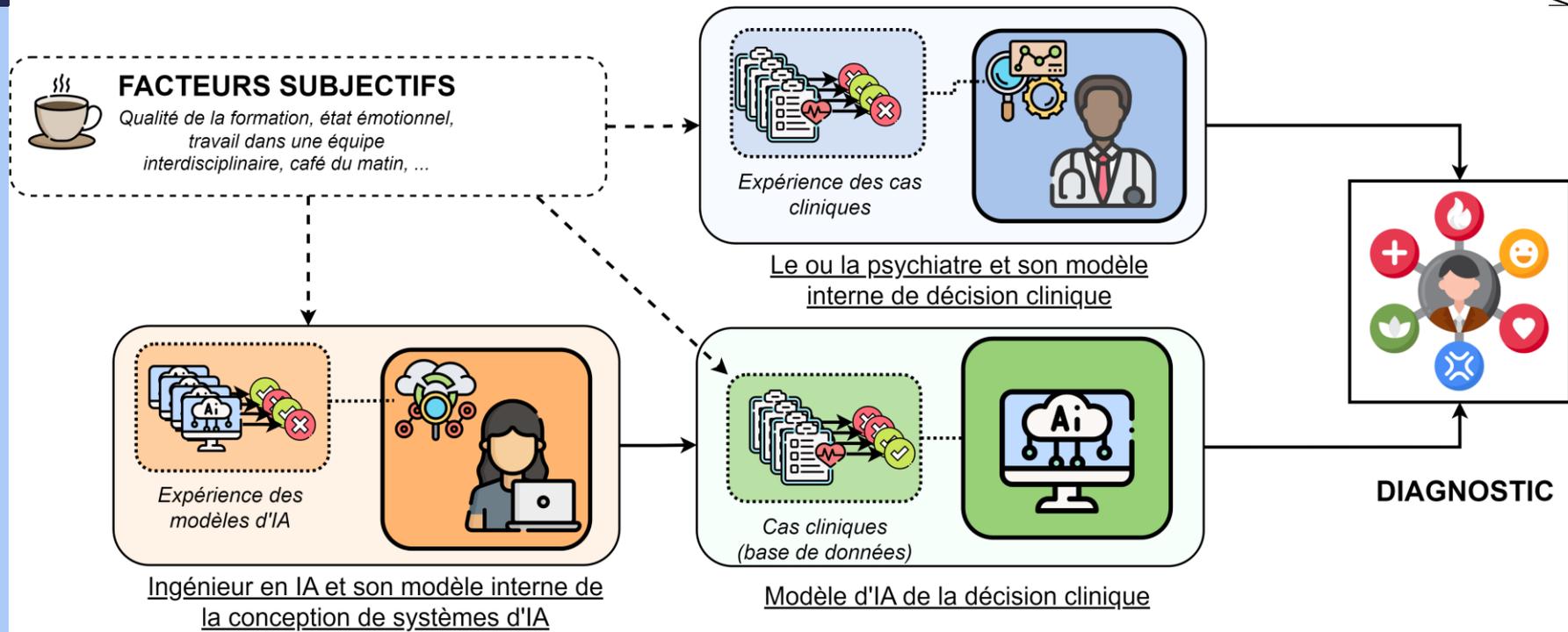


**DIAGNOSTIC**

# UN OUTIL OBJECTIF QU'EST-CE QU'UN DIAGNOSTIC OBJECTIF ?



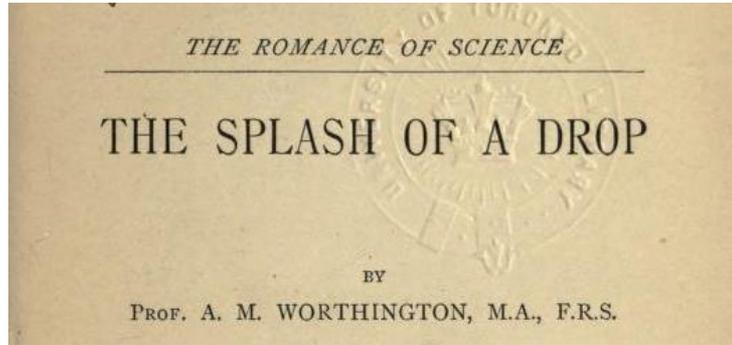
# UN OUTIL OBJECTIF QU'EST-CE QU'UN DIAGNOSTIC OBJECTIF ?



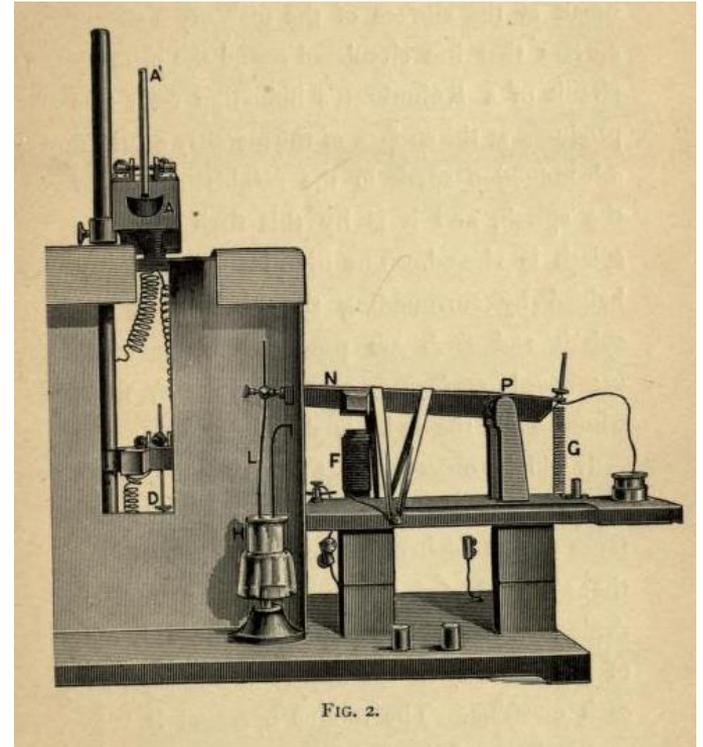
# UN OUTIL OBJECTIF EST-CE QUE «OBJECTIF», C'EST MIEUX ?

## THE SPLASH OF A DROP,

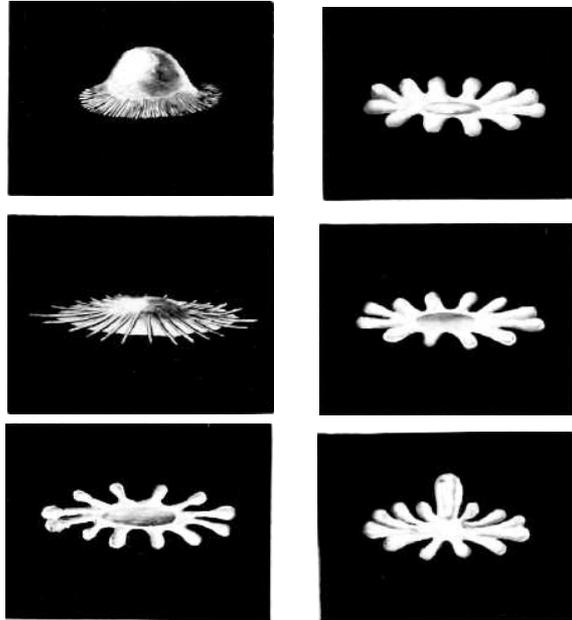
Pr. Worthington, *Royal Institution of Great Britain*, May 18, 1894



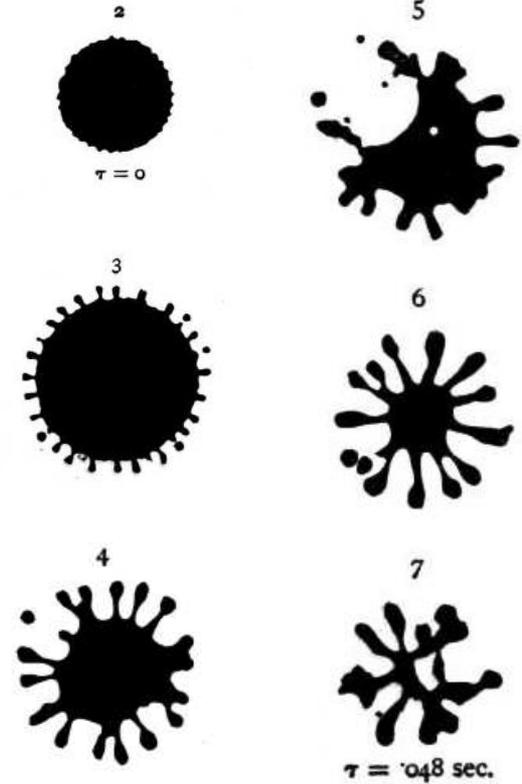
- ▶ Goutte de mercure sur du verre
- ▶ Lumière à délais constants



# UN OUTIL OBJECTIF EST-CE QUE «OBJECTIF», C'EST MIEUX ?



Lequel représente **le mieux** la réalité ?





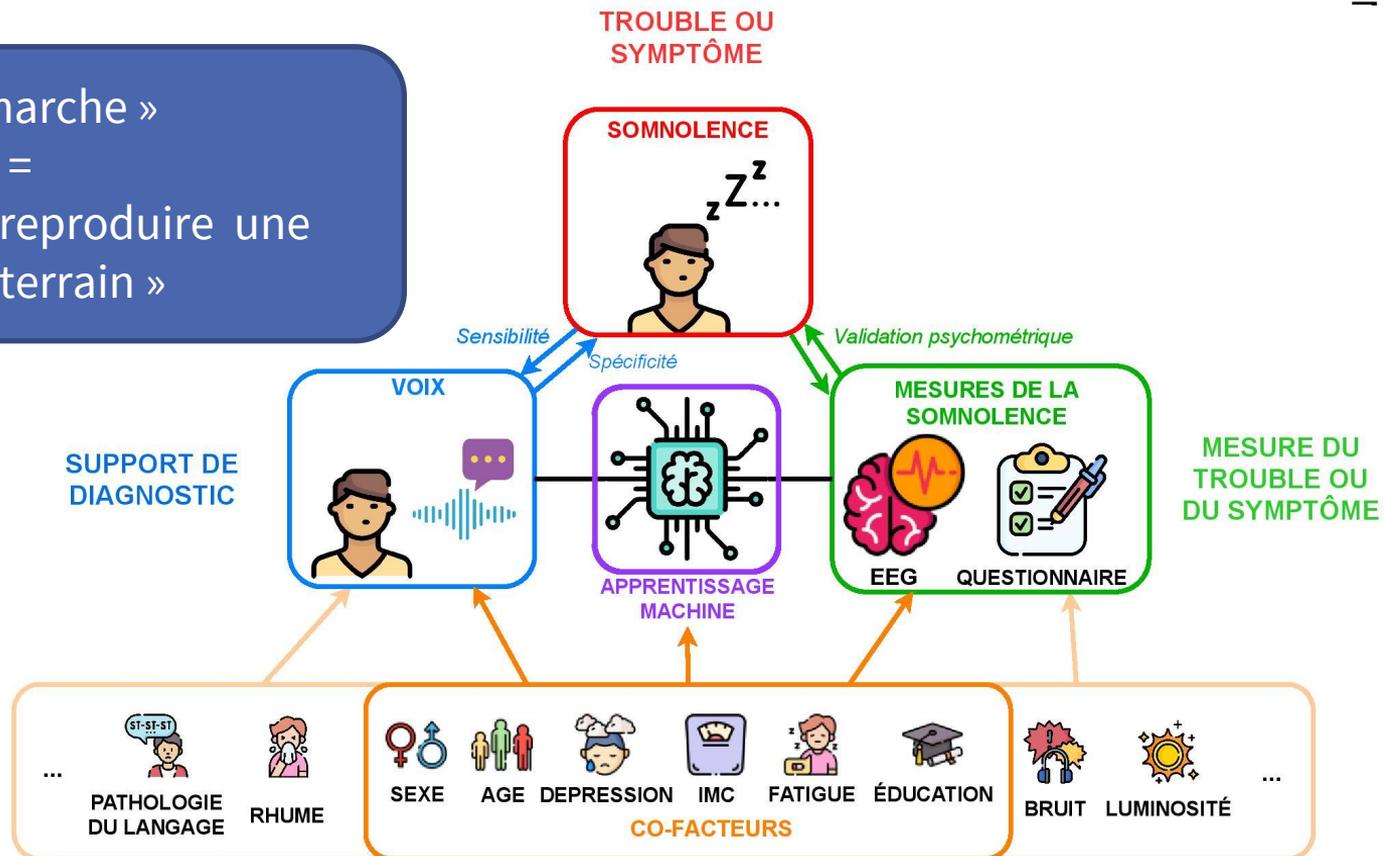
« Mais ça marche ! »

# « MAIS ÇA MARCHE ! » ÇA MARCHE ?

« Ça marche »

=

« On arrive à reproduire une  
vérité terrain »



# « MAIS ÇA MARCHE ! » ADVERSARIAL ATTACKS



"Panda"

57.7% de confiance

+ .007 ×



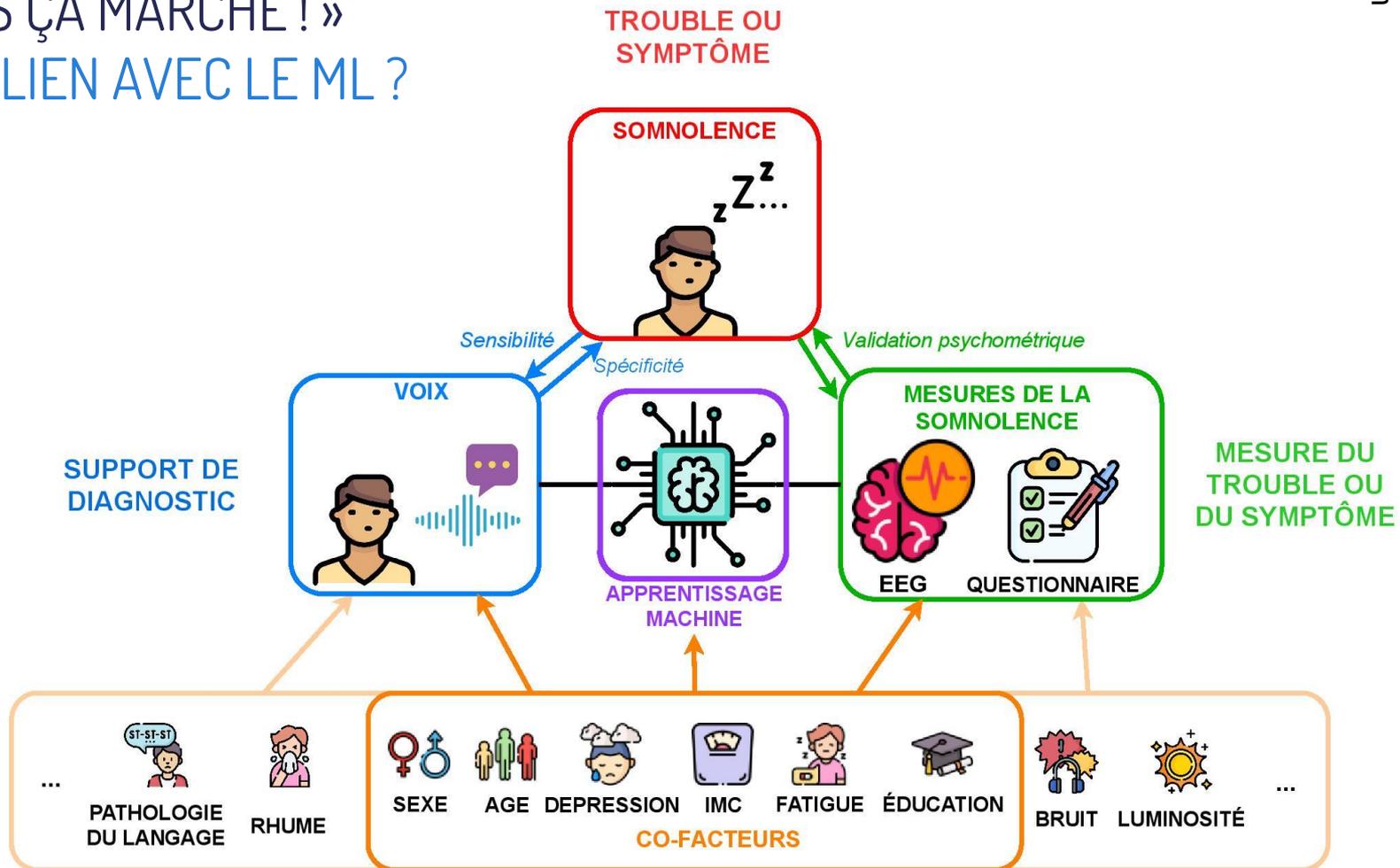
Bruit

# « MAIS ÇA MARCHE ! » HANS LE MALIN, OU L'EFFET PYGMALION

- ▶ Le cheval du Dr. Von Osten (Pfungst, 1911)



# « MAIS ÇA MARCHE ! » QUEL LIEN AVEC LE ML ?



« MAIS ÇA MARCHE ! »  
IRRELEVANT TRANSFORMATIONS

Solution ?  
**Irrelevant transformations**

Sturm 2014

3.

Et les utilisateurs ?

**Pb : non utilisés dans les  
conditions cliniques réelles**

## ET LES UTILISATEURS ? POURQUOI N'EST-CE PAS ENCORE UTILISÉ ?

- ▶ Performances ?
  - ▶ **80%** pour le trouble bipolaire, **95%** pour la schizophrénie, **89.3%** pour la dépression
  - ▶ Bonnes performances depuis des décennies (e.g. 75% for depression en 2013)



# ET LES UTILISATEURS ?

## POURQUOI N'EST-CE PAS ENCORE UTILISÉ ?

- ▶ Performances ? 
- ▶ Taille des bases de données ?
  - ▶ Bases de données enregistrées en condition écologique
    - ◆ n=9920 ([Rutowski et al. 2022](#))
    - ◆ n=3580 ([Di et al. 2021](#))



# ET LES UTILISATEURS ? POURQUOI N'EST-CE PAS ENCORE UTILISÉ ?

- ▶ Performances ? 
- ▶ Bases de données ? 
- ▶ Limites réglementaires ?



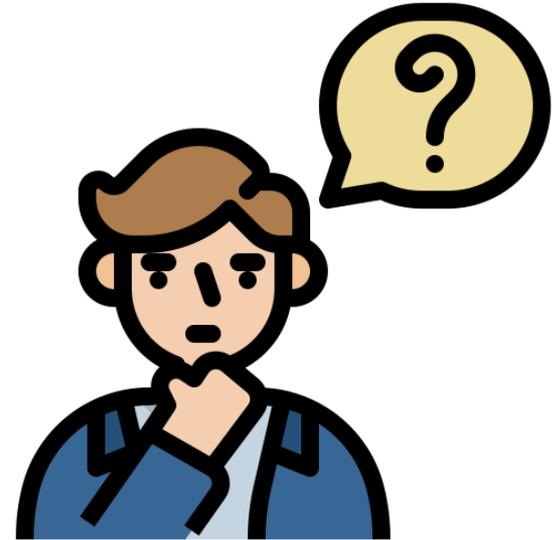
# ET LES UTILISATEURS ? POURQUOI N'EST-CE PAS ENCORE UTILISÉ ?

- ▶ Performances ? 
- ▶ Bases de données ? 
- ▶ Limites réglementaires ? 
- ▶ Transparence ?
  - ▶ **CONFIANCE**

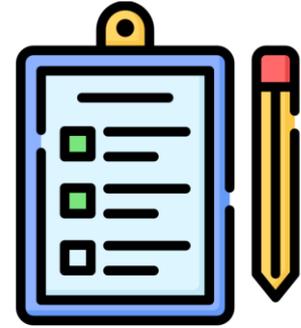


## ET LES UTILISATEURS ? POURQUOI N'EST-CE PAS ENCORE UTILISÉ ?

- ▶ Performances ? ❌
- ▶ Bases de données ? ❌
- ▶ Limites réglementaires ? ❌
- ▶ Transparence ? ❌



## ET LES UTILISATEURS ? RELATION THÉRAPEUTIQUE



- ▶ **Bourla et al.:** [\*Bourla et al. 2018\*](#)
  - ▶ 515 psychiatres
  - ▶ 3 scénarios: bracelet connecté pour le phénotypage numérique, tests sanguins analysés par ML, magnetic resonance imaging (MRI) analyse avec ML.
  - ▶ 4 domaines : utilité, utilisabilité, fiabilité, risque
  
  - ▶ Acceptabilité globale = moyenne.
  - ▶ **Tous les systèmes = risqués (410/515, 79.6%).**
  - ▶ Acceptabilité = Très influence par caractéristiques socioepidemiologiques culture professionnelle, sexe, age, approche théorique.
  - ▶ **Inquiétudes =**
    - ◆ Sécurité des données, stockage des données, risqué liés à la privacité
    - ◆ **Relation thérapeutique**

## ET LES UTILISATEURS ? RELATION THÉRAPEUTIQUE

*Bourla et al. 2018*

- ▶ Importante pour le traitement et l'issue thérapeutique
- ▶ « Vous êtes dépressif », « Vous avez sûrement une schizophrénie », ...  
= Utile ni pour les cliniciens, ni pour les patients

**+ limites conceptuelles des critères diagnostiques**

# **Limites** des critères diagnostiques

# ET LES UTILISATEURS ?

## LIMITES DES CRITÈRES DIAGNOSTIQUES

### Questionnaires

- ▶ Non utilisés par les cliniciens
- ▶ Validés sur les critères diagnostiques

### Critères diagnostiques

- ▶ Culture (hikikomori)
- ▶ Temps (versions of the DSM)
- ▶ **Hétérogénéité**

# ET LES UTILISATEURS ?

## LIMITES DES CRITÈRES DIAGNOSTIQUES

### Dépression

- ▶ Nombre de profils symptomatiques
- ▶  $n = \binom{2}{1} \times \left( \binom{8}{4} + \binom{8}{5} + \dots + \binom{8}{8} \right)$
- ▶ = **326 profils uniques**
- ▶ **Eiko Fried: [STAR\\*D \(2015\)](#) : 1030 profils sur 3703 patients “dépressifs”**



### Major Depressive Disorder

#### Diagnostic Criteria

- A. Five (or more) of the following symptoms have been present during the same 2-week period and represent a change from previous functioning; at least one of the symptoms is either (1) depressed mood or (2) loss of interest or pleasure.
- Note:** Do not include symptoms that are clearly attributable to another medical condition.
1. Depressed mood most of the day, nearly every day, as indicated by either subjective report (e.g., feels sad, empty, hopeless) or observation made by others (e.g., appears tearful). (**Note:** In children and adolescents, can be irritable mood.)
  2. Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day (as indicated by either subjective account or observation).
  3. Significant weight loss when not dieting or weight gain (e.g., a change of more than 5% of body weight in a month), or decrease or increase in appetite nearly every day. (**Note:** In children, consider failure to make expected weight gain.)
  4. Insomnia or hypersomnia nearly every day.
  5. Psychomotor agitation or retardation nearly every day (observable by others, not merely subjective feelings of restlessness or being slowed down).
  6. Fatigue or loss of energy nearly every day.
  7. Feelings of worthlessness or excessive or inappropriate guilt (which may be delusional) nearly every day (not merely self-reproach or guilt about being sick).
  8. Diminished ability to think or concentrate, or indecisiveness, nearly every day (either by subjective account or as observed by others).
  9. Recurrent thoughts of death (not just fear of dying), recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

# ET LES UTILISATEURS ?

## LIMITES DES CRITÈRES DIAGNOSTIQUES

[Newson 2021](#)

- ▶ **107349** patients
- ▶ **10** troubles les plus prévalents
- ▶ **47** symptômes
  
- ▶ Conclusion : « DSM-5 disorder criteria **do not separate individuals from random** when the complete mental health symptom profile of an individual is considered.»

# ET LES UTILISATEURS ?

## LIMITES DES CRITÈRES DIAGNOSTIQUES

### Questionnaires

- ▶ Non utilisés par les cliniciens
- ▶ Validés sur les critères diagnostiques

### Critères diagnostiques

- ▶ Culture (hikikomori)
- ▶ Temps (versions of the DSM)
- ▶ Hétérogénéité

**Schéma thérapeutique = transdiagnostic**

Donc le diagnostic est  
inutile ?



# ET LES UTILISATEURS ?

## RÔLE DU DIAGNOSTIC

“the main aim of the psychiatric science **is not classification** as an end in itself but rather **identification of causes** and **interventions**”

*Keneth Kendler, 2012*

“[...] **classification in itself is** less important than often supposed to be, and **less important than other tasks.**”

*Derek Bolton, 2012*

« [...] one of its most important goal is to **facilitate communication among clinicians, researchers, administrators and patients** [...] by establishing a common language.”

*Derek Bolton, 2012*

- + **pronostic**
- + **diagnostic différentiel**

# QUE FAIRE ?

# *Symptômes*

3.

# Symptômes : perspectives

# SYMPTÔMES : PERSPECTIVES DIAGNOSTIC VS. SYMPTÔMES

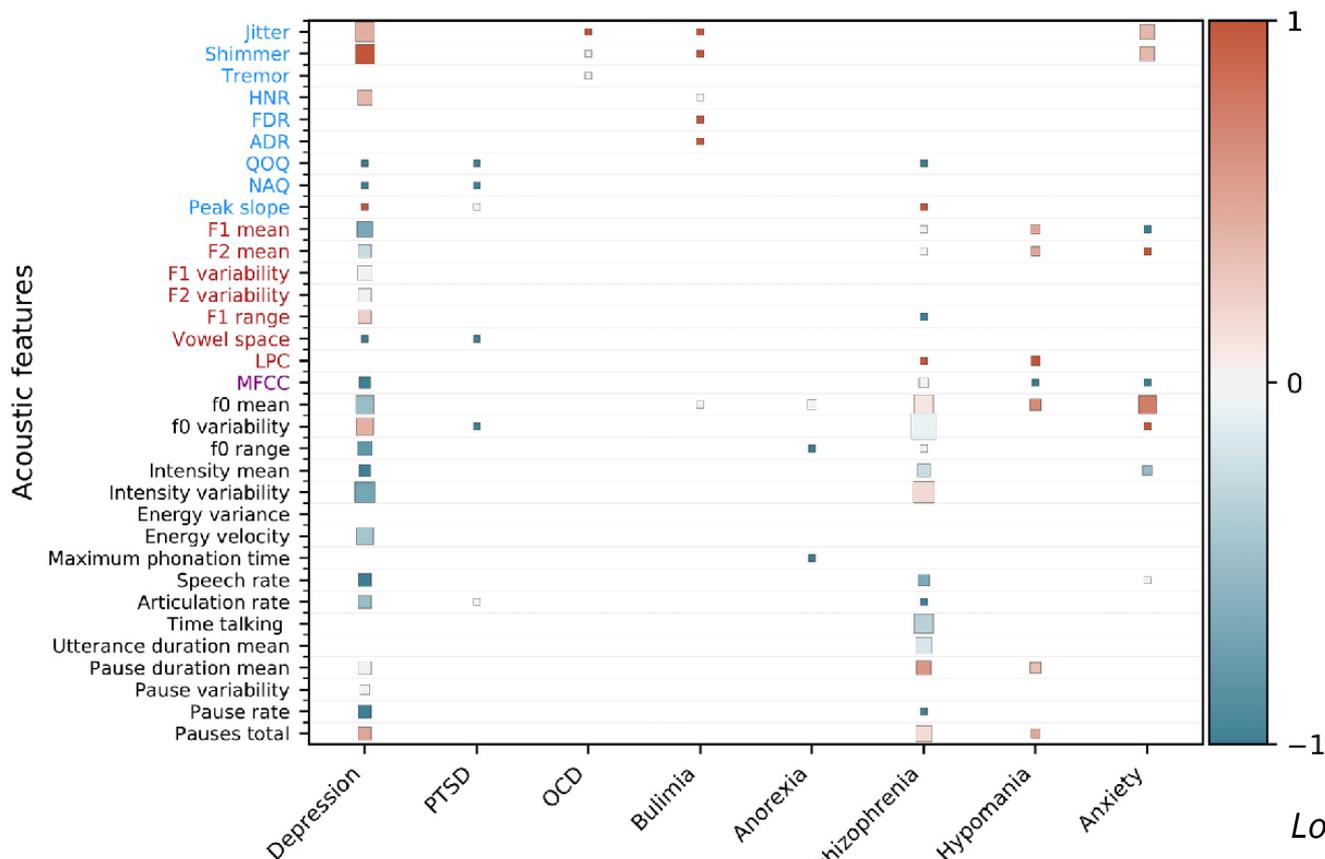


Diagnostic	Symptômes
Dépendance temporelle <i>e.g. DSM IV, DSM 5, ...</i>	Stable à travers le temps
Dépendance à la culture <i>e.g. Hikikomori</i>	Indépendant de la culture
Hétérogène	Homogène
Symptômes → Syndromes → Diagnostic	



# SYMPTÔMES : PERSPECTIVES

## BIOMARQUEURS : SPÉCIFICITÉ



# SYMPTÔMES : PERSPECTIVES DIAGNOSTIC VS. SYMPTÔMES



Diagnostic	Symptômes
Dépendance temporelle <i>e.g. DSM IV, DSM 5, ...</i>	Stable à travers le temps
Dépendance à la culture <i>e.g. Hikikomori</i>	Indépendant de la culture
Hétérogène	Homogène
Symptômes → Syndromes → Diagnostic	
-	<b>Explication mécanistique</b>



# SYMPTÔMES : PERSPECTIVES DIAGNOSTIC VS. SYMPTÔMES



Diagnostic	Symptômes
Dépendance temporelle <i>e.g. DSM IV, DSM 5, ...</i>	Stable à travers le temps
Dépendance à la culture <i>e.g. Hikikomori</i>	Indépendant de la culture
Hétérogène	Homogène
Symptômes → Syndromes → Diagnostic	
-	Explication mécanistique
-	<b>Nécessaire pour le diag. différentiel et le pronostic</b>



# Mieux que les symptômes ?

## Les symptômes **numériques**

# SYMPTÔMES : PERSPECTIVES

## SYMPTÔMES NUMÉRIQUES

“subjects have no need to be equipped with multiple sensors or even be burdened by **invasive devices** (e.g., endoscopy) [...] Additionally, CA can make it feasible to collect data from subjects via mobile devices (e.g., a smartphone), which can provide the subjects **24×7 monitoring service.**”

*Qian et al. 2020*

- + Pas de jugement
- + Facile d'accès (smartphones)
- + **Pas de biais (patients and cliniciens)**



# SYMPTÔMES : PERSPECTIVES SYMPTÔMES NUMÉRIQUES

<b>Anchoring bias</b>	Tendency to focus on a first impression or on the first information received to form an opinion about a number, a person, an event ... This judgmental bias can prevent important information received later to be taken into account.
<b>Ascertainment</b>	Tendency to selectively analyse clinical data in the light of prior expectations or beliefs (belief bias). This bias can impact the interpretation of new information resulting from precise surveillance or screening of certain symptoms.
<b>Availability bias</b>	Tendency to form an opinion based on the most recent and readily available information in one's mind, considered more likely. For example, for an opinion on a treatment, we remember the last few patients rather than a series of 100.
<b>Base-rate neglect</b>	Type of error due to poor knowledge of disease incidence rates, either by underestimating or by overestimating the occurrence of a diagnosis.
<b>Confirmation bias</b>	Tendency to select and interpret information confirming a clinical intuition or a priori diagnosis, and to neglect information that contradicts or invalidates this intuition.
<b>Diagnosis momentum</b>	Diagnosis or treatment plans established by previous clinicians are rarely questioned by new practitioners and stick to the patient. This phenomenon can prevent considering new options and enhancing the diagnosis or provided healthcare.
<b>Illusory correlation</b>	Tendency to infer causation relationships between correlated but independent events.
<b>Premature closure</b>	Tendency to stop reasoning, evaluating or looking for a better diagnosis or treatment alternative after finding a suitable enough option (close to 'satisfaction search bias').
<b>Primacy effect</b>	Mnemonic bias, tendency to remember and consider more the first information out of a list of equal importance.
<b>Recency effect</b>	Mnemonic bias, tendency to remember and consider more the most recent information (received last), for example the last words of a clinical interview or the last symptoms of a list.
<b>Unpacking principle bias</b>	Type of error occurring when not all the necessary information were requested to make an objective judgement. The risk would be, for example, to omit information that would allow a differential diagnosis.
<b>Affect bias</b>	When decisions are made in a context where the immediate emotions are strong and can influence our choices.
<b>Ambiguity or risk aversion</b>	Type of bias describing the tendency to favour choices with known risks and associated probabilities rather than ambiguous or uncertain options.
<b>Commission bias</b>	Tendency to favour action over inaction, even when inaction would be more rational. It can result in overprescription.
<b>Default bias or status quo bias</b>	Tendency to stick to the default option and avoid changes. The cost of change in terms of cognitive effort is automatically considered too great and one continues to behave in the same way.
<b>Framing bias</b>	The perception of a situation can be influenced by the way options are being presented (formulation with different numerical presentations, or with positive or negative connotations...).
<b>Information bias</b>	This bias translates into errors in the collection of information, for example during an interview: it can be a failure to observe, a misclassification or organisation of data, or errors in memory recall during synthesis.
<b>Loss aversion</b>	Tendency to be more sensitive to the loss of a certain amount of resources (cognitive effort, time, money ...) than to the gain of the same amount of resources, resulting in choices that tend to avoid losses rather than attempt gain.

## Mouchabac et al. 2021

<b>Omission bias</b>	Tendency to favour inaction or to avoid difficult issues over action ('wait and see'). It affects self-doubting clinicians.
<b>Outcome bias</b>	Tendency to focus on the outcome of the decision rather than the information to be interpreted to make a relevant decision. This bias is more common among clinicians with lower self-confidence and can lead to an incorrect diagnosis.
<b>Representativeness restraint bias</b>	Tendency to rely on the 'frequency argument,' i.e., to favour the most common hypotheses and not to mention the rarer ones. It is a restriction of thought that prevents a broader questioning of a clinical situation.
<b>Retrospective prejudice</b>	When the result of a situation is known, it can influence the way in which we perceive the preceding events as we forget the uncertainty we were facing at that time, and lead to fallacious reconstruction ('we are remaking history'). It can prevent learning and lead to the repetition of error.
<b>Self-served bias</b>	Tendency to reduce the analysis of clinical data and the diagnosis to one's own point of view. It affects communication between the different parties (physician, patients, and other stakeholders).
<b>Sunk cost fallacy</b>	Tendency, when one has already invested a lot of resources (time, energy or money) in a project or an action that seems to have little chance of succeeding, to continue investing although it is doomed to failure. In medicine, it is a question of pursuing an ineffective strategy, for example.
<b>Bandwagon effect</b>	Tendency to conform and reproduce a behaviour or an attitude just to act as others do.
<b>Fundamental attribution error</b>	While making judgments about people's behaviour, it's the tendency to overemphasise dispositional factors or personality-based explanations and underestimate situational ones. The consequence is the risk of making incorrect judgments, discounting reasons that might have contributed to their observed behaviour.
<b>Stereotyping</b>	Tendency to infer characteristics about an individual based on the group in which we categorised him/her. This can result in a wrong diagnosis solely based on our belief that the patient belongs to a certain group with a typical disease.

# SYMPTÔMES : PERSPECTIVES

## SYMPTÔMES NUMÉRIQUES

“subjects have no need to be equipped with multiple sensors or even be burdened by **invasive devices** (e.g., endoscopy) [...] Additionally, CA can make it feasible to collect data from subjects via mobile devices (e.g., a smartphone), which can provide the subjects **24×7 monitoring service.**”

*Qian et al. 2020*

- + Pas de jugement
- + Facile d'accès (smartphones)
- + **Pas de biais (patients and cliniciens)**



# SYMPTÔMES : PERSPECTIVES

## SYMPTÔMES NUMÉRIQUES

“subjects have no need to be equipped with multiple sensors or even be burdened by **invasive devices** (e.g., endoscopy) [...] Additionally, CA can make it feasible to collect data from subjects via mobile devices (e.g., a smartphone), which can provide the subjects **24×7 monitoring service.**”

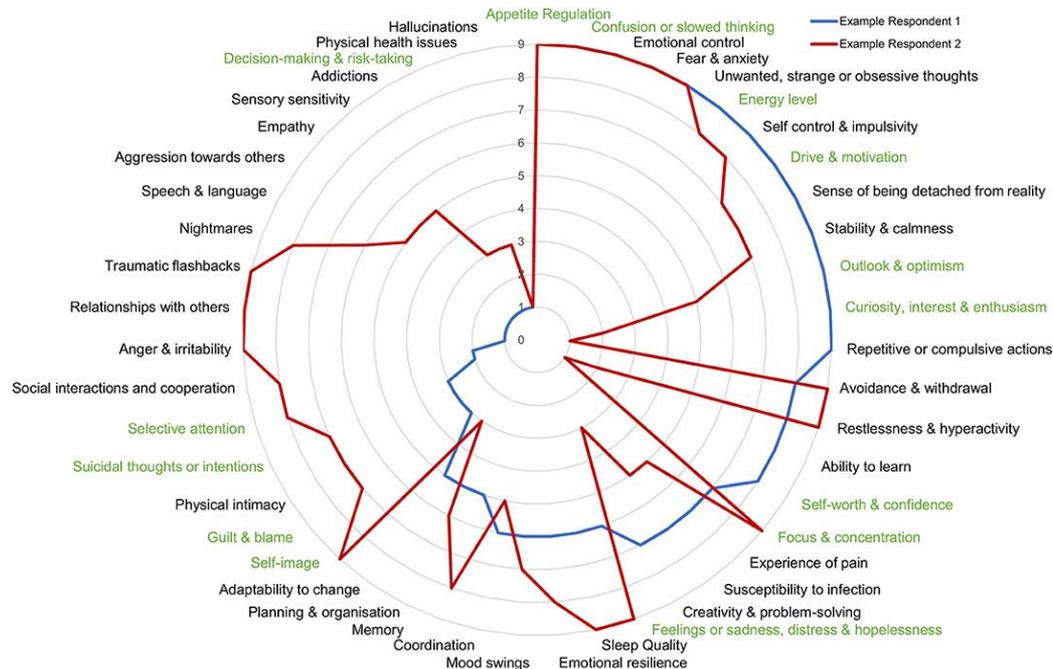
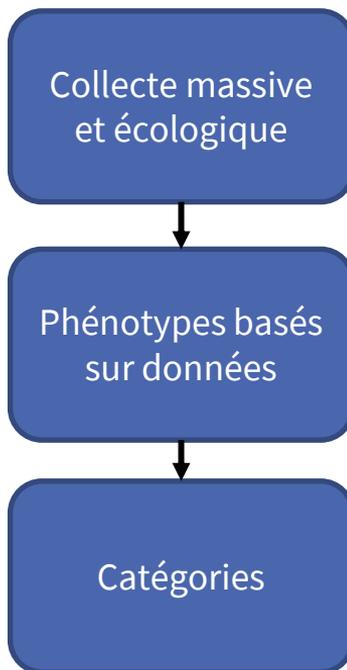
*Qian et al. 2020*

- + Pas de jugement
- + Facile d'accès (smartphones)
- + Pas de biais (patients and cliniciens)
- + **Injustices épistémiques**



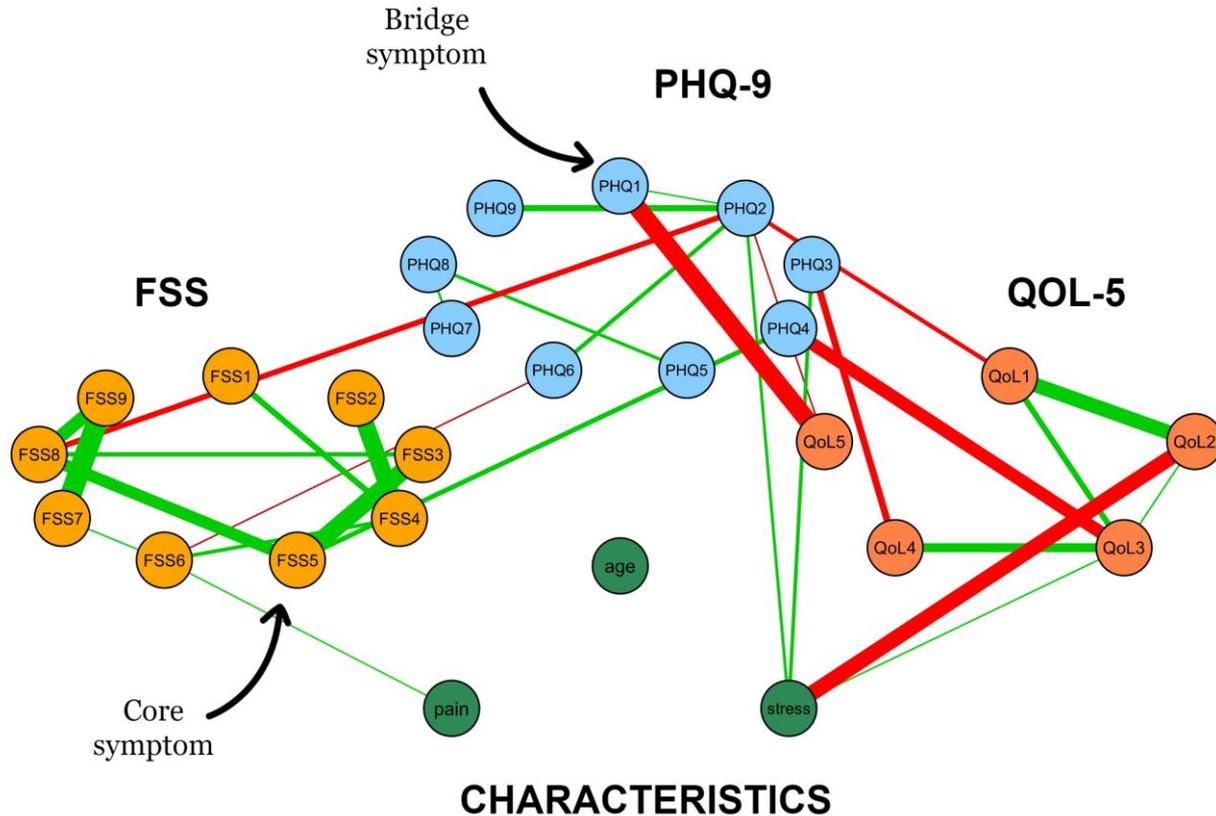
# SYMPTÔMES : PERSPECTIVES SYMPTÔMES NUMÉRIQUES

## Médecine stratifiée



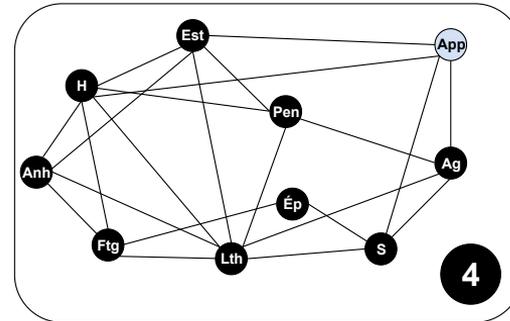
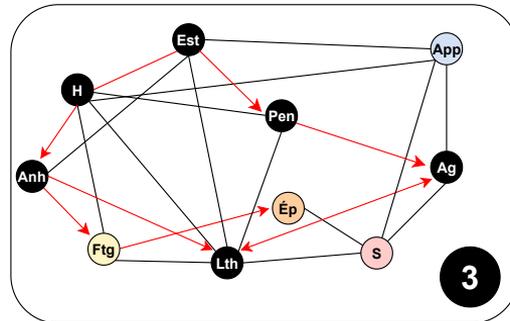
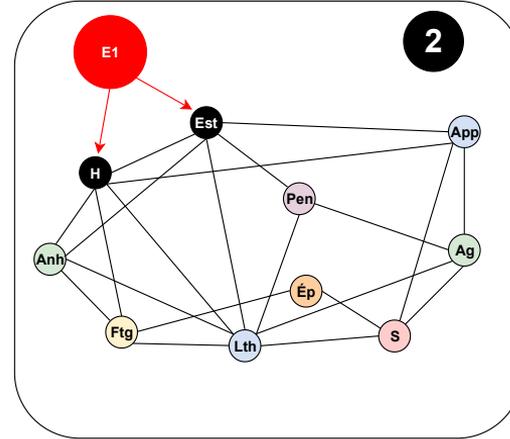
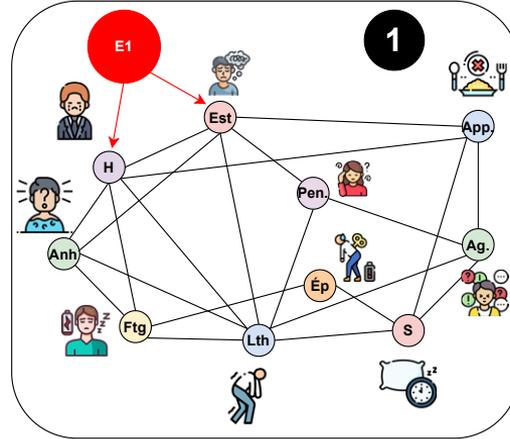
# Nouveaux modèles des troubles : les réseaux de symptômes

# SYMPTÔMES : PERSPECTIVES RÉSEAUX DE SYMPTÔMES



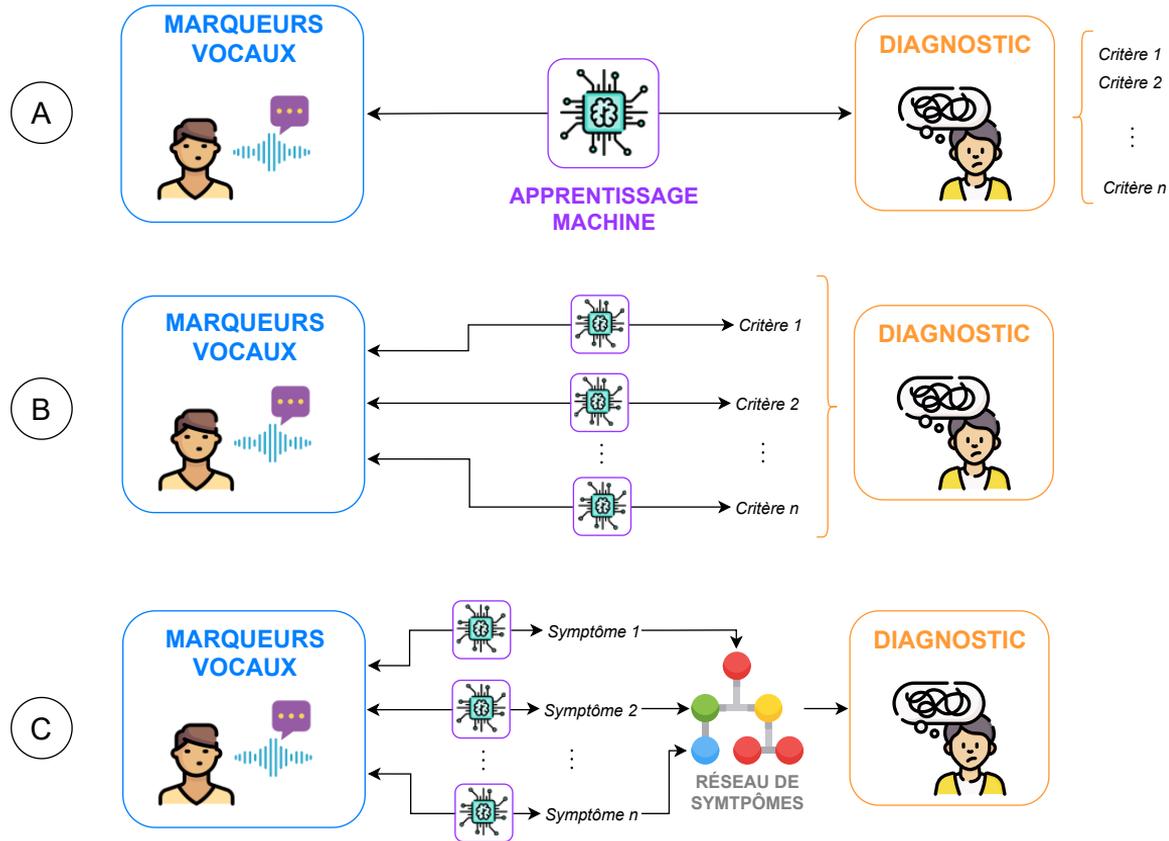
# SYMPTÔMES : PERSPECTIVES

## RÉSEAUX DE SYMPTÔMES



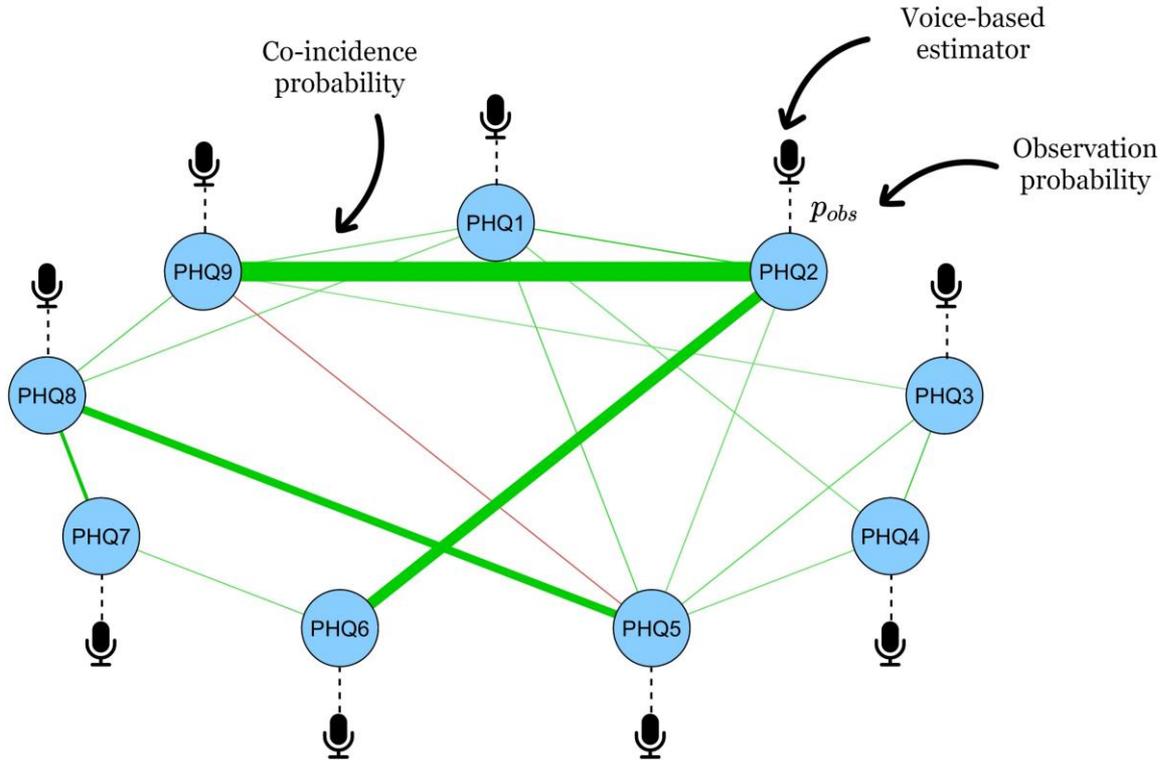
# SYMPTÔMES : PERSPECTIVES

## RÉSEAUX DE SYMPTÔMES



# SYMPTÔMES : PERSPECTIVES

## RÉSEAUX DE SYMPTÔMES



# Conclusion

Doggy bag

# DOGGY BAG

- ▶ Informatique très prometteuse en psychiatrie
- ▶ **MAIS** avant les développement technologiques, écoute et compréhension des utilisateurs
- ▶ Attention aux systèmes “objectifs”

# Merci de votre attention!

# QUESTIONS?



[vincent.martin@labri.fr](mailto:vincent.martin@labri.fr)



[vincentpmartin.github.io](https://vincentpmartin.github.io)



Vincent-P-Martin