

# Hallucination Assessment through Longitudinal Observation (HALO)

U01MH135901

MPI Dror Ben-Zeev, Trevor Cohen



LOUISIANA STATE UNIVERSITY



UNIVERSITY OF MINNESOTA





**Dror Ben-Zeev**  
PI  
UW



**Trevor Cohen**  
PI  
UW



**Alex Cohen**  
Co-I  
LSU



**Serguei Pakhomov**  
Co-I  
UM



**Patrick Wedgeworth**  
Co-I  
UW



**Justin Tauscher**  
Co-I/Project Director  
UW



**Benjamin Buck**  
Co-I  
UNC



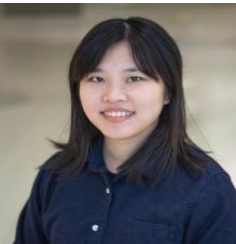
**Patrick Heagerty**  
Co-I  
UW



**Alexa Beaulieu**  
Research Manager  
UW



**Anna Larsen**  
Co-I  
UW



**Changye Li**  
Post-Doc  
UW



**Ella DeVries**  
Research Coordinator  
UW



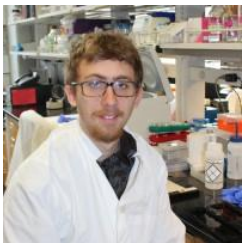
**Gillian Sparks**  
Research Coordinator  
UW



**Michael Michalowski**  
Co-I  
UM



**Feng Chen**  
Research Assistant  
UW



**Jacob Solinsky**  
Research Assistant  
UM



**Maya Stemmer**  
Co-I  
UW



**Oliver Bear Don't Walk**  
Co-I  
UW

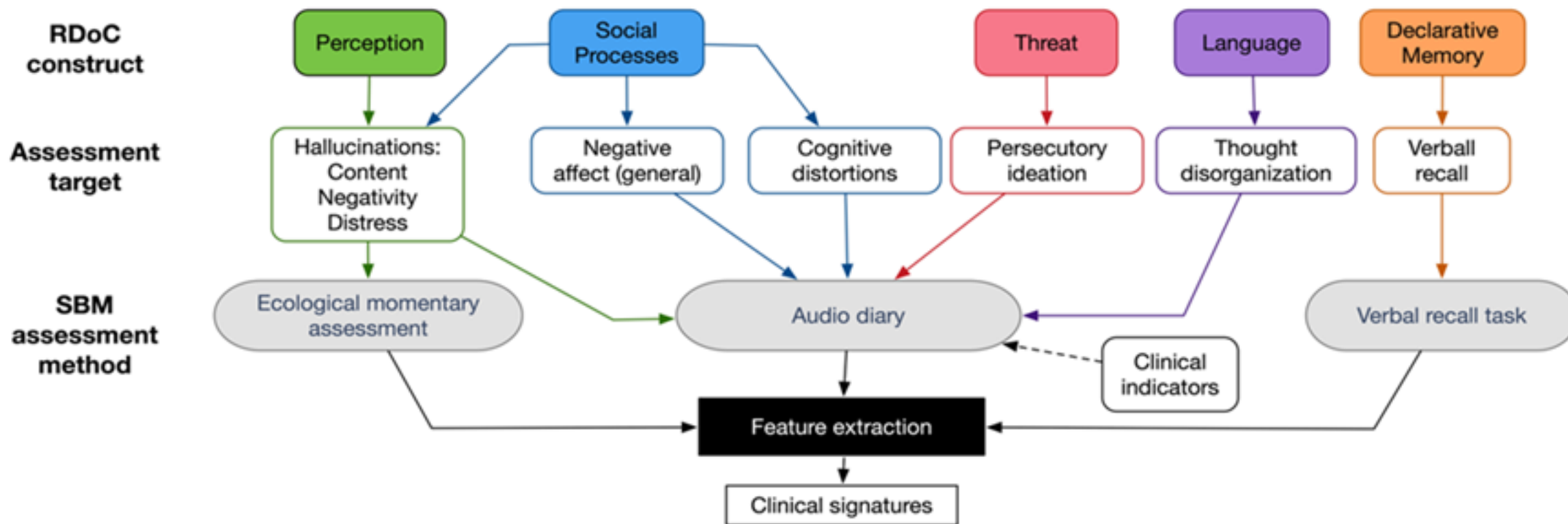


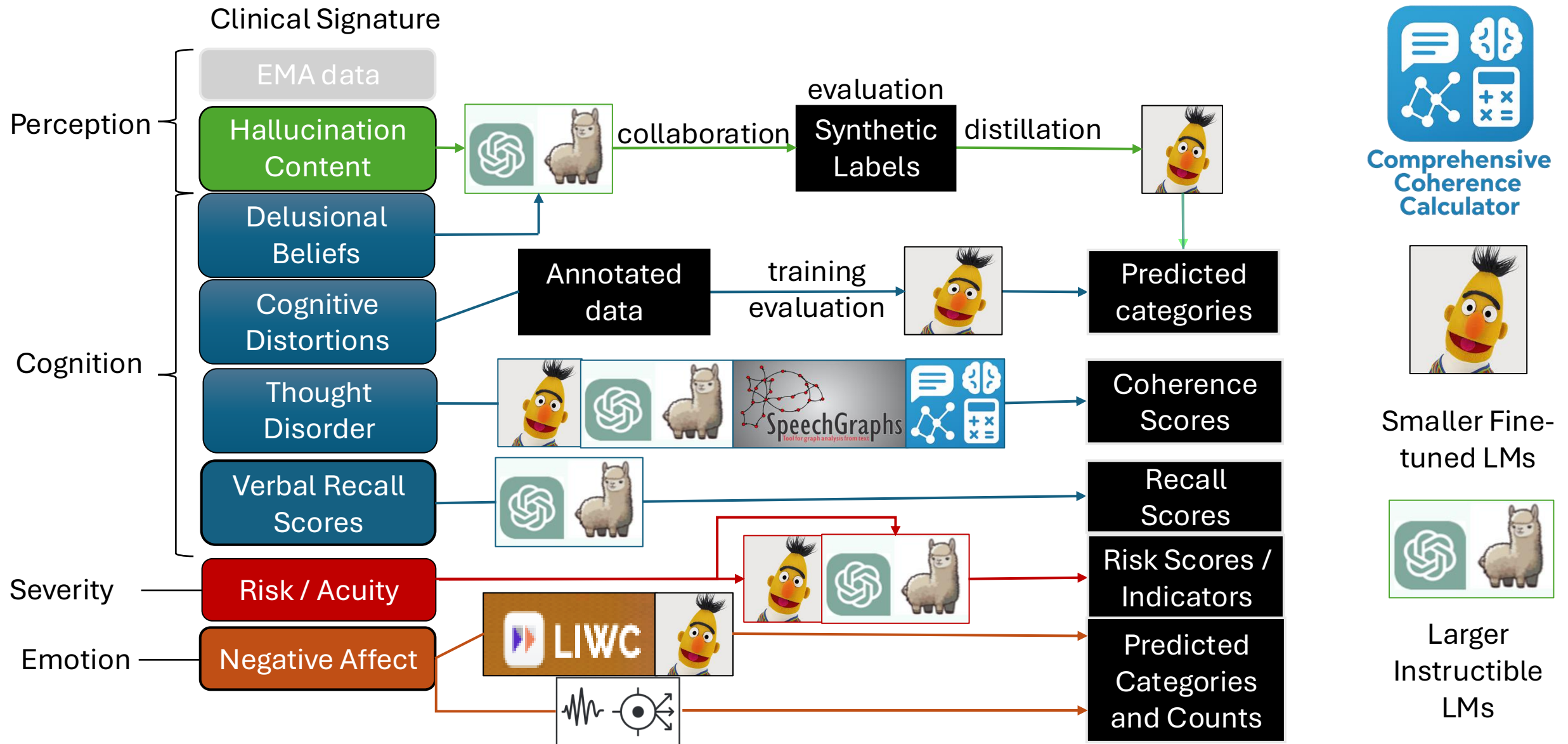
**Weizhe Xu**  
Research Assistant  
UW

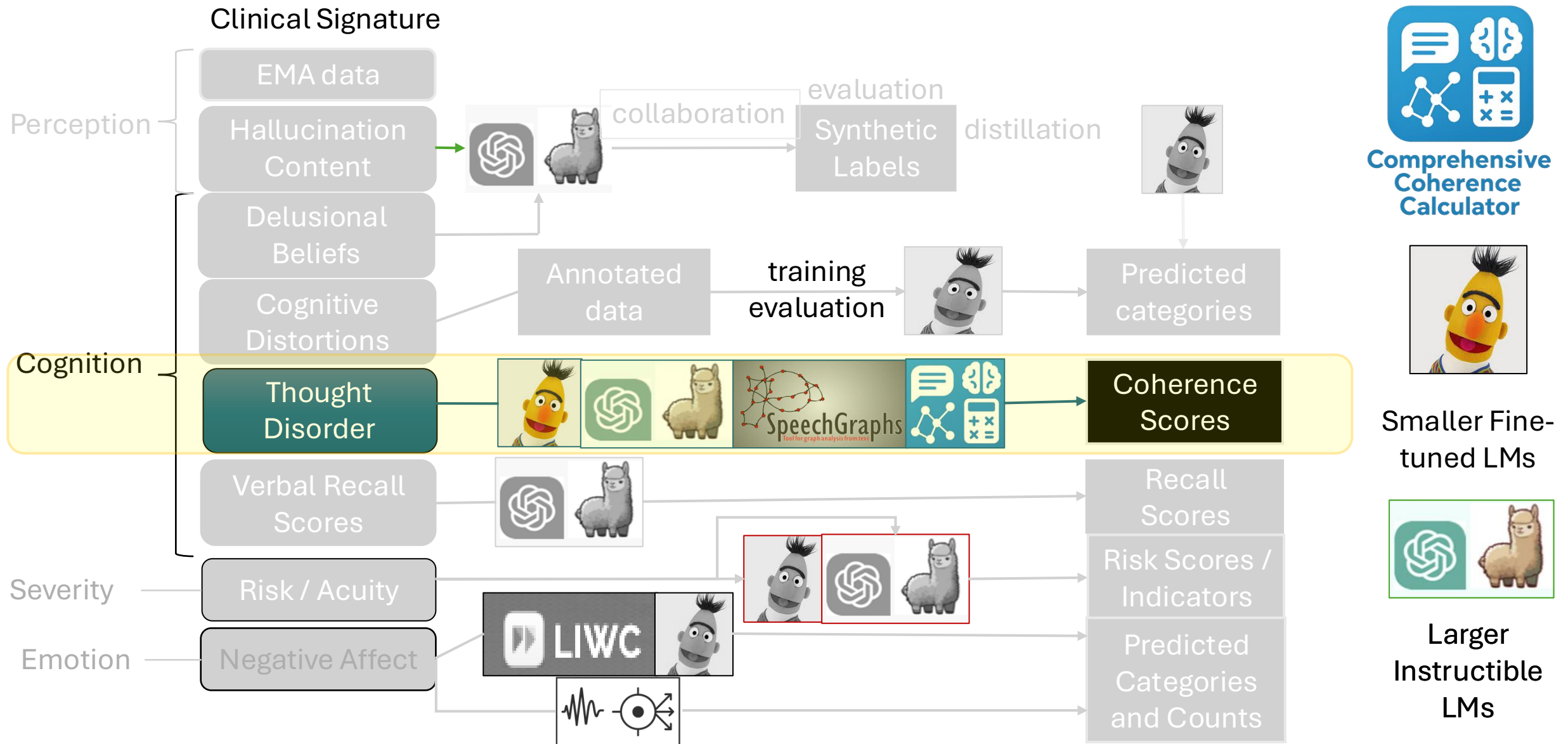


**Meliha Yetsigen**  
Co-I  
UW

# Clinical Signature Development



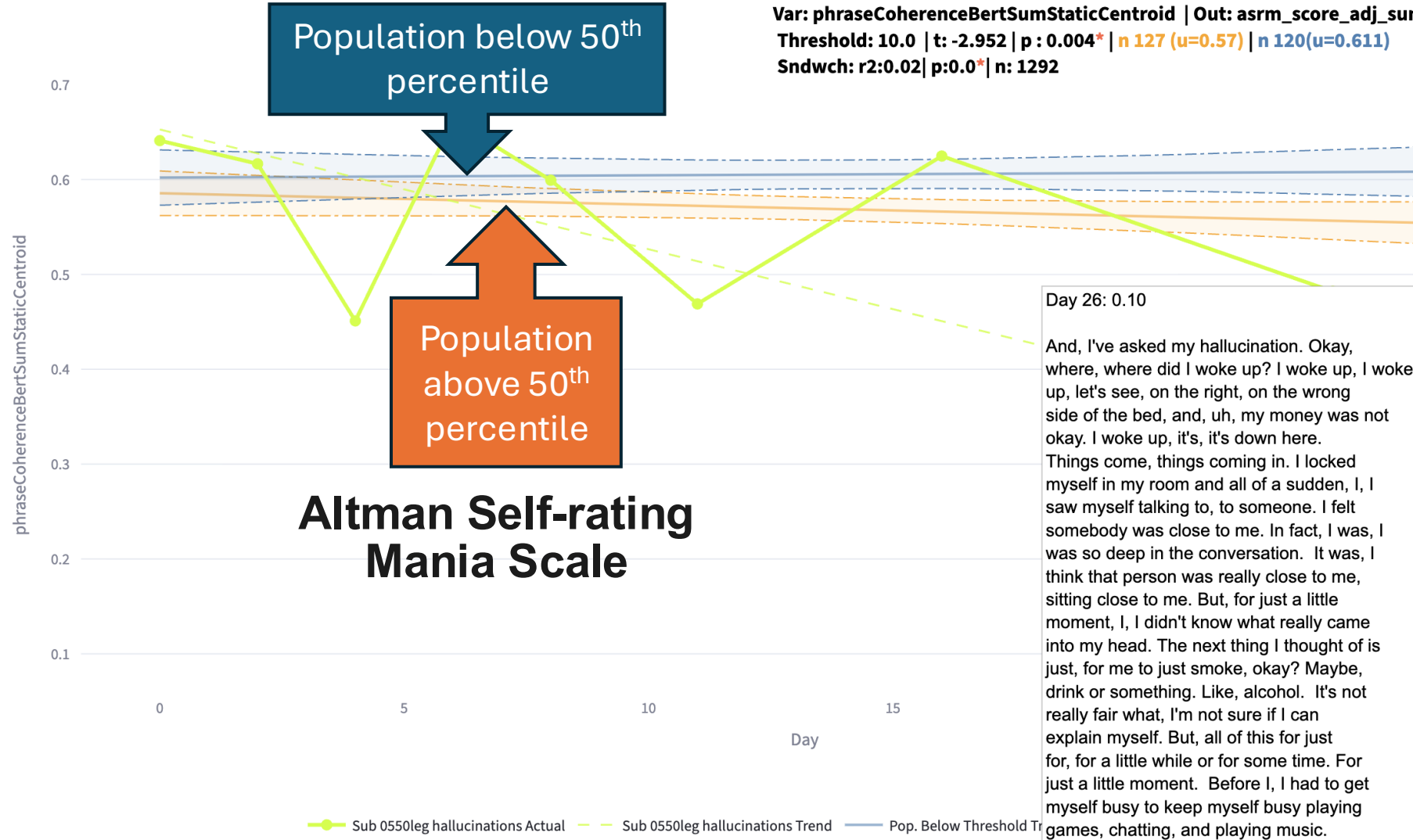




Var: phraseCoherenceBertSumStaticCentroid | Out: asrm\_score\_adj\_sum  
 Threshold: 10.0 | t: -2.952 | p: 0.004\* | n 127 (u=0.57) | n 120(u=0.611)  
 Sndwch: r2:0.02 | p:0.0\* | n: 1292



Comprehensive Coherence Calculator

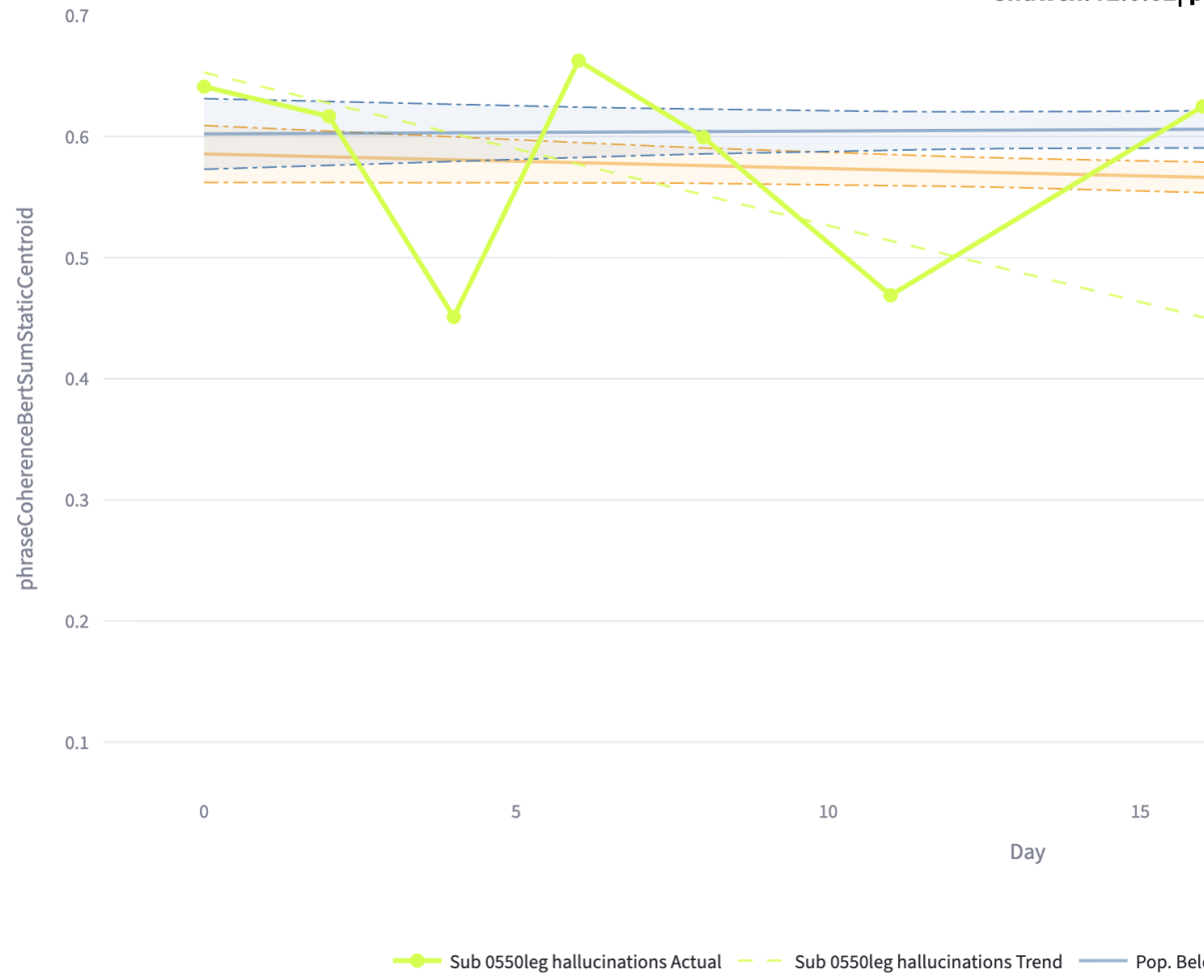


Smaller Fine-tuned LMs



Larger Instructible LMs

Var: phraseCoherenceBertSumStaticCentroid | Out: asrm\_score\_adj\_sum  
 Threshold: 10.0 | t: -2.952 | p: 0.004\* | n 127 (u=0.57) | n 120(u=0.611)  
 Sndwch: r2:0.02 | p:



Day 26: 0.10

And, I've asked my hallucination. Okay, where, where did I woke up? I woke up, I woke up, let's see, on the right, on the wrong side of the bed, and, uh, my money was not okay. I woke up, it's, it's down here. Things come, things coming in. I locked myself in my room and all of a sudden, I, I saw myself talking to, to someone. I felt somebody was close to me. In fact, I was, I was so deep in the conversation. It was, I think that person was really close to me, sitting close to me. But, for just a little moment, I, I didn't know what really came into my head. The next thing I thought of is just, for me to just smoke, okay? Maybe, drink or something. Like, alcohol. It's not really fair what, I'm not sure if I can explain myself. But, all of this for just for, for a little while or for some time. For just a little moment. Before I, I had to get myself busy to keep myself busy playing games, chatting, and playing music.

myself busy to keep myself busy playing games, chatting, and playing music.



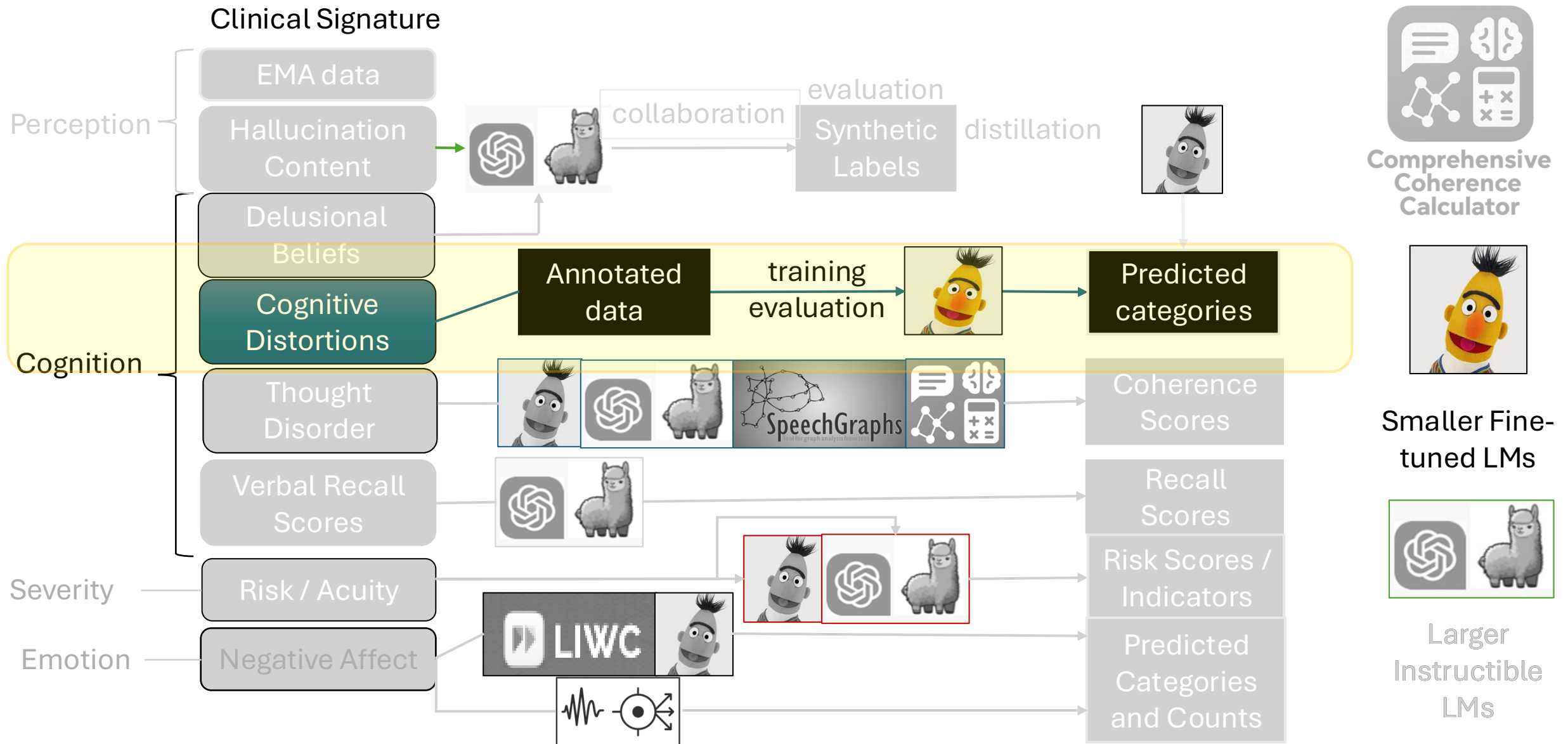
Comprehensive Coherence Calculator



Smaller Fine-tuned LMs



Larger Instructible LMs



Day 1: 0.88

Um, if I go to work, like I said earlier, I had an issue with my partner. And we actually ended my work today, so. I'm not really doing good at work. I don't really do good at work, uh. I feel detached from everyone. Everyone think I'm a bad guy or maybe... Everyone just, I don't know, they just feel ashamed of me and they can't even move closer to me.

um  
 .13\* | n 125 (u=0.303) | n 124(u=0.278)  
 i53

CG

0.9  
0.8  
0.7  
0.6  
0.5  
0.4  
0.3  
0.2



Comprehensive Coherence Calculator



Smaller Fine-tuned LMs

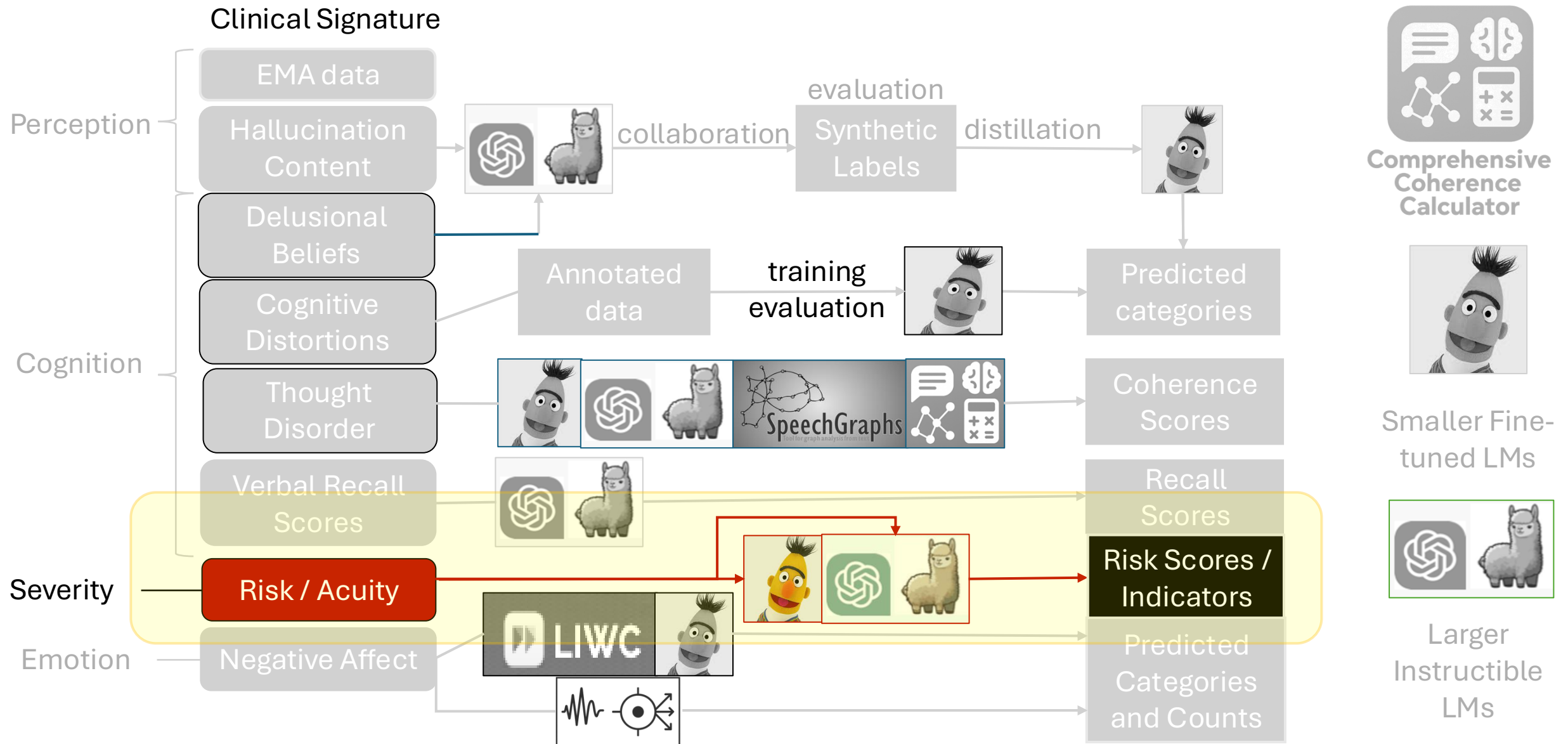


Larger Instructible LMs

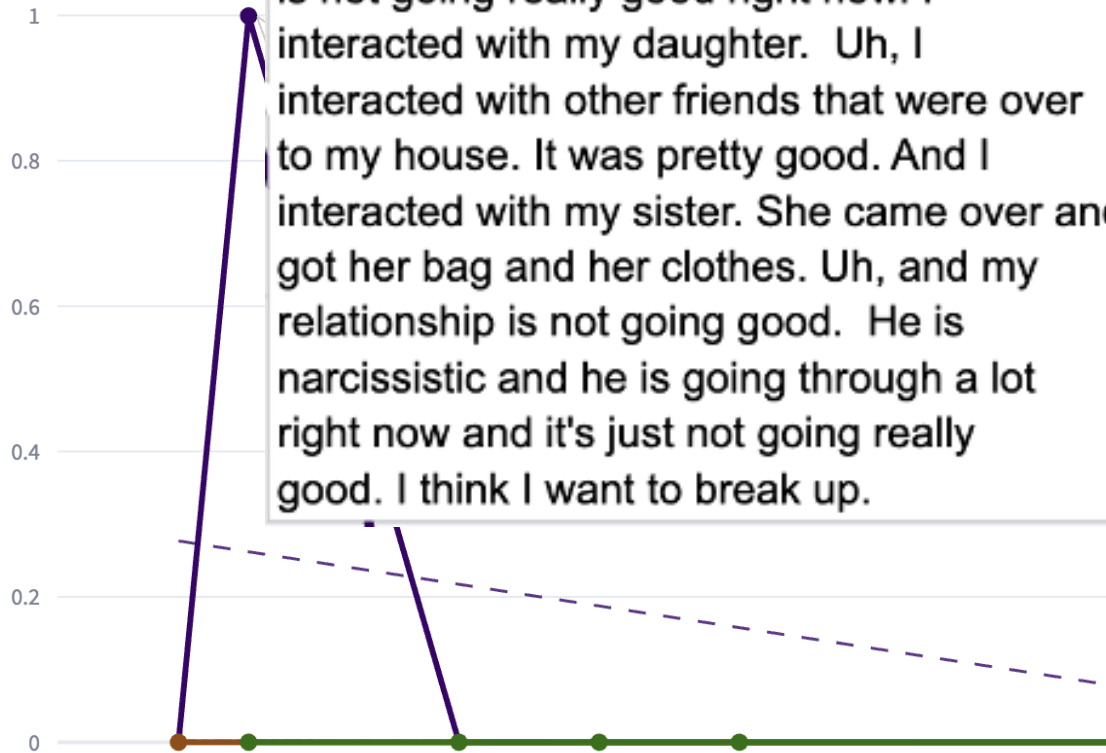
Thinking style	Cognitive distortion	Distortion example
Categorization & generalization	Dichotomous (Black & White) thinking	If I didn't have these thoughts, I'd have it all together
	Labeling	The voice is telling me I'm a failure for not getting the job. I'm an absolute loser
	Overgeneralization	I overheard them saying I wasn't normal. I am never comfortable around other people. I'm always going to be alone

Tauscher J, et al. Journal of Technology in Behavioral Science. 2025 Sep 11:1-0.

● Sub 0344nut interactions Actual    - - Sub 0344nut interactions Trend    — Pop. Below Threshold Trend    — Pop. Above Threshold Trend



Interpersonal Negative Life Events



Day 1: 1.00

Today I went to, across the street to go see my friend. Um, we sat down and talked about how I was feeling in my relationship, which is not going really good right now. I interacted with my daughter. Uh, I interacted with other friends that were over to my house. It was pretty good. And I interacted with my sister. She came over and got her bag and her clothes. Uh, and my relationship is not going good. He is narcissistic and he is going through a lot right now and it's just not going really good. I think I want to break up.



Comprehensive Coherence Calculator



Smaller Fine-tuned LMs

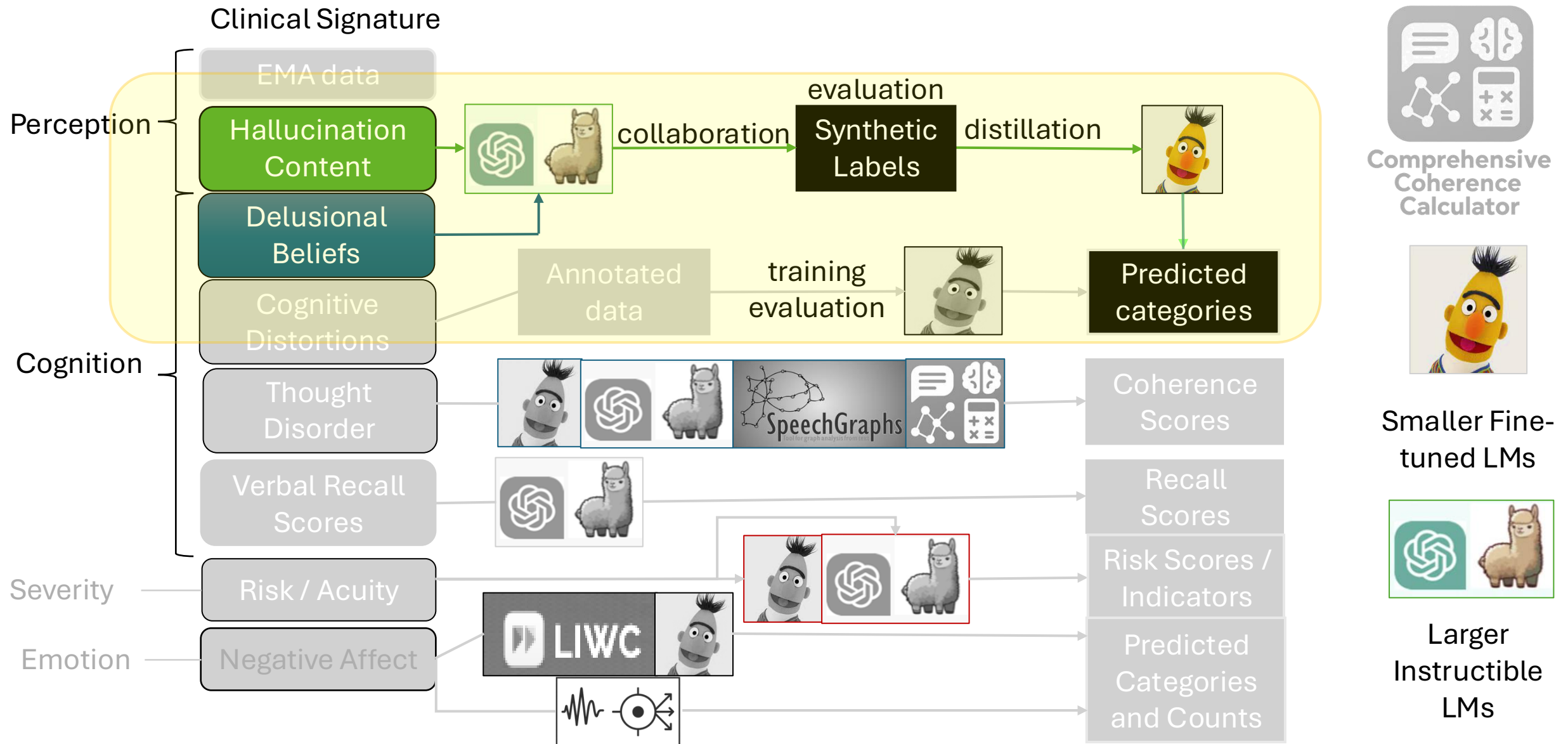


Larger Instructible LMs



UNIVERSITY OF MINNESOTA

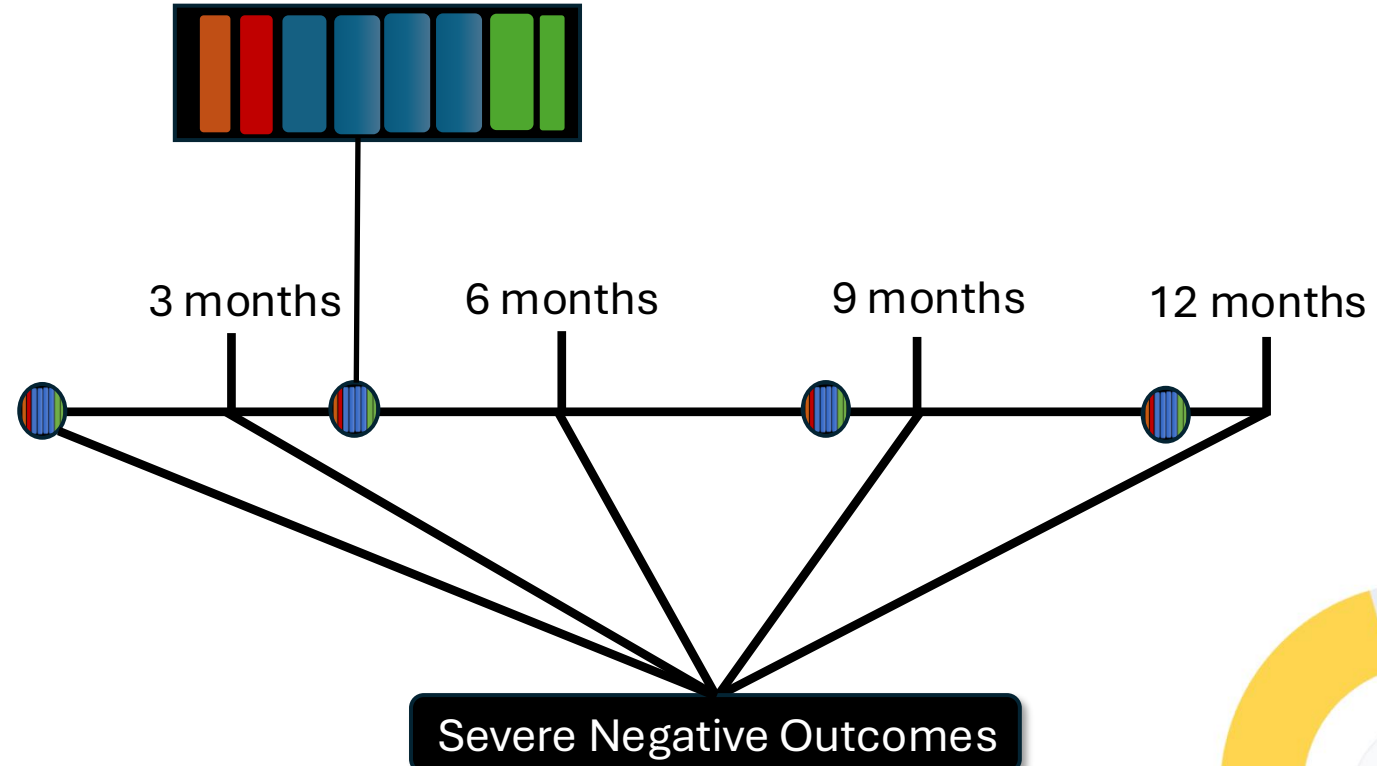




# Computational psychiatry in the wild?

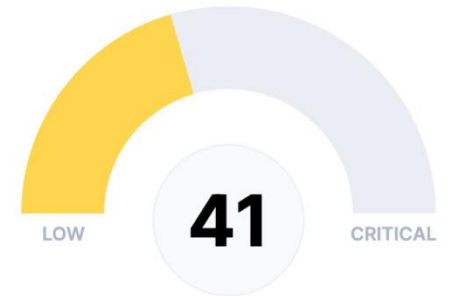
Clinical Signature

- EMA data
- Hallucination Content
- Thought Disorganization
- Persecutory Ideation
- Cognitive Distortions
- Verbal Recall Scores
- Risk / Acuity
- Negative Affect



Severe Negative Outcomes

Psychiatric symptoms  
Functional impairment



Current: **High Risk**

• Low • Moderate • High • Very High • Critical



# Acknowledgements

- Now:
  - NIMH, NLM, IMPACT-MH, Garvey Institute for Brain Health Solutions
- Then:
  - NIMH, NLM, NIA, NIH Common Fund
  - Garvey Institute for Brain Health Solutions

