Is this the real life?
The language of Reality Monitoring.

Avi Gamoran[1], Michael Gilead[4,5] and Talya Sadeh[1,2,3]

1) Department of Psychology 2) Department of Cognitive and Brain Sciences 3) Zelman School of Brain sciences and Cognition, Ben Gurion University of the Negev
4) School of Psychological Sciences 5) Sagol School of Neuroscience, Tel-Aviv University

The Memory and Forgetting Lab

SCI Symbolic Cognition and Interaction Lab

@AviGamoran

אוניברסיטת בן-גוריון בנגב
Ben-Gurion University of the Negev

Introduction:

- Episodic memory, like Imagination, is constructive rather than depictive[1,2]
- Remembering & Imagining are similar processes with neural overlapping[3]
- Reality Monitoring (RM): Is the ability to discern memories of true events from imagination[4,5], by relying on cues of distinct experiences for information from Internal / External sources[6,7]
- Our project examines:
  - Is there a “there there” in natural language that distinguishes describing memory or imagination?
  - If so, what are these cues?
  - Are people able to use utilize such cues for classification?

Method

- We collected texts recounting real and recombined events

Person
Dan
Talya
Sue Ellen
Michael

Person	Location	Object
Dan	Beach	Sunglasses
Talya	Porch	Grapes
Sue Ellen	Forest	Bike
Michael	TAU	Book

2 Texts
(1 real, 1 imaginary)
X 1,054 Authors

Think back about the REAL MEMORY from the event which includes:

Sue Ellen **Forest** **Bike**

Please write a short paragraph (90-110 words), recalling the REAL MEMORY just described.

Picture an IMAGINARY event occurring in the PAST 5 years which includes:

Michael **Beach** **Grapes**

Please write a short paragraph (90-110 words), recalling the IMAGINED PAST event that was just described.

Human Evaluators:

10 Texts
(5 real, 5 imaginary)
X 820 Evaluators

“Jenna had come over my house for a sleepover one afternoon. It just so happened that…”

Rate this story on a scale from didn't happen to happened:

Didn’t Happen 1 — Happened 100

Please rate the story you read on a scale of 1 to 7

	1	2	3	4	5	6	7
How interesting is this story?	o	o	o	o	o	o	o
Is the story coherent?	o	o	o	o	o	o	o
Does the story include vivid descriptions?	o	o	o	o	o	o	o
How plausible is the event described?	o	o	o	o	o	o	o

Marquice and I were at the animal shelter one Sunday afternoon. We decided to adopt a cat and were now waiting in the office part of the shelter in order to fill out some paper work. While in the office, Marquice became intrigued with the copy machine. He ended up doing something he shouldn't have done and made the machine malfunction. He started freaking out and I came over to his rescue. I ended up finding a button to make the machine stop malfunctioning. When it was over and the mess was done, we both burst out laughing.

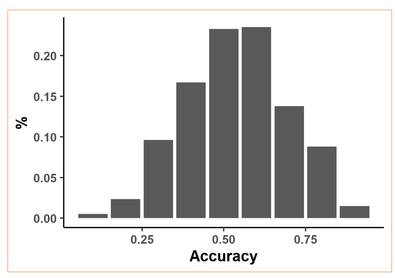
Jenna had come over my house for a sleepover one afternoon. It just so happened that we were the only ones at my house because my parents had went somewhere until the next morning. We were both excited and started running all around my house. We eventually made our way to my backyard where I had a huge trampoline. Jenna was excited about this and insisted we get on it and do cool tricks and flips. She did a somersault and I was amazed. I tried to do one and ended up spraining my ankle pretty bad. We still ended up having a lot of fun.

Results & Conclusions

- Combined transformer model outperformed the feature-based model and human classification

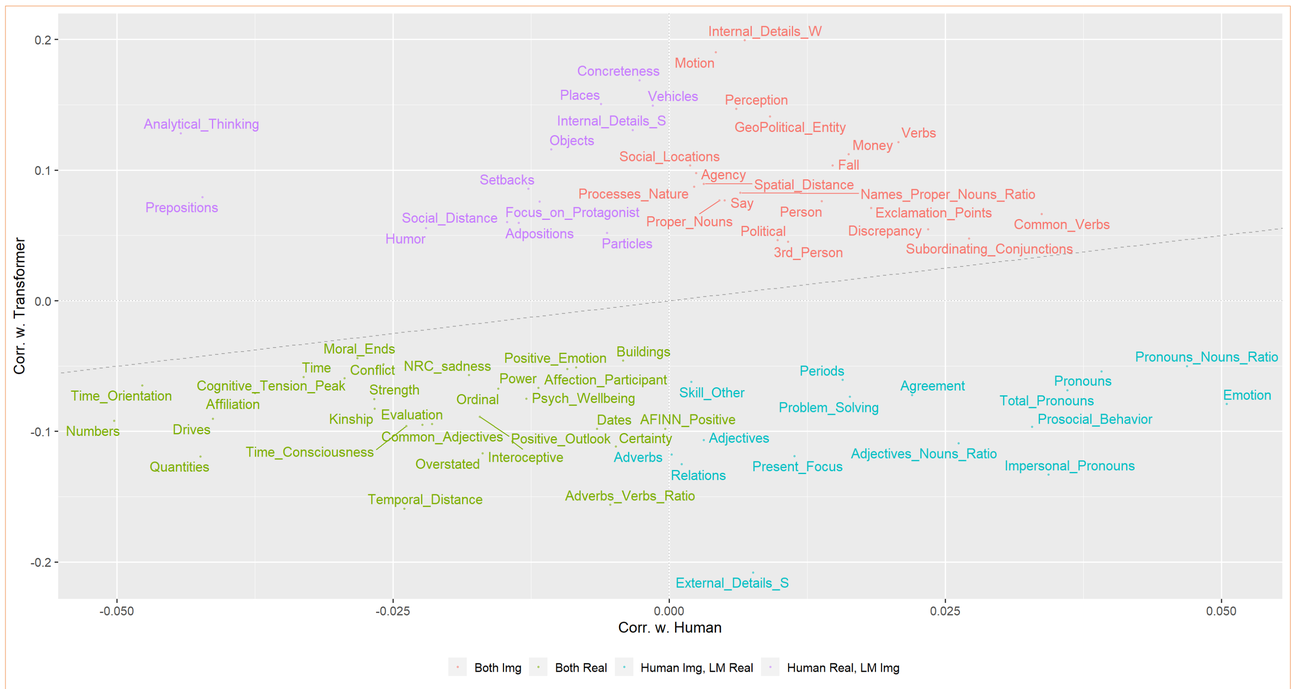
Model	Dataset	Accuracy	Precision	Recall	F1	AUC
Transformer (DistilBERT + GPT-3)	Train (n=1,686)	0.82	0.82	0.81	0.82	0.85
	Test (n=422)	0.65	0.66	0.63	0.64	0.68
Linguistic Features (Radial SVM)	Train	0.67	0.67	0.67	0.67	0.74
	Test	0.59	0.58	0.62	0.60	0.60
Human Direct	Train	0.56	0.59	0.43	0.49	0.58
	Test	0.59	0.61	0.47	0.53	0.62
Human Indirect	Train	0.55	0.56	0.50	0.53	0.58
	Test	0.60	0.61	0.56	0.58	0.62
Bag of Words (Naïve Bayes)	Train	0.76	0.77	0.76	0.76	0.82
	Test	0.57	0.57	0.56	0.57	0.58

Evaluators’ Individual accuracies (N=820)	
Median	0.5
Mean (95% CI)	0.54 (0.53-0.55)



- Linguistic Features help examine differences between Real and Imaginary texts
- And shed light on distinct Humans’ and Language Models’ classifications

Feature	Direction	Train Set (834 pairs) p	Train Set (834 pairs) Cohen’s d	Train Set (834 pairs) BF_{10}	Test (211 Pairs) p	Test (211 Pairs) Cohen’s d	Test (211 Pairs) BF_{10}
Episodic details (Word)	Imagined> Recalled	**< .001*** **	**0.15**	**657.41**	**.004****	**0.2**	**4.79**
Particles (to, not)		**< .001*** **	**0.13**	**58.95**	.025*	0.16	0.94
Concreteness		**< .001*** **	**0.12**	**16.04**	.036*	0.15	0.68
Focus on Protagonist		**.002****	**0.11**	**3.94**	.033*	0.15	0.72
Verbs		.006**	0.09	1.6	.01**	0.18	2.08
Episodic details (sentence)		.024*	0.08	0.5	.011*	0.18	1.85
Affiliation	Recalled> Imagined	.022*	-0.08	0.52	.038*	-0.14	0.65
Kin		.025*	-0.08	0.47	.012*	-0.18	1.8
Sadness		.021*	-0.08	0.56	.021*	-0.16	1.05
Number		.018*	-0.08	0.63	.033*	-0.15	0.73
Overstating		.007**	-0.09	1.48	.015*	-0.17	1.45
Certainty		.006**	-0.09	1.68	.028*	-0.15	0.84
Quantifiers (all, some)		.006**	-0.09	1.58	**.005****	**-0.2**	**3.81**
Drives		**.002****	**-0.11**	**4.02**	.043*	-0.14	0.58
Non-episodic details (sentence)		**< .001*** **	**-0.14**	**198.32**	**.003****	**-0.21**	**5.79**



- Our model can serve as a useful tool for research of state and trait reality monitoring via text analysis
- This corpus will soon be publicly shared, inviting attempts to achieve better classification accuracy

References

1. Bartlett, F. C. F. C. Remembering: An experimental and social study. Cambridge: Cambridge University (1932).
2. Schacter, D. L., Chiao, J. Y. & Mitchell, J. P. The Seven Sins of Memory. Ann. N. Y. Acad. Sci. (2003).
3. Schacter, D. L., Addis, D. R. & Buckner, R. L. Remembering the past to imagine the future: the prospective brain. Nat. Rev. Neurosci. 8, 657–661 (2007).
4. Johnson, M. K. Reality monitoring: An experimental phenomenological approach. J. Exp. Psychol. Gen. 117, 390–394 (1988).
5. Johnson, M. K. Memory and reality. Am. Psychol. (2006).
6. Johnson, M. K., Hashtroudi, S. & Lindsay, D. S. Source Monitoring. Psychological Bulletin (1993).
7. Johnson, M. K. & Raye, C. L. Reality monitoring. Psychol. Rev. 88, 67 (1981).