

## Reading Notes

### [Recollection versus Imagination: Exploring Human Memory and Cognition via Neural LMs](#)

#### Background and intro//main gist

- NLP as measure of cognitive process in imagination vs recollection of events
- Release hippocampus - 7000 stories about imagined and recalled events
- Introduce measure of narrative flow
- Measure differential recruitment of knowledge attributed to semantic memory versus episodic memory
- Finding 1: imagined stories have a substantially more linear narrative flow, compared to recalled stories in which adjacent sentences are more disconnected
- Finding 2: recalled stories rely more on autobiographical events based on episodic memory, imagined stories express more commonsense knowledge based on semantic memory
  - with increased temporal distance or increased frequency of recollection, recalled stories flow more linearly, express more commonsense knowledge, and are less concrete.
- Concreteness in recalled, generality in imagined
- 2 key aspects:
  - Narrative flow: likelihood of sentences in general LMs conditioned on carrying amounts of history
  - Semantic knowledge vs episodic knowledge: measure of frequency of commonsense events and count of realistic events (respectively)

#### Dataset

- Dataset collected using: crowdsourcing pipeline to get 6854 diary like short stories about salient life events - collect pairs of recalled and imagined stories written about the same topic
  - Three categories: imagined, recalled, retold (same prompts for imagined and recalled so pairing so control for variation of main topic of stories)
  - Imagined stories contain more commonsense events and elaborations - flow more linearly
  - recalled stories are more dense in concrete event
  - Surface language reflects differences in cognitive processes used in imagining and remembering

#### Measures

- Narrative flow: 2 probabilistic models used bag and chain - used gpt lang model trained on fiction to compute likelihood of sentences
- Episodic vs semantic:
  - Prevalence of realistic events ie factual and non hypothesized events - identified using realistic event tagger using bert-base

- Semantic and common sense knowledge - used as proxy for semantic memory - used social commonsense knowledge graph - first match possible ATOMIC events to sentences by selecting events that share noun chunks and verb phrases with sentences - then search the matched sentences' surrounding sentences for commonsense inferences
- Lexical and stylistic measures - coarse grained lexical counts - count psychologically relevant word categories using linguistic inquiry word count
  - focusing only on the cognitive processes, positive emotion, negative emotion, and I-word categories, as well as the ANALYTIC and TONE summary variables
  - average concreteness level of words in stories using the lexicon by Brysbaert et al. (2014)

#### Imagined vs recalled differences found

- Imagined more linear (ie sentences in imagined stories are substantially more predictable based on context)
- Recalled more event dense ie more realis events (controlling for story length)
- Imagined have more commonsense knowledge
- Lexicon based counts - imagined are more self focused (I-words), more emotional (TONE, positive and negative emotion) and evoke more cognitive processes
- Recalled more concrete and have more logical or hierarchical descriptions (ANALYTIC)

	measure	effect size ( $d$ or $\beta$ )	direction
	avg. $\Delta_l$ (linearity)	0.52***	imagined
	realis events	0.10**	recalled
	commonsense	0.15***	imagined
<i>lexicon-based</i>	ANALYTIC	0.26***	recalled
	concrete	0.13***	recalled
	neg. emo.	0.07***	imagined
	TONE	0.12***	imagined
	I-words	0.17***	imagined
	pos. emo.	0.22***	imagined
	cog. proc.	0.30***	imagined

Table 2: Summary of differences between imagined and recalled stories, according to proposed measures (top), and lexical or word-count measures (bottom). All associations are significant when controlling for multiple comparisons (\*\*\*:  $p < 0.001$ ; \*\*:  $p < 0.01$ ).

#### Narrativization of recalled Stories

- Used temporal distances to find that retold stories have more commonsense knowledge and that more an event is thought or talked about the more linearly its story flows and fewer realis events it contains
- Suggesting proposed language and commonsense methods can measure effects of narrativization over time in recalled memories
- suggests that stories that become more narrativized, either by the passing of time or by being recalled repeatedly, become more similar in some ways to imagined stories