Beyond Possession Existence: Duration and Co-Possession

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Problem statement

- Possession - asymmetric semantic relation between two entities (possessor and possessee)

  Example: John rented a car.
  - Types - ownership or not?
  - Temporal anchors - when?

- Possession duration
  - How long? hours? months? years?

- Co-Possession
  - More than one possessor?

Dataset - curated from existing possession corpora

- Banea et al. (NLE, 2018)
  - Blogs (authors of blogs, objects mentioned in blog)
  - 799 instances

- Chinnappa and Blanco (NAACL, 2018)
  - Ontonotes (persons, concrete objects)
  - 358 instances

- Chinnappa et al. (EMNLP, 2019)
  - Tweets with images (authors of tweets, concrete objects)
  - 1,100 instances

Total: 2,257

Annotation process: Possession Duration

- Labels:
  - Lower bound and Upper bound (e.g., 10 minutes to 1 hour)
- Kappa agreement by converting bound values to normal distribution
  (Pan et al., 2011): 0.37
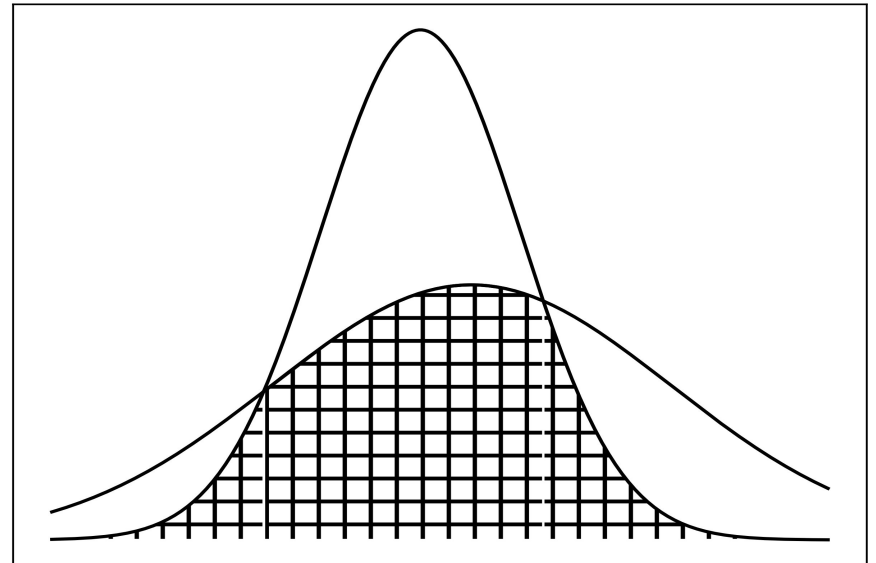
Possessor: person
Possessee: home
Annotator 1:
    Lower bound: 6 months
    Upper bound: 50 years
Annotator 2:
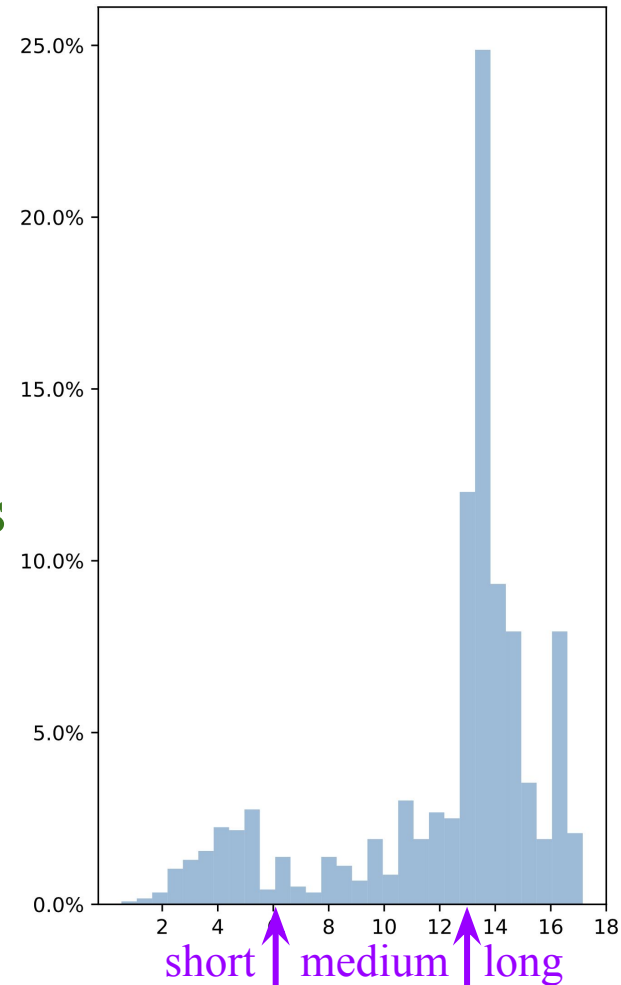   Lower bound: 1 year
    Upper bound: 100 years

Possession Duration: Bound values to discrete labels

- Deduced from histogram of
  mean of bound values

- Labels: short, medium, long
  short: <= 6 hours
  medium: > 6 hours & <=10 months
  long: >= 10 months

- Cohen's kappa: 0.63

short ↑ medium ↑ long

Annotation process: Co-Possession

- Does the possessee belong to a possessor than the possessor mentioned?

- Labels: Yes or No
- Cohen's kappa: 0.65

Examples: Ontonotes, Blogs

	Sentence with possessor and possessee	Dur.	Co-pos
1	Everything served cold, with ice cream, fruit salad and strawberry yoghurt pudding for dessert [...] (author of weblog)	short	no
2	"At least we have the decency to drop bombs from airplanes", he said.	med.	no
3	I had to get out my phone for a couple pics.	long	no
4	We took a taxi along the path of the highway that heads toward Disney, trying to experience this mysterious park from close by.	short	yes
5	The first two months of the summer,[...] and then the last two months, the dealership was able to provide me with a loaner car. (author of weblog)	med.	yes
6	They kept my father's car for a year without writing a confiscation order.	long	yes

Examples: Tweet

Possessor: AJ (Author of tweet)

Possessee: computer

Possession duration: long

Co-possession: no

AJ @Idkblue · Apr 17

How my computer has me feeling. It works. It runs stuff well. And it doesn't overheat my room anymore.

Examples: Tweet

Possessor: P.B. (Author of tweet)

Possessee: jackets

Possession duration: medium

Co-possession: yes

P.B. ♐ @sweetnuggetTL · Apr 16

I swear 90% of the jackets i wear are not mine
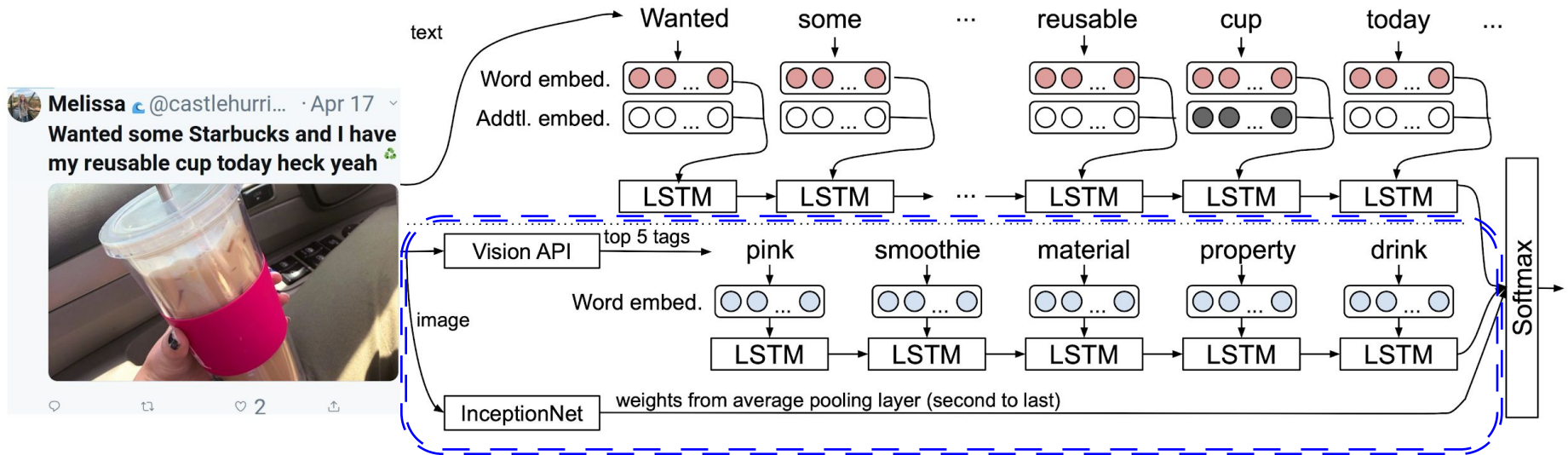
Architecture

Text component: Glove embeddings
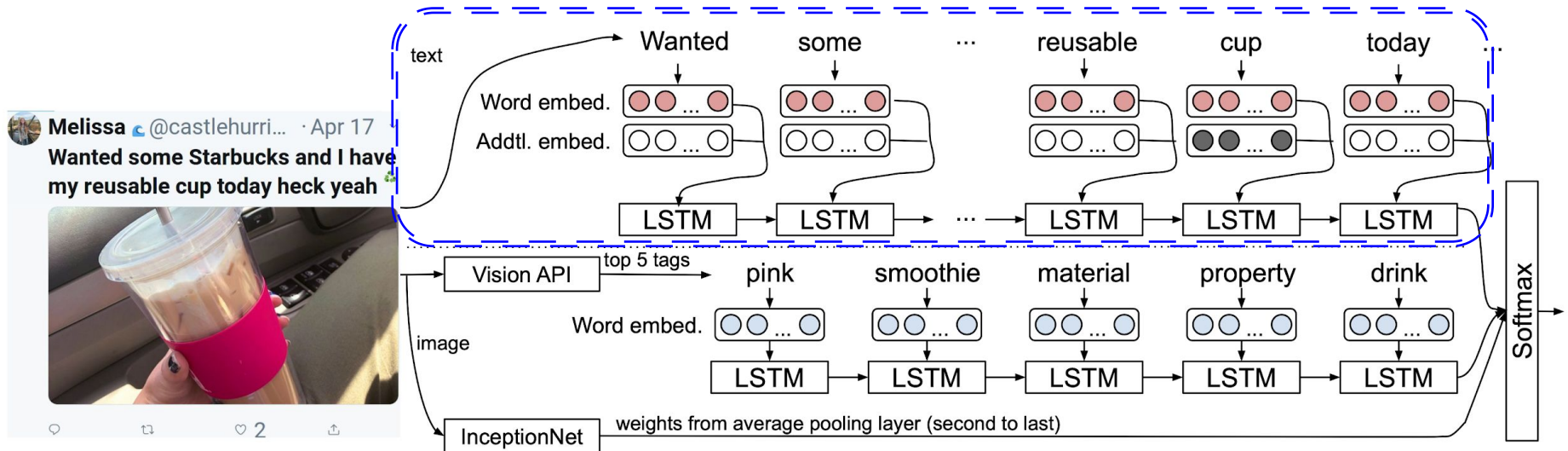
Architecture

Image component: InceptionNet weights + Vision API tags

Results

- Blogs + Ontonotes:
  - Possession duration: 0.82 F1
  - Co-possession: 0.73 F1

- Tweets:
  - Possession duration
    - Text only: 0.65 F1
    - Image only: 0.49 F1
    - Text +Image: 0.56 F1

  - Co-possession
    - Text only: 0.68 F1
    - Image only: 0.63 F1
    - Text +Image: 0.64 F1

Conclusions

- Extract possession duration and co-possession over corpora confirming possession existence

- Possession duration -- bound values and discrete labels

- Co-possession --yes or no

- Experimental results show images are not very useful in identifying possession duration and co-possession

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