Conclusion

- We pointed to the related cognitive and linguistic studies for representation of spatial meaning.
- We introduced some of the related resources and benchmarks for spatial information extraction and training models for spatial representations that can help reasoning.
- Pointed to approaches for mapping the spatial information to 2D/ 3D representations that can help human-like spatial reasoning.
- We reviewed several downstream tasks where they paid or did not pay attention to spatial information explicitly and we pointed to the possible research directions.
- Pointed to spatial capabilities of current language models, contextual representations and new efforts to create benchmarks and sources of supervision at low annotation cost.

Future Directions

- There is a gap between the past studies and what is used in current deep learning models for downstream tasks.
  - *The current deep architectures ignore the cognitive linguistic studies on how space is expressed in language.*
- There are no sufficient benchmarks to evaluate the capabilities of the deep architectures and language models for spatial language understanding and reasoning on spatial language.
- Spatial meaning representation is still a challenging topic despite all the past linguistic and cognitive studies.
- Spatial language understanding needs commonsense about object affordances and real-world situations.
  - *Spatial representations is a research question, in particular for carrying spatial commonsense*
  - *We need more sophisticated models that take the explicit spatial semantics into account to be able to rely on them in real-world scenarios and unobserved situations.*
- Novel Pre-training and fine-tuning, data-augmentation, for symbolic conceptualizations
  - *Exploiting symbolic semantic abstraction for minimum task supervision for more generalizable models*
  - *Exploiting interactions for gaining spatial knowledge with indirect supervision*

Tutorial Webpage

We will add all the related info and link in here:

- https://spatial-language-tutorial.github.io

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