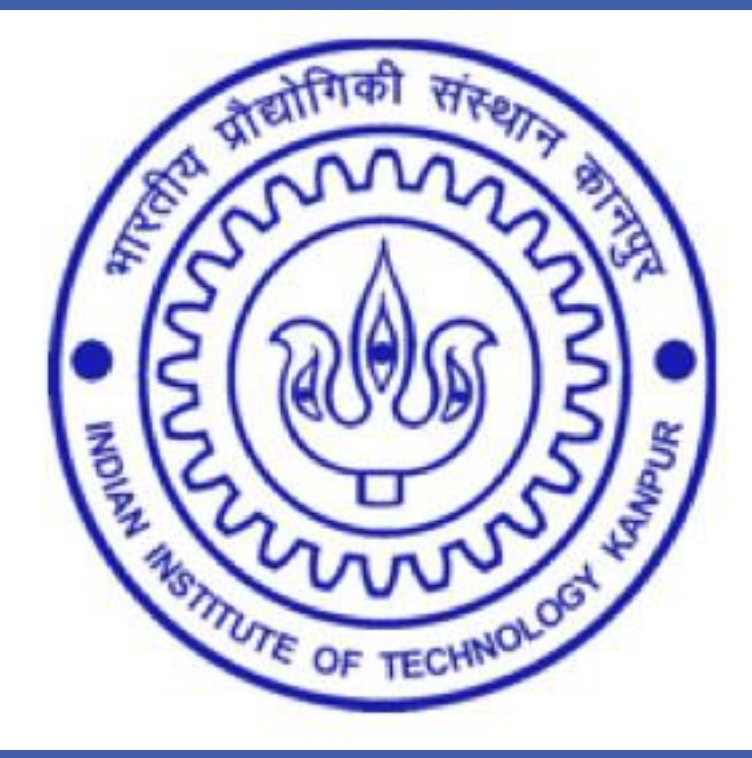




Spatial Role Labelling



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Introduction to the Problem Statement and its Importance

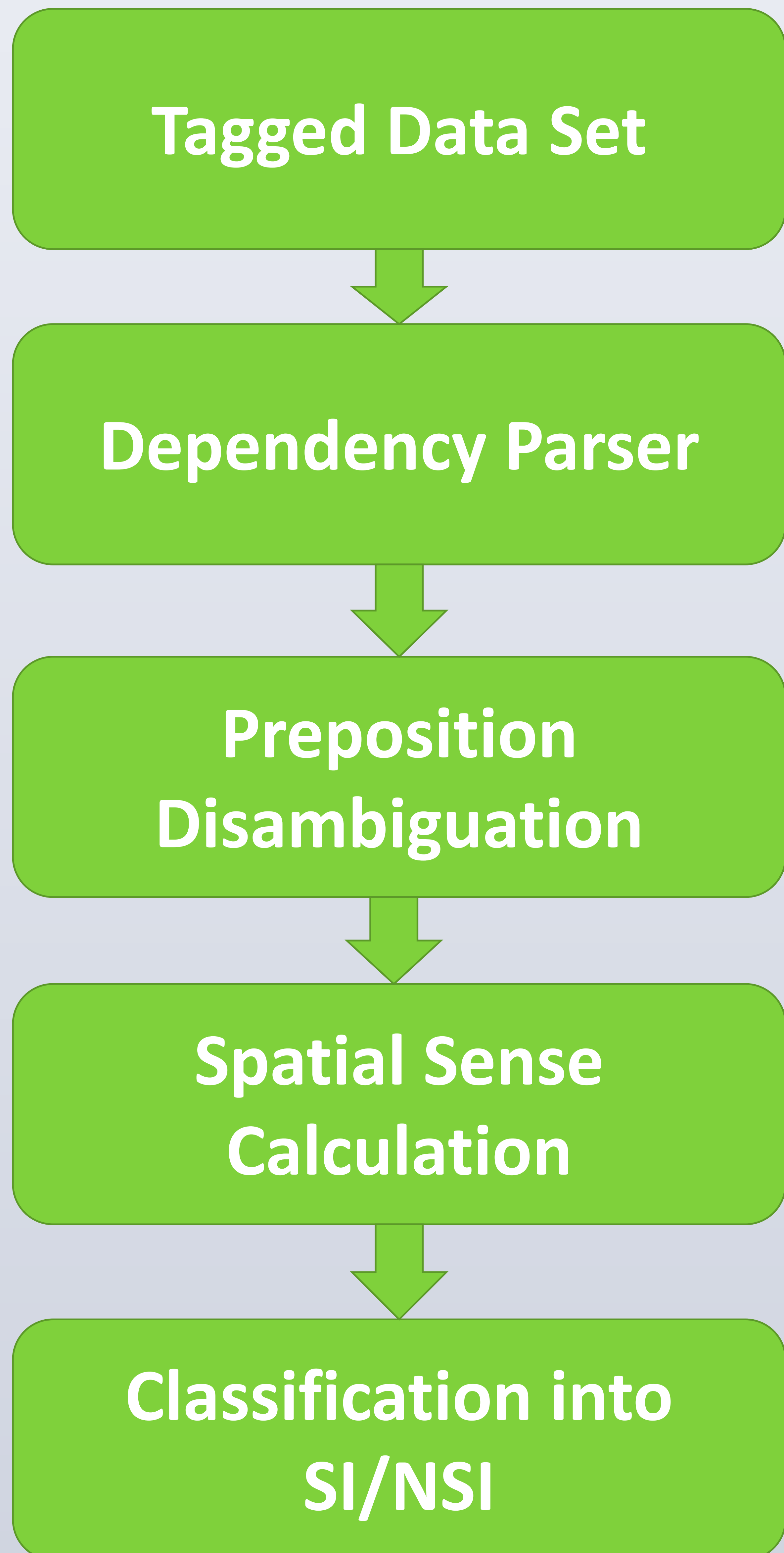
Spatial Role labeling concerns with the extraction of spatial semantics from natural language : trajectors , landmarks and spatial indicators.

Learning how to map this information onto a formal representation from text is a challenging problem. At present no well-defined framework for automatic spatial information extraction exists that can handle all of these issues. This task has been introduced recently in SemEval 2012 , where an annotation scheme was proposed that is language-independent and facilitates the application of machine learning techniques.

Motivation and Usefulness

- We can control a robot by audio instructions.
- Helpful in systems that perform text-to-scene conversion and generation of textual descriptions from visual data.
- We can use this in geographical information systems (GIS).

Approach



ALGORITHM

- Implemented an algorithm to find the percentage of acceptions in which the preposition acts as a spatial indicator.
- Calculated the spatial sense for the each extracted preposition in TPP Dictionary (The Preposition Project).
- Extract Preposition class as SI or NSI.

EXPERIMENTS

- Dataset : The main annotated corpus is a subset of IAPR TC-12 Benchmark. It consists of 600 sentences annotated with basic spatial roles of trajector, landmark and their corresponding spatial indicators.
- Tools Used : NLTK , Stanford Parser , Naïve Bayes Classifier and SVM-HMM Tool.
- Used K- Fold Cross Validation on different amount of datasets and calculated the accuracy with Naive Bayes Classifier for spatial indicators on the rest of the dataset.
- Achieved a maximum of 86.2% accuracy for training data of 70% and the rest for test data.

RESULTS

```

SENTENCE :: a yellow building with white columns in the background .

TOKENIZED SENTENCE :: ['a', 'yellow', 'building', 'with', 'white', 'column
s', 'in', 'the', 'background', '.']

TAGGED WORDS :: [('a', 'DT'), ('yellow', 'JJ'), ('building', 'NN'), ('with
', 'IN'), ('white', 'JJ'), ('columns', 'NNS'), ('in', 'IN'), ('the', 'DT'),
('background', 'NN'), ('.', '.')]

Getting spatial sense of :: with
Features extracted:
{'head1': u'building',
 'head1_LEMMA': u'building',
 'head1_POS': 'NN',
 'head2': u'columns',
 'head2_LEMMA': u'column',
 'head2_POS': 'NNS',
 'preposition': u'with',
 'preposition_POS': 'IN',
 'preposition_spatial': 0.0}

Getting spatial sense of :: in
Features extracted:
{'head1': u'building',
 'head1_LEMMA': u'building',
 'head2': u'background',
 'head2_LEMMA': u'background',
 'head2_POS': 'NN',
 'preposition': u'in',
 'preposition_POS': 'IN',
 'preposition_spatial': 0.13333333333333333}
  
```

Horizontal (Category) Axis	Accuracy
1	0.80
2	0.86
3	0.86
4	0.82
5	0.85
6	0.84
7	0.84
8	0.78
9	0.76

CONCLUSIONS

- Taking into account the probability of a preposition being a Spatial Indicator we could achieve favorable results on the test data set.
- Will try to extend into to identification of landmarks and trajectors from the sentences pertaining to the difficulty level in adapting the training data with features extracted to the HMM Network.

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ACKNOWLEDGEMENTS

- We would like to thank our mentor and guide Prof. Amitabha Mukerjee for guiding us throughout the project and giving us helpful insights towards our objective.
- Also we have used the libraries and some part of code developed by a team headed by Victor Ponce , Universitat de Barcelona, Spain.