ENHANCING PERFORMANCE OF THE VIETNAMESE DEPENDENCY PARSING TASK

based on attention mechanism and the linguistic patterns

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- Including our researching task: **Dependency Parsing**.

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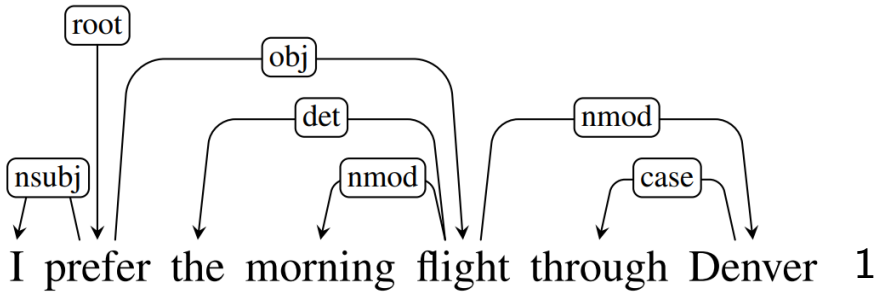
Dependency Grammar

- Dependency grammar is a grammar formalism, where each word of a sentence is describe by a binary relationship called **head** and **dependent**, which is used to build a **dependency tree**.



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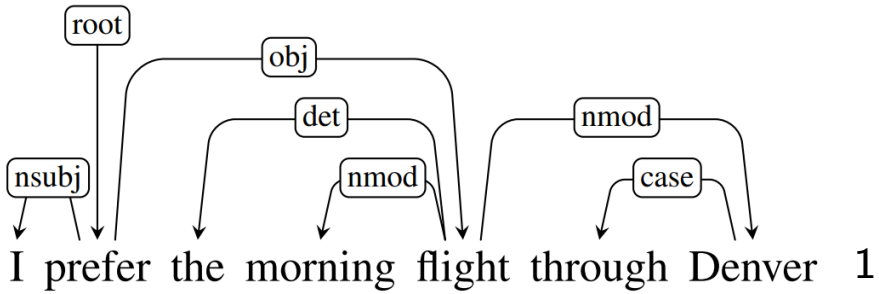

- Each arc in the given picture illustrates a grammatical relation from a head to a dependent and comes with a label to classify the relation.

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- For example, in Vietnamese, adjective can come both before and after the noun, depends on the scenario.

Hồ Tây

or

Tây Hồ

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Dependency Relations and Dependency Treebanks

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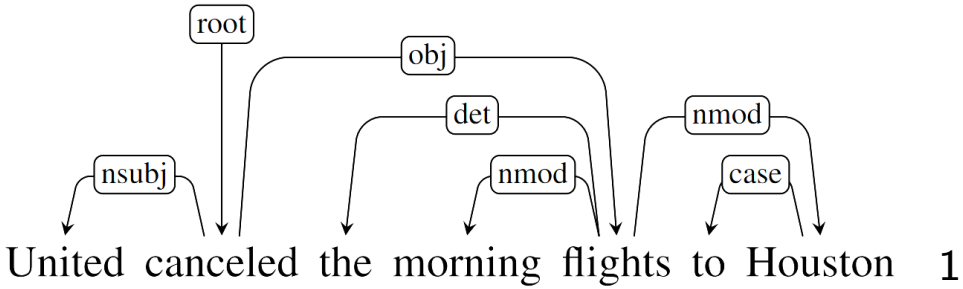

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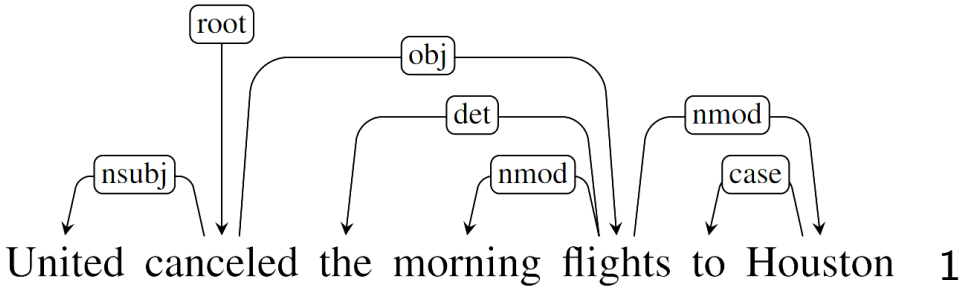

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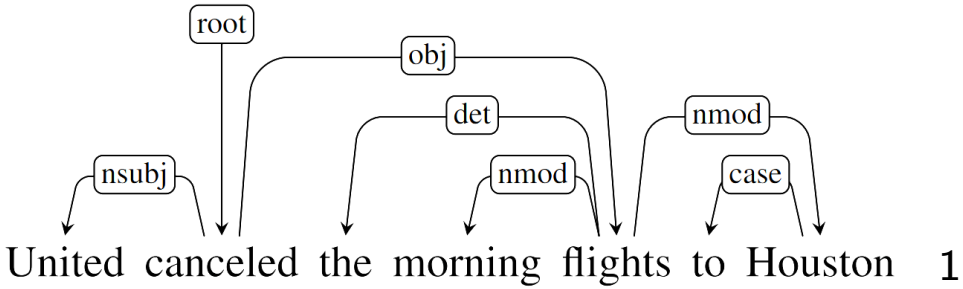

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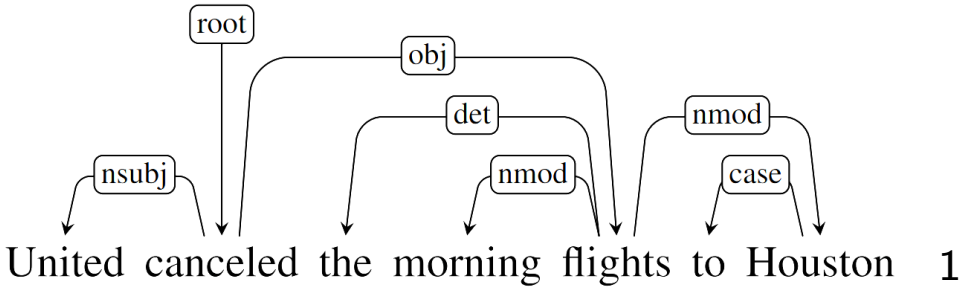

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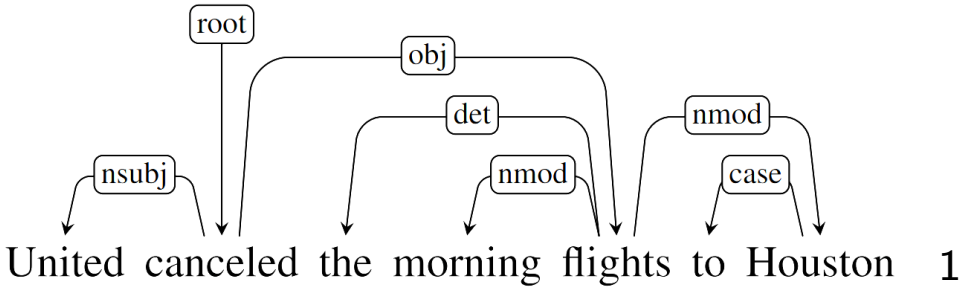

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- As there is a gap between treebanks, which can cause a *cross-domain* problem.

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Transition-based Dependency Parsing

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- Current research focuses on using machine learning and neural network to extract feature and gain score for each transition.

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Graph-based Dependency Parsing

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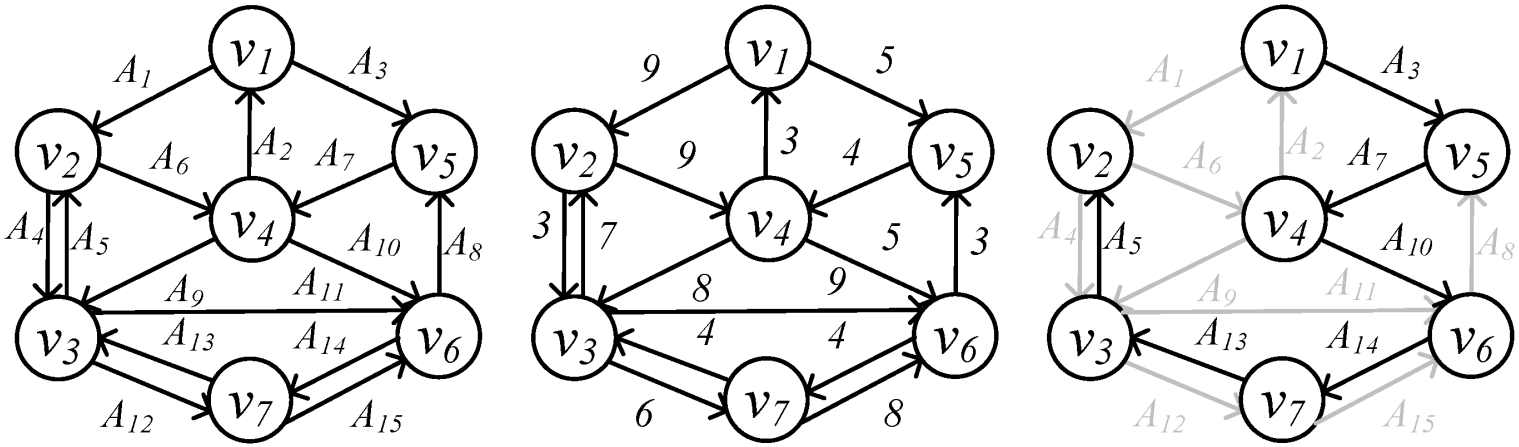
- Then, each of $n(n-1)$ edges in this graph is gained a score.
- Use Chu-Liu Edmonds (a variance of MST algorithm) to build the dependency tree.



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Linguistic Patterns

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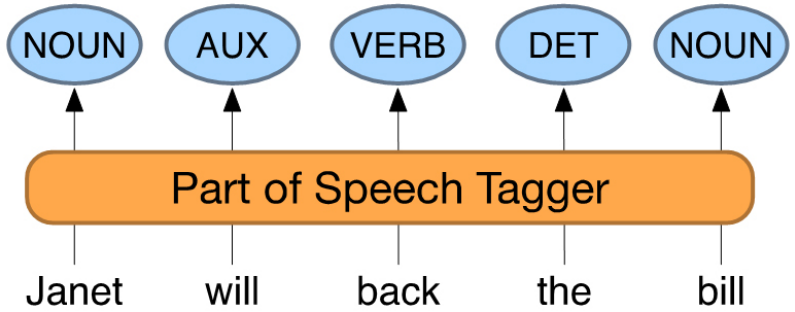

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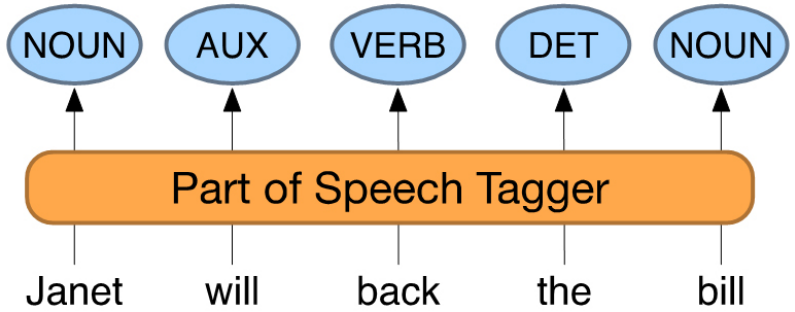

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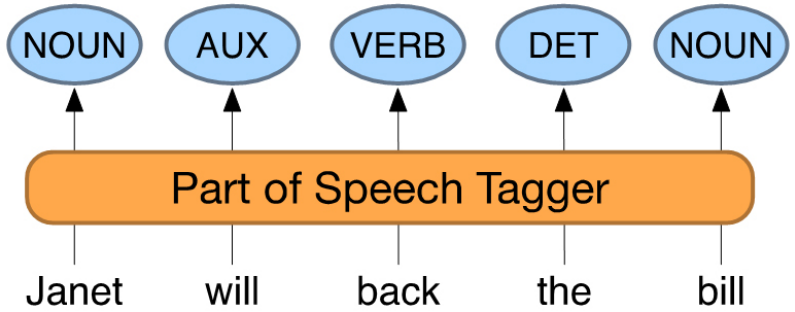

An example of part-of-speech (POS) tagging

- Some research has shown that adding these patterns as an input to NLPs may help to receive better performance.
- We want to try applying this approach for the task in Vietnamese, as it has flexible word orders.

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  - Able to beat the record on to make the new state-of-the-art model in this task.
  - Able to handle the cross-domain problem between different datasets.
- Our approach is based on current research, then applying next-generation encoders (such as BERT, RoBERTa) and adding Vietnamese linguistic patterns.

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Methodology

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- We propose to implement the parser of (Eliyahu Kiperwasser and Yoav Goldberg, 2017) in Vietnamese there are only a few of research about transition-based parser in Vietnamese.

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- As almost all current graph-based parsers take the idea of (Dozat and Manning, 2017), we want to reimplement it by replacing the LSTM with next-generation encoders.
- Another point of view is taking the unlabeled data and multi-task training of (Clark et al., 2018), but this solution require dataset for various tasks.

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- (Tian et al., 2022) is an instance where the biaffine attention is adapted to face with multiple domains. However, this solution use a large amount of data, we could only try this view in case of having high-performance system.

Preliminary Results

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We have implemented the solution of (Tian et al., 2022) and (Zhang et al, 2020) with the VnDT treebank by replacing the lstm encoder with PhoBERT and recevied the following result.

Model	UAS	LAS
(Tian et al., 2022)	85.66%	77.88%
(Zhang et al, 2020)	85.60%	77.24%

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