

# Paper: *Incrementality in Deterministic Dependency Parsing*

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**Quote**      *“In this paper, we analyze the constraints on incrementality in deterministic dependency parsing and argue that strict incrementality is not achievable. We then analyze the algorithm proposed in Nivre (2003) and show that, given the previous result, this algorithm is optimal from the point of view of incrementality.”*

**Overview**      The paper in discussion, sheds light to the question of whether it is possible for natural language to be incrementally processed or not and they argued that it cannot. The incremental processing of natural language is important for two reasons as mentioned in the paper. First reason is for the application of incremental parsing such as speech recognition. The other reason is that it directly connects to the cognitive modelling similar to human parsing of natural language. To show that the incremental parsing is not achievable, the authors at first analyzes the constraints on incrementality in deterministic dependency parsing. Moreover, they analyzed the arc-eager parsing algorithm proposed in Nivre (2003) and conclude that this algorithm is optimal. Finally, they listed the degree of incrementality achieved with the algorithm. They formed the conditions for dependency graph namely- Unique Label, Single Head, Acyclic, Connected and Projective. Also, they mentioned three transitions to meet the above conditions which are- Left-Reduce, Right-Reduce and Shift.

There are some mentionable accomplishment of this paper. This paper proved that the strict incrementality is not possible and also showed the degree of incrementality with a memory based classifier. Authors claimed 85.7% accuracy using a Swedish treebank data.

**Intellectual Merit**      This researched advanced the understanding of incremental parsing by answering a research question that incremental parsing is not achievable. Apart from that, they validated the optimality of the arc-eager algorithm. This research answers some important questions in language processing and discussed the robust and efficient approach for incremental dependency parsing. The results of this study is well reasoned and organized. The authors measured their results in accuracy and listed the accuracies for different input data. The author is a professor of Computational Linguistics at Uppsala University, Sweden. He has a good and he is well qualified to carry this research given his experience and expertise in this field. The author has appropriate resources like required datasets along with his knowledge of empirical research outcomes.

**Broader Impact**      Though this research validates some known concerns of incremental parsing, it has a broader impact in the field of language processing. This research is referenced frequently in the field of natural language processing studies. Nivre used a dataset from a Swedish treebank which is available online. This research was conducted by a Professor of Uppsala University in Sweden funded by the Swedish Research Council. This research did not include author from under-represented group.

Keywords    Natural Language Processing, arc-eager algorithm, Incremental Processing

- Discussion  
Questions
- Can we increase the accuracy? Can we calculate the upperbound of the incremental parsing?
  - The paper explores different areas of incremental processing but the paper should discuss more about why the algorithm is optimal and for which specific tasks the algorithm is optimal.
  - Author mentioned that the measurement of the incrementality parser was done using the number of connected components. However, my question is are there any kind of approach exist other than considering the connected components of the input data?

Table 1: Grade deductions by section

Overview	Intellectual M.	B. Impact	Keywords	Questions	Is Online?