

#37 Syntax Error Propagation in Context-Free Languages

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Christine Tasson

Rejected

 **Submission (483kB)** 28 Oct 2022 9:40pm EDT · e173d88c

☐ **Abstract**

Brzozowski (1964) defines a regular expression derivative as the suffixes which complete a known prefix. In this work, we establish a Galois connection with Valiant's (1975) fixpoint construction in the context-free setting, and further extend their work into the hierarchy of bounded context-sensitive languages realizable by finite CFL intersection. We illustrate how to lower context-free language recognition onto a tensor algebra over finite fields, loosely inspired by partial differentiation in Euclidean spaces. In addition to its theoretical value, this connection has yielded surprisingly useful applications in incremental parsing, code completion and program repair. For example, we use it to repair syntax errors, perform sketch-based program synthesis, and decide various language induction and membership queries.

☐ **Authors** (anonymous)

B. Considine, X. Si [\[details\]](#)

	OveMer	RevExp
Review #37A	1	1
Review #37B	2	1
Review #37C	1	1

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Review #37A

Overall merit

1. Reject

Reviewer expertise

1. No familiarity

Paper summary

The authors take an approach of Valiant to encode context-free grammars into matrix operations on finite fields, and extend this Brzozowski derivatives to this setting. They use this to sketch novel approaches to parsing and syntax repair.

Comments for authors

The abstract is very densely written, and I unfortunately lack the background to evaluate its technical contribution.

However, the work is neither about probabilistic nor differentiable programming. The abstract touches on a variety of issues which could be relevant to LAFI (PCFGs, program synthesis, randomized algorithms, differentiation) but it is unclear if those are mere tangential analogies, i.e. the linear algebra is over finite fields. I am therefore not convinced that LAFI is the right venue to present this work.

Review #37B

Overall merit

2. Accept

Reviewer expertise

1. No familiarity

Paper summary

This abstract is unfortunately beyond my comprehension, due to no fault of the authors, but my insufficient expertise. I have a high-level appreciation that CFG parsing can be reduced to boolean matrix multiplication, but I'd have to dig very deep indeed to understand the commutative diagram or anything beyond it.

From my under-qualified perspective it looks like many people at POPL with a background in compilers will find this work fascinating, but my intuition is that a relatively small proportion of the LAFI audience will be familiar enough with parsing to appreciate much beyond an introduction to this work within a 15min talk. I therefore recommend this be presented as a poster. This is not a judgement on the quality of the abstract, but simply a guess about the distribution of expertise/interests among workshop participants.

Review #37C

Overall merit

1. Reject

Reviewer expertise

1. No familiarity

Paper summary

This paper explores an interesting connection between differentiation and context-free grammar parsing. There appear to be a number of applications of this approach in interesting domains such as program synthesis and sketching, which hints at this method being an interesting general framework in which to study these other approaches.

Comments for authors

Overall this is a very nicely prepared abstract, and I can tell that the authors put work into the presentation. The authors do make an argument that this paper would be of interest to the LAFI community.

Unfortunately I found this abstract extremely difficult to follow both due to its technical density and the fact that it is quite outside the usual kind of paper that we find in LAFI. I think that the work certainly has potential to be quite interesting to the broader PL community and do not want to discourage the authors from pursuing it, but I think that within LAFI it will be difficult to find much of an audience, so I must recommend rejection here.

In the future, to draw a more tight connection with LAFI and garner interest, it would be interesting to see how techniques and tools developed within the probabilistic or differentiable programming community could be applied in this interesting parsing setting.

HotCRP