

# Efficiently Inferring Non-hierarchical Structure in Parsing and Computation

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*Abstract:* This paper proposes to revise the general definition of a “grammar”<sup>1</sup> as well as “parsing”<sup>2</sup>. A meta-language named “Simultaneous Productions” (or “S.P”) is proposed for specifying a parseable grammar (similar in intent to EBNF<sup>3</sup>). This meta-language is shown to be equivalent to a Turing Machine<sup>4</sup>, and several favorable properties of this meta-language across various use cases are discussed.

An actual “evaluation method” (or “parsing algorithm”) is then introduced for the proposed S.P. grammar model, which shares some similarities with the CYK algorithm<sup>5</sup>. This method is shown to terminate in  $\mathcal{O}(n^3)$  time across  $\mathcal{O}(n)$  inputs. This method is then demonstrated to have the peculiar property of parameterizing context-sensitivity<sup>8</sup>.<sup>9</sup> The practical and theoretical ramifications of this result are discussed and speculated on.

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## 1 Background

asdf

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<sup>1</sup>cite: grammar defn

<sup>2</sup>cite: parsing defn

<sup>3</sup>cite: EBNF

<sup>4</sup>cite: T.M. defn

<sup>5</sup>cite: CYK algorithm!

<sup>6</sup>TODO: parsing runtime?

<sup>7</sup>TODO: parsing inputs?

<sup>8</sup>cite: context-sensitivity defn

<sup>9</sup>TODO: is this peculiar?