Plains Cree verb template: An information-theoretical perspective

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Plains Cree, along with other Algonquian and Indigenous American languages, demonstrates extensive verbal morphology, including complex polysynthesis, which has attracted semantic, syntactic, and computational analyses (Harrigan et al. 2017; Kang 2017; Wolvengrey 2011). This presentation aims to add to the quantitative investigation into the morphosyntax and morphemic template in Plains Cree, specifically from the perspective of information theory.

Information theory, the mathematical study of how information is stored, communicated, and quantified, has been increasingly used to describe how predictability is organized within a word and how this organization relates to typology and morphological processing. One way of quantifying these concepts of predictability is entropy, which is a measure of complexity closely related to surprisal. Entropy describes the intricacy and predictability of items in a system, and previous research has demonstrated cross-linguistic tendies to reduce surprisal and entropy through morphological order (Hahn et al. 2022).

Previous research has observed that cross-linguistic morpheme orderings demonstrate information locality, i.e. morphemes that are more mutually predictable to the root are found closer to the root (Hahn et al. 2022). According to Hahn et al., this tendency of placing more root-predictive morphemes closer to the root maximizes information gain and reduces strain on working memory. Other information-theoretical concepts, such as mutual information, have been applied previously to Plains Cree data to analyze preverbal combinations (Schmirler et al. 2019). However, entropy has yet to have been applied to morphological organization in the Plains Cree template. In this presentation, we plan to analyze inflectional entropy of the Plains Cree verb and entropy reduction of morphological slots in Plains Cree verbs using a newly-expanded corpus.

We plan our observation of entropy in Plains Cree verbs to be specifically in inflectional entropy through an n-gram analysis. In other words, how much does knowing the first morpheme of the word form reduce predictive complexity of all other word forms with that morpheme? Same question with knowing the first two morphemes, etc. We will also look at this analysis on the individual morphemic level by observing specific morphemes and their entropy-reduction abilities. We will also potentially relate our results to Karlsson's notion of core forms (Karlsson 1985), and how our quantifications can shed light on what forms in Plains Cree are core to their verbal paradigm.

References

Kang, E. B. (2017). Morphological variation in Cree inflection. *Toronto Working Papers in Linguistics*, 39.

Hahn, M., Mathew, R., & Degen, J. (2022). Morpheme Ordering Across Languages Reflects Optimization for Processing Efficiency. *Open Mind,* 5, 208–232.

Harrigan, A. G., Schmirler, K., Arppe, A., Antonsen, L., Trosterud, T., & Wolvengrey, A. (2017). Learning from the computational modelling of Plains Cree verbs. *Morphology*, 27(4), 565–598.

Karlsson, F. (1985). Paradigms and word forms. Studia Gramatyczne, 7, 135–154.

Schmirler, K., Harrigan, A. G., Arppe, A., & Wolvengrey, A. (2019). Plains Cree Verbal Derivational Morphology:
In Papers of the Forty-Eighth Algonquian Conference (pp. 239–254). Michigan State University Press.

Wolvengrey, A. (2011). *Semantic and pragmatic functions in Plains Cree syntax*. LOT.