

Varying Spreading Algorithm's ρ

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Our **Spreading Algorithm** takes a list of angles on the unit circle and a spreading factor $\rho \in [0, 1]$, and outputs a new list of angles that are more evenly distributed while preserving their relative order. For $\rho < 1$, the algorithm:

1. Unrolls the unit circle onto the real line, mapping the angles to positions in $[0, 2\pi]$
2. Computes $\delta = 2\pi\rho/((1 - \rho)n)$ where n is the number of angles
3. For each mapped position:
 - (a) Inserts $(1 - \alpha)\delta$ padding before the position
 - (b) Inserts $\alpha\delta$ padding after the positionwhere α is determined by the “average angle’s” relative position between its two nearest neighbors
4. Scales this expanded line (now length $2\pi + n\delta$) back to length 2π
5. Rolls the line back into a circle, yielding the spread-out angles

The Spreading Algorithm ensures the “average angle” (angle of the average of the points on the unit circle) remains fixed. When $\rho = 0$, angles remain unchanged; as ρ approaches 1, angles approach even spacing; and $\rho = 1$ corresponds to the limit, where angles reaching even spacing.

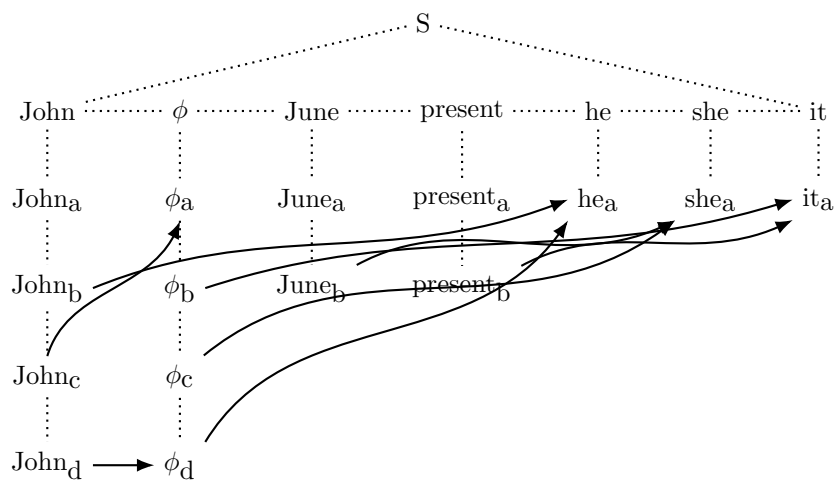
The Spreading Algorithm helps position arrows around nodes in chaining.py’s Tikz diagrams, preventing arrows from overlapping while maintaining their general directional relationships.

The remainder of this document illustrates how varying the input ρ passed to the Spreading Algorithm varies the position arrows around nodes in chaining.py’s Tikz diagrams applied to example sentence (10.1). Ultimately, we settled on using $\rho = 0.5$ which is a nice compromise between direct flight arrows and completely spread out arrows.

This document’s chaining diagrams can be recreated using `varying_rho_doc()` which creates file `docs/varying_rho.tex`.

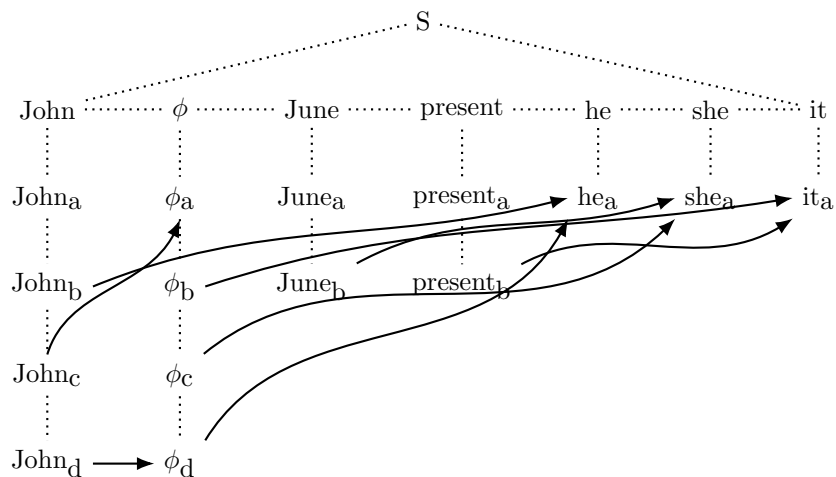
Case $\rho = 0.0$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



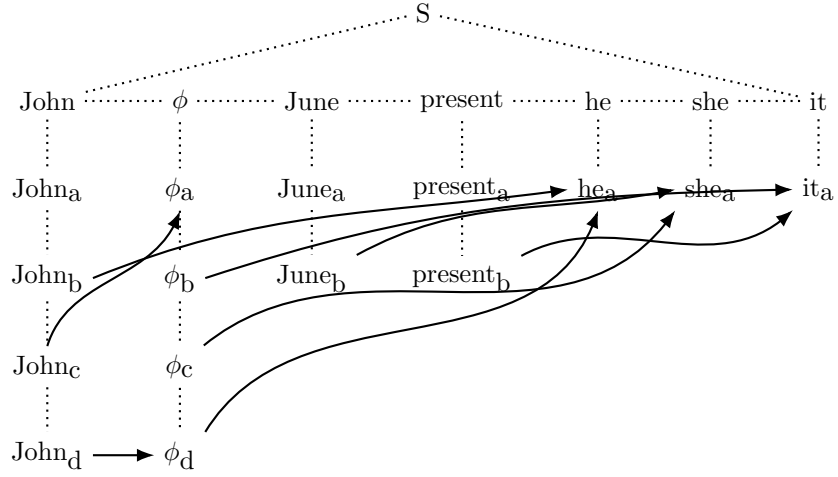
Case $\rho = 0.1$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



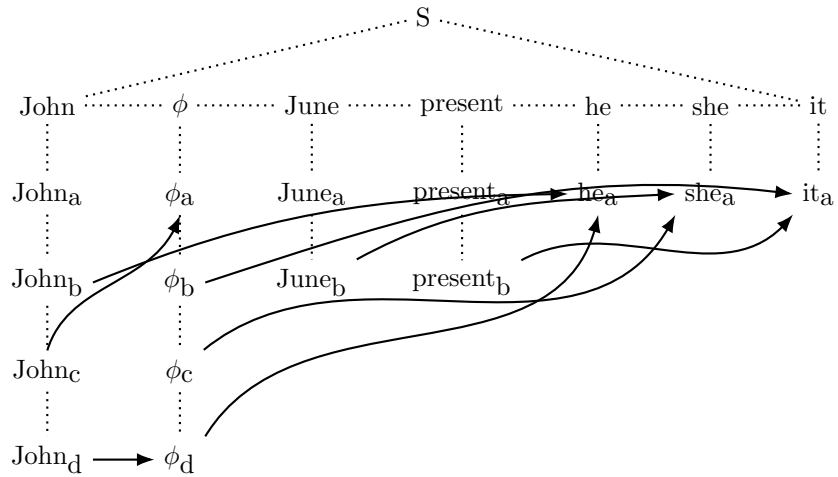
Case $\rho = 0.2$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



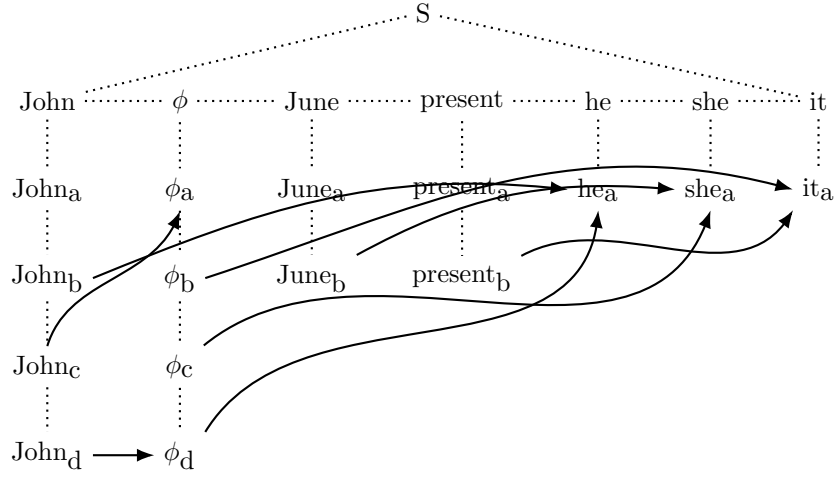
Case $\rho = 0.3$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



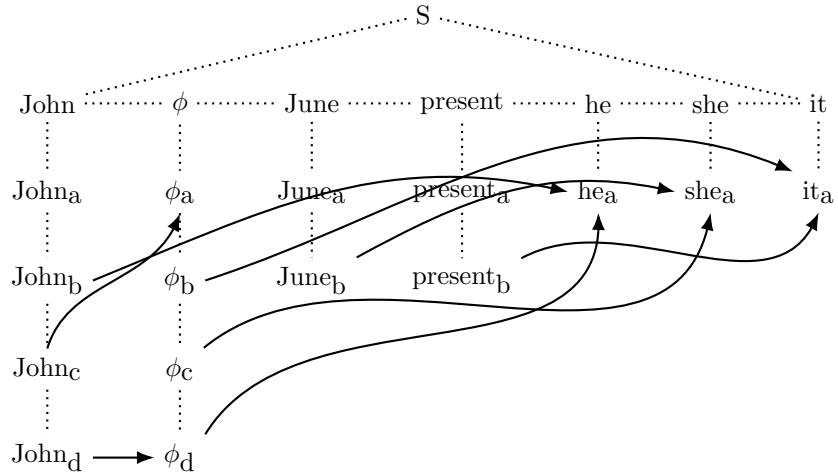
Case $\rho = 0.4$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



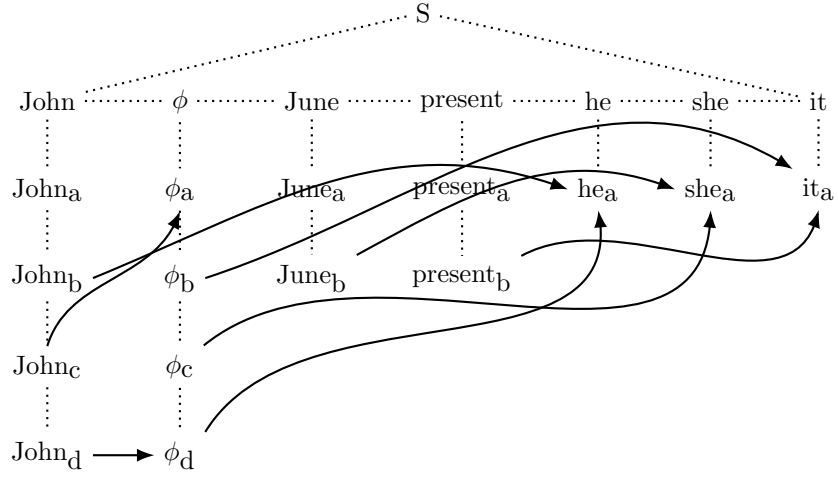
Case $\rho = 0.5$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



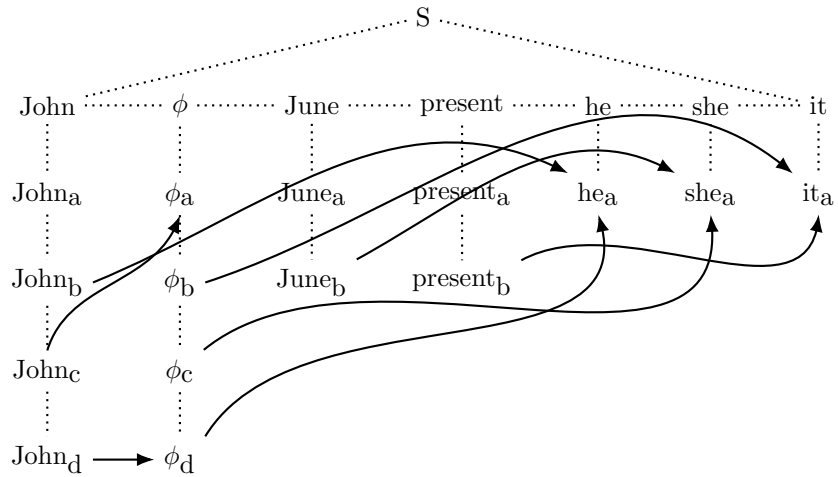
Case $\rho = 0.6$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



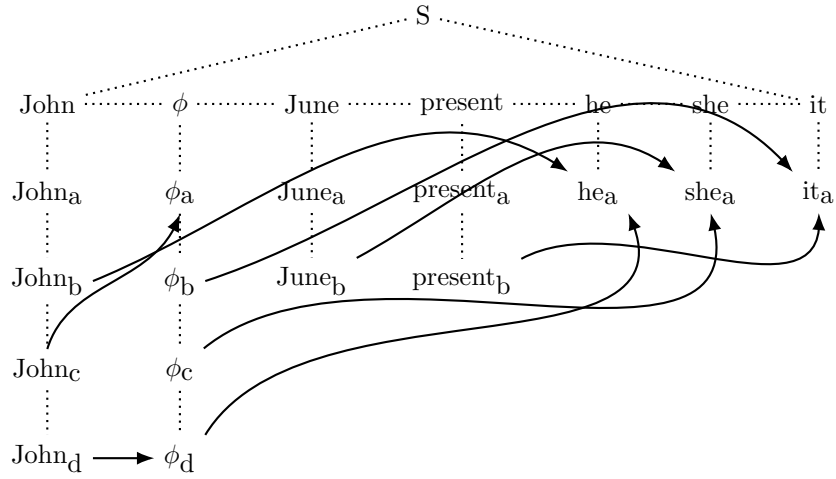
Case $\rho = 0.7$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



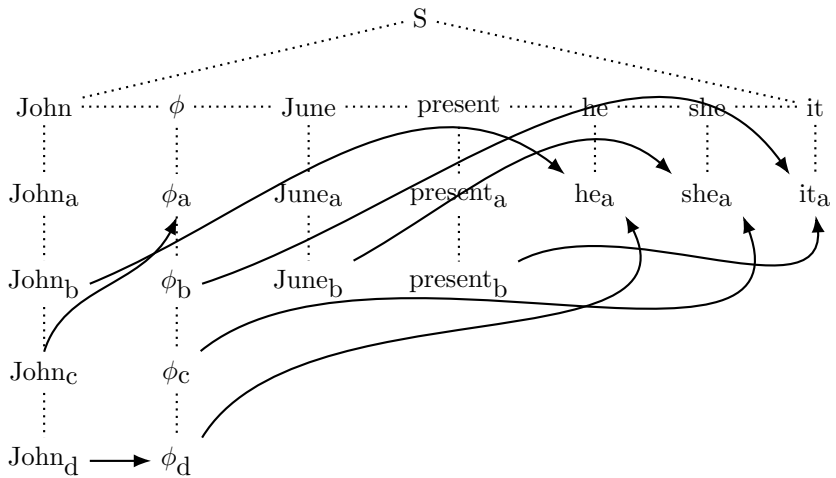
Case $\rho = 0.8$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



Case $\rho = 0.9$

(10.1) John wants to give June a present, but he isn't sure she'll like it.



Case $\rho = 1.0$

(10.1) John wants to give June a present, but he isn't sure she'll like it.

