1. Introduction
- Long-distance phonological processes display distance-based decay: rate of application decreases as transparent distance between the trigger and target increases.
- This is challenging for approaches to assimilation and dissimilation in which distance does not play a role.
- My account uses the maximum entropy framework (Smolensky and Legendre 2006, et seq.) and a decay function to account for the effect in three processes across four languages.
- The account is implementable in ABC (Hansson 2001, et seq.) with weighted constraints and probabilistic output.

2. Empirical background
Distance-based decay can be observed in a variety of different long-distance phonological processes:

<table>
<thead>
<tr>
<th>Process</th>
<th>Example</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trigger-target</td>
<td>/k-</td>
<td>k-</td>
</tr>
<tr>
<td>Vowel harmony in Hungarian: /B-</td>
<td>B-</td>
<td>60.79%</td>
</tr>
<tr>
<td>Liquid dissimilation in Latin:</td>
<td>/r-</td>
<td>r-</td>
</tr>
<tr>
<td>Liquid dissimilation in English:</td>
<td>/r-</td>
<td>r-</td>
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</tbody>
</table>

3. Statistical analysis
Likelihood ratio tests over generalized linear models of the data reveal the following:
- The number of transparent syllables comes out significant in producing the decay effect for all of the covered languages (p < 0.001 for all languages except Latin, for which p = 0.03).
- When number of transparent segments was pit against number of transparent syllables, the number of transparent segments did not come out significant.
- In Latin, triggers in onset-noninitial position are associated with lower application rates (p < 0.01), while labial consonants and velar consonants were not significant (contra Cser 2010).
- In English, triggers in onset-noninitial position or in coda position are associated with lower application rate (p < 0.001); velar consonants were associated with lower application rates (p = 0.02), while labial consonants were not.
- In Hungarian, height of transparent vowels is significantly related to likelihood of application (p < 0.001) as noted by Hayes and Londe 2008.

4. Account rationale
- Positioning distance-based markedness constraints is too powerful: learners never acquire small weights for local constraints and large weights for nonlocal ones.
- My account is an extension of Kimper 2011, who proposes a better option: posit one nonlocal markedness constraint whose weight is then scaled with distance.
- Distance-based constraints show that the weight of markedness of cooccurrences decreases with distance in an inverse-exponential fashion (also predicted by Kimper 2011).
- I posit d(x) = 1/x^k, where x is syllabic distance (0 if the trigger and target are in the same syllable, 1 if they are adjacent, etc.), and k is a real-valued parameter.
- E.g., in Latin, d(x) scales the weight of markedness as follows:

5. Fitting the model parameters
- Three parameter values must be found: the weight of markedness, the weight of faithfulness, and the decay parameter k.
- I found parameter values that minimize the summed difference between the observed and predicted probabilities.
- As it turns out, we do not need language-specific values of k.
- Setting k = 0.98 constant across languages and letting the learner determine weights leads to a model with minimal error:
- My current findings suggest that swapping the inverse exponential model for a linear model results in compromised fit.

6. Implementation in ABC
- We can scale the weight of correspondence using d(x).
- Imagine we want to account for a consonant harmony process. Suppose that the value of d(x) at two transparent syllables is 0.5.

7. Sources of data
Malagasy: Beaujardière 1994; www.malagasyword.org
Latin: The Perseus Digital Library
English: The Oxford English Dictionary
Hungarian: Hayes, Zuraw, Siptar, and Londe 2006

8. Selected references