

LI 511: Computational models of sound change

Summer 2013

Tuesday, Thursday 3.30–5.20,¹ 2347 Mason Hall

James Kirby (j.kirby@ed.ac.uk)

Morgan Sonderegger (morgan.sonderegger@mcgill.ca)

Office hours: By appointment

Aims and objectives

Decades of empirical research have led to an increasingly nuanced picture of the nature of phonetic and phonological change, incorporating insights from speech production and perception, cognitive biases, and social factors. However, there remains a significant gap between observed patterns and proposed mechanisms, in part due to the difficulty of conducting the type of controlled studies necessary to test hypotheses about historical change.

Computational and mathematical models (henceforth ‘computational models’) provide an alternative means by which such hypotheses can be fruitfully explored. With an eye towards Box’s dictum (all models are wrong, but some are useful), this course asks: how can computational models be useful for understanding why phonetic and phonological change occurs?

Over the next several weeks, we will explore the growing and varied literature on computational models of sound change that has emerged over the past 15 years, including models of change in individuals over the lifespan, and change in speech communities in historical time. Discussion topics will include the strengths and weaknesses of different approaches (e.g. simulation-based vs. mathematical models); identifying which modeling frameworks are best suited for particular types of research questions; and methodological considerations in modeling phonetic and phonological change.

Prerequisites

Some background in programming (especially in R) or mathematics (probability theory, single-variable calculus, or linear algebra) is helpful, but not required.

Electronic logistics

Please make sure you are signed up on the course Piazza site (http://piazza.com/lsa_linguistic_institute/spring2013/li511).

Please include “LI 511” in the subject line of emails to the instructors.

Course structure

Each of the first three weeks will be centered around one type of computational model of sound change which has been proposed in the literature. During these weeks, we will alternate between two types of class:

- Tuesdays will be seminar-style lecture/discussions, where we will discuss the assigned readings on some topic(s), as well as related work, at a relatively high level.
- On Thursdays (including F, 7/5), we will discuss in detail a single computational model described in one of the week’s readings. The goal is to understand each model in sufficient detail to implement it (in any programming language), filling in any details left out by the authors. We will also discuss questions about the model which can be tested using an implementation, such as what behavior would be expected to result when particular model parameters are changed, or when the model is extended in some way. Starting from an implementation which

¹Note that the class scheduled for Thursday 4 July will be held on Friday 5 July instead.

the instructors will provide, you will explore some of these questions in a Lab to be completed by the following Tuesday.

The last week will consist of two seminar-style classes (without an associated lab).

This course has relatively heavy load of assignments (readings and labs). However, the actual amount of assessment is relatively light, and we have tried to make the course accessible to both registered students and auditors with different interests.

Assessment

Participation	25%
Project	75%

Labs: Labs may be completed either individually, or in groups of up to 3 students. Completion of the labs and discussion of your findings will form your participation grade.

Project: A paper of around 4–5 pages describing a small extension of one of the three models used in the labs. Some possible topics will be discussed in class.

Schedule (subject to change)

Week 1: T 25/6, R 27/6

- Introduction to sound change, computational models
 - What is sound change? When does change take place? (What are we trying to model?)
 - Why computational models?
 - How do we build and use computational models?
- Exemplar models of change in individuals
 - Model exegesis 1: ?
- Readings:
 - For 6/25: ?, Chapter 1; ?
 - For 6/27: ?, ?

Week 2: T 7/2, F 7/5

- Discussion of Lab 1
- Models of inventory change
 - Inventory change as an emergent phenomenon
 - Model exegesis 2: ?
- Readings: ?, ?

Week 3: T 7/9, 7/11

- Discussion of Lab 2
- Models of change in populations
 - Dynamical systems, iterated learning models.
 - ‘Iterated learning’ vs. ‘social learning’

- Model exegesis 3: ?
- Reading: 2, 3, 4, Ch. 6

Week 4: T 7/16, R 7/18

- Discussion of Lab 3
- Modeling more complex changes
 - The evolution of multidimensional phonetic categories in Seoul Korean
 - Stress shift in English noun/verb pairs
- Sound change in historical linguistics
 - The standard model of sound change
 - Reconstruction using probabilistic models of sound change
- Reading:
 - For 7/16: 2, 3
 - For 7/18: 4; 5