Computational Phonology (LING 236)

Spring 2024

Instructor: Claire Moore-Cantwell

TR 10:00-11:50 Bunche Hall 2121

General Info

INSTRUCTOR: Claire Moore-Cantwell
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Course website: https://bruinlearn.ucla.edu/courses/185286

Description

This course will provide an introduction to both practical and philosophical foundations of computational work in phonology. Students will learn practical skills such as Python programming, how to use existing software for particular learning problems, and some basic mathematical skills for developing computational projects. We will also discuss the different ways that computational work is useful in cognitive science in general and phonology in particular, as well as strategies for developing algorithms to address particular research questions.

Prerequisites: *Ling 200A, or instructor permission.*

Requirements

- Class Discussion: **10%** Please come to class ready to discuss the most recent homework, and any readings assigned. Certain class days may have specific discussion requirements.

- <u>Perusall Discussion</u>: **10%** Readings will be hosted on Perusall, accessible from the course website. I expect enrolled students to comment (or ask a question) at least three times on most readings. You can skip up to 3 readings without penalty to this grade.

- <u>Homework</u>: **60%** There will be weekly homeworks, assigned on Thursday after class, and due the following Tuesday at the beginning of class.

  ○ Late homework assignments will not be accepted, unless in case of legitimate disruption (illness, religious observance, bereavement, etc.)

  ○ You may collaborate with other students on the homeworks, but the writeup you turn in must be your own. Please note at the top of your homework who you collaborated with, if you did.

- <u>Final Project</u>: **20%** You will turn in a final paper at the end of the course which will consist of a write-up of a computational project that you will undertake throughout the quarter. You should include a relevant theoretical hypothesis, or practical goal, a statement of the computational techniques you used, and why, and a discussion of your findings. A presentation day will be scheduled sometime in December for you to present your work to your fellow classmates.

Accommodations Note

If you have a disability or ongoing medical condition, and require accommodations for this course, you should contact the Centre for Accessible Education (CAE), https://www.cae.ucla.edu. Other concessions can be made in this course in order to fully support you as a student and as a person. **Please let me know as soon as possible** if you need to miss class or assignments because of reasons such as physical illness or injury, mental health concerns, religious observance, work to support yourself or a family member, or caretaking responsibilities. For forseeable conflicts, such as religious observance, you must notify me in advance, preferably at least one week in advance. For unforseeable conflicts, like illness, injury, mental health concerns, or sudden changes in job/caretaking schedule, let me know as soon as possible.

Week	Topic	Reading(s)
1	Introduction and Assessing complexity	Pylyshyn (1980), Pertsova (2012)
2	FSA's and subregular phonology	Forbes et al. (2021), Chandlee and Heinz (2018)
3	Python, Algorithms, and Data structures	(none)
4	Learning Harmonic Grammar and OT	Shih (2017), Tesar and Smolensky (1998)
5	MaxEnt grammar	Goldwater and Johnson (2003)
6	Hidden Structure learning	Jarosz (2013)
7	Learning the Lexicon	Hughto et al. (2019), Smolensky and Goldrick (2016)
8	Fitting model parameters, error terms	Keane et al. (2017)
9	Parsing and Simulating Data	Nelson (2019), Schrimpf and Jarosz (2014)
10	Your suggestions	TBD
11	Party with final presentations	

References

Jane Chandlee and Jeffrey Heinz. Strict locality and phonological maps. *Linguistic Inquiry*, 49(1):23–60, 2018.

Clarissa Forbes, Garrett Nicolai, and Miikka Silfverberg. An FST morphological analyzer for the Gitksan language. *Proceedings of the seventeenth SIGMORPHON workshop on computational research*, pages 188–197, 2021.

Sharon Goldwater and Mark Johnson. Learning OT constraint rankings using a maximum entropy model. In Jennifer Spenader, Anders Eriksson, and Osten Dahl, editors, *Proceedings of the Stockholm Workshop on Variation within Optimality Theory*, pages 111–120, 2003.

Coral Hughto, Andrew Lamont, Brandon Prickett, and Gaja Jarosz. Learning exceptionality and variation with lexically scaled maxent. *Proceedings of the Society for Computation in Linguistics*, 2(1):91–101, 2019.

Gaja Jarosz. Learning with hidden structure in Optimality Theory and Harmonic Grammar: beyond Robust Interpretive Parsing. *Phonology*, 30:27–71, 2013.

Jonathan Keane, Zed Sevcikova Sehyr, Karen Emmorey, and Diane Brentari. A theory-driven model of handshape similarity. *Phonology*, 34, 2017.

Elliott Moreton. Evolving constraints and rules in harmonic grammar. *Proceedings of the society for computation in linguistics*, 3(8), 2020.

Max Nelson. Segmentation and UR acquisition with UR constraints. *Proceedings of the society for computation in linguistics*, 2(8), 2019.

Katya Pertsova. Linguistic categorization and complexity. *Proceedings of the twelfth meeting of the special interest group on computational morphology and phonology (SIGMOR-*

PHON2012), (72-81), 2012.

Zenon Pylyshyn. Computation and cognition: issues in the foundations of cognitive science. *The behavioral and brain sciences*, 3:111–169, 1980.

D. E. Rumelhart and J. L. McClelland. *On Learning the past tenses of English verbs*, chapter 18, pages 216–271. MIT press, 1986.

Natalie M. Schrimpf and Gaja Jarosz. Comparing models of phonotactics for word segmentations. *proceedings of the 2014 joint meeting of SIGMORPHON and SIGFSM*, pages 19–28, 2014.

Stephanie Shih. Learning lexical classes from variable phonology. In *Selected Papers from Asian Junior Linguists Conference*, volume 2, pages 1–15. ICUWPL, 2018.

Stephanie S. Shih. Constraint conjunction models super-additivity in weighted probabilistic grammar. *Phonology*, 34(2):243–268, 2017.

Caitlin Smith, Charlie O'Hara, Eric Rosen, and Paul Smolensky. Emergent gestural scored in a recurrent neural network model of vowel harmony. *Proceedings of the society for computation in linguistics*, 4(7), 2021. doi: 10.7275/qyey-4j04. URL https://scholarworks.umass.edu/scil/vol4/iss1/7.

Paul Smolensky and Matthew Goldrick. Gradient symbolic representations in the grammar: The case of French liason. *Rutgers Optimality Archive*, 1552, 2016.

Bruce Tesar and Paul Smolensky. Learnability in optimality theory. *Linguistic Inquiry*, 29 (2):229–268, 1998.