HG 2051: Language and the Computer (Computational Linguistics with Python)

Week 1: Introduction, Organization, Main Issues

Today's lecture/session

- Introductions and preliminaries
- Administrative matters
- Course overview
  - Why computers & linguistics?
  - What this course is (and what it isn't)
- Getting Started
  - Algorithmic thinking
  - Environment Setup
  - Basics of Version Control
  - Running Python
  - Introduction to GitHub
  - Homework 1

Instructor background

Dr. Hiram Ring

I'm a field linguist with interests in:

- language documentation/description (PhD, NTU 2015)
- linguistic typology and language contact
- historical reconstruction
- natural language processing and machine learning (since 2015)
- SEAsian languages, particularly of the Austroasiatic phylum

I also write/record/perform music (www.hiramring.com)
and maintain a website for classification of implicit motives
(www.implicitmotives.com)

Main fieldwork site

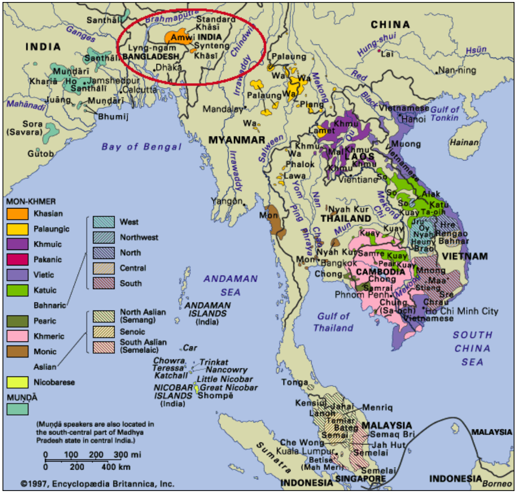


Figure 1: The Austroasiatic languages

Main fieldwork site: Meghalaya, India

Instructor contact

Dr. Hiram Ring
Office: TBD
E-mail: hiram.ring@ntu.edu.sg

Consultation hours: email me for an appointment – either in person, or online

Student Introductions

- Name, year, linguistic interest (i.e. field/course of study)
- What background or knowledge do you have concerning programming?
  - Javascript, C/C++, Excel spreadsheets, R, Python etc.
  - Awareness of what programming is used for (algorithms, security, etc..) and related concerns
  - "nothing" is ok
- Why are you taking this course? (What do you hope to gain out of it?)
  - NOT "nothing"

Administrative matters

- Schedule: https://hg2051-ntu.github.io
- Continuous Assessment:
  - Homework (autograded)
  - Project 1 (30%)
  - Project 2 (30%)
  - Quiz 1 (15%)
  - Quiz 2 (15%)
  - Participation (10%)
- Extra Credit: You can get 1∼5% extra credit by getting a patch accepted to an open source project related to the course (e.g., NLTK). Your total grade cannot go over 100%. Contact me if you're interested.

Continuous Assessment components

- Homework (autograded):
  - gives you practice writing actual code and submitting it
- Project 1 (CA1: 30%)
  - Write a Python program that extracts text from corpora to produce a new annotated resource for a low-resource language, then write a brief 4-page paper describing the process and findings.
- Project 2 (CA2: 30%)
  - Work with a group of 2-4 to develop a POS tagger for a low-resource language. Summarize your process and findings in an 8-page cowritten paper.

Continuous Assessment components

- Quiz 1 (CA3a: 15%)
  - Midterm quiz (2hrs) involving a programming challenge with the ability to access online resources.
- Quiz 2 (CA3b: 15%)
  - Final quiz (2hrs) involving a programming challenge with the ability to access online resources.
- Participation (CA4: 10%)

Why use Computers in Linguistics?

- Linguistics without computers is like taking a walk (or a long, hard hike)
  - It can be very pleasant
  - You can see lots of details
  - There is only so much ground you can cover
- Using a software tool is like catching the MRT
  - Very efficient for set routes
  - You have to adapt to it
  - Hard to customize
- Programming is like driving a car
  - It is expensive to start off (you have to learn!)
  - You are free to go where you want to

The Goal of this Course

*To learn *enough* about programming to flexibly* ***analyze*** *data and then *do something with it**

- Coding is done in Python
- We will learn techniques and some software libraries particular to computational linguistics
- You will be able to write your own programs by the end

HG2051 Prerequisites

- A little linguistic knowledge
  - You know what a word is
  - You know what a part of speech is
  - You know what a parse tree is
    (If you don't know these, you will have to do a little background reading)
- A computer running Windows, Mac OS, or Linux
  - It is possible to learn using school computers, but it will be much harder
- No computational knowledge required
  - You have to be ready to learn
  - If you are a very experienced Python programmer, then you will not learn so much

What HG2051 isn't

- We won't be learning how to build cars
  - this is the prerequisite for further NLP courses
  - … but we won't be writing taggers and parsers (yet)
- It is not just an introduction to Python, but rather one motivated by NLP
- It is not very easy, but it is fun

The Three Virtues of a Programmer

- **Laziness**: The quality that makes you go to great effort to reduce overall energy expenditure. It makes you write labor-saving programs that other people will find useful, and document what you wrote so you don't have to answer so many questions about it.
- **Impatience**: The anger you feel when the computer is being lazy. This makes you write programs that don't just react to your needs, but actually anticipate them. Or at least pretend to.
- **Hubris**: The quality that makes you write (and maintain) programs that other people won't want to say bad things about.

Larry Wall, Tom Christiansen, Randal L. Schwartz, and Stephen Potter (1996) Programming Perl 2nd Ed, O'Reilly.

Readings

- Readings will come from a variety of freely available sources (no required textbook)
- You must read the material before class
  - I will assume you have done so
  - Programming is not (just) knowledge but a skill; we should spend our class time practicing that skill

Homework

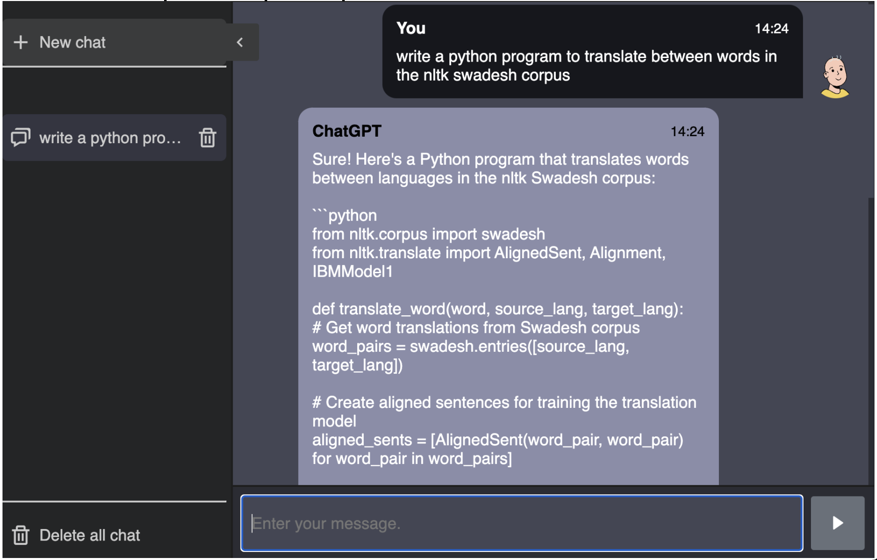
- Homework will comprise various practice problems aimed at familiarizing you with practical programming skills/tools.
- Some general guidelines:
  - Try to type everything on your own (at least at first), don't just copy/paste. This can be time-consuming initially, but the process will help you to remember the coding elements.
  - Try to understand the logical steps/process so you can apply them to different problems in the future.

AI tools

- On the use of AI tools (such as ChatGPT), this course will adopt NTU's policy on the use of AI tools for coursework:
  - Give proper citations if you use any AI tool
    1. identify any generative AI tools used
    2. declare how the tools are used in submitted work

- Some additional notes:
  - the tool may give slightly wrong information, requiring extensive debugging
  - you may end up with a working Python program that doesn't produce any output or produces plausible but incorrect output
  - if you don't understand what the code does, this will be pretty clear to me

AI tools example 1: prompt



You 14:24

write a python program to translate between words in the nltk swadesh corpus

ChatGPT 14:24

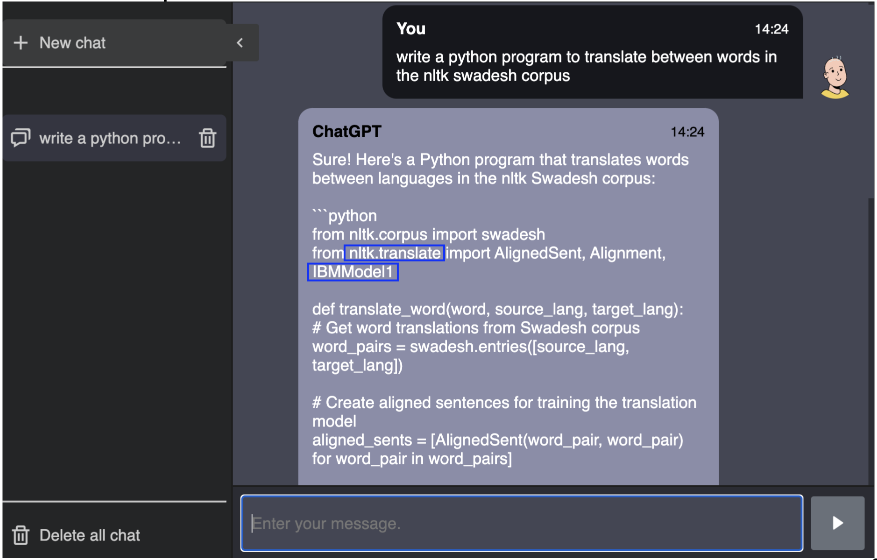
Sure! Here's a Python program that translates words between languages in the nltk Swadesh corpus:

~~~
```python
from nltk.corpus import swadesh
from nltk.translate import AlignedSent, Alignment,
IBMModel1

def translate_word(word, source_lang, target_lang):
# Get word translations from Swadesh corpus
word_pairs = swadesh.entries([source_lang,
target_lang])

# Create aligned sentences for training the translation
model
aligned_sents = [AlignedSent(word_pair, word_pair)
for word_pair in word_pairs]
~~~

AI tools example 1: issues



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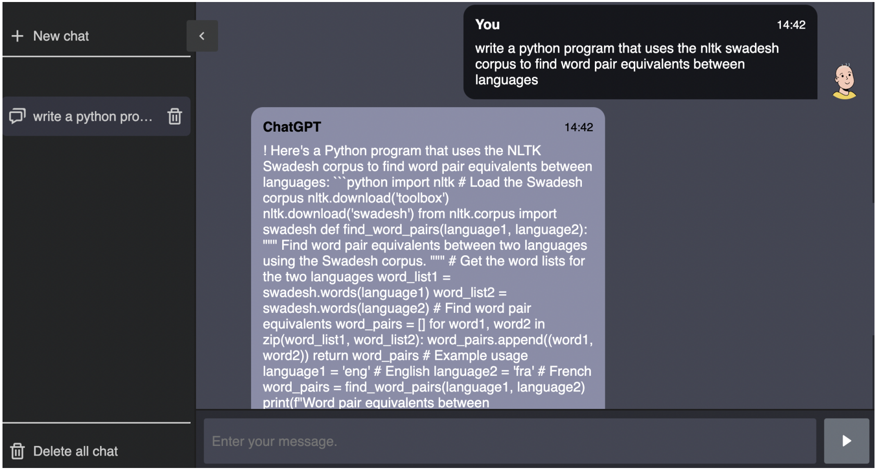
~~~

AI tools example 2: prompt



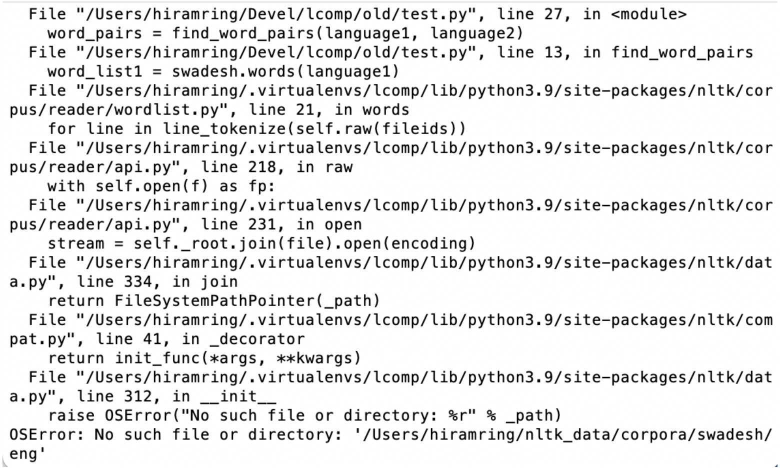
You 14:42

write a python program that uses the nltk swadesh corpus to find word pair equivalents between languages

ChatGPT 14:42

! Here's a Python program that uses the NLTK Swadesh corpus to find word pair equivalents between languages: ```python import nltk # Load the Swadesh corpus nltk.download('toolbox') nltk.download('swadesh') from nltk.corpus import swadesh def find_word_pairs(language1, language2): """ Find word pair equivalents between two languages using the Swadesh corpus. """ # Get the word lists for the two languages word_list1 = swadesh.words(language1) word_list2 = swadesh.words(language2) # Find word pair equivalents word_pairs = [] for word1, word2 in zip(word_list1, word_list2): word_pairs.append((word1, word2)) return word_pairs # Example usage language1 = 'eng' # English language2 = 'fra' # French word_pairs = find_word_pairs(language1, language2) print(f"Word pair equivalents between

AI tools example 2: errors



```
  File "/Users/hiramring/Devel/lcomp/old/test.py", line 27, in <module>
    word_pairs = find_word_pairs(language1, language2)
  File "/Users/hiramring/Devel/lcomp/old/test.py", line 13, in find_word_pairs
    word_list1 = swadesh.words(language1)
  File "/Users/hiramring/.virtualenvs/lcomp/lib/python3.9/site-packages/nltk/cor
pus/reader/wordlist.py", line 21, in words
    for line in line_tokenize(self.raw(fileids))
  File "/Users/hiramring/.virtualenvs/lcomp/lib/python3.9/site-packages/nltk/cor
pus/reader/api.py", line 218, in raw
    with self.open(f) as fp:
  File "/Users/hiramring/.virtualenvs/lcomp/lib/python3.9/site-packages/nltk/cor
pus/reader/api.py", line 231, in open
    stream = self._root.join(file).open(encoding)
  File "/Users/hiramring/.virtualenvs/lcomp/lib/python3.9/site-packages/nltk/dat
a.py", line 334, in join
    return FileSystemPathPointer(_path)
  File "/Users/hiramring/.virtualenvs/lcomp/lib/python3.9/site-packages/nltk/com
pat.py", line 41, in _decorator
    return init_func(*args, **kwargs)
  File "/Users/hiramring/.virtualenvs/lcomp/lib/python3.9/site-packages/nltk/dat
a.py", line 312, in __init__
    raise OSError("No such file or directory: %r" % _path)
OSError: No such file or directory: '/Users/hiramring/nltk_data/corpora/swadesh/
eng'
```

AI tools: notes

There are lots of issues with current AI systems. For an accessible introduction to the many concerns, this Scientific American article is a good start:

- AI Causes Real Harm. Let's Focus on That over the End-of-Humanity Hype

Algorithmic Thinking

- Exercise: How to make kaya toast
- Also see: http://www.cookingforengineers.com/

(break)

Environment setup, Git, Python, Homework

https://hg2051-ntu.github.io/week1.html