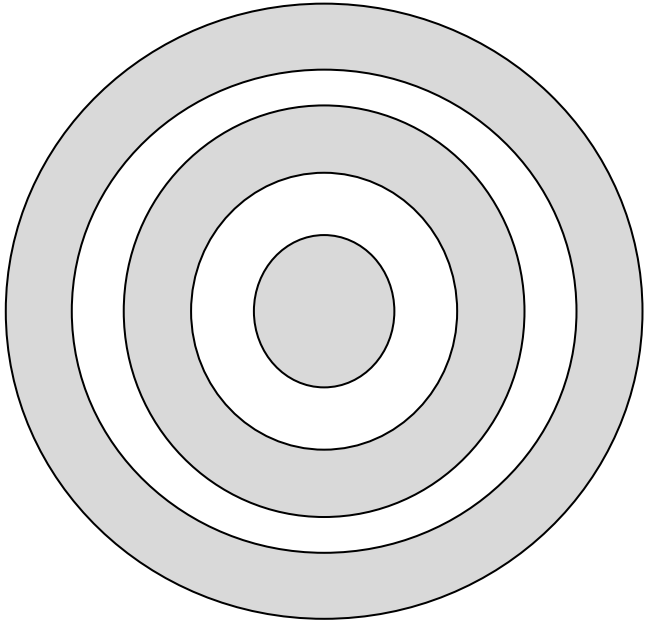
Introduction to the Classical Language Toolkit (CLTK)

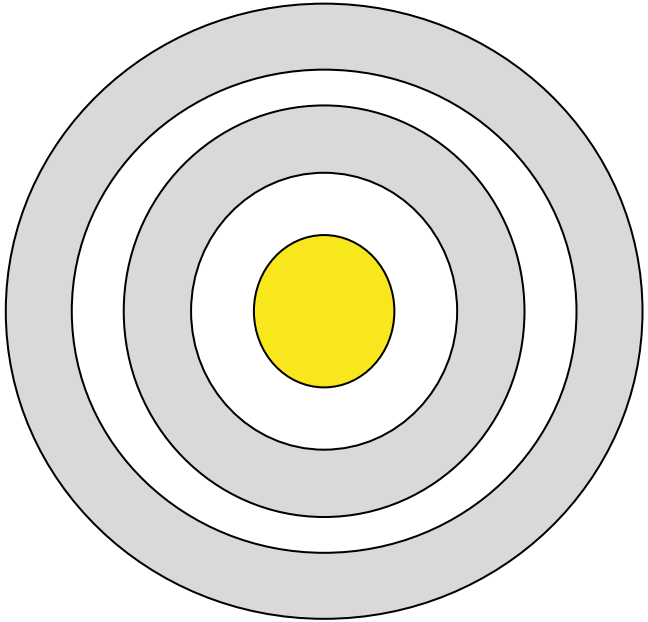
Kyle P. Johnson, PhD
kyle@kyle-p-johnson.com
http://cltk.org

NYU, Classics Dept.
Nov 17, 2015

The CLTK's goals …

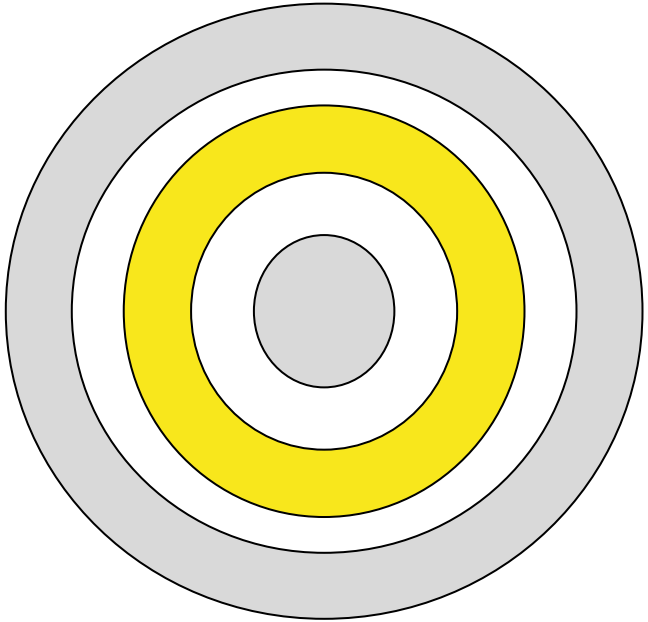


The CLTK's goals ...



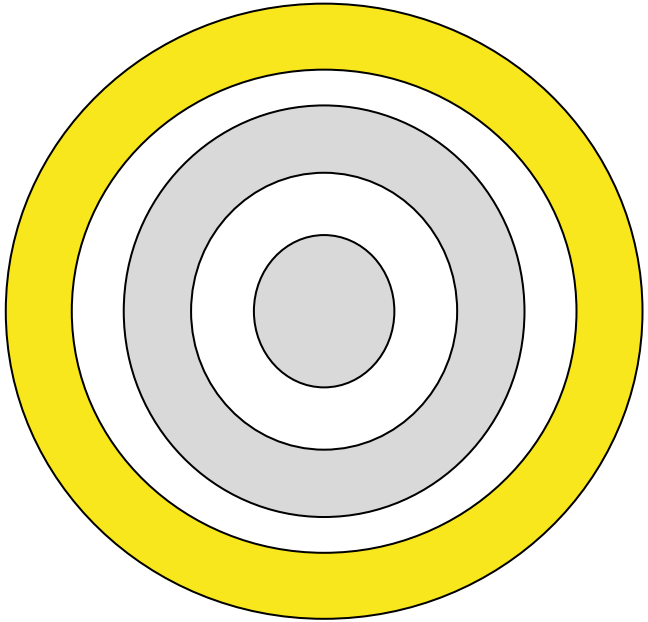
- Low: Good datasets for advanced NLP of Ancient Greek and Latin languages

The CLTK's goals ...



- Low: Good libraries for advanced NLP of Ancient Greek and Latin languages
- Medium: Quantified Classics

The CLTK's goals ...



- Low: Good libraries for advanced NLP of Ancient Greek and Latin languages
- Medium: Quantified Classics
- High: Framework for an integrated study of ancient literature

Some basic terms

- Python: A programming language known for its easy-to-read syntax and general friendliness

Some basic terms

- Python: A programming language known for its easy-to-read syntax and general friendliness
- NLP: Natural language processing

Some basic terms

- Python: A programming language known for its easy-to-read syntax and general friendliness
- NLP: Natural language processing
- Package or “library”: Collection of software for a particular set of tasks

Some basic terms

- Python: A programming language known for its easy-to-read syntax and general friendliness
- NLP: Natural language processing
- Package or “library”: Collection of software for a particular set of tasks
- NLTK: A prominent NLP package for the Python language

Some basic terms

- Python: A programming language known for its easy-to-read syntax and general friendliness
- NLP: Natural language processing
- Package or “library”: Collection of software for a particular set of tasks
- NLTK: A prominent NLP package for the Python language
- Git: Software for distributed software development

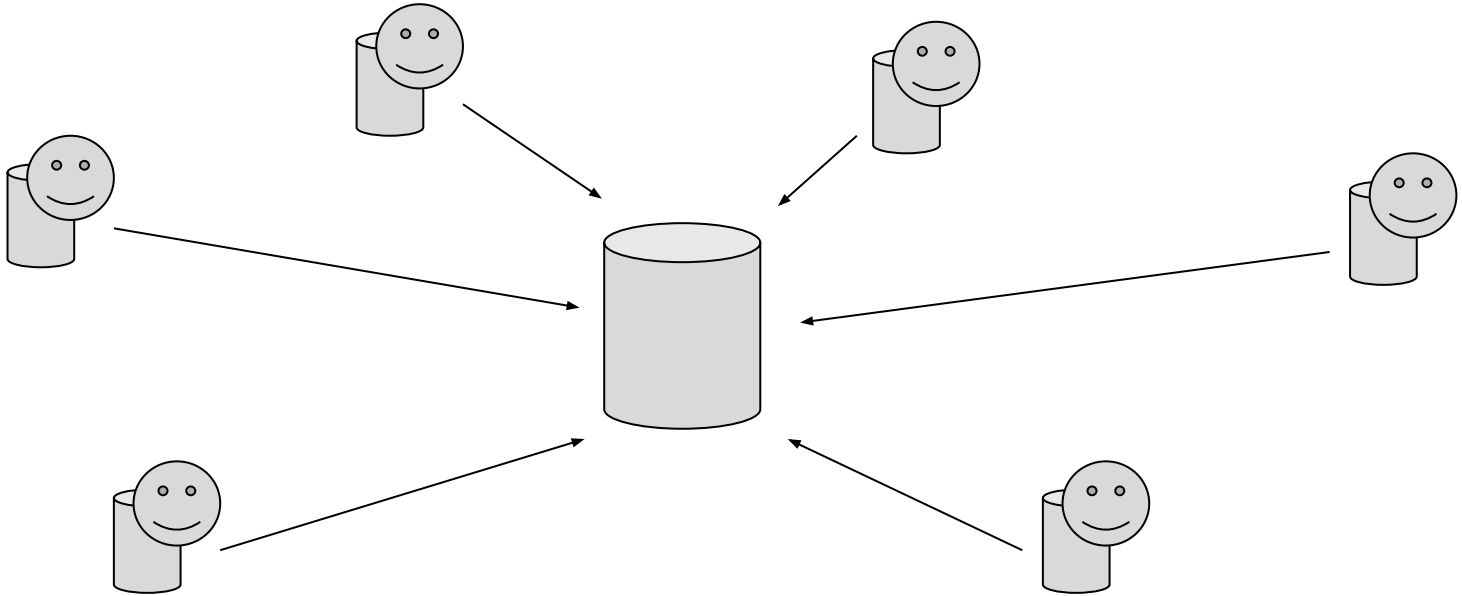
Some basic terms

- Python: A programming language known for its easy-to-read syntax and general friendliness
- NLP: Natural language processing
- Package or “library”: Collection of software for a particular set of tasks
- NLTK: A prominent NLP package for the Python language
- Git: Software for distributed software development
- GitHub: A website which makes Git easy

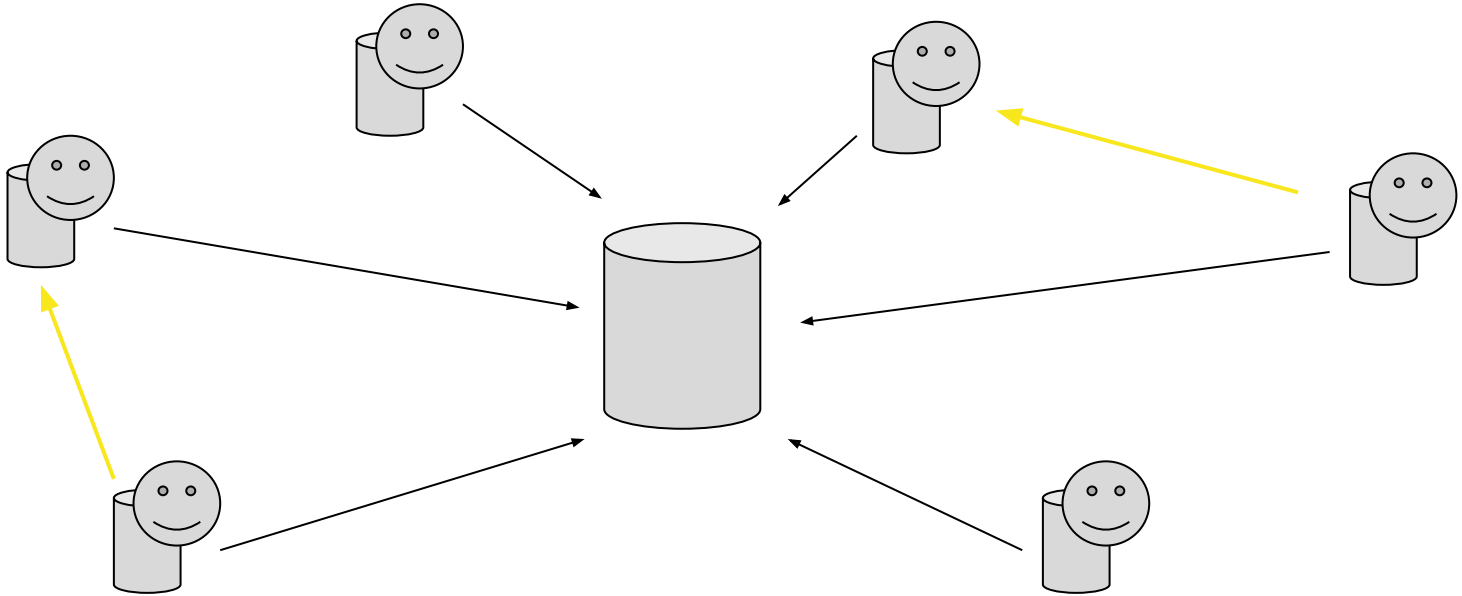
Some basic terms

- Python: A programming language known for its easy-to-read syntax and general friendliness
- NLP: Natural language processing
- Package or “library”: Collection of software for a particular set of tasks
- NLTK: A prominent NLP package for the Python language
- Git: Software for distributed software development
- GitHub: A website which makes Git easy
- Jupyter (formerly IPython): “Scientific notebooks”, an easy way to share code

Technical organization: Repositories



Technical organization: Repositories



Technical organization: Core vs. Data

- CLTK Core software
  - Led by programmers
  - Coordinates data processing
  - Downloads and installs data repositories

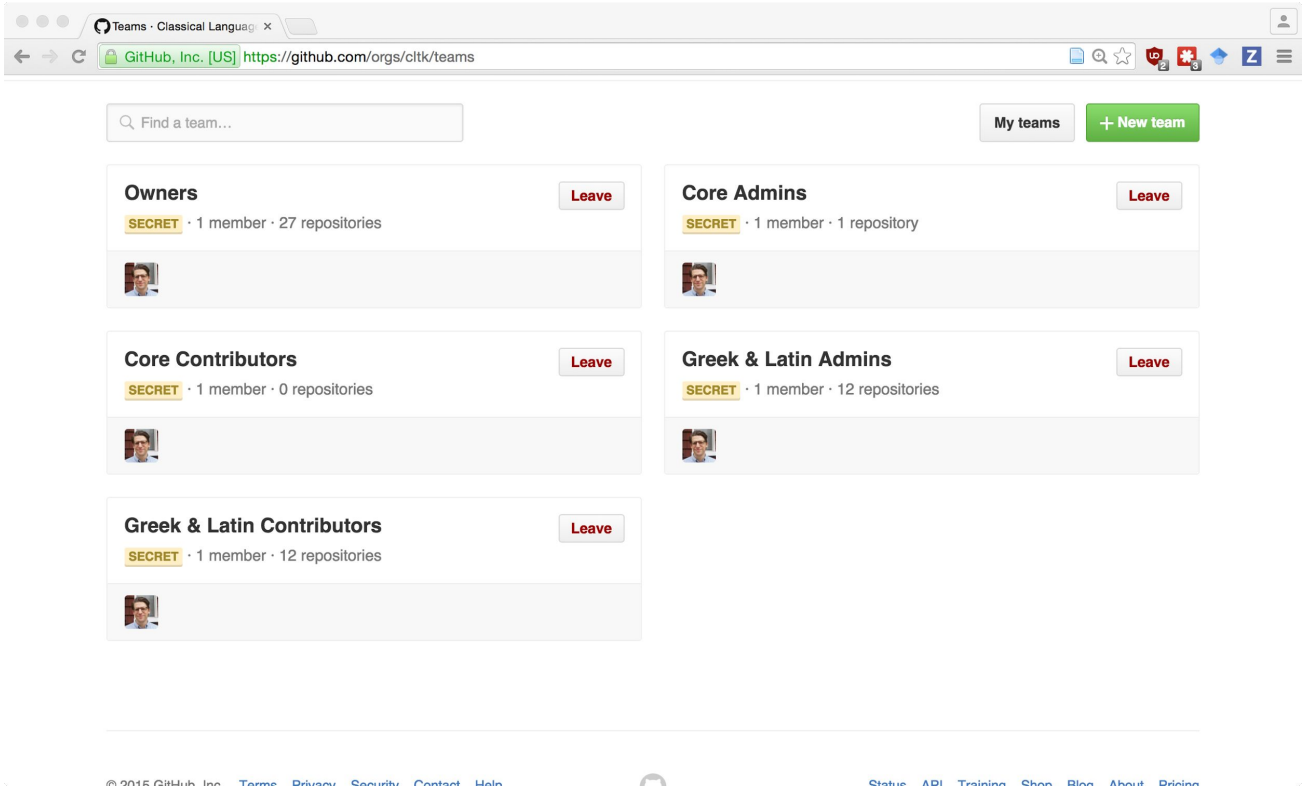
Technical organization: Core vs. Data

- CLTK Core software
  - Led by programmers
  - Coordinates data processing
  - Downloads and installs data repositories
- Linguistic data repositories
  - Led by language experts
  - Plaintext corpora
  - Trained models (for machine learning)
  - Dictionaries, word lists
  - Tagged texts (for part-of-speech, dependency grammar)

Personnel organization: Teams

- CLTK organization on GitHub (forthcoming)
  - Admins
  - Contributors
  - Unaffiliated contributors

Personnel organization: Teams (cont'd.)



(Really quick) quickstart

- Make virtualenv and download core
  - `$ pyvenv venv`
  - `$ source venv/bin/activate`
  - `$ pip install cltk`
- Download and import corpora
  - `$ python`
  - `>>> from cltk.corpus.utils.importer import CorpusImporter`
  - `>>> ci = CorpusImporter('greek')`
  - `>>> ci.list_corpora`
  - `['greek_software_tlgu', 'greek_text_perseus', 'phi7', 'tlg', 'greek_proper_names_cltk', 'greek_models_cltk', 'greek_treebank_perseus', 'greek_lexica_perseus', 'greek_training_set_sentence_cltk', 'greek_word2vec_cltk']`
  - `>>> ci.import_corpus('greek_text_perseus')`

Setup for PHI and TLG corpora

- PHI5, PHI7, and TLG_E
  - Not downloaded, but imported from local files
  - `>>> ci.import_corpus('tlg', '~/Documents/corpora/TLG_E/')`
  - Makes copy of corpus at `~/cltk_data/originals`
- Convert TLG from Beta Code into Unicode
  - `>>> from cltk.corpus.greek.tlgu import TLGU`
  - `>>> t = TLGU()`
  - `>>> t.convert_corpus(corpus='tlg')`
  - `>>> t.convert_corpus(corpus='phi5')`
  - Makes copy of corpus in `~cltk_data/greek/text/tlg` or `~/cltk_data/latin/text/phi5`

NLP for all languages

- Concordance
- Information retrieval
  - Plain and regex searching
  - Robust boolean search on the way
- n-gram: 'Ut primum nocte discussa sol’
  - bigrams: ('ut', 'primum'), ('primum', 'nocte'), ('nocte', 'discussa'), ('discussa', 'sol')
  - trigrams: ('ut', 'primum', 'nocte'), ('primum', 'nocte', 'discussa'), ('nocte', 'discussa', 'sol')
  - 5-grams: ('ut', 'primum', 'nocte', 'discussa', 'sol')
- Word frequencies
  - simple count for a word
  - complete reports for a text
- Word tokenization (via NLTK)

NLP for Greek and Latin

- Text normalization
  - j ↠ i, v ↠ u (Latin)
  - Beta Code conversion (for legacy Greek texts)
  - TLG and PHI corpus specific (remove formatting)
- Sentence tokenizer
- Lemmatizer
- Stemmer (Latin)
- Word tokenizer, for enclitics (Latin)
- Stopword filtering

NLP for Greek and Latin (cont'd.)

- Named Entity Recognition (NER)
- Part-of-speech (POS) tagger
  - From Perseus/Alphaeus treebank
  - Great work remaining to be done, convert their codes to others (Brill, PROIEL, etc)
- `# TODO!` Dependency grammar tagger
- Prosody scanner
- Syllabifier (Greek)
- TLG and PHI5 indices
  - File to author, genre to authors, date to authors, gender to authors, etc.
- Word2Vec

Beyond Greek and Latin

- Chinese, Coptic, Pali, Tibetan
  - 2.5 GB (!) of Chinese Buddhist texts
  - Corpus of Coptic texts
  - Pali Tipitaka
  - Tibetan POS tagged texts and a lexicon

Beyond Greek and Latin

- Chinese, Coptic, Pali, Tibetan
  - 2.5 GB (!) of Chinese Buddhist texts
  - Corpus of Coptic texts
  - Pali Tipitaka
  - POS tagged texts and a lexicon
- Growth areas
  - Many more ancient resources to be discovered, normalized, and incorporated into the CLTK ecosystem.
  - Great opportunities for outreach
    - To departments, disciplines, countries, and traditions
    - See List of Classical languages
  - Follow the Greek and Latin code patterns to add support any language!

Citation

- Developed by many talented contributors!
- BibTex
  - ```
    @Misc{johnson2014,
    author = {Kyle P. Johnson et al.},
    title = {CLTK: The Classical Language Toolkit},
    howpublished = {\url{https://github.com/kylepjohnson/cltk}},
    note = {{DOI} 10.5281/zenodo.<current_release_id>},
    year = {2014--2015},
    }
    ```
- Chicago author-date
  - ```
    Kyle P. Johnson et al.. (2014-2015). CLTK: The Classical Language Toolkit. DOI 10.5281/zenodo.
    <current_release_id>
    ```

Note: Current DOI release id available at: https://github.com/kylepjohnson/cltk

Resources

- This lecture's code
- Core software: https://github.com/cltk/cltk
  - Bug tracking: https://github.com/cltk/cltk/issues
    - Beginners' issues labeled easy
- Project repositories: https://github.com/cltk
- Docs: http://docs.cltk.org
  - Installation: http://docs.cltk.org/en/latest/installation.html
- Python + Command line basics
  - Intro to the command line: http://blog.teamtreehouse.com/introduction-to-the-mac-os-x-command-line
  - Python installation: https://www.python.org/downloads/ (choose 3.5)
  - Good self-paced Python lessons: http://learnpythonthehardway.org/