Revision of CGS600A
(IDP in Cognitive Science)

Title: Computational tools for Cognitive Science

Course No: CGS 600A

Units: 3-0-3-12

Proposer: Harish Karnick

Others interested in teaching the course: Nisheeth Srivastava, Devpriya Kumar

Pre-requisites: None

About the course:
This course will focus on learning the basics of programming and use it to analyse experimental data and build predictive models. Examples will be taken from the cognitive science domain.

It will use the open source Python language and its extensive module system. The course will also discuss and introduce basic probability, statistics and hypothesis testing.

The first part of the course will be devoted to programming in Python after a basic introduction to the Linux command line interface and a few useful command line tools. The second part will discuss applications to data analysis, visualization and simple model building. An introduction to basic practical statistics and hypothesis testing will be integrated with the data analysis part.

At the end of the course students should be proficient in Python, should be competent to handle the analysis and modelling component of any aspect of a cognitive science experiment and be able to build simple models of the phenomenon they are studying.

Topics:

Firt part:

1. Linux command line basics and commonly used tools.
2. Python:
    - Obtaining and installing Python. Other Python resources.
    - Values, types, variables, expressions, statements, functions.
    - Conditionals.
    - Iteration, recursion.
    - Strings, files - reading and writing.
    - Tuples, lists, dictionaries.
    - Object oriented Python: objects, classes, functions, methods, inheritance.
    - Modules NumPy, SciPy, matplotlib, RPy.

Second part:

1. Basics of elementary probability, statistics.
2. Analysis of data.
3. Testing hypotheses.
4. Modelling.

References:

1. Allen Downey, Think Python, How to think like a computer scientist, Green Tea Press, 2012. Available at: http://www.greenteapress.com/thinkpython/thinkpython.pdf.
2. John Guttag, Introduction to Computation and Programming Using Python with Application to Understanding Data, MIT Press, 2016.
3. D S Moore, G P McCabe, B A Craig, Introduction to the Practice of Statistics, 8th Ed., WH Freeman and Co., 2014.

Proposers signature: Harish Karnick

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