

# C105: Prediction, Probability, and Pigskin

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## Critical Approaches Course Proposal

### Overview

This course is about empiricism, basing theories on observed data. Students will be introduced to modern analytical techniques used to make informed predictions, test theories, and draw conclusions from a given dataset. *But this is no ordinary course...*

Rather than memorizing these empirical approaches in abstraction, students will employ these methods in the active, immersive, hands-on learning laboratory of *Fantasy Football*, an online game that provides a plethora of decision making opportunities in the face of uncertainty, and a wealth of data for analyzing these decisions. In this way, *C105: Prediction, Probability, and Pigskin* will weave together two contiguous threads: an introductory overview of data analysis techniques, and a captivating application of these techniques through a semester-long experience in Fantasy Football with their classmates.

### The Question

The question at the heart of this course is: *How can we use information to make predictions about uncertain events?*

### Educational Value and Student Lifecycle

The worth of analytical savvy is tremendous, both during a student's college education and after graduation. The tools described in this course, practical and conceptual, will build a foundation for critical thinking, will conjoin theory with evidence, and will refine the student's approach to extant information. These skills are interdisciplinary-- universal even, and moreover, immensely valuable.

"Through Critical Approaches courses, students should learn about the ways particular disciplines solve problems, seek answers, and organize ideas."\* This goal resonates throughout *C105: Prediction, Probability and Pigskin*. The philosophy behind this proposal is that, by introducing students to quantitative methods of analysis *early* in their college career, we'd set a relevant and important benchmark for future study. In subsequent years, when they encounter theories, explanations, or problems, they'll be better equipped to operationalize them in terms of actual, measurable behavior, and to generate new insight from observed data and information. Successful students will become powerfully analytical, an effect that would snowball into future insights across the disciplines.

Not only will students be taught these techniques, but students will actively apply these techniques. Providing an engaging and immersive example application of otherwise abstract material creates a learning experience conducive to *transfer*. In many ways, transfer is the holy grail of education; when teaching empirical techniques (or any method or concept), educators hope that material learned will generalize toward new situations that weren't explicitly described when learning. Research has shown

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\* *Critical Approaches to the Arts and Sciences*. (n.d.). Retrieved from <http://college.indiana.edu/faculty/uci/critical.shtml>

that an example application will serve as an analogical basis for translation to future situations.<sup>†</sup> Fantasy Football provides an initial utilization of material learned, facilitating transfer to future applications, from anthropology to economics.

While the primary goals of *Prediction, Probability, and Pigskin* are for students to gain quantitative analysis and critical thinking skills, this proposed course is designed with hopes to improve the undergraduate's broader skillset. Instead of fitting into the cookie-cutter textbook and multiple-choice-exam course format, students will be reading primary source material, composing written work on a weekly basis, actively pursuing their curiosities about the course material, and will critically analyze their own previous ideas. Such tactics are unfortunately rare in science education, but nevertheless valuable and important aspects of training scholarly thinkers in the College of Arts and Sciences.

## Format

This course will be offered in the Fall semester only.

Class would meet Monday, Wednesday, and Friday; Monday and Wednesday's classes would be traditional lecture, and Friday's classes would meet in an instructional STC lab for hands-on learning activities and demonstrations.

Grades will be calculated from combined performance on (1) regular "journaling" activities; (2) written reports on original empirical analyses; and (3) practical examinations. See the draft syllabus for more details.

## Required Questions

### 1. To whom will the course appeal?

Considering the popular draw of Fantasy Football, this is expected to have broad appeal across campus. The attractiveness of a course related to Fantasy Football will be levered to introduce a diverse range of students to empirical reasoning and analytical techniques.

Subject matter will be particularly relevant to students who wish to continue their studies in applied statistics, behavioral sciences, and/or social sciences, including psychology, marketing, education, sociology, anthropology, and economics.

Reviewers of this course proposal may, understandably, be concerned about a potential gender bias in the target audience of this course, and that course development efforts will disproportionately benefit male students. Granted, Fantasy Football players nationwide have long been measured at 90% male. However, recent studies see major growth among females; in late 2010, SportsBuff.com and Lotame have measured Fantasy Football participants at 20-30% female, many at college age. Furthermore, NFL "fanship" is only 55% male. While males may comprise the majority of the class, we may nevertheless expect

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<sup>†</sup> Goldstone, R.L. & Day, S.B. (2011). Analogical transfer from a simulated physical system. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 37(3): 551-567.

interest from a modest segment of females who are NFL fans, who are curious about Fantasy Football, or who are simply interested in analytical techniques.

2. What learning outcomes do you anticipate for this course?

Successful students will:

- Learn to value empirical inference over speculative supposition
- Be proficient in manipulating and summarizing datasets
- Ask educated questions when confronted with decisions in the face of uncertainty.
- Be familiar with common analytical techniques for predicting the outcome of uncertain events, and for uncovering latent causes of patterns in observed data.

3. Why does it make more sense to offer this course as part of the Critical Approaches inventory rather than through your department?

While there's a common theme to all the topics in this course (using information to make predictions about uncertain events), no single department encompasses the breadth of analytical techniques covered in this context. This course borrows material that is traditionally compartmentalized in economics, statistics, psychology, marketing, and informatics. Rather than filling an instructional gap in an individual department's curriculum, this course offers an interdisciplinary overview and an engaging application of a variety of modern techniques.

4. Do you anticipate 60 or 120 students? (To ensure equity across departments and for the College to be able to accommodate the necessary number of students, Critical Approaches courses proposed must target one or the other enrollment size.)

Due to the format of the course, with Friday classes held in a computer lab, this course should be capped at 60 students. There will need to be two Friday meetings, with 30 students each, since there is no STC classroom that can accommodate 60 students at one time.

5. Recognizing that many courses do not fit neatly into any one category, should this course carry A&H, S&H, or N&M credit (it must fall within one of these rubrics.)?

N&M credit.

## Additional notes

### NFL Data

Student analyses would require weekly datasets from NFL games. Some companies provide commercial data feeds at a nominal cost, a few hundred dollars for the season, but it may be possible to obtain data

for educational purposes directly from the NFL or broadcast agencies. Data sources are currently being investigated.

A desktop server in the instructor's office will warehouse these weekly NFL datasets in the form of a relational database that is network accessible and password protected. This server has already been obtained and configured for eventual use in *C105: Prediction, Probability, and Pigskin*.

### Computing Software

The course, as proposed, utilizes R for statistical analyses (<http://www.r-project.org/>). R is a free software environment; students can download it at no charge, and it is already available on all STC workstations.

*C105: Prediction, Probability, and Pigskin* is not a programming course. All efforts will be made to simplify the process of data analysis, mitigating any student disengagement due to software complexity. During course development, scripts will be written that shoulder the computational workload. These scripts will perform database queries, data selection and manipulation, and the actual analyses described in the course, shielding students from the burden of programming. In this way, it is expected that student effort will be focused on asking questions and interpreting results, not implementing complicated algorithms.

For example, when implementing cluster analyses, the process should be as simple as (1) requesting a particular dataset from the database server, (2) sending this dataset to a clustering routine, and (3) interpreting the output.

Despite the relative ease of the actual analyses, students will nevertheless be familiarized with the R computing environment; two weeks are dedicated to software basics in the proposed course schedule.