

MATH/COMPUTER SCIENCE

Statistical Inference

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I attempted to incorporate the Ignatian mission into the Statistical Inference (MATH 312) class I taught in the Spring 2008 semester. This course is typically offered every two years, and is aimed at advanced majors in mathematics, especially those undergraduates who are interested in pursuing advanced degrees in statistics. Although the list of topics in MATH 312 is typical for such a course, my effort to include Jesuit values made it a unique pedagogical experience.

To be honest, I found the task of explicitly demonstrating the Ignatian mission in an upper-level statistics course to be challenging. In my view, fulfilling this responsibility would require creative and careful planning to ensure that the course remains true to its objectives: introduce abstract statistical theory, prove the main results rigorously, and apply the results to solve a wide array of data analysis problems. As a significant number of students in the class may continue their mathematical education in graduate school, a solid foundation on the course topics is of utmost importance. Assignments dealing with Jesuit principles may not appear relevant or appeal to a student in a math class.

In order to create an avenue through which Ignatian ideals could be integrated in MATH 312, I interpreted the Ignatian phrase *Finding God in All Things* as a general invitation to “see the big picture”. In particular, students are encouraged to appreciate the wonder of God in their daily lives, search for God's presence in past events, and contemplate the future path that God's will has in store for them. Specific to the Statistical Inference course, this means providing a sense of perspective that elevates their understanding of the ideas presented in the class. To this end, I created supplementary assignments involving journal article readings. The purpose for each article reading can be classified into one of three categories which correspond to my basic interpretation of *Finding God in All Things*. For classification into the first category, the article should demonstrate the wide applicability of MATH 312 topics in the present-day. For the second category, the article should place the statistical methods discussed in the course in historical context: *Why was the statistical inference method needed? What problems motivated the development of the theory?* And for the third category, the article should illustrate some questions and problems which are at the forefront of statistics research today.

The following is an example of how an article reading was incorporated into MATH 312. The theory of maximum likelihood estimation is based on the assumption that the parameter of a probability distribution is a fixed constant, whose value is unknown, but is to be estimated using a random sample of data. Within the statistics community, methods developed in this context are called *frequentist* methodology. However, if the parameter itself is modeled with a probability distribution, then the statistician is said to be employing *Bayesian* inferential methods. To better understand the differences between the frequentist and Bayesian paradigms, I assigned article readings from various sources, such as statistics journals and mainstream periodicals such as *The Economist*

and *Scientific American*. This activity extended the students' perspective on the historical implications of these two statistical philosophies, since scholarly arguments between frequentists and Bayesians played a key role in the development of statistics as a discipline in and of itself in the 20th century.

To help encourage dialogue among the students, I set aside time during the semester for discussion of the articles. I also required that each student write down a brief summary of their readings. Although there were only a few occasions in which article readings were assigned, the students found this activity to be a valuable component to the course and a welcomed excursion from the usual lecture dynamic.

The phrase *Finding God in All Things* captures the spirit of Ignatian values. With thoughtful consideration, each one of us can discover evidence of God's wonder, inspiration, and love every day. As a second-year faculty member at Xavier, my involvement in the Ignatian Mentoring Program has given me an opportunity to reflect on how God is revealed in my own life, on and off campus. It has truly been a worthwhile endeavor. Eight years prior to my arrival at Xavier, I was a busy graduate student and post-doc who was consumed with scholarly activities in the field of statistics. As a participant in the Ignatian Mentoring Program, my perspective on my academic career path has been positively broadened.

Although I have described a special approach I implemented in MATH 312, I have also developed a clearer sense of my role as a faculty member at Xavier University. As a professor, it's important for me to view Jesus Christ as the ideal teacher. One specific event, the washing of the disciples' feet on the night of the Last Supper, is a valuable reminder for those who are called to lead: The act of leading requires the willingness to be of service. A teacher, who in fact is a "leader of students", needs to anticipate situations in which students seek guidance and direction. This means being organized and prepared for each lecture, and being able to provide examples to elucidate abstract mathematical concepts to the student. As Jesus often made use of parables to illustrate religious lessons, moral truths, and apparent paradoxes, the use of examples, demonstrations, and discussion can serve a similar purpose in my own classroom. With respect to scholarship, an active research program is an exemplary way for a faculty member to contribute to the advancement of knowledge in his academic specialty. Engagement in research is not only an exercise of discovery in which the scholar strives to uncover new and exciting ideas, but it also supplies the scholar a deeper perspective on the discipline he teaches, which in turn is reflected in a student's educational experience.