



The University of Chicago  
Department of Statistics  
Seminars for Fourth Year PhD Students

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**Statistics for Astronomy:  
Inference About the Population of Quasars**

Advisor: Marc Coram

**TUESDAY, November 15, 2005 at 2:00 pm**  
**110 Eckhart Hall, 5734 S. University Avenue**

**ABSTRACT**

I am interested in the problem of density estimation when there is a known bias in the data collection procedure. This interest is motivated by a research problem that was brought to our attention by Sebastian Jester, formerly of the Experimental Astrophysics Group at FermiLab and currently a researcher at Oxford. We have been working with Sebastian to estimate the density of quasars at various redshift distances from Earth. A major complicating factor in our analysis is that the quasars in our dataset were not selected uniformly at random from all quasars in the universe. Rather, the selection probabilities for each quasar are dependent on that quasar's apparent brightness when viewed by a telescope from Earth as well as on its redshift distance from Earth. To date we have constructed a likelihood-based parametric model for quasar density that utilizes the apparent optical luminosity of each quasar.

In my thesis work, I would like to further develop our applied research by expanding our model to include additional .extended. quasars, as well as to incorporate both the optical and radio luminosity of each quasar into the model. More broad issues that I would like to explore include assessing goodness of fit, building more flexible parameterizations, and penalizing to avoid overfitting.