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Dr. Shunpu Zhang   November 12, 2014
Statistics Department
University of Nebraska
Lincoln, NE

Dear Dr. Zhang,

I write to apply for the Assistant Professor position in the Statistics Department at UNL. I am a PhD candidate in the Statistics Department at Iowa State, and am defending my dissertation in February 2015. My computing skills, experience in bioinformatics and social science, and research focus would nicely complement research in the department.

My doctoral research focuses on human perception of statistical graphics, with the ultimate goal of designing graphics to effectively communicate statistical results. Research on graphical perception is conducted in many different fields, including psychology, statistics, human-computer interaction, and communication. In each of these fields, though, the research focuses either on extremely low-level effects, or very specific problems that are not applicable to most statistical graphics. Integrating an understanding of human perception and methodology from cognitive psychology and human-computer interaction in an interdisciplinary approach to this problem, I am exploring several facets of human perception that meaningfully impact the way we interact with statistical graphics. My dissertation covers perceptual distortions that impact variance estimation along nonlinear trend lines (the "sine illusion"), the influence of visual ability on graphical inference, and which features of a graph are most visually compelling. Two experiments examining the sine illusion were presented at JSM in 2013 and 2014, and one article has been accepted for publication in JCGS; another is nearly ready for submission. A paper detailing the relationship between visual ability and graphical inference is being prepared for publication as well, and I expect that the final study will be ready for publication review by March 2015.

Additionally, I collaborate with researchers in bioinformatics, genetics, and engineering, assisting with statistical analyses as well as data visualization. My masters' research, a collaboration between bioinformatics and materials engineering, presented a nonparametric peak detection algorithm designed for use in spectroscopy data and explored Bayesian regression models for mass spectra. Currently, I am working with a group of soybean geneticists at UNL, Iowa State, and the USDA to explore, analyze, and visualize populations of soybean sequence data. This project is challenging on several fronts: it is extremely large, there are many separate analysis approaches, and even analysis results are difficult to visualize in context, because of the length of genetic code.

In the future, I plan to investigate the perception of interactive graphics, creating guidelines for interactive graphics optimized for the human visual system. Visualizations which respond to user attention dynamically and incorporate motion through animation or other transitions have the

potential to more intuitively communicate results, particularly for large datasets which overwhelm static graphics. However, the additional complexity of interactive graphics may reduce the amount of information that can be encoded, due to the increased demands on working memory and attention. As web-based interactive visualizations become more common, it is important that statisticians design graphics that are not only visually attractive, but also clearly communicate the overarching message in perceptually appropriate ways.

In addition to my research, I have experience teaching both computational and introductory statistics classes. For several years, I have co-taught workshops on R programming as a resource for the Iowa State community (students, researchers, and local businesses), introducing the language and presenting advanced topics including data visualization, formatting and arranging data for analysis, and linear models. Extending this series, I designed workshops using new software packages, such as `knitr` for reproducible research and Rstudio's `Shiny` package for creating interactive web applets. I also have experience teaching undergraduate and graduate introductory statistics lab courses for engineering, bioinformatics, social science, and business students. In both settings, I utilize frequent examples which allow students to independently apply the course material, reinforcing their understanding of the material and providing opportunities for self-assessment and feedback.

The interdisciplinary nature of applied statistics research often attracts students with technical skills who need to communicate results to non-technical audiences. As I specialize in communicating such results using statistical graphics, I would be interested in developing or teaching a class which focuses on strategies for communication of technical results in a non-technical manner, including the use of graphics and charts to effectively convey information.

I had the opportunity to live on-campus at UNL for a summer as an undergraduate and very much enjoyed the school and the surrounding area. As a department, UNL seems to be very similar to Iowa State, focusing on applications of statistics while ensuring that new techniques are well-grounded in theory. If there are any additional materials I can provide, please feel free to contact me directly or look through my research and current projects on github. Thank you for your consideration, and I look forward to hearing from you soon.

Yours,

Susan VanderPlas