Overview and Strategic Plan

September 2017

Department of Statistics
College of Liberal Arts & Sciences
University of Virginia, Charlottesville

Summary: Vision Statement

The Department of Statistics aims to:

1. Build upon its current faculty's world-class research in statistical models and data analysis to solve 21st century problems, including research in massive (distributed, diverse) data sets in science, (e.g. fMRI, biology, forensic science), medicine (e.g., pharmocokinetic models, screening trials), and social science (e.g., psychology, sociology, economics);

2. Provide students at all levels a firm foundation in theory and applications, enabling undergraduate majors and graduate students to understand and/or conduct research in statistics and to solve real-world problems;

3. Support the research and teaching missions of UVA:

   (i) Provide undergraduate and graduate service courses;

   (ii) Teach courses in theory and practice for undergraduate majors and graduate students

   (iii) Identify research collaborations within Arts & Sciences and across Schools (e.g., forensic science, biostatistics);

   (iv) Offer statistical support to the UVA research community;

   (v) Host research colloquia and "career seminars" for faculty and students;

   (vi) Coordinate with other initiatives involving statistical research, teaching, or service (e.g., Quantitative Collaboration (QC), UVA Library's *StatLab*, Data Science Institute).

As student enrollments and declared undergraduate majors continue to climb, the hiring plan for the department (separate document) aims to attract future faculty and lecturers to advance this mission, with as much diversity as possible. To date, the department includes three professors (two tenured track; one general faculty), three associate Professors, five assistant professors (three tenure-track and two general faculty), two lecturers, and one post-doc. (Among these 14 members are six women: 1 Professor, 1 Associate Professor, 1 Assistant professor, 2 lecturers, and 1 post-doc.) Primary considerations in future hires include research expertise in development of analytical methods appropriate for large, distributed data sets (e.g., large-scale inference, feature selection, models for high-dimensional data) and collaborative research in applications.

1. **Faculty Expertise: Research and Teaching (support)**

   - **Chao Du** (Assistant Professor, 2014): Statistical research in Bayesian statistics and nonparametric high-dimensional density estimation; interdisciplinary research in biophysics and systems biology, including stochastic modeling and statistical inference of dynamical cellular and molecular systems such as single molecule enzymatic reaction and gene regulatory networks.
   - **Jeff Holt** (Professor, 1999; 67% stat/33% math): Research in ecological sampling, developments in undergraduate education and educational resources, including degree programs in statistics (B.A., M.S., Ph.D.), and online educational resources (e.g., *WeBWorK*) (NSF).
   - **Karen Kafadar** (Professor, 2014): Statistical research in robust methods and exploratory data analysis; statistical methodology for applications in physical, chemical, biological, and forensic sciences; computational and graphical statistics for massive and streaming data sets; design and analysis of data from randomized screening trials (NSF, Army Research Office, NIH).
   - **Daniel Keenan** (Professor, 1989): Statistical modeling of problems in science and medicine, specifically in computer vision and artificial intelligence (1980-95); physiology and endocrinology (1996-2010) and brain (2011-) (NIH).
   - **Jordan Rodu** (Assistant Professor, 2017): Statistical research in high-dimensional time series and dimension reduction; Statistical modeling and methodology for applications in neuroscience and text data.
   - **Dan Spitzner** (Associate Professor, 2007): Research interests include hypothesis testing in functional data analysis; Bayesian approaches to hypothesis testing, including variable selection and clustering; consequences of multiplicity; general Bayesian inference; applications in the social sciences.
   - **Xiwei Tang** (Assistant Professor, 2017): Dimension reduction, Imaging data analysis, personalized medicine modeling, longitudinal data analysis, mixture modeling, tensor factorization, unstructured data learning.
   - **Tingting Zhang** (Assistant Professor, 2009): Statistical research in functional data analysis, Bayesian statistics, and high-dimensional variable selection; statistical methodology development with applications to the multidisciplinary field of human brain mapping, including brain activation and brain network studies (NSF; Virginia Affective Neuroscience Laboratory, with J. Coan, UVA-Psychology).
   - **Jianhui Zhou** (Associate Professor, 2005): Research interests in dimension reduction, feature selection, structural identification for high dimensional complex data, robust statistics, quantile regression; applications of longitudinal and functional methods on growth data on malnutritioned individuals to find interventions leading to improved health (NSF, Gates).
   - **Gretchen Martinet** (Assistant Professor, General Faculty, 2014): Research interests in sample surveys, special cases calibration method adjustment for

nonresponse; practical applications of sampling and survey methods. Teaching interests in introductory statistics with a focus on preparing students for careers in industry and connecting them to the broader statistical community.

- **Jeffrey Woo** (Post-Doc, 2016) Research interests include statistical disclosure control, including misclassification of categorical variables in generalized linear models, and convex optimization issues in application of disclosure control methods to official statistics. Teaching interests in introductory statistics with a focus on preparing students for careers in business and finance.
- **Caitlin Steiner** (Post-Doc, 2016): Research interests in the area of quantitative social science, including dynamic modeling and survey analysis using techniques from pattern recognition and social network analysis.
- **Rebecca Hehn** (Lecturer, 2016): Teaching statistics for biologists and premedical students.
- **Krista Varanyak** (Lecturer, 2017): Teaching statistics to undergraduates and undergraduate majors.

2. **Teaching and Student Activities**

   Directors of Undergraduate Programs and Graduate Studies: Jeff Holt (DUP), Tingting Zhang (DGS)

3. **Colloquia and Career Seminars**

   Vijay Nair, Oct 24, 2015: "Big Data" (ISI President); Sir Bernard Silverman, Jan 23, 2017: "Modern Slavery" (former Chief Scientist, Home Office)

   Research Colloquia for faculty and graduate students; Seminars conducted by invited practicing statisticians who present to students information and experiences about their careers and the current challenges that they face in their positions. Speakers have included statisticians from USDA, NASS, Bureau of the Census, Google, and Abt Associates. (Colloquia organizers: Chao Du, Xiwei Tang)

4. **Interface with other UVA units**

   - A&S Quantitative Collaboration: Dan Spitzner
   - A&S Psychology department: T. Zhang (J. Coan)
   - A&S Mathematics department: J. Holt (33% appointment)
   - School of Medicine: J. Zhou (J. Ma, Biostat; W. Petri, infectious disease)
   - New courses in other departments (biology, economics): Kafadar, Holt
   - Computational Science major, Data Science Initiative: KK, Spitzner, Holt

Future plans:

1. "Stat Literacy" class to satisfy undergraduate quantitative core requirement (e.g., "Statistics in Forensic Science")

2. More advanced "Stat Literacy" class for more quantitative-oriented students

3. Coordinate the Computational Sciences major and the Data Science Institute's academic objectives

4. "Cavalytics Competition" (organized by Jordan Rodu)

5. Coordinate with *StatLab: Statistics & Data Analysis Consulting* (`statlab.library.virginia.edu`): "We provide advice and training in data analysis and statistical methods to UVA researchers through individual consulting, workshops, and online tutorials."

6. Identify opportunities for teaching and research in other departments (KK; all)

	Course Enrollments: AY Ending in:										
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Ugrad	1487	1962	1654	1441	1567	1581	1675	1763	2106	2431	2882
Grad	231	225	354	385	536	547	395	508	744	723	642
Total	1718	2187	2008	1826	2103	2128	2070	2271	2850	3154	3524

	Graduates										
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
B.A.	3	7	7	5	7	30	25	46	62	75	99
M.S.	6	6	9	11	16	17	19	3	25	41	14
Ph.D.	–	–	2	4	1	2	3	3	3	4	2