RESOLUTION TO APPROVE MASTER OF ARTS DEGREE IN DATA ANALYSIS AND APPLIED STATISTICS

Documents included:

- 1. Resolution to Approve Master of Arts Degree in Data Analysis and Applied Statistics
- 2. Degree Proposal for Master of Arts Degree in Data Analysis and Applied Statistics
- 3. Degree Proposal Presentation slides

RESOLUTION TO ESTABLISH THE MASTER OF ARTS DEGREE IN DATA ANALYSIS AND APPLIED STATISTICS

WHEREAS, one of the main goals of the university is the education and training of students to be quantitatively adept and ready to meet the needs of industry, government, and academics in an era of unprecedented data abundance and previously unimagined data sources; and

WHEREAS, the demand for applied statistics education and training among students majoring in many master's and doctoral programs across the university has been increasing; and

WHEREAS, the ever-growing abundance of data in science, industry, and business requires employees with extensive statistical knowledge in various specialized topics; and

WHEREAS, expert analyses in the U.S. and elsewhere point to a shortage of trained quantitative scientists and scholars in the social sciences, humanities, physical sciences, medicine, and other fields; and

WHEREAS, the Department of Statistics has the capacity to respond to the demand for quantitatively trained scholars from a variety of fields by offering a master of arts in data analysis and applied statistics;

NOW, THEREFORE BE IT RESOLVED, that the master of arts degree in data analysis and applied statistics be established, effective fall, 2016.

RECOMMENDATION:

That the resolution to establish a master of arts degree in data analysis and applied statistics be approved.

June 1, 2015

Virginia Tech Degree Proposal Master of Arts in Data Analysis and Applied Statistics (CIP: 27.0304)

Type of degree action (circle one):

New Spinoff Revision Discontinuance

Program description

The Department of Statistics and College of Science at Virginia Tech request approval for a new Master of Arts (M.A.) in Data Analysis and Applied Statistics (DAAS) to commence in the fall semester of 2016. Other programs and departments sponsoring this request include the Education Research and Evaluation Program (EDRE), the Departments of Psychology, Fish and Wildlife Conservation, Forest Resources and Environmental Conservation, Geography, Economics, Human Development, Sociology, Psychology, Biological Sciences, and the Genetics, Bioinformatics, and Computational Biology program.

Due to the continually increasing demand for individuals educated and trained in the analysis of data, the Department of Statistics has seen more applications for admission than ever before and our graduate program continues to grow and now is at its largest size in its 65 year history. Among those applying are a group of students who wish a more applied-oriented degree in statistics rather than our current theoretically-oriented M.S. degree. Indeed, among the approximately 170 annual applications for admission to our graduate program, only approximately 50% of these applicants meet our mathematical requirements of having successfully completed two full years of calculus. This fact suggests that the other approximately 50% of these applicants, those rejected for admission due an inadequate mathematical background, would be interested in our DAAS program.

The M.A. DAAS degree will be distinctly different from the M.S. Statistics degree currently offered by the Department of Statistics in that the latter requires advanced calculus (Calculus IV) for admission into the graduate program. In addition, two mathematical statistics courses (Probability and Distribution Theory, and Statistical Inference) are core requirements for the M.S. in statistics degree. These two courses provide the mathematical framework that supports the other core and elective courses that the student must complete for the M.S. degree in statistics. The department's current statistics degree has a strong mathematical foundation. Such a foundation better prepares our students for the study of advanced statistical theory required for Ph.D. studies but is not intended to be appropriate for students seeking an application-focused degree.

Our proposal is to offer a curriculum that provides a broad variety of applied statistical tools to students, without the emphasis on statistical theory steeped in mathematics. These courses are currently offered by the Department of Statistics and by other departments at Virginia Tech. The M.A. DAAS degree will be structured so that certain courses that emphasize the fundamentals of statistics, are required. Electives in specialized topics in statistics can then be chosen by the student. Thus, the degree will offer sufficient depth in the fundamentals of contemporary applied statistical methods and give students an understanding of how these methods are applied in different fields.

It is anticipated that students seeking admission to the M.A. DAAS degree are those wishing to expand their statistical knowledge beyond the material presented in graduate service courses, tackling more specialized topics, whether they are taught statistical methodology by the Department of Statistics or by other programs/departments on campus. The Statistics Department is fully prepared to take on the qualified students who seek the M.A. DAAS degree alone or seek an M.S. degree and/or Ph.D. in another discipline, and desire to complement their

training with the M.A. DAAS degree. The applied statistics emphasis of the M.A. DAAS will empower students to perform more statistically sophisticated research, improving the quality of their theses/dissertations, and leading to papers published in higher level journals than would be possible without such courses.

Curriculum summary

The proposal offers a curriculum featuring a broad variety of applied statistical tools for nonstatistics graduate students, forgoing the traditional emphasis on statistical theory steeped in mathematics. The courses in the proposed curriculum are currently offered by the Department of Statistics and by other departments at Virginia Tech (no new courses are needed). The M.A. DAAS degree will be structured so that certain courses, that emphasize the fundamentals of statistics, are required (see core below). A student can choose electives in specialized topics in statistics with their particular research interests in mind. Thus, the degree will offer sufficient depth in the fundamentals of contemporary statistical methods while providing flexibility that allows students to build degree programs suitable for their needs.

The program requires 33 credit hours of coursework (21 hours from the core and 12 hours of electives). The core requirements will be based on courses from four topic areas (see table below): Data Analysis, Design of Experiments or Study Design, Regression Analysis, and Statistical Theory, and also a professional development course in consulting.

Topic Area	Staffing	Course
Statistics in Research I and II (Data Analysis)	Statistics	STAT 5615/16 (6 credits)
Experimental Design: Concepts and Application	Statistics	STAT 5204G (3 credits)
Advanced Methods of Regression Analysis	Statistics	STAT 5214G (3 credits)
Theoretical Statistics	Statistics	STAT 5105G (3 credits)
Effective Communication in Statistical Consulting	Statistics	STAT 5024 (3 credits)
Project and Report	Statistics	STAT 5904 (3 credits)

Table 1. Core courses for the DAAS degree (21 credits)

Attachment C In addition to the core, 12 credit hours must be completed from the following list of electives, with approval from the individual student's guidance committee:

Department	Approved electives
Statistics	STAT 5106G, 5514G, 5504G, 5524G, 5474,
	5664
Agricultural and Applied Economics,	AAEC/ECON 5125, 5126, 5946, 6554
Economics	
Educational Research & Evaluation	EDRE 5504, 5644, 6654, 6664, 6794, 6634,
	6605, 6606, 6694
Fisheries & Wildlife	FIW 5514, 5214, 6114, 6514
Forest Resources & Environmental Cons.	FOR 5494, 5224
Geography	GEOG 5034, 5314
Human Development	HD 6514, 6524
Psychology	PSYC 5134, 5315, 5316, 6014
Public Administration and Public Affairs	PAPA 5214, 6514, 6524
Political Science	PSCI 5115, 5116, 5124
Sociology	SOC 5204, 5214, 6204

Table 2. Restricted Elective courses for the DAAS degree (12 credits)

To complete the requirements for the M.A. in DAAS, the student must submit and successfully pass a final project and report (STAT 5904). The project, possibly related to the student's research, will illustrate an M.A. level command of statistical techniques. The topic for the project will be determined by the student's DAAS committee and evaluated by this committee on a pass/fail basis. The student will present the completed project to the committee in both written and oral format. A majority vote by the committee members will determine the result. Should the student not pass the final project and report, they will be required to take the exam a second time, although not in the same semester. The student may only take the exam twice. Failing the project and report a second time results in dismissal from the program.

The DAAS project should be presented and evaluated in the semester in which the student plans on receiving the M.A. degree. Completion of the 33 credits in the student's Plan of Study and the passing of the final project and report would complete the DAAS M.A. degree requirements

Relevance to university mission and strategic planning

One of the main goals of the university is the training of students to be quantitatively adept and ready to meet the needs of industry, government and academics in an era of unprecedented data abundance and previously unimagined data sources. This is expressed in the current strategic plan, *A Plan for a New Horizon*:

"Our goals are to ensure competency in data analysis and computational methods as a component of general education for all students and to develop an appropriate infrastructure for e-learning and high-performance computing."

The M.A. in DAAS aligns with the university's mission by training students in the quantitativelybased techniques of knowledge discovery, and will accomplish this with a constant eye on the real problems of science and society. This academic focus aligns with Virginia Tech's mission: the discovery and dissemination of new knowledge, through teaching and learning, research and discovery, and outreach and engagement. Knowledge discovery is intimately connected with the university's commitment to create, convey, and apply knowledge to expand personal growth and Attachment C opportunity, advance social and community development, foster economic competitiveness, and improve the quality of life.

With regard to graduate education, the strategic plan indicates a focus on graduate education that is quantitative and the university will increase enrollment in quantitatively oriented programs. One of the institution's principal strategies (Virginia Tech, 2012, page 11) focuses on the goal to:

"Increase graduate enrollment toward a target of an additional 1,000 students, mostly at the doctoral level in science, technology, engineering, mathematics, and health sciences (STEM-H), broadly defined to include associated subject areas, such as STEM related entrepreneurship, science and technology policy, and ethics."

The M.A. in DAAS is timely addition to the curriculum as it advances the university's strategic objective to increase the number of graduate students in STEM-H areas. The M.A. DAAS will offer students more opportunities to enroll in quantitative courses, especially outside of their home department, and will create an opportunity for a quantitative degree in support of their research. By focusing on analysis and interpretation of data rather than the mathematics underlying the methods, the program will better prepare students for the design of research studies, analysis of data collected in these studies, and proper interpretation of results.

Justification for the proposed program

The proposed M.A. DAAS degree program is a response to well-documented trends in science: collecting, processing, and analyzing large amounts of information and cross-disciplinary work. These trends have led to a shortage in and a need for master's level graduates with training in applied statistics and data analysts. The M.A. DAAS provides education and training that will address this need and lead its graduates to excellent job opportunities. Our logic is based on the following two arguments.

1. There is an increased demand for applied statisticians-

According to Hillary Clinton, "Data not only measures progress, it inspires it." Given that data are the raw material of knowledge, the ability of institutions of higher education to produce master's level graduates with the requisite skills to gather, examine, and interpret data in meaningful ways is crucial to advances in almost every domain of life. "We're rapidly entering a world where everything can be monitored and measured," said Erik Brynjolfsson, an economist and director of the <u>Massachusetts Institute of Technology</u>'s Center for Digital Business. "But the big problem is going to be the ability of humans to use, analyze and make sense of the data." (http://www.nytimes.com/2009/08/06/technology/06stats.html?_r=0).

A number of articles in scientific and popular media have noted the increase in demand for statisticians (for example, Kollipara, 2014). The demand is often attributed to the growth of the internet. A March 2013 Wall Street Journal article quotes the chief economist of Google, Hal Varian, (http://blogs.wsj.com/numbers/the-upbeat-stats-on-statistics-1216/). "Until 2003, Google hadn't hired a statistician. Now it has dozens," Varian said, "working on quantitative projects throughout the company in improving the company's namesake search engine, helps its advertisers advertise better, and studying customer behavior." It is clear that the growth of the internet and connections with mobile devices has generated large amounts of data.

In addition to the internet, a tremendous amount of data result from other sources such as sensors. For example, data on gene sequencing information for cancer research, and sensor and location data to optimize the handling of food shipments used to be expensive to collect and is now

Attachment C inexpensive to collect, resulting in an abundance of data to analyze This over-abundance of data opens the door for opportunities in the physical and social sciences that did not exist before. **Statistics** has become the lingua franca of the scientific community. (http://www.nytimes.com/2009/08/06/technology/06stats.html?_r=0).

The demand for data analysis results, in the widespread use of statistical analysis to make informed decisions in business, healthcare, environment, and other science policy arenas. Statisticians are needed in the pharmaceutical industry, actuarial, and other areas (http://sciencecareers.sciencemag.org/career magazine/previous issues/articles/2014 03 04/cared it.a1400058). As the U.S. population ages, pharmaceutical companies are developing new treatments, medical devices and medical technologies. Biostatisticians (i.e. applied statisticians who focus on medical studies) have an important role in the conduct of the clinical trials necessary for companies to obtain approval for their products from the Food and Drug Administration (https://collegegrad.com/careers/statisticians). Government agencies are expected to employ additional statisticians to improve the quality of the data available for policy analysis, census data collection and analysis, and for healthcare purposes. The occupation will see growth in research and development in the physical, engineering, and life sciences. Here the role of the statistician is to design tests, evaluate quality of products, and provide computational support. (https://collegegrad.com/careers/statisticians).

In financial services, "there has been serious demand for people well trained in data analysis and statistics, and it has been increasing" (Kahn, WSJ, 2013 article). One reason Kahn cites for expecting continued growth is "how new statistics is. It's still just penetrating into civilizations. It's still in its adolescence. There are dozens — hundreds — of areas in civilization where the understanding of statistics is going to have a transformative influence."

(http://business.time.com/2011/11/21/nine-jobs-of-the-near-future/slide/26029-2/)

2. There is a need for master's level graduate training in applied statistics

The rise in available "big" data has led to important advances. In addition, expectations are high for the use and analysis of large data sets. Graduate training in applied statistics is needed to respond to these increased expectations. Along with the opportunities, come potential problems. (http://bits.blogs.nytimes.com/2014/03/28/google-flu-trends-the-limits-of-big-data/). Cheerleaders for big data have made a number of claims about the value of automatic analysis of data. In Wired magazine (http://archive.wired.com/science/discoveries/magazine/16-07/pb theory), Chris Anderson (2008), claims that the scientific method is no longer required; that if a sufficient amount of data are collected valid results will be clearly observed. "Google's founding philosophy is that we don't know why this page is better than that one: If the statistics of incoming links say it is, that's good enough. No semantic or causal analysis is required." Anderson is also quoted as saying "with enough data, the numbers speak for themselves".

A different and less optimistic conclusion is being reached by scholars and practitioners of science, statistics, and computer science. As noted by machine-learning guru Michael Jordan of Berkeley, "the overeager adoption of big data is likely to result in catastrophes of analysis comparable national epidemic collapsing bridges." to а of (http://spectrum.ieee.org/robotics/artificial-intelligence/machinelearning-maestro-michael-jordanon-the-delusions-of-big-data-and-other-huge-engineering-efforts).

Jeff Leek, a John Hopkins applied statistician, notes that it is not just data from the internet that can have erroneous analyses. He provides a number of examples of fundamental analytical errors in genomic science and economics. Leek states,

"a team of scientists led by Anil Potti created an algorithm for predicting the response to chemotherapy. This solution was widely praised in both the scientific and popular press. Unfortunately the researchers did not correctly account for all the sources of variation in the data set and had misapplied statistical methods and ignored major data integrity problems. The lead author and the editors who handled this paper didn't have the necessary statistical expertise, which led to major consequences and cancelled clinical trials."

(http://simplystatistics.org/2014/05/07/why-big-data-is-in-trouble-they-forgotabout-applied-statistics/)

Another example of a flawed study is that of economists Reinhart and Rogoff (Cassiday 2013). They published a paper that claimed that GDP growth was slowed by high governmental debt. The paper reached considerable prominence and was cited by Paul Ryan as part of his "Path to Prosperity". Later it was discovered that, in addition to other problems, there was an error in an Excel spreadsheet the economists had used to perform the analysis (http://en.wikipedia.org/wiki/Growth_in_a_Time_of_Debt). As noted by Leek, "the primary failing was a lack of sensitivity analysis to data analytic assumptions that any well-trained applied statisticians would have performed." The New York Times article by Gary Marcus and Ernest Davis (2014) described several addition problems with expectations concerning big data and the analysis of internet data.

As highlighted by Leek's blog title: they forgot about **applied** statistics.

Many of the difficulties with big data have been recognized for a number of years by applied statisticians and identification of these difficulties argues for better and advanced training in statistics. The challenges of analysis of big data are explored in courses in applied statistics as well as in quantitative courses in other fields where case studies are used to support learning (for example, Tabachnick and Fidell, 2013, is a popular text used in statistics courses in psychology). In fact, many of the same issues were discussed in the popular book (Huff, 1954) "How to Lie with Statistics" that was published in 1954! As described by Hahn and Doganaksoy (2012),

"Applied statisticians bear primary responsibility for everything from helping ensure the right data are collected to analyzing the data (or directing such analyses) and reporting the findings. They interact closely with other technical staff and management and, ideally, are integral members of the project team."

These examples illustrate the need for the M.A. in Data Analysis and Applied Statistics. In particular, the M.A. DAAS will educate and train students in the essentials of data preparation, cleaning, analysis, and interpretation. We need a program that provides a cross-disciplinary platform for education and knowledge, not just about the language of statistics, but also that of other areas of the physical and social sciences. An academic degree program, provides the rigor and experience required for well-educated and trained applied statisticians in a variety of fields. A certificate program, in which several courses are bundled, is not sufficient to address the in-depth needs of Virginia Tech's students. A recent blog post outlines considerations for master's programs in statistics, both in industry and in academia, is that they often have very little subject-matter knowledge." <u>http://stats.stackexchange.com/questions/25713/things-to-consider-about-masters-programs-in-statistics</u>. Such advice is also echoed in a talk and publication by Gerald Hahn (2000) a prominent industrial statistician (see also Hahn and Doganaksoy, 2011, 2012) as well as by others (Stern et al, 2013). The Department of Statistics provides the requisite rigorous experience through quantitative application courses from the natural and social sciences.

Finally, a Ph.D. in statistics is worthwhile in academics and research areas, and yet, is not always necessary. The Ph.D. is designed for theoreticians. The master's degree will open many doors, especially when statistical education and training is linked to application in the social and physical sciences. Our focus on application, rather than theory, will be advantageous for the analysis of data and also the communication of results. The M.A. DAAS will produce a "statistical scientist" rather than a theoretical statistician. The degree's linkage to courses in other departments will help students learn multiple disciplinary vocabularies and create extra opportunities. The M.A. DAAS will provide solid statistical training that will help a student get a *position* and a *promotion*.

Student Demand

Students (n=200) in the fall 2014 semester course, STAT 5615, Statistics in Research, were asked if they would be interested in pursuing the M.A. in DAAS, if it were currently available to them. Of the 111 students who responded to the question, 42 (38%) were very interested and 22 (20%) were moderately interested, indicating considerable interest in the degree and a potential for a considerable class of students for the program. The majority of the students surveyed were in their first year of graduate study (survey questions and responses are reproduced in Appendix C).

An additional indicator of interest in the program is the increase in graduate teaching of statistics. A measure of this interest is the fall enrollments for three classes that form the core of the program. The table below provides final enrollments in the three classes.

Course	Fall 2010	Fall 2011	Fall 2012	Fall 2013	Fall 2014
STAT 5615	198	157	200	206	230
STAT 5204G	11	27	16	25	29
STAT 5214G	12	14	19	20	20

Table 3. Graduate enrollment in core statistics classes in fall semesters (last 5 years)

The table indicates a steady and possibly increasing enrollment in these classes. Prior to 2010, the Department of Statistics only taught the STAT 5204G and STAT 5214G once per year. Additional sections of these classes were added starting in 2011 to accommodate the increased interest in the course material at the undergraduate and graduate levels. The Department of Statistics intends to maintain a minimum enrollment of 20 students by the target year of the program (2019-2020), graduating nine students per year.

Employment Demand

All indications are that strong training in applied statistics will benefit our graduate students in obtaining jobs. Employment demand was evaluated through web-based job searches, the Bureau of Labor Statistics (BLS), and the Virginia Employment Commission (VEC) and is summarized in Tables 4 and 5. The tables provide information about two highly relevant labor categories: 1) statisticians and, 2) survey researchers, both of which require master degrees. Although no categories exist for applied statisticial analysis to make informed business, healthcare, and policy decisions, clearly all areas related to training in applied statisticians, especially associated with "big data". As data processing continues to become less expensive and more efficient, employers may hire statisticians to take advantage of the new information available.

Attachment C Likewise, careers in survey research will grow as organizations increase their reliance on data and information acquired through research. Although growth in the need for survey researchers is not as robust as statisticians, projected growth rate of 18% is faster than the national average for all occupations.

Occupational Title	SOC Code	2012 Employment	2022 Employment	Numeric Change 2012- 2022	Perc ent cha nge
Statisticians (http://www.bls.gov/ooh/math/ statisticians.htm)	15-2041	27,600	34,900	7400	27%
Survey Researchers (http://www.bls.gov/ooh/life- physical-and-social- science/survey- researchers.htm#tab-6)	19-3022	18,000	21,200	3,200	18%

Table 4. Degree-related employment projections 2012-2022 (U.S. Bureau of Labor Statistics).

Table 5. Degree-related employment projections 2012-2022 (Virginia Employment Commission)

Occupational Title	SOC Code	Employment 2012	Projected Employment 2022	Total Change	Percent Change	Annual Percent Change
Statisticians	15-2041	638	836	198	31.03%%	2.74%
Survey Researchers	19-3022	354	389	35	.95%	9.89%

In addition to the job outlooks listed above, we anticipate that students who couple their graduate training in science, social science, humanities, and engineering fields with the M.A. DAAS degree will advantage themselves for jobs as biologists, psychologists, sociologists, fisheries scientists and others where strong quantitative training is highly desired. As indicated by the web page http://educationportal.com/articles/Bioinformatics_Analyst_Job_Duties_Salary_and_Outlook.html, bioinformatics scientists and bioinformatics analysts with quantitative background can find career opportunities within the federal government, postsecondary schools, scientific research and development, pharmaceutical companies and state government. The BLS stated that there were 91,300 biological scientists in 2008. Of these biological scientists, approximately 40% were employed in some area of government in 2008. The BLS projected that biological scientists will see employment growth of 21% from 2008-2018, which is much faster than the average. The growth in the field is expected to stem from research and development in biotechnology, specifically in the areas of gene identification and sequencing, stated the BLS. Regarding those with master's degrees in statistics, the BLS reports those with a strong background in an allied field such as biology, finance, computer science, or engineering should have the best prospects of obtaining a job related to their field of study. The growth in statistical positions suggests that the stand-alone program will also be desirable. Currently the job market is somewhat limited for students with a B.S. degree in statistics. By adding a master's degree in a relatively short time (possible 3 semesters), the department is providing a relatively cost effective way to obtain a better job. Clearly this has advantages for the student from Virginia who wants to move to a better paying

job without incurring a large amount of debt.

A variety of recent job advertisements are given in Appendix B.

Resource Needs/Savings

The faculty members associated with the M.A. DAAS degree program, span numerous Departments and agree that Virginia Tech is uniquely positioned to offer this degree program with primary support from faculty currently in place in the Department of Statistics. However, the program will need to employ two professors of practice to provide specific statistical expertise by the target year of operation (2019-2020). The Department of Statistics will also hire two graduate teaching assistants by the target year of operation to assist with courses in the core of the degree.

RESOURCE	QUANTITY	ESTIMATED COSTS (NA if not applicable)
Faculty	2 (Professors of Practice)	\$85,150.00
Administrative Staff	NA	NA
Graduate Teaching/Research Assistants	2	\$59,960
Space	NA	NA
Library	NA	NA
Equipment	NA	NA
Other	NA	NA

Table 6. Resource requirements for proposed M.A. DAAS degree

Appendix A Support letters from departments



College of Architecture and Urban Studies

Center for Public Administration and Policy 104 Draper Road (0520) Blacksburg, Virginia 24061 540/231-5133 Fax: 540/231-7067 www.cpap.vt.edu

December 5, 2013

Eric P. Smith Professor and Chair Statistics Department Virginia Tech Blacksburg, VA 24061

Dear Dr. Smith:

Please accept this letter in support of the proposed program for a Master of Arts degree in Data Analysis and Applied Statistics to be housed in the Department of Statistics, College of Science at Virginia Tech. The degree proposal has been developed in cooperation with faculty in the Center for Public Administration and Policy, and we fully support it.

The DAAS degree will be an attractive option for our graduate students, particularly those pursuing a Ph.D. in Public Administration and Public Affairs who wish to gain core competency in Applied Statistics and Data Analysis. The degree program in DAAS is designed to be accessible to graduate students in applied sciences like public administration, while providing essential coursework in statistical theory, applied statistics and data analysis. The M.A. degree in DAAS, together with a Ph.D. in Public Administration and Public Affairs for those who choose to pursue dual degrees, will provide our graduates with an immediate advantage in their career pursuits, and set them on solid footing to succeed as researchers, analysts, or consultants in public administration and public policy and related fields.

Several existing courses taught in PAPA are included in the list of electives for the degree, and no new resources will be required to accommodate additional students in these courses. These courses are:

PAPA 6514: Public Administration and Policy Inquiry (3 cr) PAPA 6524: Advanced Quantitative Methods in Public Administration and Policy (3 cr)

The CPAP faculty endorses the new degree and we look forward to seeing some of our students begin to pursue the degree in the near future.

Sincerely,

Brien J. Cook

Brian J. Cook Professor and Chair

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Educational Leadership and Policy Studies 219 East Eggleston Hall (0302) Blacksburg, Virginia 24061 (540) 231-5642 Fax (540) 231-9075 http://www.soe.vt.edu/elps/index.html

December 2, 2013

Letter of Support for Master of Arts in Data Analysis and Applied Statistics

Dr. Eric Smith, Department Head, Statistics Department:

As Program Leader, I am writing to communicate the support of the faculty in the Educational Leadership and Evaluation (EDRE) Program for the Masters of Arts in Data Analysis and Applied Statistics. As an applied degree, the goals and fundamental assumptions of this degree are consistent with the mission of the EDRE Program. We support the inclusion of quantitative EDRE courses in the list of electives for this degree.

I anticipate that two to three of the EDRE doctoral students in the statistics track will opt to pursue the degree each year. Because many students in a variety of degrees take our introductory quantitative courses (6605-6606) and these courses appear in the list of acceptable electives, I expect that students in other degree programs are likely to opt to use EDRE courses as electives for this master's degree. We support the opportunity for additional enrollments in our specialized upper-level methods courses and have no expectation at present of the need for additional resources as a consequence.

Professor and Program Leader, EDRE Program

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College of Agriculture and Life Sciences

Attachment C Department of Agricultural and Applied Economics (0401) 208 Hutcheson Hall, Virginia Tech 250 Drillfield Drive Blacksburg, Virginia 24061 540.231-6301 Fax: 540.231-7417 www.agecon.vt.edu

November 11, 2013

Dear Dr. McNamee,

Please accept this letter in support of the proposed program for a Master of Arts degree in Data Analysis and Applied Statistics to be housed in the Department of Statistics, College of Science at Virginia Tech. The degree proposal has been developed in cooperation with faculty in the Department of Agricultural and Applied Economics, and we fully support it.

The DAAS degree will be an attractive option for our graduate students, particularly those pursuing a Ph.D. in Economics who wish to gain core competency in Data Analysis and Applied Statistics. The degree program in DAAS is designed to be accessible to graduate students in applied sciences like applied economics, while providing essential coursework in statistical theory, applied statistics and data analysis. The M.A. degree in DAAS, together with a Ph.D. in Economics for those who choose to pursue dual degrees, will provide our graduates with an immediate advantage in their career pursuits, and set them on solid footing to succeed as scientists, analysts, or consultants in applied economics and related fields.

Several existing courses taught in Agricultural and Applied Economics are included in the list of electives for the degree, and no new resources will be required to accommodate additional students in these courses. These include

AAEC/ECON 5125: Empirical Research Methods in Economics I (3 cr) AAEC/ECON 5126: Empirical Research Methods in Economics II (3 cr) AAEC/ECON 5946: Econometric Theory and Practice (3 cr) AAEC/ECON 6554: Panel Data Econometrics (3 cr)

Our faculty has embraced the proposed DAAS degree program as a way to increase crossdepartmental teaching and learning. The Master of Arts degree in DAAS will provide measurable benefits for graduate students in our department. We enthusiastically endorse the degree proposal and look forward to participating fully in its implementation.

Sincerely,

Steve Blank

Steven C. Blank, Ph.D. Department Head and Professor



and Environment

Steve L. McMullin, Interim Department Head Fish and Wildlife Conservation 108 Cheatham Hall (0321) Blacksburg, Virginia 24061 540/231-8847 Fax: 540/231-7580 http://www.fishwild.vt.edu/faculty/mcmullin.htm

December 6, 2013

Eric P. Smith, Professor and Head **Department of Statistics**

Dear Dr. Smith -

I write to express the support of the Department of Fish and Wildlife Conservation for the proposed Master's degree program in Data Analysis and Applied Statistics (DAAS) put forward by the Department of Statistics. In particular, I support the active participation of my department's faculty in activities implementing the proposed degree program. The proposal leverages the talents and energies of our faculty and others, achieving a cross-disciplinary synergy not otherwise available within the respective departments.

The proposed DAAS degree will be an attractive option for a subset of our graduate students in fish and wildlife conservation, particularly to doctoral candidates seeking to achieve and demonstrate mastery of quantitative analyses. Mastery of a wide range of quantitative skills is increasingly valued in our field, especially as we develop more remotely-sensed data and longer time-series, and also as we use information theoretic approaches, simulation modeling, and Bayesian analyses more extensively. Against this background, I note that the proposed degree program is designed to be accessible to our graduate students, providing essential coursework in statistical theory, applied statistics and data analysis. I predict that students holding a Ph.D. in Fish and Wildlife Conservation and an M.A. in Data Analysis and Applied Statistics and will prove competitive for a variety of professional positions in academia, the government sector, and in consulting.

Several courses already offered by the Department of Fish and Wildlife Conservation are appropriately included in the list of electives for the proposed degree. These courses include FiW 5214, FiW 5514, FiW 5984, FiW 6114, FiW 6514, and FiW 6984. No new resources will be required to accommodate additional students in these courses. We anticipate and will value increased interaction among faculty and students across departments, resulting in more formal and informal collaboration among our respective programs.

The Department of Fish and Wildlife Conservation fully supports the proposal for a Master's degree in Data Analysis and Applied Statistics and looks forward to participating in its implementation.

Sincerely,

Steve L. McMullin Interim Department Head Fish and Wildlife Conservation

- Invent the Future

E-mail: ntideman@vt.edu Personal line: 540/231-7592 November 12, 2013

Prof. Eric Smith, Head Department of Statistics

Dear Prof. Smith:

This letter is in support of the proposed program for a Master of Arts degree in Data Analysis and Applied Statistics, to be housed in the Department of Statistics, College of Science at Virginia Tech. The degree proposal has been developed in cooperation with faculty in the Department of Economics, and we fully support it.

The DAAS degree will be an attractive option for our graduate students, particularly those pursuing a Ph.D. in Economics who wish to gain core competency in Applied Statistics and Data Analysis. The degree program in DAAS is designed to be accessible to graduate students in applied sciences like Economics, while providing essential course work in statistical theory, applied statistics and data analysis. The M.A. degree in DAAS, together with a Ph.D. in Economics for those who choose to pursue dual degrees, will provide our graduates with an immediate advantage in their career pursuits and set them on solid footing to succeed as scientists, analysts, or consultants in Economics and related fields.

Several existing courses taught in Economics are included in the list of electives for the degree, and no new resources will be required to accommodate additional students in these courses. These are:

AAEC/ECON 5125: Empirical Research Methods in Economics I (3 cr) AAEC/ECON 5126: Empirical Research Methods in Economics II (3 cr) AAEC/ECON 5945/5946: Econometric Theory and Practice (3 cr) AAEC/ECON 6554: Panel Data Econometrics (3 cr) ECON 4304 Introduction to Econometric Methods (3 cr)

I should note that AAEC/ECON 5125/5126 and 5946 are already required (Core) courses in the joint AAEC/ECON Ph.D. program and that AAEC/ECON 5945 (Time Series Analysis) and AAEC/ECON 6554 (Panel Data Analysis) are already offered as optional Field Courses in this joint Ph.D. program.

ECON 4304 is a relatively advanced undergraduate econometrics course. Although the course eschews linear algebra altogether, it is possible that some version of it could be cross-listed as 5304 at some future time. Although not part of the degree program, ECON 4984 "Advanced Econometric Methods" is being offered as a Special Studies course for the first time in Spring Term 2014; it is designed as a direct follow-on to ECON 4304, which is a pre-requisite for it. In future years we plan to seek formal approval for this course (which would involve a new course

number) and to propose a more advanced version of this sequence, to be numbered ECON 5304/5305; this sequence would fit even more comfortably in the DAAS curriculum.

Sincerely,

T. nicolaus Tileman

T. Nicolas Tideman, Head Department of Economics

{I!VirginiaTech

College of Natural Resources and Environment

Department of Forest Resources and Environmental Conservation 313 Cheatham Hall (0324) 310 West Campus Drive Blacksburg, Virginia 24061 U.S.A. 540-231-5483 Fax: 540-231-3698 Email: frec@vt.edu

November 11, 2013

To Whom It May Concern:

Please accept this letter in support of the proposed program for a Master of Arts in Data Analysis and Applied Statistics (DAAS) to be housed in the Department of Statistics, College of Science, at Virginia Tech. The degree proposal has been developed in cooperation with faculty in the Department of Forest Resources and Environmental Conservation (FREC), and we fully support it.

The DAAS M.A. will be an attractive option for FREC graduate students, particularly those pursuing a Ph.D. in Forestry who wish to gain core competency in Data Analysis and Applied Statistics. The degree program in DAAS is designed to be accessible to graduate students in applied sciences like Forestry, while providing

essential coursework in statistical theory, applied statistics, and data analysis. The M.A. in DAAS, together with a Ph.D. in Forestry for those who choose to pursue dual degrees, will provide our graduates with an immediate advantage in their career pursuits and set them on solid footing to succeed as scientists, analysts, or consultants in forestry and related fields.

Several existing courses taught in FREC are included in the list of electives for the degree, and no new resources will be required to accommodate additional students

in these courses. Our faculty has embraced the proposed DAAS M.A. program as a way to increase cross-departmental teaching and learning. We look forward to the interactions between students and faculty across disciplines and expect that new opportunities for synergies and collaboration will arise from this program.

The Master of Arts in DAAS will provide measurable benefits for graduate students in the Department of Forest Resources and Environmental Conservation at Virginia Tech. We enthusiastically endorse the degree proposal and look forward to participating fully in its implementation.

Sincer ely,

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Janaki Professor and Department Head

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY An equal opportunity, affirmative action institution



and Environment

Department of Geography 115 Major Williams Hall (0115) Blacksburg, Virginia 24061 540-231-7557 Fax: 540-231-2089 email: geog@vt.edu www.geography.vt.edu

Friday, December 06, 2013

Eric P. Smith, Professor and Head Department of Statistics

Dear Dr. Smith -

I write to express the support of the Department of Geography for the proposed Master's degree program in Applied Statistics and Data Analysis (ASDA) put forward by the Department of Statistics. In particular, I support the active participation of my department's faculty in activities implementing the proposed degree program. Statistical coursework from our department deals with applications of statistics with spatial data, and is of great interest to many on campus, and a perfect fit for this new program. The analysis of Spatial Data course has been a huge success for us in teaching our students how to apply spatial techniques to their research data, and the Advanced Spatial Analysis course is, as of this spring, being adapted to include a great deal more spatial data application in ArcGIS. Clearly, Geography sees the value in applied statistics.

The proposed ASDA degree will be an attractive option for our more analytically inclined graduate students in the Geospatial and Environmental Analysis PhD. and for those interested in the geospatial science field in general. Mastery of a wide range of quantitative skills has long been a significant part of training in the geospatial sciences, and that trend is only accelerating. Many of our graduate students have found the mathematical aspects of statistical theory very difficult, yet are adept at interpreting results in applied situations. This degree will support their skills and interests perfectly. I am confident that those students who obtain the PhD. in Geospatial and Environmental Analysis following an M.A. in Applied Statistics and Data Analysis will prove competitive for a variety of professional positions in academia, the government sector, in the GIS industry and in consulting.

Two courses already offered by the Department of Geography are appropriately included in the list of electives for the proposed degree. No new resources will be required to accommodate additional students in these courses. We anticipate and will value increased interaction among faculty and students across departments, resulting in more formal and informal collaboration among our respective programs.

The Department of Geography fully supports the proposal for a Master's degree in Applied Statistics and Data Analysis and looks forward to participating in its implementation.

Sincerely,

June W. Carston of

Laurence W. Carstensen Jr. Professor and Head Department of Geography

- Invent the Future



College of Science

Robert S. Stephens, PhD Department of Psychology A University Exemplary Department 109 Williams Hall (MC 0436) 890 Drillfield Drive Blacksburg, Virginia 24061 540/231-6304 Fax: 540/231-3652 @

December 5, 2013

Eric Smith, Professor and Head Department of Statistics Virginia Tech

Dear Dr. Smith:

I write in support of the proposed program for a Master of Science degree in Data Analysis and Applied Statistics (DAAS) to be housed in the Department of Statistics, College of Science at Virginia Tech. The degree proposal has been developed in cooperation with faculty in the Department of Psychology, and we fully support it.

The DAAS degree will be an attractive option for a subset of doctoral graduate students in psychology who are increasingly taking additional statistics and methodology courses beyond those required and offered by our department. The degree program in DAAS is designed to be accessible to graduate students in applied sciences like psychology, while providing essential coursework in statistical theory, applied statistics and data analysis. The M.S degree in DAAS, together with a Ph.D. in psychology for those who choose to pursue dual degrees, will provide our graduates with an immediate advantage in their career pursuits, and set them on solid footing to succeed as scientists, analysts, or consultants in psychology and related fields.

Existing courses taught in psychology are included in the list of electives for the degree. No new resources will be required to accommodate additional students in these courses. These include:

PSYC5134: Advanced Psychometric Theory (3 cr) PSYC5315: Research Methods (3 cr) PSYC5316: Research Methods (3 cr) PSYC6014: Quantitative Topics in Industrial and Organizational Psychology (3 cr)

Our faculty embraces the proposed DAAS degree program as a way to increase cross-departmental teaching and learning. We look forward to the interactions between students and faculty across disciplines, and expect that new opportunities for synergies and collaboration will arise from this program. The Master of Science degree in DAAS will provide measurable benefits for graduate students in our department. We enthusiastically endorse the degree proposal and look forward to participating fully in its implementation.

Sncerely,

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Robert S Stephens, Ph.D. Professor and Chair

Invent the Future

111 VirginiaTech

College of Liberal Arts and Human Sciences

Department of Political Science (0130) Major Williams Hall, Room 531, Virgina Tech 220 Stanger Street Blacksburg. Virginia 24061 540/231-6571 Fax: 5401231-6078

December 3, 2013

Eric P. Smith Professor and Chair Statistics Department Virginia Tech Blacksburg, VA 24061

Dear Dr. Smith:

The Department of Political Science supports inclusion of PSCI (GIA) 5115: Research Methods (3 cr), PSCI (GIA) 5116: Research Methods II (3 cr) and PSCI 5124: Advanced Research Issues (3 cr) for inclusion in the proposed new Master of Arts degree in Data Analysis and Applied Statistics to be housed in the Department of Statistics, College of Science at Virginia Tech. Our department supports this proposal, and we do not foresee this action requiring new resources.

Sincerely,

Timothy W. Luke University Distinguished Professor Chair, Department of Political Science

Invent the Future

From: Ryan, John Sent: Wednesday, November 13, 2013 9:16 AM To: Smith, Eric Subject: support for MS

Dear Dr. Smith

Please accept this letter in support of the proposed program for a Master of Arts degree in Data Analysis and Applied Statistics to be housed in the Department of Statistics, College of Science at Virginia Tech. The degree proposal has been developed in cooperation with faculty in the Department of Sociology and we fully support it.

The DAAS degree will be an attractive option for our graduate students, particularly those pursuing a Ph.D. in sociology who wish to gain core competency in Applied Statistics and Data Analysis. The degree program in DAAS is designed to be accessible to graduate students in applied sciences like sociology, while providing essential coursework in statistical theory, applied statistics and data analysis. The M.A. degree in DAAS, together with a Ph.D. in sociology for those who choose to pursue dual degrees, will provide our graduates with an immediate advantage in their career pursuits, and set them on solid footing to succeed as scientists, analysts, or consultants in sociology and related fields.

Several existing courses taught in our department are included in the list of electives for the degree, and no new resources will be required to accommodate additional students in these courses. These include

SOC 5204: Data Analysis (3 cr) SOC 5214: Research Methods (3 cr) SOC 6204: Survey Research Methods (3 cr)

Our faculty has embraced the proposed DAAS degree program as a way to increase crossdepartmental teaching and learning. We look forward to the interactions between students and faculty across disciplines, and expect that new opportunities for synergies and collaboration will arise from this program.

The Master of Arts degree in DAAS will provide measurable benefits for graduate students in our department. We enthusiastically endorse the degree proposal and look forward to participating fully in its implementation.

Sncerely,

John Ryan

John Ryan Professor and Chair Department of Sociology Virginia Tech 560 McBryde Hall – MC0137



College of Liberal Arts and Human Sciences

Department of Human Development 366 Wallace Hall (0416) 295 W. Campus Drive Blacksburg, Virginia 24061 540/231-4794 Fax: 540/231-7012 www.humandevelopment.vt.edu

Professor Eric Smith, Department Head Department of Statistics Virginia Tech CAMPUS

December 3, 2013

Dear Professor Smith:

Please accept this letter in support of the proposed program for a Master of Arts degree in Data Analysis and Applied Statistics to be housed in the Department of Statistics, College of Science at Virginia Tech. The degree proposal has been developed in cooperation with faculty in the Department of Human Development, and we fully support it.

The DAAS degree will be an attractive option for our graduate students, particularly those pursuing a Ph.D. in Human Development who wish to gain core competency in Applied Statistics and Data Analysis. The degree program in DAAS is designed to be accessible to graduate students in applied social sciences, while providing essential coursework in statistical theory, applied statistics and data analysis. The M.A. degree in DAAS, together with a Ph.D. in Human Development for those who choose to pursue dual degrees, will provide our graduates with an immediate advantage in their career pursuits, and set them on solid footing to succeed as scientists, analysts, or consultants in Adult Development, Child Development, Family Studies, Marital and Family Therapy, and related fields.

Several existing courses taught in Human Development are included in the list of electives for the degree, and no new resources will be required to accommodate additional students in these courses. These include: HD 5514: Research Methods (3 cr); HD 6514: Advanced Research Methods (3 cr); and HD 6524: Current Topics in Advance Research Methods (3 cr; co-enroll with HD 6514).

Our faculty has embraced the proposed DAAS degree program as a way to increase crossdepartmental teaching and learning. We look forward to the interactions between students and faculty across disciplines, and expect that new opportunities for synergies and collaboration will arise from this program. The Master of Arts degree in DAAS will provide measurable benefits for graduate students in our department. We enthusiastically endorse the degree proposal and look forward to participating fully in its implementation.

Sincerely yours,

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Anisa M. Zvonkovic, Ph.D., Professor and Department Head, Human Development

Invent the Future

Appendix B Sample job advertisement

Statistical Analyst

Location: KBM Group - Harrison, NY Job Code: 4630 # of openings: 1

Description Statistical Analyst Company Background

KBM Group, a fast paced, growing database marketing services company with offices located in Harrison, NY and Louisville, CO, has a great opportunity for a Statistical Analyst in our Harrison office. KBM Group is part of the WPP organization.

Position

The Statistical Analyst (the "Analyst") is directly responsible but not limited to developing predictive models related to the co-op and other marketing databases. The analyst should become familiar with the utilization of transaction data, in addition to household level and Census level data. The individual is required to assist with the coordination of the planning, development and execution of the modeling effort and be responsible for its documentation.

Responsibilities

• Develop Regression/Tree based models to support the database marketing efforts of co-op members and clients.

• Provide analytical services to clients and I-Behavior staff on an ongoing basis.

• Participate in the development of protocols and systems for the processing of model development, scoring and deployment within the 'rules' of the co-op environment.

• Develop and execute quality assurance procedures related to all aspects of the duties pertaining to providing analytic services.

• Interact with Client Services and Programming staff, ensuring accuracy of modeling applications.

Requires

• Some experience as a data analyst/modeler, preferably dealing with large amounts of transaction data.

• Masters in Applied Mathematics, Statistics or Econometrics and/or five years work experience required.

- Experience with SAS or comparable statistical software required
- Excellent communication and presentation skills.

• Experience/knowledge with experimental test design for comparing campaign tests results and the ability to recommend sufficient universe sizes for testing purposes.

2/4/2015 Careers Center Statistician Location USVAAlexandria Experience (Years) 0 Posted Date 1/16/2015 Category All Research and Analysis Close Date 2/13/2015

Statistician

Overview:

The Operational Evaluation Division (OED) has an immediate career opening for a Statistician to support the Department of Defense's (DoD) assessment of the operational effectiveness, suitability, survivability, and lethality of Major Defense Acquisition Programs. IDA takes great pride in the high caliber and timeliness of its analyses, which are produced in an atmosphere that encourages independent thinking and objective results. Work at IDA is conducted in a team environment and often involves a multidisciplinary approach.

Responsibilities:

The Statistician, in collaboration with IDA colleagues, will support and advise midand Seniorlevel civilian and military DoD officials regarding the operational and live fire test and evaluation of Major Defense Acquisition Programs. The Analyst will be required to evaluate survivability, lethality, and force protection for a variety of DoD programs including personal protective equipment, aircraft, land and expeditionary vehicles, and naval vessels. The position involves experimental design and statistical analysis focused on observed test results (including small sample sizes) evaluated in the context of scientificallybased insights and supporting modeling and simulation activities. Close interaction with DoD officials responsible for the planning, development, and execution of tests is required. Strong scientific and technical skills, particularly in the areas of statistical and quantitative analyses, are required as well as the ability to speak and write clearly, think analytically, and work independently. Travel is required.

Qualifications:

Candidates must have an advanced technical degree in Statistics, Industrial Systems Engineering, Applied Mathematics, or equivalent training (MS is required; PhD preferred).

Candidates must have demonstrated applied statistical skills; prefer candidates with expertise in design of experiments, small sample data analysis, uncertainty quantification, process control, computer experiments, quality assurance, or Bayesian methods.

Practical statistical experience in engineering design, operational testing, or survivability testing of military or similarly complex systems is desired for PhD candidates and is required for MS candidates. DoD test experience is a plus.

Candidates must have strong computational skills in current statistical analysis and simulation software.

Candidates are encouraged to submit a cover letter outlining how their skill set, experiences, and education align with the defined responsibilities. Upload as one document with resume.

Candidates selected will be subject to a security investigation and must meet eligibility requirements for access to classified information as required.

U.S. Citizenship is required.

IDA is an equal opportunity employer committed to providing a working environment that is free from discrimination on the basis of race, color, religion, sex (including pregnancy and gender identity), sexual orientation, national origin, age, disability, status as a protected veteran, marital status, genetic characteristic or any other legally protected condition or characteristic.

Location US-VA-Richmond Category Research and Development Statistician

More information about this job:

Options:

Overview:

Apply statistics and interact effectively with R&D scientists and engineers to understand variability in test method & study results and advise them in making statistically relevant conclusions.

Responsibilities:

• Understand statistical analysis methods that are to be applied to properly analyze data. Some statistical analysis/data modeling methods are to include

• General Linear Models - including multiple comparisons,

- ° Generalized Linear Models,
- Partial Least Squares,

• Principal Components Analysis,

• Logistic Regression,

• Random/Fixed (Mixed) Models, and

• Neural Network Models.

• Will be technically proficient in Design of Experiment (DoE/RSM/EVOP) methods.

• Perform large/small sample statistical analysis, perform distribution free statistical analysis, and generate test plan sample sizes to identify significant differences in the study factor data.

 Understand process improvement methods such as Statistical Process Control, Multivariate Statistical Process Control, Six Sigma, and Lean Manufacturing.

• Will be self-motivated to learn new methods, to learn about the factors being analyzed, to keep up-to-date technically, and to apply new knowledge to the job.

Qualifications: EDUCATION & EXPERIENCE MINIMUMS:

• Minimum 3 years of job related work experience

• Masters Degree in Statistics or related discipline that has a strong emphasis on data analysis

• ASQ Certifications (CRE, CQE, SSBB) is a plus

• Automotive, chemistry/chemical, or petroleum additive related academic background or work experience is a plus

SKILLS/ABILITIES:

• Must have excellent verbal and written communication skills.

• Can independently apply logic and reasoning to problems, develop and evaluate options, and implement solutions.

• Has experience with computer software packages such as:

° SAS, Minitab, JMP, Statistica, ProMV/ProBatch, SIMCA, Microsoft Excel, R, etc.

° Programming languages such as VB or C

• Database programs (Access, SQL, etc.)

Microsoft Office applications

All qualified applicants will receive consideration for employment without regard to the individual's race, color, sex, national origin, religion, age, disability, genetic information, status as a military veteran or any other characteristic protected by applicable law.

UNIVERSITY OF OREGON HUMAN RESOURCES

Research Informatics Analyst: Data Scientist College of Arts and Sciences

Posting: 14485

Location: Eugene

Closes: Open Until Filled

Job Context:

The University of Oregon College of Arts and Sciences seeks to form a scientific software consulting team to support the UO research community in the use of high-performance computing systems. We have already hired experts in high-performance scientific computing, parallel performance, and visualization, and wish to hire a fourth member of that group. In particular, we are seeking someone with expertise in informatics and numerical analysis to work on advancing data-intensive research on campus. The successful candidate will help transform the process of research and discovery on campus by collaborating with domain science researchers on data science challenges.

CASIT Research Support is a team of interdisciplinary research support staff committed to advancing the U of O's research mission. Our strategy takes a collaborative approach involving joint programs with methods researchers (in computer science, statistics, and applied mathematics) and domain scientists (in the life, physical, and social sciences). The successful candidate will join our team and engage in research that will advance both domain and data science methodologies, involving new platforms, new algorithms, new methods, and new applications. The Research Informatics Analyst will provide the following services:

- Work with the research support team to target the analytics research and educational needs of the university
- Develop new analytical methods, tools, and software development as needed
- Meet with faculty and researchers to discuss big data problems, identify collaboration opportunities, and recommend solutions
- Provide education, guidance, and training to faculty and graduate students on basic tools and techniques
- Prepare and deliver presentations and publications on significant results, both internally and externally
- Manage, mentor and train junior methodology staff interns
- · Perform other related duties as required or assigned
- Core competencies and skill sets that are required for this position as a Research Informatics Analyst include the following:
- 1. Exceptional math and analysis skills
- a. familiarity analyzing scientific data
- b. demonstrated proficiency in critical thinking
- c. knowledge of statistics
- d. attention to detail
- 2. Superior coding skills
- a. must be comfortable in a UNIX environment
- b. proficiency with one or more programming languages (C/C++, Java, Python, Fortran)
- c. ability to work with packages such as R, Matlab, Mathematica
- 3. Strong organizational and time management skills
- 4. Excellent customer service skills and professionalism
- 5. Ability to work both independently and in a collaborative problem solving environment

The ideal candidate will combine computational programming skills with an understanding of data analysis techniques to develop customized advanced analytical tools and solutions for big data problems. As a point of contact for data science problems across campus, the position requires a candidate with excellent communication skills (both verbal and written) to facilitate collaboration with researchers across disciplines, as well as coordination within the team and with IT and administrative professionals. In addition, the candidate must be able to succeed under minimal supervision, be familiar with the research and scientific workflows, exhibit excellent organizational skills and have a strong interest in learning. The University of Oregon is committed to creating a more inclusive and diverse institution and seeks candidates with demonstrated potential to contribute positively to its diverse community.

Qualifications & Requirements:

- Minimum Qualifications:
- M.S., or Ph.D. in applied math, statistics, physics, computational biology, computer science or related field
- · Exceptional math and analysis skills
- -familiarity analyzing scientific data
- -demonstrated proficiency in critical thinking
- -knowledge of statistics
- -attention to detail
- Superior coding skills
- -must be comfortable in a UNIX environment
- -proficiency with one or more programming languages (C/C++, Java, Python, Fortran)
- -ability to work with packages such as R, Matlab, Mathematica
- · Strong organizational and time management skills
- · Solid interpersonal skills and the capacity to work effectively on diverse teams
- · Ability to work both independently and in a collaborative problem solving environment
- Demonstrated success in data analysis related projects (publications, software, etc)

Desired Qualifications:

• Domain expertise in biology, economics, psychology, physics, geology, etc.

• Knowledge and experience with data management, analysis and data format standards

• Background in information theory, machine learning, and/or high performance computing

• Experience with open-source software

Background Check Statement: Criminal background check required for the position

Employment Beginning: January 5, 2015

Appointment Percentage: 12-month; full-time; 100%

Salary: Competitive salary based on qualifications and experience

Benefits:

In addition to the above mentioned salary, this position has an excellent benefits package including health, dental, insurance, retirement plan, employee tuition rates (transferable to immediate family members under specific circumstances) and excellent vacation and sick leave provisions.

Application Procedures:

To ensure consideration, please submit application materials by November 19, 2014. This position will remain open until filled.

Complete applications must include the following:

• A letter of application addressing your qualifications and interest in the position

• A current resume/CV

• The names, addresses, phone numbers and email addresses of three references that can speak to your qualifications for this position In addition, please provide answers to the following questions:

1. One aspect of this position is to act as a research advisor, guiding scientists towards best practices, etc. A possible scenario would be that a scientist comes to you and says, "we've just developed a new wiz-bang widget that collects massive amounts of data, what data format should be used to store our data and how do we go about analyzing it?" In terms of your background and experience, please describe what questions you would ask them regarding their data storage and analysis needs and how you would then guide them towards answers their original question.

2. Detail your most successful data analysis projects. How many people were you working with and how did you manage communication on that team? Include a discussion of the field and area of science as well as the different techniques that you used. Be explicit in describing your role on the project, the problems you were faced with, what kinds of programming languages and techniques you used to solve these problems, and how you interacted with the team.

3. Describe your workflow when starting a new data analysis project. What are your preferred go-to tools and techniques? How do you develop lines of communication with domain experts and how do you decide what methods to use for a particular problem?

4. Have you experienced data sets too large to work with on a typical desktop/laptop? How did you deal with that? What are your experiences with large-scale computing resources (such as a supercomputer or cloud computing)?

5. Have you ever worked with graduate/undergraduate students or others, in an advisory/manager/mentor-type role? If yes, describe your communication and leadership style. If no, describe your interactions with leaders/mentors in your life and how you facilitated good communication with them.

The application materials should be packaged as a single PDF file, using the position number and applicant's last name as the document name, and uploaded to: https://casitjobs.uoregon.edu/

Incomplete or improperly submitted applications may be excluded from consideration.

Review of applications will begin November 20, 2014.

The University of Oregon is an equal opportunity, affirmative action institution committed to cultural diversity and compliance with the ADA. The University encourages all qualified individuals to apply, and does not discriminate on the basis of any protected status, including veteran and disability status.

14485: Research Informatics Analyst: Data Scientist Page 3 of 3

11/25/2014

Appendix C Student Survey

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1. Current Status					
#	Answer		Response	%	
1	Freshman		0	0%	
2	Sophomore		0	0%	
3	Junior		5	5%	
4	Senior		9	8%	
5	First Year Graduate		39	35%	
6	Second Year Graduate		42	38%	
7	Other		16	14%	
	Total		111	100%	

Other
3rd year PhD
3rd year graduate
Sixth Year Graduate
3rd year graduate
First Year PhD
3rdv year phd
Third year graduate
3rd year graduate
PhD
Returning Graduate Student
Third year PhD
Third year Graduate-PhD
third year graduate
non degree seeking

Statistic	Value
Min Value	3
Max Value	7
Mean	5.50
Variance	0.98
Standard Deviation	0.99
Total Responses	111

2. Major/Minor

Text Response
Geography
Math/Statistics/Actuarial Science
Civil Engineering
ME
Computer Engineering
Animal Science
FIW
Mechanical Engineering
Molecular Virology PhD student
Fish and Wildlife Conservation
power electronics
Coastal Engineering
Marketing
ECE
Forestry
HORT
Statistics Economics/Actuarial Science
Computer Science
Fish and Wildlife Conservation
Animal and Poultry Science
dairy science
Civil Engineering
Computer Science
Business Information Technology
mechanical engineering
Forestry
Biological Sciences
Statistics
Plant Physiology
Mechanical Engineering
Clinical Psychology
Sociology
Computer Science
Computer Science
Environmental Design and Planning
animal and poultry science
Applied Computational Mathematics and Statistics
ACIS
Civil and Environmental Engineering
Statistics and Psychology
industrial engineering
Statistics
Animal and Poultry Sciences
Biological Systems Engineering
Math major stat minor
Animal & Poultry Science
Plant Pathology, Physiology and Weed Science
Industrial and Systems Engineering

ME
Computer Engineering
Mechanical Engineering
Computer Science and Applications
Hospitality Management
food science
Agricultural and Applied Economics
Biological Sciences
Mechanical Engineering
ISE
Norbeting
Statistics
Statistics Electrical Engineering
Electrical Engineering
Electrical Engineering
UDUD Finance and Developer (double)
Finance and Psychology (double)
Industrial and Systems Engineering
Urban and Regional Planning
Food Science & Technology
Mechanical Engineering
Horticulture
Mechanical Engineering
GBCB
Civil Engineering
Computer Engineering
mechanical engg
Mechanical Engineering
Geography
Electrical Engineering
Computer Science
Biological Sciences
ece
Electrical Engineering
Hospitality management
Hospitality Management
CSES
Crop and Soil Environmental Science
Biological Science
mathematics/ statistics
Ph.D. Forestry
Business Economics
ISE
CEE-EWR
Industrial and Systems Engineering
Economics/Statistics
Minor
Accounting
Crop & Soil Environmental Science
Industrial and Systems Engineering
Accounting

Natural Resources	
Statistic	Value
Total Responses	108

#	Answer	%
1	Very Interested	38%
2	Moderately Interested	20%
3	Mildly Interested	16%
4	Mildly Uninterested	10%
5	Moderately Uninterested	5%
6	Very	11%
	Total	100%

Statistic	Value
Min Value	1
Max Value	6
Mean	2.58
Variance	2.85
Standard Deviation	1.69
Total Responses	111

4. Whether you are interested in pursuing a MS in DAAS at Virginia Tech or not, what do you think about the possibility of offering such an opportunity for students who are interested?

Text Response

I think it would be a great idea!

Seems like a very relevant and interesting new degree option stellar Such an opportunity will be excellent for people who are interested in statistics Fantastic idea Great Idea! Yes it would be a good plan It would offer graduate students an opportunity to greatly strengthen their statistical knowledge. good chance It's of significance for research ability Verv cool I think it would be very useful especially for those of us in the hard sciences Seems like a great idea I think it would be very necessary to offer this degree in order to keep up with the advancing technology in the fields of statistics, big data, and research. I think it would be extremely beneficial. It would drastically improve the students' education. Not a problem if the resources are available. to apply statistics method in industrial cases, like dairy indusry I think it is a great idea, and the classes would be beneficial on an as-needed basis. I strongly recommend such an program, since data analysis has extensive appliations in various fileds. Yes, definitely. So far, the probability is about 90%. seems like a good idea It would become a big opportunity for students because understanding how to analyze data is in high demand in the job market at this time. It's a great idea It's a very good idea. I only deal with statistical analysis a little but towards the end of my time here I'm beginning to wish I had a better understanding of statistical analysis tools. I think it would be a very good opportunity for students in psychology, as it would be a great asset in the job market. I think it is a great opportunity to apply statistical tools in real world applications I think this will be a great opportunity for those who are. Necessary I think that this would be an amazing opportunity for students and also very useful because over the past few years degrees in applied mathematics and statistics is becoming desired in the work force and any opportunity to further your education is great. Excellent I think it is a valuable option for many students and would help drive the incorporation of more statistic focused work. great idea. many opportunities for the future employment it should be offered!!! I believe that would be an excellent opportunity. It would be a very appropriate degree with potential application and relevance in different fields. It is something that is lacking in most research designs and data interpretations... Yes I have interested in get this ms. This degree is more functional and more help with further job Not a high possibility

It is important to offer a diverse selection of majors and possible degrees to students. Good idea! It's great. I think it is a great opportunity. It would provide students the ability to look at data (no matter what it may be or to what field it pertains) and be able to look at it and explore what it is telling the scientist. Having the ability to take data and dig into it rather than just looking at it and drawing conclusions is very important and is an expanding factor in studies. This is a great idea, and highly needed. Excellent opportunity to gain knowledge in upcoming area. I'm very interested in pursuing the MA in DAAS since it would be a big plus to my research in Agricultural Economics. And I think lots of students with major other than Statistics will find the knowledge on Statistics being very helpful when doing empirical study. great idea! Excellent opportunity It would be beneficial for students who need statistical tools for their research Sounds great! Help you get better jobs down the road It is a very important area of study and this degree program will offer a great opportunity to those interested. No Awesome Statistical understanding is extemely important for experimenters Very likely. I think it is very worthwhile for those who know in advance that they want to pursue a career in research If faculty capable of conferring the degree are already at Virginia Tech, why not offer it? I think it is a good idea and that it would have a significant demand from across very different majors and fields. Great It is very good to have such a major here its a good idea I think it's a very good idea. Good opportunity Stats is very important for research, it will definitely help students. Getting a degree in Stats when working on something else is a bonus. Stats are a transferable skill, so it'd probably be a good option since jobs in academia are limited. It would be great. I thin it is essential. Great Idea! It is a great idea. It is a good idea I think it's a good idea, very practical Sounds like a great program for interested parties. I think it would be very helpful for some students and provide long-term benefits. Great. I think the degree would be an excellent opportunity for those who wish to add Statistics to their skill set without doing theoretical statistics. I think it sounds good. It would be a beneficial field. Great opportunity It would be a great opportunity if there was enough interest from students. I think it's a good idea having a more applied curriculum. Makes sense

I would definitely suggest that a MA in DAAS be offered. It is a great idea and would benefit a large		
variety of students who would like to increase their knowledge in the field of Statistics.		
It sounds like a great oppurtunity.		
Good		
I think it would be great especially if it was offered online or partially online		
it is a good idea		
I am not interestied in this degree.		
Great opportunity!		
It is a great idea.		
It is a good idea		
it sounds like a great opportunity as statistics are the essential to almost every research discipline out		
there		
Possibly useful for those wishing to strengthen their statistical qualifications		
It sounds like a great program!		

Statistic	Value
Total Responses	91



DEGREE PROPOSAL

Master of Arts (M.A.) Data Analysis and Applied Statistics

Eric P. Smith, Ph.D. Professor and Department Head

Department of Statistics



Background

- Increased need exists for graduate students trained in the analysis of data
 - Shortage of statistically trained scientists and practitioners
 - Need for statisticians with backgrounds in natural/social sciences and work-related skills
 - Better training in statistical methods will lead to better jobs
 - What is required is a program in statistics, with coursework from experts in applied statistics as well and from quantitative faculty from other departments





Goals

Offer an applied statistics graduate degree

1) To provide a degree that focuses on the *application* of statistical methods (our MS has a strong emphasis on the theory behind the methods)

2) To better connect the degree program with *quantitative researchers* in the social and natural sciences at Virginia Tech

3) To meet interest and demand for *applied statistical training* in a broad range of industrial and high-tech markets



Goal 1: Focus on Applied Statistics

Core courses (18 credits)

To train students in data analysis with a solid theoretical and applied statistics foundation

- > STAT 5105G: Theoretical Statistics (3 cr)
- > STAT 5204G: Experimental Design: Concepts and Applications (3 cr)
- > STAT 5214G: Advanced Methods of Regression Analysis (3 cr)
- > STAT 5615/5616: Statistics in Research I and II (6 cr)
- > STAT 5024 Effective Communication in Statistical Collaboration (3 cr)
- Restricted Electives (12 credits)
 - · From statistics and other departments

- Project-based final examination
 - STAT 5094 (3 cr)



Goal 2: Increase Collaboration with Departments Doing Applied Research

- Collaborators (number of courses)
 - Agricultural and Applied Economics (4)
 - Economics (4)
 - Educational Research & Evaluation (9)
 - Fisheries & Wildlife (4)
 - Forest Resources & Environmental Cons. (2)
 - Geography (2)
 - Human Development (3)
 - Psychology (4)
 - Public Administration and Public Affairs (2)
 - Political Science (1)
 - Sociology (3)



Attachment C

Goal 3: Meeting Student Interest and Market Demand

If Virginia Tech offered a Master of Arts (M.A.) in Data Analysis and Applied Statistics (DAAS), would you be interested in pursuing the degree?

Answer	Response 2014	%	Response 2013	%
Very Interested	32	29%	42	38%
Moderately Interested	20	18%	22	20%
Mildly Interested	25	23%	18	16%
Mildly Uninterested	10	9%	11	10%
Moderately Uninterested	12	11%	6	5%
Very Uninterested	10	9%	12	11%
Total	109	100%	111	100%

Student Interest

- Increased enrollment in statistics courses
- (Example: STAT 5214G Applied Regression introduced in 2009)



Market Demand



Quick Facts: Statisticians		
2012 Median Pay	\$75,560 per year \$36.33 per hour	
Entry-Level Education	Master's degree	
Work Experience in a Related Occupation	None	
On-the-job Training	None	
Number of Jobs, 2012	27,600	
Job Outlook, 2012-22	27% (Much faster than average)	
Employment Change, 2012-22	7,400	

In the 2010-2020 report the job growth was estimated as 14.1%

Job Opportunities - - examples

SRA International, Fairfax, VA

- Create and apply appropriate statistical analyses of large molecular datasets
- PNC, Tysons Corner, VA
 - Develop and enhance retail credit risk models

Aveshka, Arlington, VA

 Design, develop, and implement statistical methodologies

• Apex Systems Inc., Washington, DC

- Statisticians contribute to advancement of applied measurement and psychometrics, social science and policy evaluation
- BB&T, Charlotte, NC
 - Use experimental design techniques to ensure marketing and sales campaigns are designed properly

The Big Data Landscape





Who is our Target Audience?

10 Attachment 0

- Undergraduate students who are quantitative and have a social or natural science background
- Students and professionals who desire online training and degrees
- Accelerated undergraduate to graduate degrees
- Undergraduate statistics majors
- We expect to enroll 20 per year





Questions?

Funding

- Assumptions:
 - 20 students per year
 - \$593 per credit hour (in-state)
- Revenue
 - \$213,480
- Expenses
 - Professor of practice \$85,000 (including fringe, request 2)
 - Teaching assistants (2 @ 23000)
 - Total: \$208,000