Proposal for the Initiation of a New Instructional Program Leading to an
M.S. in Data Analytics
And
Graduate Certificate in Data Analytics

Oregon State University
College of Science
Department of Statistics

CPS Proposal #93153
https://secure.oregonstate.edu/ap/cps/proposals/view/93153
May 2015

1. Program Descriptions

a. Proposed CIP Number:

CIP #: 27.0599

Title: Statistics, Other.

Definition: Any instructional program in statistics not listed above.

Source: US Department of Education, National Center for Educational Statistics, CIP 2010 ed.

b. Overview of the proposed programs

The terms “big data” and “analytics” are now commonly used to describe the vast amounts of data currently being generated and analyzed in many areas of science, education, business and government. The analysis of the information in these data sets has already led to major advances in areas ranging from genomics to astronomy and high-energy physics and to development of new information-based industries. Until recently, methods of analysis of these data had largely assumed that traditional computing and inferential tools within the analyst’s own computing environment are adequate to summarize and make informative inferences from the data. With the increased capacity to collect, store and summarize data, and with the growth of the term

"analytics," it is clear that there is a demand for more training in data management and data analytic skills.

A widely circulated report by McKinsey Global Institute estimates that by 2018, the United States could face a shortage of 140,000 to 180,000 people with deep analytic skills, and an estimated 1.5 million managers and analysts will be needed with the know-how to use the analysis of available data to make effective decisions. The "deep analytic skills" referred to above are founded primarily in the disciplines of Statistics and Computer Science, and the proposed programs draw heavily on these two disciplines, with the objective of producing trained professionals with these skills. The core courses of the M.S. program come from statistics and computer science, but the program also recognizes that some of the demand for big data skills comes from biology and the health professions; the program offers areas of concentration in Health Analytics and in Statistics. The Graduate Certificate in Data Analytics will contain courses from Statistics only.

A proposal summary appears below:

Category	Information Summary
Proposal Title	**MS and Graduate Certificate in Data Analytics**
Proposal Purpose (e.g., New; Change—Rename, Move, Reorganization; Suspend; Terminate)	**New:** **Graduate Major** **Graduate Certificate**
Classification of Instructional Program (CIP) #	**27.0599**
Curriculum Proposal System # (incl link)	**https://secure.oregonstate.edu/ap/cps/proposals/view/93153** **CPS # 93153**
Banner Student Information System (SIS) #	**To be assigned by the Registrar's Office**
Degree Type (e.g., B.S., M.S., or Ph.D.)	**Master of Science (M.S.)** **Graduate Certificate in Data Analytics**
Program Type (e.g., Undergraduate, Graduate, First Professional)	**Graduate**
Academic Home	**College of Science** **Department of Statistics**
College Code	**08**
Contacts (e.g,, Name, Title, Tel #, eMail Address)	**Dr. Virginia Lesser,** **Professor and Chair, Department of Statistics** **737-3366** **lesser@science.oregonstate.edu**
Faculty (New)	**Twelve existing faculty will deliver the 45 credit**

	hours of courses. One to two new faculty will be hired in the near future when all courses are offered online.
Staff (New)	**A portion of clerical staff (0.3 FTE) will be required to support the program.**
Library	**Review Included: adequate to support the proposal.**
Facilities/Space	**No new facilities or space will be required. Students are taking courses online and are not provided office space.**
Budget (first four years)	**Year 1: $746,901; Year 2: $762,132; Year 3: $777,682; Year 4: $793,558**
Undergraduate Option(s)	**Not Applicable**
Graduate Option(s)	**Not Applicable**
Undergraduate Minor(s)	**Not Applicable**
Graduate Minor(s)	**Concentration in Health Analytics and in Statistics**
Course Designator (e.g., Existing or New or Change)	**ST and CS (Existing; no new course designator will be required)**
Courses (e.g., New Courses)	**ST Core: (Seven ST courses – 24 credit hours) CS Core: (Three CS courses – 12 credit hours) Areas of Concentration (Three ST courses – 9 credit hours)**
Location (e.g., Main; Cascades; Ecampus; HMSC)	**ECampus (only)**
Modality (e.g., Face-to-Face; On-line; Hybrid)	**On-line delivery (only)**
Enrollment Limitations	**None**
Accreditation	**None**
Program Unique Within Oregon University System (e.g., Yes or No)	**Yes**
Proposed Effective Term (e.g., term and year; Banner code)	**Winter Term 2016**

c. Course of study - proposed curriculum, including course numbers, titles, and credit hours

The proposed M.S. degree requires a total of 45 credit hours. Area concentrations will be offered in Health Analytics and Statistics, but a concentration is not required to complete the program. To be admitted to the program, a student must meet the minimum requirements for admission to the Graduate School and must have successfully completed an undergraduate statistics course at the level of ST351.

Mathematics to the level of calculus is recommended but not required. The curriculum includes (courses are 3 credits unless otherwise indicated):

- 6 core courses in statistics, for a total of 21 credit hours.
- 3 core courses in computer science, for a total of 12 credit hours.
- Concentrations:
  Area of Concentration in Health Analytics: 3 approved courses in analytics for health/biology/genetics data, for a total of 9 credit hours;
  Concentration in Statistics: 3 approved courses in Statistics, for a total of 9 credit hours;
  Degree without concentration: 3 approved courses in Health Analytics or Statistics, for a total of 9 credit hours.

  (A future track in Business is a possibility, subject to the availability of suitable online course offerings in the College of Business. Currently there are three "background business" courses offered online by the College of Business BA514, BA516, BA518).

  These courses, available to those with B. S. degrees, could prepare students for more advanced business offerings in data analytics, when available.)

  The courses comprising the M.S. in Data Analytics would be available to students not enrolled in the degree program, subject to completion of appropriate prerequisites and space availability.

Core courses in Statistics (21):

ST 516 Foundations of Data Analytics Probability distributions; basic principles of estimation and hypothesis testing; methods for one- and two-sample problems; introduction to simulation. Computer lab using R. PREREQ: ST 351 or equivalent.

ST 517 Data Analytics Linear regression – model fitting, evaluation, and interpretation; prediction; missing data and data imputation; mixed models; scaling up to large datasets. Computer lab using R. PREREQ: ST 516.

ST 518 Data Analytics II Methods for categorical data – tables of counts, logistic regression, log-linear regression, prediction, mixed models; scaling up to large datasets. Computer lab using R. PREREQ: ST 517.

ST 566 Time Series Analytics Methods for analyzing and forecasting time series data; serial correlation; smoothing; Autoregressive moving average models; spectral analysis; State-space models; Kalman Filter. PREREQ: ST 518.

ST 558 Multivariate Analytics Basics of matrix algebra, principal components analysis, cluster analysis, factor analysis, multidimensional scaling. PREREQ: ST 518.

ST 595 Capstone project Under the direction of an advisor, a team of students will tackle a complex data problem to address an important question of interest, culminating in a written report and oral presentation.

These courses are all under development, but large pieces of them will be adapted to the big data context from existing courses in the Statistics Department catalog. Most of the ST 516 material is in current versions of ST 521 and ST 511; most of ST 517 and ST 518 is in the current versions of ST 512 and ST 513; and Time Series Analytics and Multivariate Analytics will be adapted from existing courses in Time Series (ST 565) and Multivariate Analysis (ST 557).

Core courses in Computer Science (12 credits):

CS 511 Programming Concepts for Non-majors Topics include: variables, control structures, and functions; Big-O notation and concept; linear data structures (arrays, vectors, lists, stacks, queues, hash tables)**;** binary search trees; heaps; searching and sorting.

CS 512 Big Data Management Topics include: accessing and distributing data online; non-relational databases; map reduction; multi-node data processing; load balancing; types of data-stores. PREREQ: CS 516.

CS 513 Applied Machine Learning Supervised learning: algorithms (decision trees, naïve Bayes, support vector machines); ensemble methods (boosting, bagging, random forests); discriminative vs. generative methods; model selection and evaluation for supervised learning; feature selection. Unsupervised learning: algorithms (single-linkage clustering, k-means, Gaussian mixture models, spectral clustering; model selection and evaluation for unsupervised learning. Semi-supervised leaning: EM; graph-based methods; multi-view methods. PREREQ: ST 517 and CS 516.

Approved courses in the Health Analytics Area of Concentration:

ST 525 Applied Survival Analysis
ST 591 Introduction to Quantitative Genomics
ST 592 Statistical Methods for Genomic Research

Applied Survival Analysis will be adapted from our ST 625, Generalized Regression Models II course, which focuses on survival analysis. Statistical Methods for Genomic Research will be adapted for online delivery from a course offered by the Statistics Department in Winter 2013 and 2015. Introduction to Quantitative Genomics was taught for the first time in Fall 2014.

Approved courses in the Statistics Area of Concentration:

ST 515 Design and Analysis of Planned Experiments
ST 539 Survey Methods
ST 537 Data Visualization
ST 538 Modern Analytical Methods for Large and Complex Datasets
ST 588 Data Mining

ST 539 was taught via Ecampus for the first time in Spring Term 2015. ST 515 has been developed with Ecampus for on-line delivery. The Data Visualization course was taught in the Summer of 2014 on campus, and will be adapted for Ecampus. The course for large and complex datasets will be taught for the first time on campus in Spring Term 2015, and thereafter developed for Ecampus delivery.

The Graduate Certificate in Data Analytics will include ST 516, ST 517 and ST 518, as well as ST 566 Time Series Analytics and ST 548 Multivariate Analytics for a total of 18 credits. The requirements for admission to the Certificate program will be the same as those to the M.S. program.

d. Manner in which the programs will be delivered

All courses will be offered online, in cooperation with Ecampus. To give some context to this decision, we note that a 2012 Custom Research Brief on Graduate Degrees and Certificates in Analytics prepared by the Education Advisory Board examined 20 graduate programs in analytics. Eleven of these programs were established in the 2010-11 timeframe, seven began in 2012, and two were scheduled to begin in 2013. Of those programs, four offer both online and in-person formats, one program is hybrid and three programs are offered exclusively online. We expect that the audience for our programs will be drawn largely from pool of industry and government professionals (mostly outside Corvallis) in positions that require statistical or analytical skills. Students from this population would likely continue to work while pursuing an advanced degree, making the online offering quite appealing. It is possible that the programs, especially the Certificate program, will also attract students from Oregon and beyond who are not working, but who might not want to incur the added expense of moving to and living in Corvallis. These factors suggest to us that an online format is more likely to be successful.

OSU has a strong Ecampus presence with a marketing apparatus already in place, including mechanisms and resources to assist with course/program development. In addition, the Department of Statistics already has a fairly strong Ecampus presence and experience in online course development and delivery.

e. Ways in which the programs will seek to assure quality, access, and diversity.

All applications will be reviewed by the Director of the M.S. in Data Analytics program. After a preliminary screening, additional admissions committee members will review applications. Applicants must meet the minimum requirements for admission to the Graduate School, and they must have at least one undergraduate course in Statistics, at the level of ST 351. The applicants' statement of intent and reference letters will be evaluated to ensure that the applicants have the dedication required to complete a rigorous online program.

Given that the programs will be delivered exclusively online, we will work with Ecampus as we develop new courses to ensure 'best practices' and accessibility of all courses. We will also market the program broadly to help ensure diverse cohorts of students. Because of our existing M.S. program in Statistics, we are well connected with Universities around the world. We will make additional efforts to market the program in the private sector.

f. Anticipated fall term headcount and FTE enrollment over each of the next five years.

An initial cohort of approximately 10 students is anticipated for Fall Term 2015 in the M.S. program, when the program will commence. For the 2016-17 academic year we expect the total enrollment in the M.S. program to be approximately 20, increasing to 30-40 by Academic Year 2019-2020. Numbers in the Graduate Certificate program may be higher in the long run, though we anticipate smaller numbers in this program at the outset—5 students in Fall Term 2015, increasing to 15-20 by Academic Year 2019-20.

g. Expected degrees/certificates produced over the next five years .

Beginning in 2017, we expect to award about 10 M.S. degrees and 5 Graduate Certificates per year, increasing to 20 and 15 per year, respectively, over a five-year period.

h. Characteristics of students to be served

As these are online programs, many if not most of the students are likely to be outside the Corvallis area, and some may be outside the state. We anticipate that most of our students will be professionals who are looking to add more data analytic tools to their workplace and/or who are seeking advancement or transition to a new functional area. We expect to have both full- and part-time students in the M.S. program. There is not a full-time option for the Graduate Certificate as the ST 516, ST 517, ST 518 sequence must be taken before the Time Series Analytics and Multivariate Analytics courses.

i. Adequacy and quality of faculty delivering the programs

All courses in the programs will be developed and taught by full-time OSU faculty members, recruited according to the same standards as all OSU faculty. Careful vetting

will be carried out for any part-time faculty, though none are anticipated at this time. Faculty in the Statistics Department involved with developing and teaching these courses are:

Faculty	Degree	Rank	Status
Sharmodeep Bhattacharyya	PhD Statistics, Univ of Cal, Berkeley	Assistant Professor	9 month, 1.0 FTE
Yanming Di	PhD Statistics, University of Washington	Assistant Professor	9 month, 1.0 FTE
Sarah Emerson	PhD Statistics, Stanford University	Assistant Professor	9 month, 1.0 FTE
Alix Gitelman	PhD Statistics, Carnegie Mellon University	Associate Professor	9 month, 1.0 FTE
Yuan Jiang	PhD Statistics, University of Wisconsin	Assistant Professor	9 month, 1.0 FTE
Virginia Lesser	DrPH Biostatistics, University of North Carolina	Professor	12 month, 1.0 FTE
Debashis Mondal	PhD Statistics, University of Washington	Assistant Professor	9 month, 1.0 FTE
Tom Sharpton	PhD Microbiology, Univ of Cal, Berkeley	Assistant Professor	9 month, 0.3 FTE in Statistics
Charlotte Wickham	PhD Statistics, Univ of Cal, Berkeley	Assistant Professor	9 month, 1.0 FTE
Lan Xue	PhD Statistics, Michigan State	Associate Professor	9 month, 1.0 FTE

Justin Wolford	MS Computer Science, Oregon State University	Instructor	9 month, 1.0 FTE
Weng-Keen Wong	PhD Computer Science, Carnegie Mellon University	Associate Professor	9 month, 1.0 FTE

j. Faculty resources

All faculty in Statistics are full-time faculty on 9- or 12-month appointments. Wolford in Computer Science is a full-time instructor, and Wong is a 9-month, full-time Associate Professor. The Department of Statistics will have one new faculty member beginning Fall Term 2015 who will handle some of the teaching needs for this program, and possibly the Directorship of these programs.

k. Other staff

Clerical support (0.3 FTE) will be needed to help administer the programs. GTA support will be needed as the programs grow.

l. Facilities, library and other resources

A small amount of funding will be needed for student recruitment, in partnership with Ecampus marketing. Existing staff and computing infrastructure will be able to handle the increased student load. The Department is in the process of investing in additional computing resources for its faculty and students.

m. Anticipated start date

Winter 2016.

2. Relationship to mission and goals

a. The OSU mission statement reads:

"As a land grant institution committed to teaching, research, and outreach and engagement, Oregon State University promotes economic, social, cultural and environmental progress for the people of Oregon, the nation, and the world. This mission is achieved by producing graduates competitive in the global economy,

supporting a continuous search for new knowledge and solutions, and maintaining a rigorous focus on academic excellence……."

Private companies, government agencies, and academic researchers all now deal with huge data streams on an everyday basis. Teaching and research aimed at improving the ability of these groups to analyze big very large amounts of data or "big data" clearly contributes to economic, social**,** cultural, and environmental progress by promoting deeper, more accurate, and more effective utilization of the data essential to their functioning. The proposed programs, that will be unique in the state, will serve the needs of both public and private interests seeking to make more effective use of their data resources.

b. Connection to strategic priorities and signature areas of focus

One of three focus areas in OSU's Strategic Plan is Promoting Economic Growth and Social Progress, and the goal includes "an expanding institutional culture of innovation and collaboration." Making effective use of big data is essential not only to academic researchers and industry, but also to health providers, managers of ecological resources, transportation experts, and professionals in countless other fields. The proposed programs are cutting-edge programs in data analytics, and the multidisciplinary nature of the M.S. program in particular will help to advance OSU's burgeoning culture of collaboration.

c. Contribution to OUS goals for access, etc.

Since there is no OUS, we will presume that the new structure involving the Higher Education Coordinating Commission will adopt goals for access similar to those of OUS. The OUS goals for access include educational opportunities for non-traditional students. We believe that these programs will appeal mainly to working professionals in positions that increasingly demand big data analytic skills. By offering the programs online, we will provide an opportunity for students not necessarily located in Corvallis, or even in Oregon, to deepen their data analytic skills. The design and execution of courses by OSU faculty members will ensure quality products. As this is a very new area of academic study, we anticipate many opportunities for knowledge creation and innovation as the programs develop.

d. Meeting statewide needs

The need for collecting and analyzing big data does not know state boundaries. One could argue that in certain areas, such as environmental monitoring, Oregon's needs are greater than those of most states. Yet to date there is no program in Oregon aimed at preparing data analytic professionals to cope with the big data onslaught. Areas such as health services, resource management, and emergency preparedness need to gather and analyze huge data sets and so do banks, insurance companies, and marketing specialists. The proposed online program would be a resource for the entire state and for the Northwest region.

3. Accreditation

At present there is no recognized accrediting body for programs of this sort. Data analytics programs are quite new; they come in many different varieties, and there is no consensus as yet regarding what these programs should look like.

4. Need

a. Evidence of market demand

Evidence from many sources indicates that the proposed program is very timely. The McKinsey study alluded to above attests to the incipient demand for trained professionals in data analytics. Another telling sign is the nationwide proliferation of graduate programs, primarily at the Master's level, in "data analytics", "data science," and programs with other titles aimed at preparing professionals to deal with huge data sets. Some of these programs have acceptance rates below 15%, and starting salary offers to graduates of the NC State Master's program averaged over $96,000.

Our own experience provides direct evidence of interest in big data. In 2013, the Department of Statistics introduced a course, "Statistical Methods for Genomic Data", which enrolled 32 students, many from outside the department. In 2014, the course "Statistical Computing and Big Data" was offered for the first time; the course was capped at 30, and 30 students were enrolled. In addition, recent conversations involving the OSU Departments of Statistics and Electrical Engineering and Computer Science and business leaders in the state have indicated a keen interest in a program of this sort.

Finally, it is relevant to mention a market analysis carried out in 2013 for a certificate program proposed by the Department of Statistics in Applied Statistics/Data Analytics. This analysis found that about 90% of students in similar certificate programs were currently employed, with many aiming to acquire the skills to transition into a new functional area. The leading employers of these students were professional, scientific, and technical services; educational services; insurance carriers; and hospitals. The analysis noted that "industry professionals with five or more years of experience in positions that require statistical or analytical skills and who seek advancement or transition into new functional areas enroll in applied statistics/analytics programs." Significantly, students preferentially sought "data analytics" certificates; at Colorado State University, for example, there were twice as many inquiries regarding "data analytics" as for "applied statistics." It seems reasonable that at least some of this analysis would be relevant for our proposed programs, with the audience for our degree being drawn in part from this same population.

b. If the program's location is shared with another similar OUS program, proposal should provide externally validated evidence of need (e.g., surveys, focus groups, documented requests, occupational/employment statistics and forecasts).

Not applicable**.**

c. Manner in which the program would serve the need for improved educational attainment in the region and state.

One of the potentially great advantages of distance learning is that sparsely populated states (which Oregon essentially is) can participate electronically in new educational endeavors. By delivering this program through distance learning, opportunities would be enhanced for educational attainment throughout the state and region in an area rapidly becoming critical to our economic and scientific future.

To date there are no similar programs in Oregon (or Idaho, to our knowledge). The program in Data Science at the University of Washington in Seattle is run by their Department of Computer Science and appears to have more emphasis on computer science and less on statistical analysis than the programs we propose.

d. Manner in which the program would address the civic and cultural demands of citizenship

Meaningful participation in citizenship requires an informed citizenry, and with the amount of data now at our fingertips, effective ways of extracting information from data and summarizing data efficiently are critical to our civic and cultural development. The proposed program would contribute to the public's ability to develop critical thinking skills and to approach data thoughtfully.

5. Outcomes and quality assessment

a. Expected learning outcomes of the program

Learning outcomes for each of the individual courses will be provided by the instructors of the course, who will have the primary responsibility to see that these outcomes are achieved. The overall goal of the Data Analytics programs is to equip quantitative professionals with the tools to gather, analyze and interpret data collected on scales up to terabytes *(10^12 bytes)* or even petabytes *(10^15 bytes)*. Upon completion of the M.S. program, students will be able to:

(i) Describe and apply the basic principles of statistical inference and commonly used statistical models, machine-learning tools, and database tools.

(ii) Select appropriate statistical and computational methods and apply analytical skills to effectively summarize, visualize, and make valid inferences from data.

(iii) Fit and evaluate simple and multivariate linear regression models and generalized linear models.

(iv) Perform appropriate analyses on time-series data and multidimensional data.

(v) Describe and implement data-mining tools.

(vi) Show proficiency in R and database programming.

(vii) Communicate quantitative results to individuals who may not have expertise in either statistics or computer science.

(viii) Apply essential database skills such as storing, organizing and manipulating large amounts of data contained in databases.

(ix) Perform data cleaning and data imputation.

(x) Articulate principles of statistical and data ethics.

Learning outcomes for the Graduate Certificate program are items (i), (ii), (iii), (iv), (vii), and (x) from the list above.

b. Methods by which the learning outcomes will be assessed and used to improve curriculum and instruction

Learning outcomes will be assessed in course assignments, course exams, and the final capstone project. Exit surveys will be carried out with all students upon finishing the program.

c. Program performance indicators, including prospects for success of program graduates

Students will be surveyed at intervals after leaving the programs. Employment placement of students and their rate of compensation will be a key indicator of program quality. Employers will be surveyed periodically to ascertain their views of the programs and to aid in determining what skills should be emphasized (or not) in the curriculum.

d. Nature and level of research and/or scholarly work expected of program faculty

Nearly all program faculty will be full-time OSU faculty members, so the expectations will be the same as those for other OSU faculty. Therefore, publication of research in peer-reviewed journals will be the principal indicator of success.

6. Program Integration and Collaboration

To the best of our knowledge, there are no closely related programs in other Oregon universities or Oregon private institutions. As outlined above, the program represents a collaboration with the Department of Electrical Engineering and Computer Science, which will provide course offerings in the program. Although the Department of EECS is developing a suite of courses specific to the M.S. program, we would not expect any substantial impact on their budget or enrollments, apart from the teaching resources devoted to these three courses.

7. Financial Sustainability

a. Business plan for the program that anticipates and provides for its long-term financial viability.

Proposed classes will be developed and taught by existing faculty. A number of these faculty members were recently hired in the past year and another search is underway this year. We anticipate revenue generated from tuition would provide support for the GTAs that may be needed if larger classes require the need for grading assistance. For the initial program, current classified staff can assist in the program management. As the program grows, revenue generated from tuition would support additional staff needs if required. There is no anticipated need for library resources.

b. Plans for development and maintenance of unique resources necessary to offer a quality program in the field.

Since the program is online, no on-campus unique resources are needed. The department is in the process of investing departmental resources to increase computer capabilities for both on-campus and the anticipated students in this program.

c. Targeted student/faculty ratio.

Since the department recently hired three new faculty, we anticipate that there would be no negative changes to our current student/faculty ratio, which has been 5:1 at the graduate level.

d. Resources to be devoted to student recruitment.

Since this in a new online program, we are partnering with Oregon State Ecampus in the development and delivery of the M.S. Data Analytics and Graduate Certificate in Data Analytics. Marketing and student recruitment will be led by the Ecampus Marketing and Enrollment Services team. We are in the process of developing a Memorandum of Understanding with Oregon State Ecampus. This will include market research,

marketing planning, marketing implementation and enrollment management. The department will provide funds from our foundation accounts to provide travel for faculty to attend key national meetings to advertise the program and recruit students.

8. **External review.** It is our understanding that this will occur after the proposal has made it through the OSU process. The Department had one visitor in fall 2014 who discussed the M.S. program in analytics developed at his University and provided input on our program.

The following are potential reviewers for the programs. All institutions have analytics or data science programs offered from their departments.

David Dickey, PhD in Statistics
Professor of Statistics – Department of Statistics
North Carolina State University
dave_dickey@ncsu.edu
919-515-1925

Jean Opsomer, PhD in Statistics
Professor and Chair of Statistics – Department of Statistics
Colorado State University
jopsomer@stat.colostate.edu
970-491-3841

Mahler Tadesse, ScD in Biostatistics
Associate Professor – Department of Mathematics and Statistics
Georgetown University
mgt26@georgetown.edu
202-687-6067

Wayne Woodward, PhD in Mathematical Statistics
Professor and Department Chair – Department of Statistical Science
Southern Methodist University
214-768-2368

Dan Sptizner, PhD in Statistics
Associate Professor – Department of Statistics
University of Virginia
spitzner@virginia.edu
434- 924-3269

James Albert, PhD in Statistics
Professor- Department of Mathematics and Statistics
Bowling Green State University,
albert@bgsu.edu

419-372-7456