

# LISA

## Laboratory for Interdisciplinary Statistical Analysis

Annual Report  
2008-2009

October 6, 2009



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## LISA Collaborators

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Dr. Eric Vance, Director

Dr. Ying Liu, Associate Director

### Lead collaborators

Abdo Abdel-Salam

Dipayan Maiti

Denisa Olteanu

Mark Seiss

Ciro Velasco-Cruz

### Associate Collaborators

|                  |                  |                        |
|------------------|------------------|------------------------|
| Khaled Bedair    | Matthew Maher    | Xiaowei Wang           |
| Jeff Belcher     | Patrick McCann   | Matt Williams          |
| Yi Chao          | Elaine Nsoesie   | Xiangrong (Sarah) Wang |
| Jinsong Chen     | David Peng       | Pei Xiao               |
| Lulu Cheng       | Mari Rossman     | Chongrui Yu            |
| Xiaobo Guo       | Charles Sabatia  | Huaiye Zhang           |
| Nels Johnson     | Marwah Soliman   | Wen Zhang              |
| Jennifer Kensler | Nicholas Stewart | Sunan Zhao             |
| Bo Liu           | Sai Wang         | Jake Zielinski         |

### Statistics Faculty Collaborators:

Dr. Ina Hoeschele

Dr. Scotland Leman

Dr. Eric Smith

Dr. Bill Woodall

## Introduction and LISA Mission:

Created in 2008 from the Statistical Consulting Center, the mission of LISA (Laboratory for Interdisciplinary Statistical Analysis) is to provide service, research, and education to the University.

- **Service** LISA is dedicated to supporting the research mission of Virginia Tech. This includes collaborating with faculty, staff, and students on their research, assisting graduate students with theses and dissertations, and improving the statistical literacy of all University members.
- **Research** Statistical research topics often arise from practical applications. LISA seeks to nourish these research opportunities for the growth of statistical research in the Department of Statistics.
- **Education** Interdisciplinary collaboration and statistical consulting are essential components of the M.S. and Ph.D. programs in the Department of Statistics. Many projects are supervised by faculty but led by the students themselves, thus fostering learning through engagement.  
LISA also offers a series of Short Courses designed to help graduate students apply statistics in their research.

The LISA collaborators are faculty and graduate students in the Department of Statistics. LISA has a full-time director and assistant director who meet with faculty clients and oversee a team of full and part-time graduate student collaborators. In addition, the entire Statistics faculty may be available for collaboration.

Statistical assistance is free for Virginia Tech faculty, staff, and students. LISA is jointly funded by the College of Science, the Provost Office, the Office of Research, the Graduate School, and six additional colleges (Agriculture & Life Sciences, Architecture & Urban Studies, Liberal Arts & Human Sciences, Natural Resources, Business, and Engineering). The Department of Statistics also provides funding for many of the LISA statistical collaborators and provides other support for LISA's activities.

LISA provides statistical consultation and collaboration on projects outside of Virginia Tech for a fee. Students in the Department of Statistics also provide pro-bono statistical consultation and collaboration for local community non-profits, schools, and governmental organizations through StatCom.

### Activities and Innovations in 2008-2009:

From all over Virginia Tech, 819 faculty, staff, and students used LISA for assistance in designing their experiments, developing new theories from existing data, interpreting results of statistical analyses, writing grant proposals, answering quick questions about statistics, and for learning new statistical tools. LISA accomplished this by following the tradition of its predecessors—the Statistical Consulting Center (1974-2007) and the Statistical Laboratory (1948-1973)—in providing high quality, one-on-one statistical collaboration meetings for 245 researchers and collaborating on ten grant proposals. In 2008 LISA introduced the Walk-in Consulting Service for faculty, staff, and students who had quick statistical questions or projects requiring less than 30 minutes of assistance. In its first year of operation, the LISA walk-in consultants met with 195 Virginia Tech researchers. Also in 2008 LISA started a series of short courses designed to teach graduate students to use statistics in their research. Three hundred seventy-nine students attended the 14 LISA Short Courses.

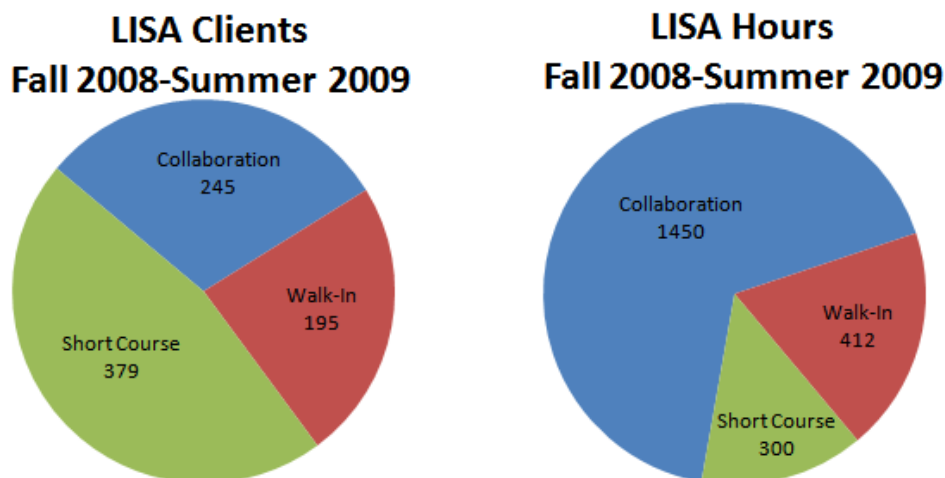


Figure 1: Number of clients and hours for LISA's three main services.

## Collaboration Meetings:

As a *laboratory* for interdisciplinary statistical analysis, LISA focuses on creating new ideas by contributing statistical expertise to projects across disciplines. During the collaboration meetings, which typically last about one hour with multiple follow-up meetings as necessary, LISA statisticians meet with researchers to discuss their research goals, the nature of the data collected or to be collected, how the data can be analyzed to answer the researcher's specific questions, and what the statistical results mean in terms of the research goals.

As Figures 2-5 show, LISA met with collaborators from all over campus, Blacksburg, and Virginia. In addition, LISA established a national and international presence by working with researchers stationed in Florida, the Dominican Republic, and Botswana.



Figure 2: Locations of researchers around the world who collaborated with LISA.





Figure 3: Locations of researchers around Virginia who collaborated with LISA.

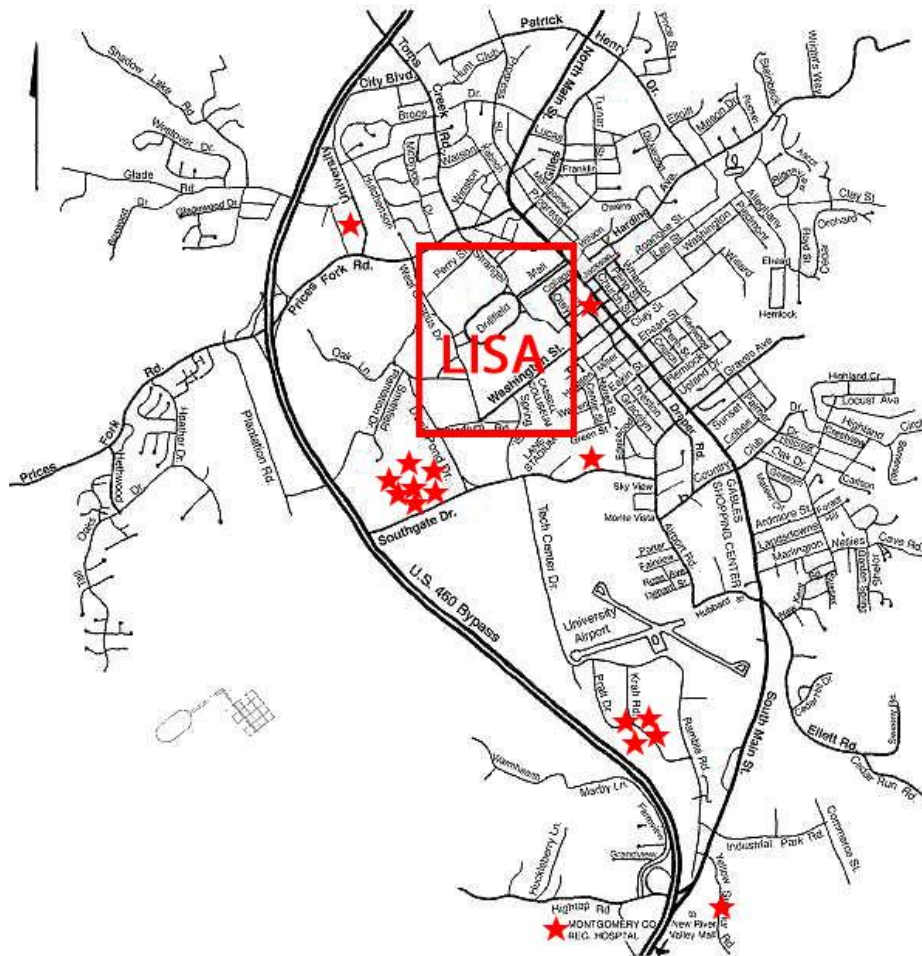
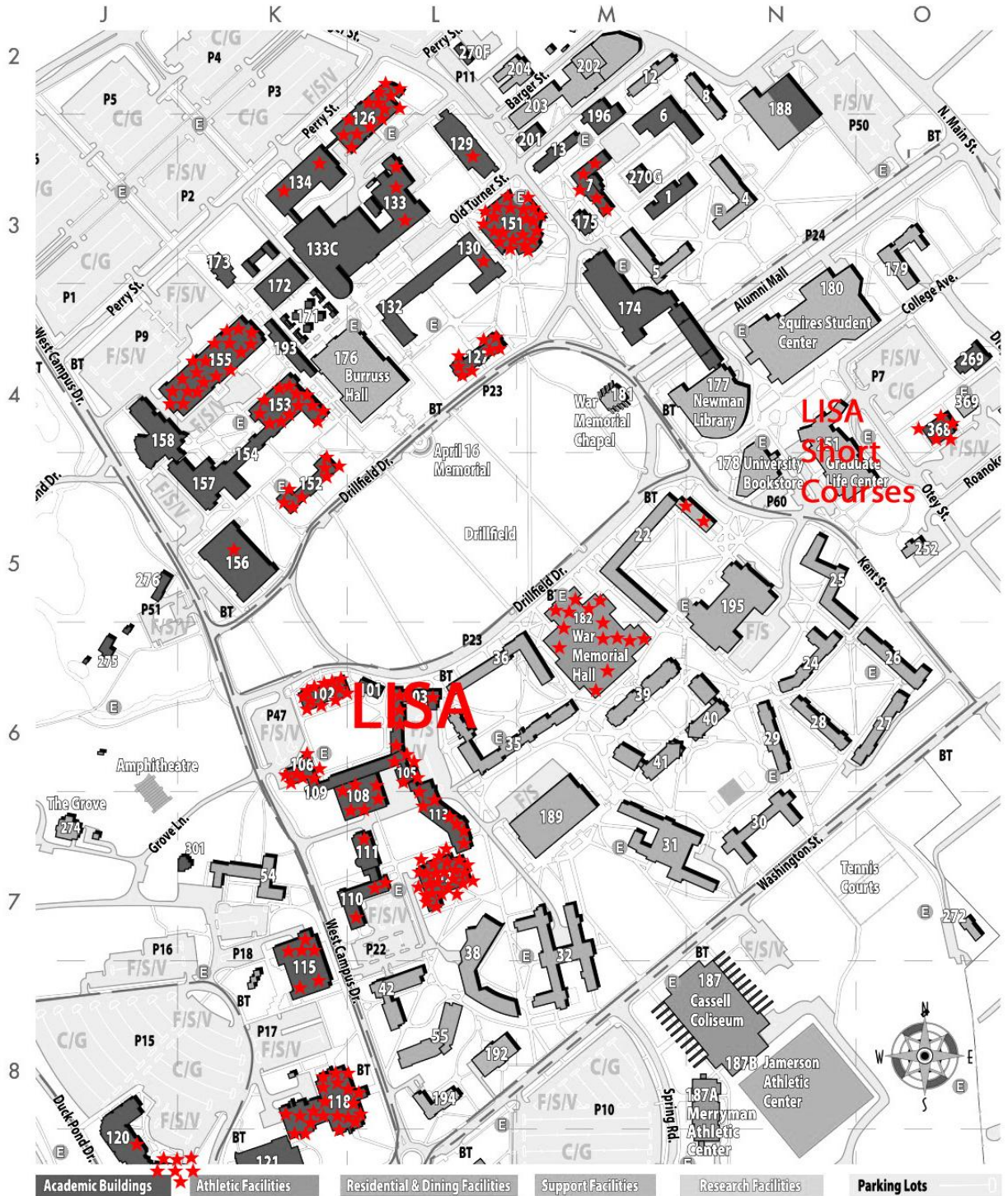


Figure 4: Locations of researchers around Blacksburg who collaborated with LISA.





# CENTRAL CAMPUS MAP



"Invent the Future" is a registered trademark of Virginia Tech. Virginia Tech is an equal opportunity, affirmative action institution.

Figure 5: Locations of researchers on Central Campus who collaborated with LISA.



LISA met with 102 researchers during Fall 2008 for a total of 560.75 hours. In Spring 2009 LISA met with 89 researchers for 594.25 hours. In Summer 2009 LISA met with 54 researchers for 295 hours. Figures 6 and 7 below show these numbers for each of the eight Virginia Tech colleges plus a combination of collaborators from VCOM, VBI, VTTI, HR, Carilion Clinic, and other institutions.

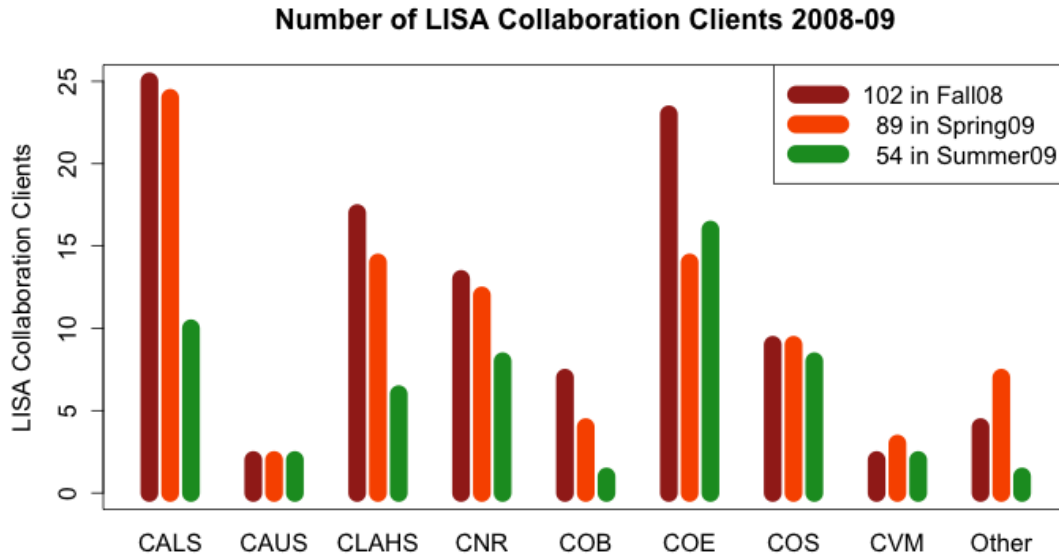


Figure 6: Number of LISA collaboration clients per college.

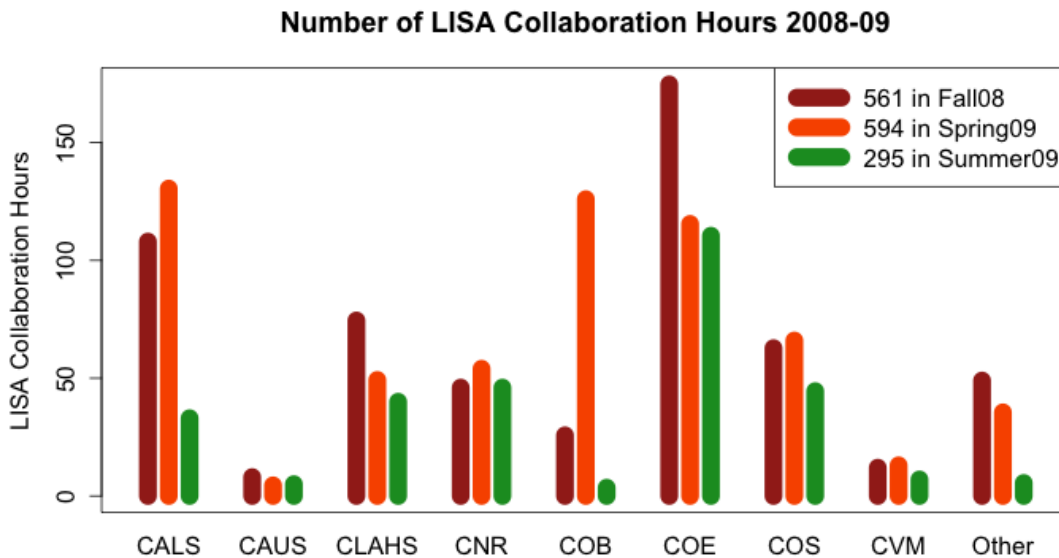


Figure 7: Number of LISA collaboration hours per college.

The following table (Figure 8) shows the total hours worked on collaboration projects by LISA faculty and graduate students. For each college the numbers of hours are tabulated according to the category of the LISA statistical collaborator—either Faculty (F) or Graduate Student (G)—and whether the client was Faculty/Staff (F/S) or a Graduate Student (G). About half (51%) of the total hours worked on collaboration projects were between graduate students from LISA and graduate student clients (G to G). About one-third (32%) of the reported hours on collaboration projects for AY 2008-2009 were from LISA Faculty members (F to F/S and F to G).

| Total Collaboration Hours 2008-2009 |          |        |          |        |             |
|-------------------------------------|----------|--------|----------|--------|-------------|
| College                             | F to F/S | F to G | G to F/S | G to G | Total Hours |
| CALS                                | 61.5     | 32     | 43.5     | 134.5  | 271.5       |
| CAUS                                | 3        | /      | /        | 14.5   | 17.5        |
| CLAHS                               | 2        | 26.25  | /        | 135.5  | 163.75      |
| CNR                                 | 8        | 20     | 13.5     | 104.5  | 146         |
| COB                                 | 23.75    | 1.5    | 88.5     | 41.5   | 155.25      |
| COE                                 | 143.5    | 17.5   | 34       | 205.75 | 400.75      |
| COS                                 | 43.75    | 10     | 39       | 80.5   | 173.25      |
| CVM                                 | /        | 12.5   | /        | 19.5   | 32          |
| Other                               | 56.5     | 3      | 28.5     | 2      | 90          |
| <b>Total</b>                        | 342      | 122.75 | 247      | 738.25 | 1450        |
| <b>Percent</b>                      | 24%      | 9%     | 17%      | 51%    | 100%        |

Figure 8: Total hours worked on collaboration projects by LISA Faculty (F) and Graduate Students (G) for Faculty/Staff (F/S) and Graduate Students (G) in the eight colleges and Other category.

## Walk-in Consulting Service:

In order to offer services to Virginia Tech researchers who might not require the intense, personalized efforts of the collaboration meetings, LISA introduced walk-in consulting for answering quick questions and giving statistical advice on smaller, simpler projects. Seventy-five clients used this service during Fall 2008. Another 74 used the LISA Walk-in Consulting Service in Spring 2009, and 46 used this service during Summer 2009. Figure 9 below shows how these numbers were distributed among the colleges.

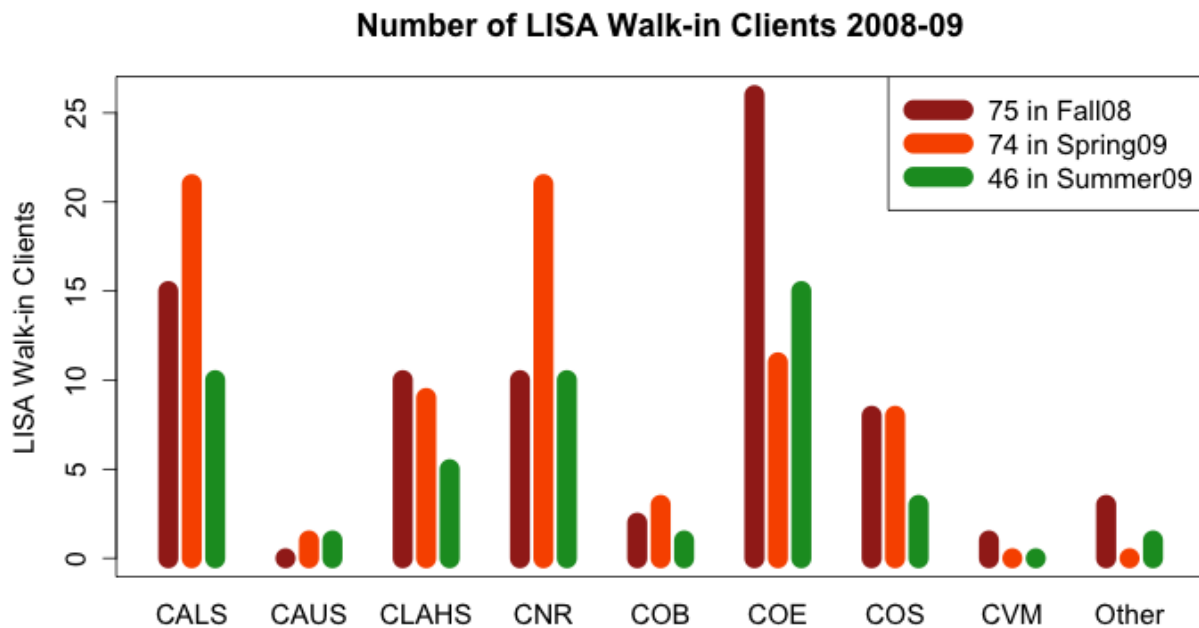


Figure 9: Number of clients for the LISA Walk-in Consulting Service by college and term.

## LISA Short Courses:

The LISA Short Courses were introduced in the Summer of 2008 to teach graduate students statistical tools to apply in their own research. These two-hour short courses, taught by graduate students from LISA, proved to be popular with students from all over Virginia Tech. The tables in Figure 10 and the plot in Figure 11 below describe the course titles, attendance figures, and distribution of students from the colleges for the 14 short courses.

| <b>Fall 2008</b>          |   |                   |
|---------------------------|---|-------------------|
| <b>Date</b>               | <b>Title</b>  | <b>Attendance</b> |
| October 15 <sup>th</sup>  | Designing Experiments: What's Important and When to Get Help  | 42                |
| October 21 <sup>st</sup>  | ANOVA, MANOVA, t-tests  | 50                |
| October 28 <sup>th</sup>  | Dimensional Reduction and Classification Using PCA, Factor Analysis and Discriminant Functions – A Short Overview | 34                |
| November 5 <sup>th</sup>  | Regression for Binary and Count Data: Logistic and Poisson Regression   | 28                |
| November 12 <sup>th</sup> | How to Do a Linear Regression and Interpret Your Results  | 37                |
|                           |   | 191               |

| <b>Spring 2009</b>     |   |                   |
|------------------------|---|-------------------|
| <b>Date</b>            | <b>Title</b>                                | <b>Attendance</b> |
| March 24 <sup>th</sup> | Introduction to R                           | 20                |
| April 1 <sup>st</sup>  | ANOVA and t-tests                           | 34                |
| April 7 <sup>th</sup>  | Overview of Non-Parametric Statistics       | 16                |
| April 14 <sup>th</sup> | Mixed Effect Models and Hierarchical Models | 21                |
| April 22 <sup>nd</sup> | Sampling                                    | 8                 |
|                        |   | 99                |

| <b>Summer 2009</b>    |  |                   |
|-----------------------|--|-------------------|
| <b>Date</b>           | <b>Title</b>                                     | <b>Attendance</b> |
| July 8 <sup>th</sup>  | Mixed Effect Models and Hierarchical Models      | 24                |
| July 14 <sup>th</sup> | Parametric Regression Analysis: A Short Overview | 24                |
| July 22 <sup>nd</sup> | Ordinal Regression                               | 18                |
| July 28 <sup>th</sup> | ANOVA and t-tests                                | 23                |
|                       |  | 89                |

Figure 10: LISA Short Course titles and attendance for Fall, Spring, and Summer 2008-2009.



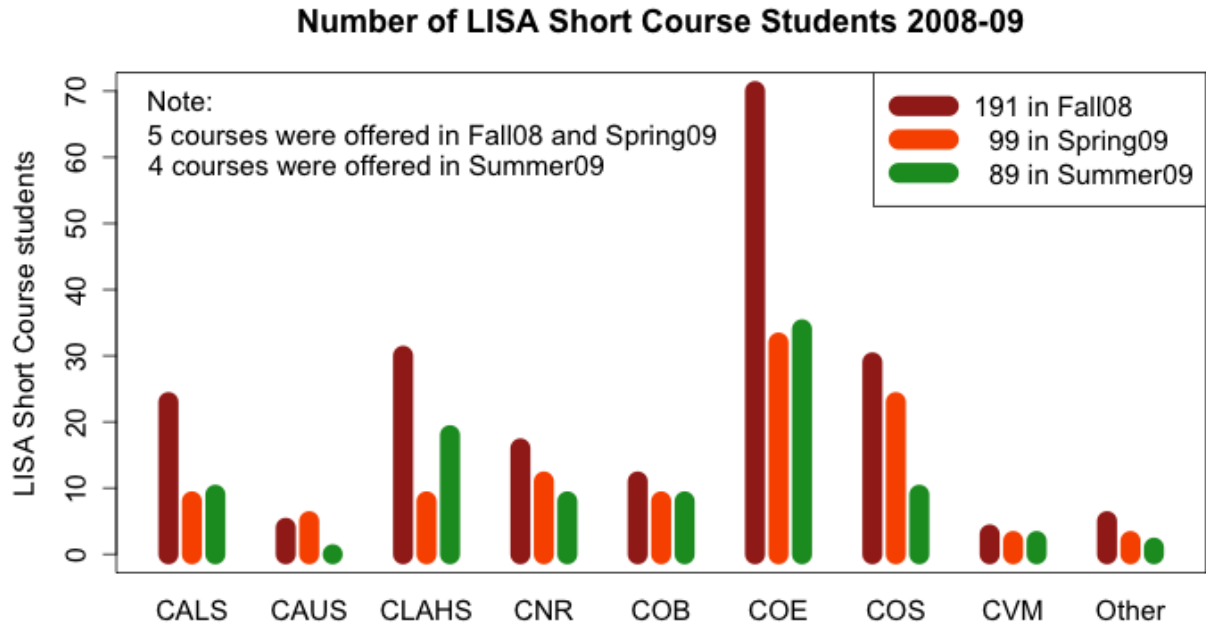


Figure 11: Numbers of LISA Short Course attendees by college.

## LISA Total Hours and Clients:

The following two tables (Figure 12) show the total number of LISA hours and clients for each college and in each semester for our three main services of Collaboration, Walk-In Consulting, and Short Courses.

A.

| Total Hours 2008-2009 |               |            |              |             |            |
|-----------------------|---------------|------------|--------------|-------------|------------|
| College               | Collaboration | Walk-In    | Short Course | Total       | %          |
| CALS                  | 271.5         | 99         | 28           | 398.5       | 19         |
| CAUS                  | 17.5          | 4          | 7            | 28.5        | 1          |
| CLAHS                 | 163.75        | 51         | 40           | 254.75      | 12         |
| CNR                   | 146           | 89         | 26           | 261         | 12         |
| COB                   | 155.25        | 13         | 21           | 189.25      | 9          |
| COE                   | 400.75        | 106        | 100          | 606.75      | 28         |
| COS                   | 173.25        | 40         | 46           | 259.25      | 12         |
| CVM                   | 32            | 2          | 6            | 40          | 2          |
| Other                 | 90            | 8          | 6            | 104         | 5          |
| <b>Total</b>          | <b>1450</b>   | <b>412</b> | <b>280</b>   | <b>2142</b> | <b>100</b> |

B.

| Total Clients 2008-2009 |               |            |              |            |            |
|-------------------------|---------------|------------|--------------|------------|------------|
| College                 | Collaboration | Walk-In    | Short Course | Total      | %          |
| CALS                    | 59            | 46         | 40           | 145        | 18         |
| CAUS                    | 6             | 2          | 9            | 17         | 2          |
| CLAHS                   | 37            | 24         | 56           | 117        | 14         |
| CNR                     | 33            | 41         | 35           | 109        | 13         |
| COB                     | 12            | 6          | 27           | 45         | 6          |
| COE                     | 53            | 52         | 136          | 241        | 29         |
| COS                     | 26            | 19         | 61           | 106        | 13         |
| CVM                     | 7             | 1          | 7            | 15         | 2          |
| Other                   | 12            | 4          | 8            | 24         | 3          |
| <b>Total</b>            | <b>245</b>    | <b>195</b> | <b>379</b>   | <b>819</b> | <b>100</b> |

Figure 12: Table A shows the total number of hours in AY 2008-2009 LISA worked with the various colleges. Table B shows the total number of clients assisted by LISA in AY 2008-2009.

The following two plots (Figures 13 and 14) display the total number of hours and clients for each college in the Fall, Spring, and Summer terms of AY 2008-2009.

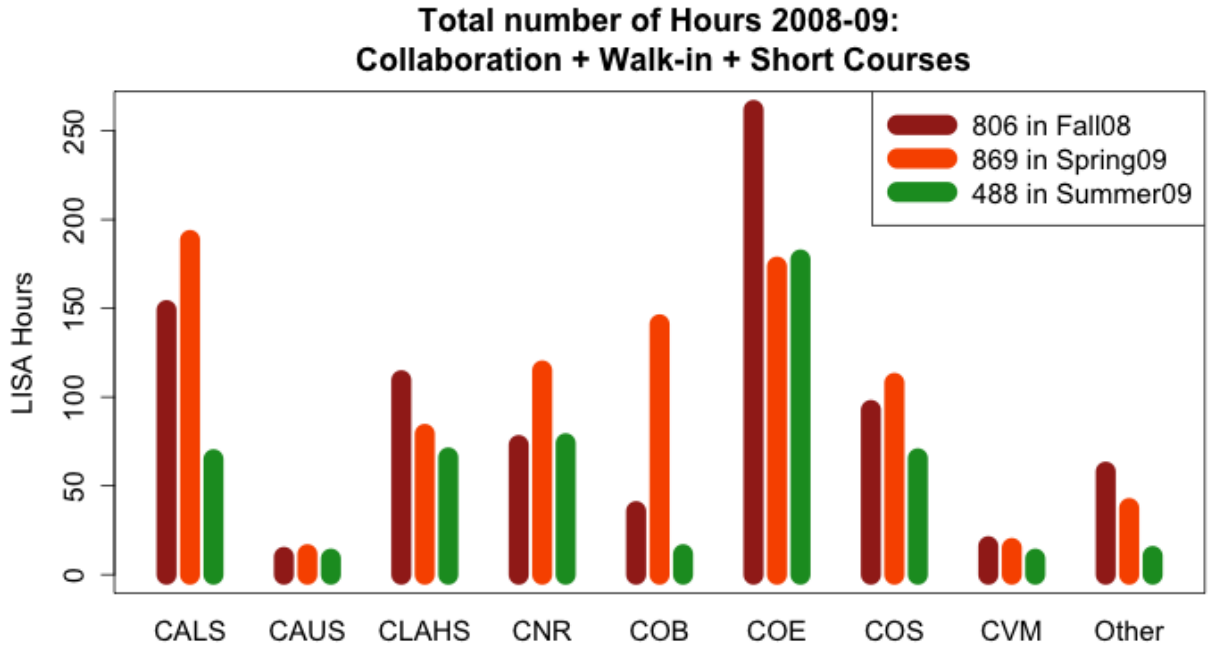


Figure 13: Total number of hours worked by LISA per college in AY 2008-2009.

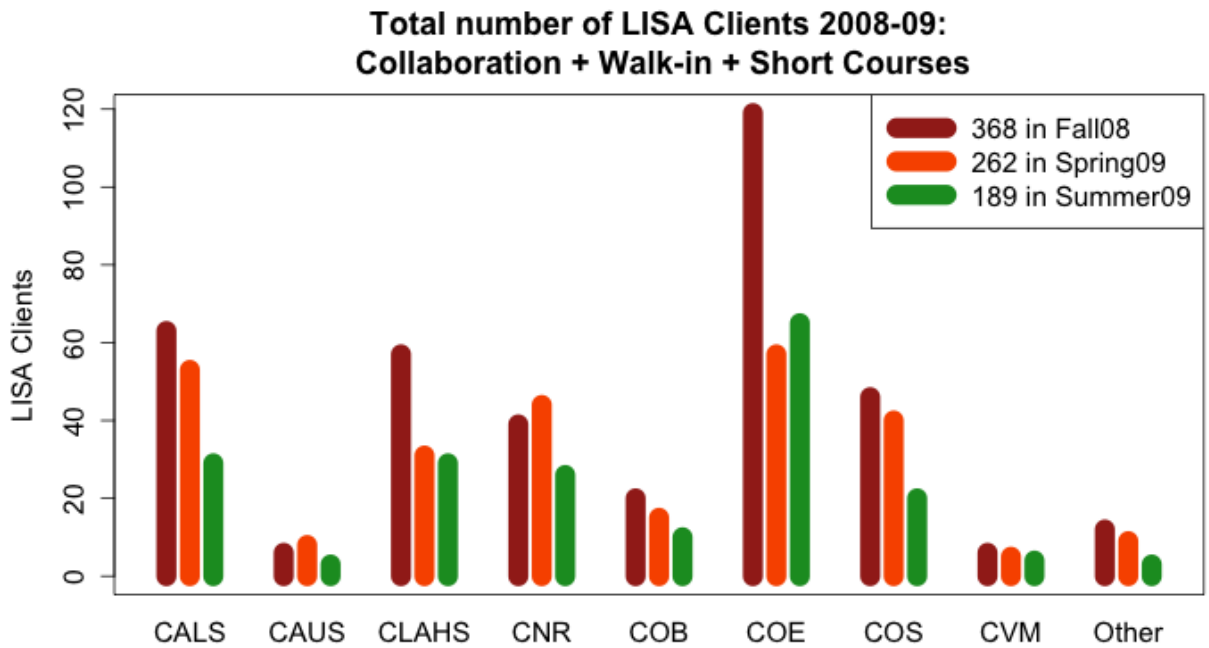


Figure 14: Total number of clients seen by LISA per college in AY 2008-2009.

## Grant Proposals Involving LISA:

One of the functions of LISA is to provide statistical support for sponsored projects and to collaborate with researchers across disciplines on grant proposals. In the AY 2008-09, LISA helped to write, and was included in a supporting role, on four grant proposals:

- “Nanomedical based treatment for Crohn’s Disease,” (PI Ronald D. Tyler Jr., DVM, VMRCVM)
- “CAREER: A Motivated Perspective on Engineering Student Engagement,” (PI Holly Matusovich, PhD, College of Engineering)
- “Contact rates, social structure, and pathogen dynamics in house finches,” (PI Dana Hawley, PhD, College of Science)
- “Assessing Regional Differences in Healthcare Technology Use and Quality,” (PI Anthony D. Slonim, MD, DrPH, Carilion Clinic; Co-PI Christian Wernz, PhD, College of Engineering)

The LISA director, Eric Vance, and assistant director, Ying Liu, were co-PI’s on six grant proposals:

- Co-PI (Ying Liu) “Nanopharmaceutical Intervention in a Rodent Model of Complex Regional Pain Syndrome,” (PI, Don Bivins, MD, VCOM)
- Co-PI (Ying Liu) “Influence of Osteopathic Manipulation on Psoas Major Function: A Sports Performance Based Study,” (PI Joy Palmer, DO, VCOM)
- Co-PI (Ying Liu) “Prevalence of Jones’ Iliacus Tenderpoints in the Young Adult Population,” (PI Joy Palmer, DO, VCOM)



- Co-PI (Eric Vance) “Polymer Beacons for Tracking Cardiovascular DNA Delivery,” (PI Theresa Reineke, PhD, College of Science)
- Co-PI (Eric Vance) “Innovative Instructional Technologies for Student Performance and Engagement in STEM Learning,” (PI Mark Pierson, PhD, College of Engineering; Co-PI Simin Hall, PhD, College of Engineering)
- Co-PI (Eric Vance) “Public Health and Molecular Epidemiology of Tuberculosis in Chobe, Botswana,” (PI Kathy Alexander, PhD, College of Natural Resources)

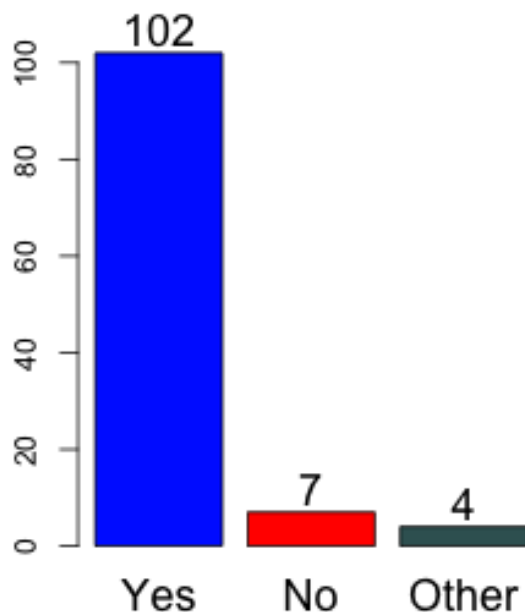
## Activities of StatCom:

StatCom, short for Statistics in the Community, was started at Purdue University in 2001 to provide pro-bono statistical consulting for local non-profits and governmental organizations. The Virginia Tech chapter of StatCom was founded in 2008 by LISA associate collaborator Matthew Williams. The students of StatCom have partnered with the Blacksburg High School AP Statistics class to help students learn statistics. They have also begun a collaboration with the YMCA at Virginia Tech, engaging on 2-3 projects to help the YMCA better serve its community.

## Feedback from Clients:

After the conclusion of each academic term, clients who requested statistical collaboration meetings were asked to fill out a feedback survey evaluating their experience with LISA. Below are the summaries of two of the survey questions (Figure 14) and a selection of comments from clients in each of the eight colleges at Virginia Tech.

**Q1: Was the service you received from LISA helpful?**



**Q2: Were you satisfied with your overall LISA experience?**

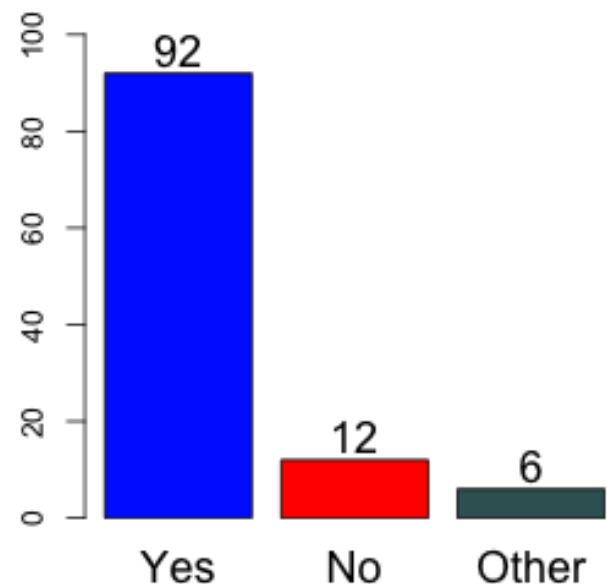


Figure 14: Summary of quantitative feedback on LISA collaboration meetings.

## Selected Client Quotes:

### **Zach Adelman, CALS**

Denisa [Olteanu] worked very hard to help me analyze my data. Eric [Vance] kept asking questions until it was very clear what was the best way forward. They were both very helpful. I feel very optimistic.

### **Callie Richardson, CLAHS**

The experience was extremely beneficial. This is a fantastic service. I feel extremely fortunate. I will definitely continue to seek assistance. My consultant was extremely knowledgeable and made the information easy for me to understand. Sunan Zhao was fantastic as was Dr. Vance. Thank you.

### **Tom McAvoy, CNR**

Felt that the collaborators took the time to understand my project and came up with methods to analyze and present data for publication.

### **Deborah Aruguete, COS**

I'm very, very glad that LISA exists. The meetings went very well. Ciro [Velasco-Cruz] and Sai [Wang] were very helpful. Ciro and Sai were great. The only thing that they possibly could have done would be to instruct me on how to formally report what statistical methods were used. In other words, what do I write in the methods section of my paper? I think I know but I want to make sure I am doing it correctly.

### **Ronald Tyler, CVM**

I am very pleased with the service the statistic department offers. The assistance was very helpful and constructive. The consultants worked to understand what the ultimate goals of the project were and what forms of analyses would be best. Thanks for all the help.

### **Ralph Hall, CAUS**

After returning from fieldwork in Senegal and Africa, our research group contacted LISA to explore whether the group could support our data analysis plans. We used seven different survey instruments in the field and collected thousands of data points, so our data analysis task was immense. Eric Vance, LISA's director, worked with the lead PIs from VT, Stanford University, and the University of Oxford to identify how his graduates could best support the data analysis. We currently have seven LISA-affiliated students working on the data and interact with them on a regular basis. This is an ambitious project and we are very happy to have the full support of LISA. The partnership has enabled the lead PIs to focus on new aspects of the data analysis while providing graduate students at VT with access to primary data collected from the field. We hope that this initial collaboration with LISA will be the first of many such efforts. I would like to thank Eric and his team for the long hours they have invested in manipulating and analyzing our data. We also look forward to working with LISA to identify new and innovate ways to make our data accessible to a broad audience, including the 100 rural communities we visited in Africa.

### **Olga Bruyaka, COB**

While working on my research project I was struggling to develop an appropriate empirical measure that would better capture the theoretical construct I was studying. I sent a request for the meeting via VT web site and in a couple of days I met with Eric Vance and his graduate assistant. We spent one hour and a half talking about my project and what I wanted to measure. I was impressed by the elegance of the solution that Eric Vance suggested to me. I have used the measure that Eric suggested in one of my research papers, which was accepted for presentation at international conferences and which I am preparing for submission in an academic journal. I believe that LISA is a very good initiative. I recommend it to my colleagues who have questions and need help with statistical issues. I will definitely come back to Eric and his team in the near future.

### **Holly Matusovich, COE**

I appreciate that Eric and Nels [Johnson] spoke in terms that I could easily understand rather than jargon. My project was not fully defined when I went to see them and they did their best to stay with my description and helped me identify and talk through some issues. I had a very good experience with LISA and want others to know that this is a valued service that I intend to use again in the future.

## Future Plans:

LISA is focused on continuing to provide high-quality statistical collaboration and consulting for Virginia Tech researchers. In the AY 2009-2010 we will be improving our advertising and publicity efforts to make more researchers across the Virginia Tech campuses aware of our services. We will work to increase our local and international outreach efforts by adding to StatCom's base of local non-profit partners and by continuing to seek opportunities to place LISA statistical collaborators "on the ground" to oversee experimental designs, data collection, and real-time data analysis for international research projects.

## Contact:

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