Victoria Ellison

810 Clarendon St. Apt. 3, Durham, NC 27705 ⧫ 540-521-2276 ⧫ [vmelliso@ncsu.edu](mailto:vmelliso@ncsu.edu)

EDUCATION

**Ph.D.** Operations Research, (*August 2017)*

**North Carolina State University** Raleigh, NC

**Master of Science** Mathematics, *(May 2010)*

**College of Charleston** Charleston, SC

**Bachelor of Science** Mathematics (minor in Statistics), *(May 2008)*

**James Madison University** Harrisonburg, VA

PEER-REVIEWED PUBLICATIONS

Victoria Ellison, Amy Langville, Tim Chartier. "A Davidson College Multi-objective Assignment Problem: A Case Study.” *4OR-A Quarterly Journal of Operations Research.* 2014

MANUSCRIPTS IN PREPARATION

Victoria Ellison, Yahya Fathi, Amy Langville. "A Hierarchical Clustering Extension of the Cluster Ratio Cut.” 2018

Victoria Ellison, Yahya Fathi, Amy Langville. "Using Parametric Linear Programming in Gene Expression Consensus Clustering.” 2018

PRESENTATIONS

* North Carolina State University, Guest Lecture Data Analytics for Engineering ISE 598: 2018. *Introduction to Python for Data Science*.
* INFORMS Annual Conference, Houston, TX: 2017. *A Hierarchical Consensus Clustering Extension of the Minimum Cluster Ratio Problem Applied to Gene Expression Profile Data.* (Session Chair)
* INFORMS Annual Conference, San Francisco, CA: 2014. *A Parametric Programming Approach to Consensus Clustering of Gene Expression Profile Data.*
* INFORMS Annual Conference, Phoenix, AZ: 2012. *Parametric Programming Approach to Gene Expression Clustering using the Clique Partitioning Problem.*
* Cha-Cha Days SEAMS Workshop, Charleston, SC: 2010. *Consensus Clustering via Linear Programming. (Poster)*
* Urban Operations Research Summer Seminar, University of Tsukuba, Tsukuba, Japan August 2010. *Clustering via Optimization.*
* SIAM SEAS Conference, Raleigh, NC: March 2010. *Minimum Weight k-Cliques in Cluster Aggregation.*
* Cha-Cha Days SEAMS Workshop, Orlando, FL: 2010. *Supplemental Instruction Scheduling Problem.* (Poster)
* MD-DC-VA Section MAA Spring 2008 Meeting, Harrisonburg, VA: 2008. *Using Statistical Techniques in Restructuring, Comparing, and Improve Health Care Systems.*
* James Madison University Mathematics and Statistics Colloquia, Harrisonburg, VA: 2008. *Using UNMIX in Estimating Bivariate Scale Mixtures of Normals in Stock Models.*

AWARDS AND HONORS

* **NSF Grant: Ranking and Clustering by Integer and Linear Optimization (Graduate Student)** CISE-CCF-AF-1116963, 2011 – 2016
* **Deans Fellowship**, North Carolina State University, January 2011
* **Honors Scholar Award**, James Madison University, May 2008
* **Graduated Cum Laude,** James Madison University, May 2008
* **President’s List Award**, James Madison University, May 2008
* **Dean’s List Award**, James Madison University, Spring 2005, Spring 2006, Fall 2006, Fall 2007
* **James Madison University Honors Program**, James Madison University, May 2004
* **Meritorious Winner of the 2008 COMAP Interdisciplinary Contest in Modeling**, James Madison University, May 2008
* **Pi Mu Epsilon: National Mathematics Honor Society Member,** James Madison University, August 2007

RESEARCH EXPERIENCE

**Graduate Researcher** *(2009 – 2017)*

**North Carolina State University** Raleigh, NC

**College of Charleston** Charleston, SC

Project: *“Using Linear Programming based Exploratory Techniques in Gene Expression Consensus Clustering.”*

* Developed a hierarchical consensus clustering algorithm using a proposed parametric linear programming model to ascertain the nested nature of disease subtypes using gene expression profile data clustering results.
* Numerical tests showed that for most inputs, this consensus clustering algorithm returned the optimal solution to the median partition problem as well as demonstrated the nested nature of the clusters.
* Proposed a hierarchical clustering extension of the minimum cluster ratio problem. Using linear programming duality theory, proved that this is extension is only a slight modification of the uniform multicommodity flow problem, to which there exists fast polynomial time solvable heuristics. This demonstrated relationship opens the door to creating fast polynomial time solvable heuristics for the consensus clustering algorithm this research proposed.
* Designed a parametric linear programming algorithm which highly reduces the amount of time required to solve large scale, highly degenerate parametric linear programming formulations.

*Technical Languages/Software Used: Xpress-IVE, Python*

**Graduate Researcher** *(2009 –2013)*

**College of Charleston** Charleston, SC

**Davidson College** Davidson, NC

Project: *“A Davidson College Multi-Objective Assignment Problem.”*

* Formulated a multi-objective binary integer linear programming model to optimize the number of volunteers assigned to a group project given volunteer time availabilities in addition to the requirement that each group have 3-5 volunteers and at least one of volunteers has a vehicle. Additional goals were optimized including volunteer group preference, group diversity, as well as the number of volunteers who were assigned to a group with a preferred partner.

*Technical Languages/Software Used: Xpress-IVE*

**Undergraduate Researcher** *(2008)*

**COMAP Interdisciplinary Contest in Modeling - Meritorious Winner**

Project: *“Using Statistical Techniques in Restructuring, Comparing, and Improving Health Care Systems.”*

* Performed factor analysis and cluster analysis to determine quantitative metrics for comparing, assessing, and restructuring a nations’ overall healthcare quality.

*Technical Languages/Software Used: SAS*

**Undergraduate Researcher** *(2007-2008)*

**James Madison University** Harrisonburg, VA

Project: *“Using UNMIX in Estimating Bivariate Mixtures of Stock Models.”*

* Evaluated a new method for estimating scale mixtures of Gaussian curves.
* Applied method to model continuously compounded stock returns

*Technical Languages/Software Used: R*

TEACHING EXPERIENCE

**Instructor**

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| North Carolina State University | College of Charleston |
| * Pre-Calculus *(Summer 2015)* * Deterministic Models in Industrial Engineering *(Fall 2012)* * Calculus II *(Summer 2012*) * Calculus I *(Summer 2011)* | * Elementary Statistics *(Summer 2010)* * College Algebra *(Summer 2010)* * Business Calculus *(Spring 2010)* * Pre-Calculus *(Fall 2009)* |

**Teaching Assistant**

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| North Carolina State University | College of Charleston |
| * Introduction to Probability and Distribution Theory *(Spring 2012)* * Statistical Methods for Quality and Productivity Improvement *(Fall 2011)* * Applied Differential Equations I *(Spring 2011)* * Probability and Statistics for Engineers *(Fall 2010)* | * Calculus I *(Spring 2010)* * Pre-Calculus *(Fall 2009)* |

WORK EXPERIENCE

**Senior Data Scientist** *(August 2015-April 2018)*

**TiVo** New York City, NY

* Designed and performed analysis on stochastic mixed integer linear and nonlinear programming formulation. These formulations were used to select the optimal commercial breaks for a client to place future ad spots on such that probabilistic target reach was maximized.
* Built custom analytics solutions designed to gauge the effectiveness of completed client ad campaigns. Incorporating both TiVo set-top-box viewings data as well as 3rd party data, these custom reports calculated a variety of advertising metrics including ROI, reach, conversion, GRP, frequency distribution. These reports allowed for a high degree of granularity, allowing clients to calculate these metrics for a fine-tuned combination of different types of ad exposures in order to better pinpoint the ad airing dates, times, networks, etc. that had the most impact.
* Created automated custom analytics tools. These tools were designed to automatically generate flexible custom analytics reports for future clients to assess their past ad campaign effectiveness.
* Techniques used include: stochastic mixed integer linear and nonlinear programming, logistic regression, moment generating functions, statistical analysis, hypothesis testing  
  *Technical Languages/Software Used: Python, SQL, Hadoop, AWS*

**Data Scientist** *(August 2014-May 2015)*

**MaxPoint Interactive, Inc.** Morrisville, NC

* Developed mathematical algorithms to recommend websites for online advertisements and to predict the probability an internet user will purchase an advertised product.
* Techniques used include: collaborative filtering, matrix factorization techniques, classification, support vector machines, online learning algorithms, boosting techniques, Bayesian analysis

*Technical Languages/Software Used: Python, SQL*

**Data Scientist/Algorithm Developer** *(July 2012 – May 2014)*

**Centice Corporation** Morrisville, NC

* Developed, implemented, and tested signal processing algorithms using nonnegative least squares regression and feature selection techniques to identify presence and concentration of narcotics in an unknown substance by analyzing the substances’ unique Raman spectral fingerprint.
* Techniques used include: classification, cluster analysis, model selection methods, image reconstruction, Bayesian analysis

*Technical Languages/Software Used: Matlab, Excel, SQL, Python*

**Software Testing Intern** *(January 2010 – May 2010)*

**Hawkes Learning Systems** Charleston, SC

* Tested mathematics instructional software.

**Data Analyst Intern** *(May 2006-August 2006, May 2009-August 2009)*

**Washington Metropolitan Area Transit Authority** Washington, DC

* Applied statistical techniques to:
  + Identify trains and train car components that needed inspection due to a higher risk of derailment.
  + Determine the cause of train cars overrunning the platform.
* Developed data mining algorithms to identify all occurrences of a train missing a track frequency marker.

*Technical Languages/Software Used: R, Excel*

**Statistician Intern** *(May 2007-August 2007, May 2008-August 2008)*

**United States Census Bureau** Suitland, MD

* Constructed and modified SAS codes to estimate income statistics of numerous subsets of the United States population sampled in the Current Population Survey.
* Researched and presented methods that U.S. think tanks use to mathematically alter Census Bureau data.

*Technical Languages/Software Used: SAS, Excel*

RELEVANT SKILLS

* Python
* SQL
* Apache Spark
* Hadoop
* AWS Redshift, RDS, S3, EMR
* Xpress-IVE
* R
* LaTeX
* Microsoft Office

RESEARCH INTERESTS

Mathematical Programming, Clustering, Classification, Consensus Clustering, Text Analytics, Natural Language Processing, Computational Journalism, Matrix Decomposition Methods, Bioinformatics, Advertising, Analytics, Data Mining, Applied Linear Algebra, Algorithm Design, Combinatorial Optimization

REFERENCES

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| Dr. Amy Langville  Department of Mathematics  College of Charleston  66 George St.  Charleston SC, 29424  [langvillea@cofc.edu](mailto:langvillea@cofc.edu)  843-670-8083 | Dr. Yahya Fathi  Operations Research Graduate Program  2152 Burlington Labs  2500 Stinson Dr.  North Carolina State University  Raleigh, NC 27695  [fathi@ncsu.edu](mailto:fathi@ncsu.edu)  919-515-6417 | Dr. Michael Kay  Operations Research Graduate Program  2152 Burlington Labs  2500 Stinson Dr.  North Carolina State University  Raleigh, NC 27695  [kay@ncsu.edu](mailto:kay@ncsu.edu)  919-515-2008 |