J. Travis Johnston

Postdoctoral Researcher

CONTACT

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EDUCATION

- **University of South Carolina**, Columbia SC
  Ph.D. Mathematics, May 2014.
  Advisor: Linyuan (Lincoln) Lu
- **University of Nebraska-Lincoln**, Lincoln NE
  B.S. Mathematics, May 2009.
  Concurrent Minors in Physics and French
  University Honors Program, Received degree with Highest Distinction
- **North Platte High School**, North Platte, NE
  Valedictorian, May 2002.

AREAS OF EXPERTISE

- Machine Learning Techniques:
  Clustering: k-means, DBSCAN, hierarchical, etc
  Modeling: Multi-Linear Regression, k-Nearest Neighbors, Polynomial, Multivariate, etc
  Dimensionality Reduction: PCA, Multi-Dimensional Scaling (MDS), Autoencoders
  Support Vector Machines
  Neural Networks (for classification, regression, and dimensionality reduction)
- Programming Languages and Frameworks:
  Python (expert proficiency), CUDA C/C++ (moderate proficiency), Maple
  Apache-Spark (expert proficiency), Hadoop (moderate proficiency)
  Caffe (expert proficiency), MXnet (contributor)

POSITIONS HELD

- **Postdoctoral Researcher**, Oak Ridge National Lab, July 2016-present.
  Advisor: Robert Patton
  Worked on designing Neural Nets (convolutional feed forward nets and fully convolutional neural networks) for a variety of tasks including object recognition, text mining and sentiment analysis, and image segmentation. Worked on designing tools to predict the topology of top performing networks and well as optimizing strategies for training the neural nets.

- **Postdoctoral Researcher**, University of Delaware, September 2014-July 2016.

  Advisor: Michela Taufer

  Designed algorithms for extreme scale, scientific computing on big data sets with applications to numerical reproducibility, protein folding and prediction, and performance modeling. Used wide range of statistical machine learning techniques including surrogate modeling, support vector machines, and clustering algorithms. Collaborated with and mentored undergraduate and graduate student researchers.

- **Graduate Teaching Assistant**, University of South Carolina, August 2009-May 2014.

  Instructor of several classes including Precalculus, College Algebra, Finite Mathematics, Calculus I/II, and Business Calculus. Gave lectures, recitations, and Maple labs, held office hours, review sessions, wrote, proctored, and graded exams and quizzes, designed activities for Maple labs.

- **Mathematics Summer Intern**, National Security Agency, May 2008-August 2008.

  Studied graphics editing techniques. Developed algorithms to detect editing techniques and effects, and implemented these algorithms into image processing software.

- **Teaching Assistant**, University of Nebraska-Lincoln, August 2007-May 2009.

  Taught recitations, held office hours, review sessions, proctored exams and quizzes, graded exams, quizzes and homework.

HONORS AND AWARDS

- **Director's Discretionary Allocation on Titan**, 1.5M Core-hours allocation on Titan to study surrogate-based modelling as a technique for hyper-parameter optimization of neural networks. As part of this allocation, I built Apache-Spark on Titan and ran it (using Spark+GPUs) on 18k nodes to tune hyper-parameters for a cloud detection network.

- **2014 Breakthrough Graduate Scholar**

  "The Breakthrough Graduate Scholars program honors USC graduate students who demonstrate excellence in the classroom, and make considerable contributions to research and scholarly activities in their field."

- **Dean's Dissertation Fellowship**

  $25,000 award from the College of Arts and Sciences. Designed to give graduating students more opportunity to travel and conduct research.

- **SIAM Service Award**

  An award from SIAM for "outstanding efforts and accomplishments on behalf of the SIAM chapter."

- **Graduate Recruitment Fellowship**

  University of South Carolina Graduate School fellowship, $8000/yr for 3 years.

- **3rd Place 2009 Cryptanalytic Literature Competition**

  Sponsored by the Kryptos Society; paper written while a summer intern at the National Security Agency (NSA). This was the first time student work was ever considered in the competition.

- **Chair's Prize for Outstanding Undergraduate in Mathematics**

  University of Nebraska-Lincoln, Department of Mathematics prize awarded to one graduating math major.

- **Regent's Scholar**

  University of Nebraska-Lincoln Board of Regent's Scholarship, full-tuition for 4 years.

PAPERS

(*) indicates that the co-author was a **graduate** student which I mentored.
(+) indicates that the co-author was an **undergraduate** student which I mentored.

Journals

1. Robert Searles(*), Stephen Herbein(*), **Travis Johnston**, Michela Taufer, and Sunita Chandrasekaran. A Portable, High-Level Graph Analytics Framework Targeting Distributed, Heterogeneous Systems, International Journal of High Performance Computing and Networking, IJHPCN 2017, vol 10.

2. Sebastian M.Cioabă, W.H. Haemers, Matt McGinnis(*), and **Travis Johnston**. Cospectral Mates for the Union of some Classes in the Johnson Association Scheme. (Submitted)

3. **Travis Johnston** and L. Lu. Strong Jumps and Lagrangians of Non-Uniform Hypergraphs. (Submitted)

   Available on arXiv at: https://arxiv.org/abs/1403.1220

4. **Travis Johnston**, B. Zhang(*), A. Liwo, S. Crivelli, and M. Taufer. In-Situ Data Analytics and Indexing of Protein Trajectories, *J. Comput. Chem.* 2017.

5. É. Czabarka, A. Dutle, **Travis Johnston**, and L. Székely. Abelian groups yield many large families for the diamond problem, *European Journal of Mathematics* 1 (2), 320-328 (2015).

6. **Travis Johnston**, L. Lu, and K. Milans. Boolean Algebras and the Lubell Function, *Journal of Combinatorial Theory Series A (JCTA)* 136, 174-183 (2015).

7. **Travis Johnston** and L. Lu. Turán Problems on Non-uniform Hypergraphs, *Elec. Journal of Combinatorics*, volume 21, issue 4, (2014).

8. (See Honor's and Awards) Internally published paper at National Security Agency (while working as summer intern). Won award for the paper–this was the first time a student paper was ever considered in the competition.

9. S. M. Nakhmanson, R. Korlacki, **Travis Johnston**, S. Ducharme, Z. Ge. Vibrational properties of ferroelectric β-vinylidene fluoride polymers and oligomers, *Physical Review B* **81**, 174120 (2010).

10. R.Korlacki, **Travis Johnston**, et al. Oligo (Vinylidene Fluoride) Langmuir Blodgett films studies by spectroscopic ellipsometry and the density functional theory, *Journal of Chemical Physics* (2008).

Peer Reviewed Conferences

1. **Travis Johnston**, Steven Young, David Hughes, Robert Patton, and Devin White. Optimizing Convolutional Neural Networks for Cloud Detection. (Submitted, ACM-SIGSPATIAL)

2. **Travis Johnston**, C. Zanin(+), and M. Taufer. HYPPO: A Hybrid, Piecewise Polynomial Modeling Technique for Non-Smooth Surfaces, *In Proceedings of the 28th IEEE Symposium on Computer Architecture and High Performance Computing* (SBAC-PAD), 1-8 (2016).

   Acceptance Rate: $27/77 \sim 35\%$, one of four best paper finalists

3. M. R. Wyatt II(*), **Travis Johnston**, M. Papas, and M. Taufer. A Scalable Method for Creating Food Groups Using the NHANES Dataset and MapReduce, *ACM Bioinformatics and Computational Biology Conference* (ACM-BCB), 1-10 (2016).

   Acceptance rate: $47/112 \sim 42\%$

4. D. Chapp(*), **Travis Johnston**, and M. Taufer. On the Need Reproducible Numerical Accuracy through Intelligent Runtime Selection of Reduction Algorithms at the Extreme Scale, *In Proceedings of the IEEE Cluster Conference*, 166-175 (2015).

   Acceptance rate: $38/157 \sim 24\%$

5. **Travis Johnston**, M. Alsulmi(*), P. Cicotti, and M. Taufer. Performance Tuning of MapReduce Jobs Using Surrogate-based Modeling, *Procedia Computer Science (International Conference on Computational Science, ICCS)*, volume 51, 49-59 (2015).

   Acceptance rate: $79/304 \sim 26\%$

Notes on authorship:
For mathematics journals it is typical to list authors in alphabetical order; this convention is followed in the above mathematical papers. In other disciplines the order of authorship varies. Typically the first author is the individual primarily concerned with the collection and analysis of data and has the primary responsibility of writing the paper. The co-authors are collaborators who contribute to the research and potentially mentor the (first) author.

Notes on publication venue:
A number of my publications are in proceedings of Computer Science Conferences. Conferences are the preferred venue for publication and presentation of research results in computer science. Conference papers are rigorously peer-reviewed comparable to journal papers in other disciplines. When a paper is selected for publication the work is presented at the conference, assuring a fast research contribution turnaround. The fast turnaround is essential in a rapidly evolving environment such as Computer Science.

INVITED TALKS and POSTERS

1. Oak Ridge National Laboratory, **Two problems in extremal combinatorics and extreme scale computing**, December 2015.
2. Connections in Discrete Mathematics, **New Non-jump Values for Uniform Hypergraphs**, June 2015.
3. International Conference on Computational Science (ICCS) at University of Reykjavik, Iceland, **Performance Tuning of MapReduce Jobs Using Surrogate-based Modeling**, June 2015.
4. 28^{th} Cumberland Conference on Combinatorics, Graph Theory, and Computing, **In-Situ Analysis of Protein Folding Trajectories**, May 2015.
5. University of Delaware Discrete Math Seminar, **Hypergraphs and the Jumping Constant Conjecture**, March 2015.
6. University of Delaware Math Club, **Ramsey Theory: searching large haystacks for small needles (which may not exist)**, February 2015.
7. 45^{th} Southeastern International Conference on Combinatorics, Graph Theory, and Computing, **Jumps (and non-jumps) in Hypergraphs**, March 2014.
8. Brigham Young University, **Turán Problems on Hypergraphs,** January 2014.
9. University of Chicago Theory of Computing Seminar, **Connecting Turán Problems on Hypergraphs to Forbidden Subposet Problems**, October 2013.
10. USC Discrete Math Seminar, **Connecting Turán Problems on Hypergraphs to Forbidden Subposet Problems**, September 2013.
11. 26^{th} Cumberland Conference on Combinatorics, Graph Theory, and Computing, **Lagrangians and Jumps for Non-uniform Hypergraphs**, May 2013.
12. USC Discrete Math Seminar, **Lagrangians of Non-uniform Hypergraphs**, April 2013.
13. AMS Sectional Meeting, Ames IA, presented poster: **Turán Problems on Non-uniform Hypergraphs**, April 2013.
14. SIAM SEAS conference, Knoxville TN, **Turán Problems on Non-uniform Hypergraphs**, March 2013.
15. 44^{th} Southeastern International Conference on Combinatorics, Graph Theory, and Computing, **Turán Problems on Non-uniform Hypergraphs**, March 2013.

16. USC Discrete Math Seminar, **Turán Problems on Non-uniform Hypergraphs**, Fall 2012.

17. 25^{th} Cumberland Conference on Combinatorics, Graph Theory, and Computing, **Boolean Algebras, the Lubell function, and more,** May 2012.

18. Graduate Student Conference on Combinatorics, **Boolean Algebras, the Lubell function, and more,** April 2012.

19. Undergraduate Research Conference, presented poster: **Sorting Signed Permutations Using Cut-And-Paste Operations,** April 2008.

20. Midwest Solid State Physics Conference, presented poster: **Modeling and Spectroscopic Studies of Vinylidene Fluoride Oligomers,** October 2007.

21. Undergraduate Research Conference, April 2006 and April 2007, presented posters detailing UCARE research (physics dept).

SERVICE

Academic/Professional

- Served on Program Committee for IEEE Cluster 2017 (Applications Track)
- Served as ORPA Secretary (Oak Ridge Postgraduate Association) FY 2017.
- Served on the Applications track program committee for SBAC-PAD 2016.

  This involved reviewing a half dozen submissions to the conference and assisting with the final selection of papers for the Applications track.
- Reviewed a number of papers for journals including: Order, Discrete Applied Mathematics, and the Journal of Parallel and Distributed Computing (JPDC).
- Co-organized the USC Discrete Math Seminar 2013-2014 academic year.
- SIAM (student chapter), President Fall 2012 - Spring 2013.
- SIAM (student chapter), Webmaster Fall 2010 - Spring 2012.
- *King Bee* for Pi Mu Epsilon's annual Integration Bee, March 2013.

  Created the integrals, the beamer presentation, and hosted the competition.
- *King Bee* for Pi Mu Epsilon's annual Integration Bee, March 2011.
- *Grader* for Pi Mu Epsilon's annual Integration Bee, March 2010.
- Phi Beta Kappa, inducted Spring 2009
- Pi Mu Epsilon, Nebraska Alpha Chapter, Secretary Fall 2007 - Spring 2008.

Community

- Spent 3 days in Louisiana (near Baton Rouge) assisting with flood recovery as a part of Mormon Helping Hands, Sept 2016.
- Church Organist, Sept 2009 - Sept 2013, Oct 2014-Present.
- Assistant Scoutmaster, Sept 2009 - Sept 2013.
- Served Full-time mission for The Church of Jesus Christ of Latter Day Saints, France Paris Mission (French speaking), Mar 2003 - Mar 2005

COURSES TAUGHT

University of Delaware

- High Performance Computing and Data Analytics (co-taught w/UD instructor), Fall 2015
- High Performance Computing and Data Analytics (co-taught w/UD instructor), Fall 2014

  Assisted with the preparation of course materials. Gave lectures on machine learning techniques and graph algorithms using MapReduce.

University of South Carolina

- Calculus II (Lecture/Recitations/Labs) Spring 2013
- Finite Mathematics (Lecture) Fall 2012
- Calculus I (Lecture) Spring 2012
- Intensive College Mathematics (Lecture) Fall 2011
- Precalculus (Lecture) Summer 2011
- Business Calculus (Lecture) Spring 2011
- Precalculus (Lecture) Fall 2010
- Finite Mathematics (Lecture) Summer 2010
- Calculus I (Recitations/Labs) Spring 2010
- Calculus I (Recitations/Labs) Fall 2009