Deepak Nag Ayyala

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Work Experience

- **Assistant Professor** — Augusta University
  Department of Population Health Sciences — *September 2017 – Present*

- **Postdoctoral Associate** — The Jackson Laboratory for Genomic Medicine
  Zhengqing Ouyang Lab — *November 2015 – August 2017*

- **Postdoctoral Researcher** — The Ohio State University
  Department of Statistics — *August 2013 – October 2015*

- **Undergraduate Teaching Assistant** — University of Maryland, Baltimore County
  Department of Mathematics and Statistics — *2007 – 2013*

- **Instructor** — University of Maryland, Baltimore County
  Courses Taught — *2009 – 2013*

- **Undergraduate Orientation Advisor** — University of Maryland, Baltimore County
  Office for Academic and Pre-Professional Advising — *2009 – 2010*

Education

- **Doctorate of Philosophy in Statistics**
  University of Maryland, Baltimore County, Baltimore, MD — *2009 – 2013*

- **Master of Science in Statistics**
  University of Maryland, Baltimore County, Baltimore, MD — *2007 – 2009*

- **Bachelor of Mathematics (Honors)**
  Indian Statistical Institute, Bangalore, India — *2004 – 2007*

Research Interests

- High dimensional statistics - Study asymptotic properties of estimators to construct better small sample procedures. Investigate new methods to incorporate dependence structure in high dimensional models.

- Transcriptomics - Study transcriptomic data obtained from various experiments such as bulk and single cell RNA-seq, RNA secondary structure and post-transcriptional modifications.

- Metagenomics - Understand the dynamics of human microbiome over time and determine its direct and mediatory role in disease progression.

- Epigenetics - Develop novel statistical models to integrate different sequencing techniques and data arising from different experiments.

Academic Service

- **The Jackson Laboratory Summer Student Program**   Summer 2016

  Lead journal club meetings for participants, hosting a platform to discuss and debate research topics.

- **Omics Data Analysis workshop (Webpage link)**   September 2015

  Introduced the R language and basic analysis tools to research faculty in the College of Medicine at the Ohio State University

- **The Ohio State University - Mathematical Biosciences Institute Research Experience for Undergraduates**   Summer 2014

  Supervised summer research program of two undergraduate participants in developing a permutation test of functional data for detection of differential methylation.

- **Grant reviewer - Discovery Themes Initiative, The Ohio State University**

  Reviewed request for proposals to recommend allocation of university funds and resources towards faculty hiring.

- **Scholarly service**

  Reviewer – Bioinformatics, Journal of Americal Statistical Association (Ad-hoc).

Students supervised

- Emma Rogge and Shuyuan Luo - The Ohio State University Mathematical Biosciences Institute Research Experience for Undergraduates   Summer 2014

- Kimberly McLaughlin - Graduate student, Summer intern in Ouyang Lab, Jackson Laboratory for Genomic Medicine   Summer 2016

- Anthony Cheng - Predoctoral student in Ouyang Lab, Graduate student in University of Connecticut Health Center   June 2016 – September 2017

- Henry M. Linder and Disheng Mao – Graduate students from Yuping Zhang's Lab, Department of Statistics, University of Connecticut   January 2017 – September 2017

Professional Membership

American Statistical Association, Institute of Mathematical Statistics, International Indian Statistical Association.

Programming Skills

- Proficient in R, MATLAB and C.

- Fluent in Julia, SAS and Python.

Packages

- **MethylCapSig: Detection of Differentially Methylated Regions using MethylCap-Seq Data**
  https://cran.r-project.org/web/packages/MethylCapSig/index.html
  Provides a univariate and several high dimensional multivariate test statistics for detecting differentially methylated regions based on MethylCap-seq data.

- **GrammR: Graphical Representation and Modeling of Metagenomic Reads**
  http://cran.r-project.org/web/packages/GrammR/index.html
  Provides a graphical user interface in R to construct representations of metagenomic samples on the Euclidean space. Given the matrix of metagenomic counts for samples, this package

  - quantifies dissimilarity between samples using Kendall's tau-distance
  - constructs multidimensional models of different dimension
  - plots the models for visualization and comparison.

Publications

- **Ayyala, D. N.**, Roy, A., Park, J. and Rao, G., "Testing equality of autocorrelation matrices at lag zero: Application to Resting State Networks", *to appear in Sankhyā B, doi:10.1007/s13571-017-0138-x.*

- **Ayyala, D. N.**, Park, J. and Roy, A., "Mean vector testing for high-dimensional dependent observations", *Journal of Multivariate Analysis*, Volume 153, Issue 1 (January 2017), pp. 136 – 155, *dx.doi.org/10.1016/j.jmva.2016.09.012.*

- Qin, Z., Li, B., Conneely, K. N., Wu, H., Hu, M., **Ayyala, D. N.**, Park, P., Jin, V. X., Zhang, F., Zhang, H., Li, L., Lin, S., "Statistical Challenges in Analyzing Methylation and Long-Range Chromosomal Interaction Data", *Statistics in Biosciences*, Volume 8, Issue 2 (March 2016), pp. 284 – 309, *doi:10.1007/s12561-016-9145-0.*

- **Ayyala, D. N.**, Lin, S., Frankhouser, D., Yan, P., Bundschuh, R., Ganbat, J. O., Marcucci, G., "Statistical methods for detecting differentially methylated regions based on MethylCap-seq data", *Briefings in Bioinformatics*, October 2015, *doi:10.1093/bib/bbv089.*

- **Ayyala, D. N** and Lin, S., "GrammR: Graphical representation and modeling of count data with application in metagenomics", *Bioinformatics*, Volume 31, Issue 10 (May 2015), pp. 1648 – 1654, *doi:10.1093/bioinformatics/btv032.*

- Park, J. and **Ayyala, D. N.**, "A test for the mean vector in large dimension and small samples", *Journal of Statistical Planning and Inference*, Volume 143, Issue 5 (May 2013), pp. 929 – 943, *dx.doi.org/10.1016/j.jspi.2012.11.001.*

Conference Presentations

- **SAMSI Beyond Bioinformatics - Transition workshop**   Research Triangle Park, NC
  Invited Talk   *2015*
  Title: 3D Chromatin Reconstruction using TAD-Penalized Models.

- **University of Nebraska**   Lincoln, NE
  Invited Talk   *2015*
  Title: Graphical representation and feature selection in metagenomic count data

- **University of Massachusetts - Lowell**   Lowell, MA
  Invited Talk   *2015*
  Title: Mean vector testing for high dimensional dependent observations.

- **SAMSI Beyond Bioinformatics - Epigenetics workshop**   Research Triangle Park, NC
  Invited Talk   *2015*
  Title: Statistical methods for detecting differentially methylated regions based on MethylCap-seq data.

- **Probability and Statistics Day, UMBC**   Baltimore, MD
  Invited Talk   *2014*
  Title: Graphical representation of microbial community subpopulations using penalized Kendall's distance.

- **Algorithms for Threat Detection Program Review**   Boulder, CO
  Poster Presentation   *2014*
  Title: Graphical representation of microbial community subpopulations using penalized Kendall's distance.

- **Maryland Neuroimaging Retreat**   Baltimore, MD
  Poster Presentation   *2012*
  Title: Investigation of experimental factors in resting state networks.

- **IISA Conference on Probability, Statistics and Data Analysis**   Raleigh, NC
  Invited Talk   *2011*
  Title: Testing for mean vector in high dimensional Gaussian time series.

- **Joint Statistical Meetings**   Miami, FL
  Contributed Talk   *2011*
  Title: Testing equality of correlation matrices at lag zero for time-dependent observations.

- **Probability and Statistics Day, UMBC**   Baltimore, MD
  *Contributed Talk (**First prize for Best Student Presentation**)*   *2010*
  Title: A new test for the mean vector for *large p, small n* problem.

- **International Conference on Statistics, Probability, Operations Research, Computer Science and Allied Areas**   Visakhapatnam, India
  Contributed Talk   *2010*
  Title: Estimation of the proportion of exponential signals.

- **Joint Statistical Meetings**   Washington D.C.
  Contributed Talk   *2009*
  Title: Estimation of the proportion of exponential signals.

Leadership Experience

- Vice-President, Mathematics and Statistics Graduate Student Association, UMBC, 2009-2010.
- Senator, Graduate Student Association, UMBC, 2008-2009.
- President, EKTA - UMBC Indian Graduate Student Association, 2008-2009.

Awards & Honours

Outstanding graduate teaching assistant in the field of statistics College of Natural and Mathematical Sciences, UMBC	2013
International Indian Statistical Association conference travel grant	2011
Three-time receipient of UMBC Graduate Student Association travel grant	2009-2011
First Prize - Student presentation competition Probability and Statistics Day, UMBC	2010
Master graduate teaching assistant in statistics College of Natural and Mathematical Sciences, UMBC	2009
Grant for Bachelor of Mathematics, Ministry of Statistics and Programme Implementation, Government of India	2004-2007