BIOGRAPHICAL SKETCH

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NAME: Shannon, William D.

POSITION TITLE: President, BioRankings

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Union College, Schenectady, NY	BS	1985	Biology
University of Massachusetts, Amherst, MA	MS	1989	Zoology
University of Pittsburgh, Pittsburgh, PA	PhD	1995	Biostatistics
Washington Univ. Olin Business School, St Louis	MBA	2012	Business

A. Personal Statement

I am a biostatistician whose initial training was in the field of zoology and the use of rigorous mathematical analysis of biological data using clustering and classification methods. As President of BioRankings and the former Director of the Washington University Dept. of Medicine's Biostatistical Consulting Center, I have significant experience supervising MS and PhD level staff members on statistical methods research and who provide statistical consulting support to investigators from many areas of medicine (e.g., pediatrics, oncology, pulmonology, infectious disease, neurology, and cardiology) and basic science (e.g., genetics, immunology, pathology). In addition I have been funded to develop novel methods for analysis of Big Data in metagenomics, connectomics, graphical data objects, and actigraphy that are directly related to developing methods for analyzing microbiome data.

I have led projects like this for 20 years as a tenured professor at Washington Univ. School of Medicine and President of BioRankings. I have authored and co-authored 140+ peer-reviewed papers, have led data analysis R&D on both big data and small data projects in clinical and pre-clinical research, and have repeatedly been able to solve data analysis problems his clients could not solve.

I received an MBA in 2012 to help develop data analysis solutions for business clients. As of June 2016, I have retired from Washington University and is now 100% full time at BioRankings.

B. Positions and Honors

1989-1994	Graduate Student Researcher, Dept. of Biostatistics, Univ. of Pittsburgh, Pittsburgh, PA
1994-1995	Post-Doctoral Researcher, Dept. of Human Genetics, Univ. of Pittsburgh, Pittsburgh, PA
1995-2004	Assistant Professor of Biostatistics in Medicine, Division of General Medical Sciences, Washington University School of Medicine, St. Louis, MO
1999-present	Director of the Department of Medicine Biostatistics Consulting Center, Washington University School of Medicine, St. Louis, MO
2004-2010	Associate Professor of Biostatistics in Medicine, Division of General Medical Sciences, and Associate Professor of Biostatistics, Division of Biostatistics, Washington University School of Medicine, St. Louis, MO
2010-2016	Professor of Biostatistics in Medicine, Division of General Medical Sciences, and Associate Professor of Biostatistics, Division of Biostatistics, Washington University School of Medicine, St. Louis, MO
2016-present	Professor of Biostatistics in Medicine (Emeritus), Washington University School of Medicine, St. Louis, MO
2005-present	Founder and President of William D. Shannon Consulting, LLC (DBA: BioRankings LLC)

C. Contribution to Science

1. The Human Microbiome Project is generating 'big data' on the genetic sequences of populations of bacteria living in and on humans. The goal of this project is to learn how these bacterial populations impact health. This field is still in the development phase and few PhD biostatisticians have become actively involved, though this is beginning to change. I was involved with this area from the start and have made important contributions to the statistical analysis of this data. BioRankings has several contracts with major nutrition and pharmaceutical companies to apply these methods to their microbiome research data.

a) La Rosa PS, Brooks JP, Deych E, Boone EL, Edwards DJ, Wang Q, Sodergren E, Weinstock G, Shannon WD. Hypothesis testing and power calculations for taxonomic-based human microbiome data. PLoS One. 2012;7(12):e52078. doi: 10.1371/journal.pone.0052078. PubMed PMID: 23284876; PMCID: 3527355. https://www.ncbi.nlm.nih.gov/pubmed/23284876

b) Zhou Y, Gao H, Mihindukulasuriya KA, La Rosa PS, Wylie KM, Vishnivetskaya T, Podar M, Warner B, Tarr PI, Nelson DE, Fortenberry JD, Holland MJ, Burr SE, Shannon WD, Sodergren E, Weinstock GM. Biogeography of the ecosystems of the healthy human body. Genome biology. 2013;14(1):R1. doi: 10.1186/gb-2013-14-1-r1. PubMed PMID: 23316946. https://www.ncbi.nlm.nih.gov/pubmed/23316946

c) La Rosa PS, Warner BB, Zhou Y, Weinstock GM, Sodergren E, Hall-Moore CM, Stevens HJ, Bennett WE, Jr., Shaikh N, Linneman LA, Hoffmann JA, Hamvas A, Deych E, Shands BA, Shannon WD, Tarr PI. Patterned progression of bacterial populations in the premature infant gut. Proc Natl Acad Sci U S A. 2014;111(34):12522-7. doi: 10.1073/pnas.1409497111. PubMed PMID: 25114261; PMCID: PMC4151715. ttps://www.ncbi.nlm.nih.gov/pubmed/25114261

d) Zhou Y, Mihindukulasuriya KA, Gao H, La Rosa PS, Wylie KM, Martin JC, Kota K, Shannon WD, Mitreva M, Sodergren E, Weinstock GM. Exploration of bacterial community classes in major human habitats. Genome biology. 2014;15(5):R66. doi: 10.1186/gb-2014-15-5-r66. PubMed PMID: 24887286; PMCID: PMC4073010. https://www.ncbi.nlm.nih.gov/pubmed/24887286

2. Object Oriented Data Analysis of graphical data is an emerging area of statistics that promises to provide new ways of looking at large, complex dataset. I have been studying this since graduate school and have found areas of research where this is providing new ways to analyze data from brain connectomes, taxonomic trees in microbiome research, cancer clinical trials, and genetic epidemiology. These methods will be fundamental to the work proposed in this project.

a) La Rosa P, Brooks T, Deych E, Shands B, Prior F, Larson-Prior L, Shannon W. Gibb's Distribution for Statistical Analysis of Graphical Data with a Sample Application to fcMRI Brain Images. Statistics in Medicine. 2016 Feb 20;35(4):566-80. doi: 10.1002/sim.6757. PubMed PMID: PMID: 26608238. https://www.ncbi.nlm.nih.gov/pubmed/23152838

b) La Rosa PS, Shands B, Deych E, Zhou Y, Sodergren E, Weinstock G, Shannon WD. Statistical object data analysis of taxonomic trees from human microbiome data. PLoS One. 2012;7(11):e48996. doi: 10.1371/journal.pone.0048996. PubMed PMID: 23152838; PMCID: 3494672. https://www.ncbi.nlm.nih.gov/pubmed/23152838

c) Shannon WD, Banks D. Combining classification trees using MLE. Statistics in medicine. 1999;18(6):727-40. Epub 1999/04/16. PubMed PMID: 10204200. https://www.ncbi.nlm.nih.gov/pubmed/10204200

d) Shannon WD, Province MA, Rao DC. Tree-based recursive partitioning methods for subdividing sibpairs into relatively more homogeneous subgroups. Genetic epidemiology. 2001;20(3):293-306. Epub 2001/03/20. doi: 10.1002/gepi.1. PubMed PMID: 11255239. https://www.ncbi.nlm.nih.gov/pubmed/11255239

3. Biostatistical Methods Development is necessary when data needs to be analyzed and no statistical methods currently exist. Having teams with the skills to do this is becoming even more vital with the emergence of new biotechnology (e.g., sequencing, NGS, fMRI, proteomics) that generate big data. I have been developing new methods since starting graduate school and applying them to important clinical problems.

a) Wang J, Xian H, Licis A, Deych E, Ding J, McLeland J, Toedebusch C, Li T, Duntley S, Shannon W. Measuring the impact of apnea and obesity on circadian activity patterns using functional linear modeling of actigraphy data. Journal of circadian rhythms. 2011;9(1):11. Epub 2011/10/15. doi: 10.1186/1740-3391-9-11. PubMed PMID: 21995417; PMCID: 3245508. https://www.ncbi.nlm.nih.gov/pubmed/21995417

b) Shannon WD, Bryant J, Logan TF, Day R. An application of decision theory to patient screening for an autologous tumour vaccine trial. Statistics in medicine. 1995;14(19):2099-110. PubMed PMID: 8552889 https://www.ncbi.nlm.nih.gov/pubmed/8552889
c) Shannon WD, Watson MA, Perry A, Rich K. Mantel statistics to correlate gene expression levels from microarrays with clinical covariates. Genetic epidemiology. 2002;23(1):87-96. doi: 10.1002/gepi.1115. PubMed PMID: 12112250. https://www.ncbi.nlm.nih.gov/pubmed/12112250
d) Shannon W, Faifer M, Province M, Rao DC. Tree-based recursive partitioning methods for fitting stratified linear regression models. *Journal of Classification* 2002; 19:113-S30.

4. Applied Biostatistics is the application of data analysis to solve clinically important problems. I have been doing this for the last 20 years and have made important contributions to clinical medince. The ability to work with clinicians and researchers will be important for this project as we develop tools for translational fMRI analysis.

a) Gage BF, Doggette AD, Shannon W, Boechler M, Rich MW, Radford MJ. Validation of clinical classification schemes for predicting stroke: results from the National Registry of Atrial Fibrillation. *Journal of the American Medical Association* 2001 June 13; 285(22):2864-70. PMID: 11401607 https://www.ncbi.nlm.nih.gov/pubmed/11401607
b) Zeitzer JM, David R, Friedman L, Mulin E, Garcia R, Wang J, Yesavage JA, Robert PH, Shannon W. Phenotyping Apathy in Individuals With Alzheimer Disease Using Functional Principal Component Analysis. The American journal of geriatric psychiatry : official journal of the American Association for Geriatric Psychiatry. 2012. Epub 2012/03/01. doi: 10.1097/JGP.0b013e318248779d. PubMed PMID: 23498386; PMCID: 3368995. https://www.ncbi.nlm.nih.gov/pubmed/23498386
c) Colvin JM, Muenzer JT, Jaffe DM, Smason A, Deych E, Shannon WD, Arens MQ, Buller RS, Lee WM, Weinstock EJ, Weinstock GM, Storch GA. Detection of viruses in young children with fever without an apparent source. Pediatrics. 2012;130(6):e1455-62. doi: 10.1542/peds.2012-1391. PubMed PMID: 23129086; PMCID: PMC3507256. https://www.ncbi.nlm.nih.gov/pubmed/23129086
d) Ding L, Ley TJ, Larson DE, Miller CA, Koboldt DC, Welch JS, Ritchey JK, Young MA, Lamprecht T, McLellan MD, McMichael JF, Wallis JW, Lu C, Shen D, Harris CC, Dooling DJ, Fulton RS, Fulton LL, Chen K, Schmidt H, Kalicki-Veizer J, Magrini VJ, Cook L, McGrath SD, Vickery TL, Wendl MC, Heath S, Watson MA, Link DC, Tomasson MH, Shannon WD, Payton JE, Kulkarni S, Westervelt P, Walter MJ, Graubert TA, Mardis ER, Wilson RK, DiPersio JF. Clonal evolution in relapsed acute myeloid leukaemia revealed by whole-genome sequencing. Nature. 2012;481(7382):506-10. doi: 10.1038/nature10738. PubMed PMID: 22237025; PMCID: PMC3267864. https://www.ncbi.nlm.nih.gov/pubmed/22237025

Partial List of Published Work in biomedical journals (does not include peer-reviewed conference proceedings and non-medical journals)
http://www.ncbi.nlm.nih.gov/pubmed/?term=shannon%2C+william+d%5BAuthor%5D