

# William R. Gray Roncal

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## Education

- 2010 – 2016 **Ph.D. in Computer Science**, Johns Hopkins University, Committee Chair: Gregory D. Hager, **Dissertation Title:** Enabling Scalable Neurocartography: Images to Graphs for Discovery. I developed a scalable computer vision framework to create and assess connectomes across multiple modalities, from millimeter (magnetic resonance imaging) to nanometer (electron microscopy) scales, supporting novel algorithms, community pipelines, and a deeper understanding of the brain.
- 2004 – 2005 **M.S. in Electrical Engineering**,  
University of Southern California.
- 1999 – 2003 **B.E. in Electrical Engineering, Math Minor**,  
Vanderbilt University, Nashville, TN.
- 2012 **Successfully completed Introduction to Connectomics course**, Co-offered by MIT and Harvard Universities, Massachusetts, USA.
- 2002 **Study Abroad program**, University of Leeds, England.

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## Professional Experience

2007 – present **Senior Research Engineer, Project Manager**, Research and Exploratory Development Department - Johns Hopkins University, Applied Physics Laboratory, Laurel, MD.

- *Technical Lead:* IARPA MICrONS (2017-Present), a cutting-edge program to store, map, assess, and develop algorithms from a cubic millimeter (i.e., cortical column) of mammalian cortex. Task Lead for Evaluation (2016-Present).
- *Principal Investigator (2017-Present):* NIH SABER grant to build reproducible cloud processing pipelines for big data neuroscience (2017-Present).
- *Technology Evangelist and Research Thrust Lead (2017-Present):* Designed and initiated APL BRAIN: Breakthrough Research in Artificial Intelligence and Neuroscience, a multi-disciplinary initiative supporting community-facing research in areas of critical national importance in a variety of areas, including applied connectomics.
- *Section Supervisor Learning Machines Section (2018-Present):* Line management role, supporting a variety of staff development, mentoring, strategy initiatives, business development, hiring, and technical leadership efforts. (Acting Section Supervisor, 2017)
- *Data Scientist (2017-Present):* JHU Precision Medicine leadership and analytics for Multiple Sclerosis data science efforts, including support to clinical care team.

Provided technical and project leadership for several efforts to build, analyze, and operationalize brain graphs (ranging from millimeter to nanometer scale). Developed a novel, scalable, fully automated pipelines to estimate and assess brain graphs. Supported three Presidential BRAIN Initiative efforts, including lead roles on two projects (MICrONS, SABER). Led the research direction for a team of approximately 30 students and professionals on various projects. Previously led team to develop a passive sonar target tracking solution that applied across diverse projects and sponsor communities. Provided expertise in system engineering, computer vision, data science, and computational neuroscience for a variety of research efforts.

- 2017 – **Assistant Research Professor**, *Department of Computer Science*, Johns Hopkins University.  
 Present Teach courses, collaborate on projects, and advise multidisciplinary research projects for undergraduate and graduate students.
- 2010 – 2017 **Researcher**, *Neurodata and the Open Connectome Project*, Johns Hopkins University.  
 Lead and organize a variety of research thrusts in the areas of mesoscale and nanoscale connectomics, community analytics, and computer vision. Responsible for translating raw image volumes to knowledge for subsequent statistical inference. Supported researchers from multiple institutions in achieving their scientific goals. [neurodata.io](http://neurodata.io)
- 2009 – **Co-Director and Co-Founder**, *College Prep Program at APL*, Laurel, MD.  
 present Lead all-volunteer annual summer program to support and encourage under-served students who have the desire and academic potential to excel in college, but who lack the mentoring and resources necessary to succeed. 98% of program alumni (n=168) are on track to earning a 4-year college degree. 500+ hour annual volunteer commitment.
- 2001 – 2007 **Electrical and System Engineer**, *Northrop Grumman Corporation*, Information Technology (TASC), Chantilly VA, Space Technology, Redondo Beach, CA.  
 Subject Matter Expert and Responsible Engineer for a group of satellite systems. Regularly interfaced with customers and provided support. Program received 100% Award Fee. Responsible for the design, execution and assessment of several system compatibility tests. (Intern 2001-02)

## Skills and Memberships

- Skills **Proficient with Python, MATLAB, LaTeX, MS Office, Linux, OSX, and Windows · Experience with big data analytics · Six Sigma Greenbelt, Engineer Intern (EIT).**
- Memberships **Secret Clearance · Society for Neuroscience, Eta Kappa Nu, Tau Beta Pi Honor Societies.**

## Awards & Honors

- 2018 **REDx Imagine Award for work in combining artificial intelligence and connectomics**, *JHU Applied Physics Laboratory*.
- 2017 **Outstanding Young Alumni Award**, *Greeneville High School*.
- 2015 **JHU/APL Author's First Paper Publication Award for Images to Graphs Manuscript**, *JHU Applied Physics Laboratory*.
- 2014 **Hart Prize Award for Best Research Project**, *JHU Applied Physics Laboratory*.
- 2014 **Volunteer of the Year Award**, *Howard County, Maryland*.
- 2010 – 2016 **Full-tuition PhD Fellowship**, *JHU Applied Physics Laboratory*.
- 2010 **Post-Master's Certificate in Electrical Engineering**, *Johns Hopkins University*.
- 2009 – 2013 **APL Diversity Awards**, *JHU Applied Physics Laboratory*.
- 2009 **Diversity Leadership Award**, *Johns Hopkins University*.
- 2004 – 2005 **Full-tuition Master's Degree Fellowship**, *Northrop Grumman Corporation*.
- 2003 **Graduated Magna Cum Laude**, *Vanderbilt University*.
- 2003 **Program Award for Top EECS Student**, *Vanderbilt University*.
- 2003 **Dean's Award for Outstanding Service**, *Vanderbilt University*.
- 1999 – 2003 **Full-tuition Harold Stirling Vanderbilt Scholarship**, *Vanderbilt University*.

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## Teaching

- 2017-Present **CIRCUIT: Cohort-based Integrated Research Community for Undergraduate Innovation and Trailblazing**, *Johns Hopkins University Applied Physics Laboratory*, Designed and founded connectomics institute to establish a successful, enduring nationally recognized research and mentoring program for trailblazing students. Initial program sessions focused around high-throughput error-checking of nanoscale brain maps and independent research projects, combining an intensive summer experience with additional activities during the school year..
- 2018 **Frontiers in Neuroinformatics**, *Johns Hopkins University Engineering for Professionals*, Designed modules for and co-taught an advanced topics survey course for Biomedical Engineering graduate students..
- 2015-2018 **Introduction to Connectomics Intersession Course**, *Johns Hopkins University*, Conceived, designed and taught intensive research-based class, culminating in a student poster session. Class evaluation score is consistently one of the highest in the Whiting School.
- 2011 – present **Mentor**, *Johns Hopkins University*, Supported approximately 20 student projects at the high school, undergraduate, and graduate student levels, in addition to course projects described elsewhere.

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## Publications

- 1 K. Gray-Roncal, L. Huynh, T. Kolarik, M. Roncal, M. A. Saunders, and W. Gray-Roncal. The college prep program at apl: An experiential model to help high-achieving, underserved students trailblaze and achieve success. In *2018 IEEE Integrated STEM Education Conference (ISEC)*, pages 90–97, March 2018.
- 2 M. Encarnacion, C. Bishop, J. Downs, N. Drenkow, J. K. Matelsky, P. K. Rivlin, B. Wester, and W. Gray-Roncal. Circuit summer program: A computational neuroscience outreach experience for high-achieving undergraduates via sponsored research. In *2018 IEEE Integrated STEM Education Conference (ISEC)*, pages 45–52, March 2018.
- 3 R. Burns, E. Perlman, A. Baden, W. Gray Roncal, B. Falk, V. Chandrashekhar, F. Collman, S. Seshamani, J. Patsolic, K. Lillaney, M. Kazhdan, R. Hider, D. Pryor, J. Matelsky, T. Gion, P. Manavalan, B. Wester, M. Chevillet, E. T. Trautman, K. Khairy, E. Bridgeford, D. M. Kleissas, D. J. Tward, A. K. Crow, M. A. Wright, M. I. Miller, S. J. Smith, R. J. Vogelstein, K. Deisseroth, and J. T. Vogelstein. A Community-Developed Open-Source Computational Ecosystem for Big Neuro Data. 2018.
- 4 G. Kiar, E. Bridgeford, W. G. Roncal, V. Chandrashekhar, D. Mhembere, S. Ryman, X.-N. Zuo, D. S. Marguiles, R. C. Craddock, C. E. Priebe, R. Jung, V. Calhoun, B. Caffo, R. Burns, M. P. Milham, and J. Vogelstein. A High-Throughput Pipeline Identifies Robust Connectomes But Troublesome Variability. *bioRxiv*, 2018.
- 5 E. P. Reilly, J. S. Garretson, W. Gray Roncal, D. M. Kleissas, B. A. Wester, M. A. Chevillet, and M. J. Roos. Neural Reconstruction Integrity: A metric for assessing the connectivity of reconstructed neural networks. *arXiv preprint*, pages 1–19, 2017.
- 6 E. Dyer, W. Gray Roncal, J. Prasad, H. Fernandes, D. Gürsoy, V. De Andrade, K. Fezzaa, X. Xiao, J. Vogelstein, C. Jacobsen, K. Körding, and N. Kasthuri. Quantifying mesoscale neuroanatomy using X-ray microtomography. *eNeuro*, 4(5), 2017.
- 7 D. Kleissas, R. Hider, D. Pryor, T. Gion, P. Manavalan, J. Matelsky, A. Baden, K. Lillaney, R. Burns, D. D’Angelo, W. Gray Roncal, and B. Wester. The Block Object Storage Service (bossDB): A Cloud-Native Approach for Petascale Neuroscience Discovery. *bioRxiv*, 2017.
- 8 J. K. Matelsky, J. Downs, B. Wester, and W. Gray Roncal. A substrate for modular, extensible data-visualization. *bioRxiv*, 2017.

- 9 W. Gray Roncal, C. Lea, A. Baruah, and G. D. Hager. [SANTIAGO : Spine Association for Neuron Topology Improvement](#). *arXiv preprint*, 2016.
- 10 G. Kiar, K. J. Gorgolewski, D. Kleissas, W. Gray Roncal, B. Litt, B. Wandell, R. A. Poldrack, M. Wiener, V. R. Jacob, R. Burns, and J. T. Vogelstein. [Science In the Cloud \(SIC\): A use case in MRI Connectomics](#). *arXiv preprint*, 2016.
- 11 W. Gray Roncal, E. L. Dyer, G. Doga, and K. Kording. [From sample to knowledge : Towards an integrated approach for neuroscience discovery](#). *arXiv preprint*, pages 1–8.
- 12 W. Gray Roncal, D. M. Kleissas, and J. T. Vogelstein. [An Automated Images-to-Graphs Framework for High Resolution Connectomics](#). *Frontiers in Neuroinformatics*, 9:1–10, 2015.
- 13 W. Gray Roncal, M. Pekala, V. Kaynig-fittkau, D. M. Kleissas, J. T. Vogelstein, H. Pfister, R. Burns, R. J. Vogelstein, M. A. Chevillet, and G. D. Hager. [VESICLE : Volumetric Evaluation of Synaptic Interfaces using Computer vision at Large Scale](#). *British Machine Vision Conference*, pages 1–9, 2015.
- 14 N. Kasthuri, K. J. Hayworth, D. R. Berger, R. L. Schalek, J. A. Conchello, S. Knowles-Barley, D. Lee, A. Vázquez-Reina, V. Kaynig, T. R. Jones, M. Roberts, J. L. Morgan, J. C. Tapia, H. S. Seung, W. Gray Roncal, J. T. Vogelstein, R. Burns, D. L. Sussman, C. E. Priebe, H. Pfister, and J. W. Lichtman. [Saturated Reconstruction of a Volume of Neocortex](#). *Cell*, 162(3):648–661, 2015.
- 15 M. Kazhdan, K. Lillaney, W. Gray Roncal, D. Bock, J. T. Vogelstein, and R. Burns. [Gradient-Domain Fusion for Color Correction in Large EM Image Stacks](#). *arXiv*, 2015.
- 16 W. Gray Roncal, Z. H. Koterba, D. Mhembe, D. M. Kleissas, J. T. Vogelstein, R. Burns, A. R. Bowles, D. K. Donavos, S. Ryman, R. E. Jung, L. Wu, V. Calhoun, and R. J. Vogelstein. [MIGRAINE: MRI Graph Reliability Analysis and Inference for Connectomics](#). *GlobalSIP*, dec 2013.
- 17 R. Burns, W. Gray Roncal, D. Kleissas, K. Lillaney, P. Manavalan, E. Perlman, D. R. Berger, D. D. Bock, K. Chung, L. Grosenick, N. Kasthuri, N. C. Weiler, K. Deisseroth, M. Kazhdan, J. Lichtman, R. C. Reid, S. J. Smith, A. S. Szalay, J. T. Vogelstein, and R. J. Vogelstein. [The Open Connectome Project Data Cluster: Scalable Analysis and Vision for High-Throughput Neuroscience](#). *Proceedings of the 25th International Conference on Scientific and Statistical Database Management (SSDBM)*, jun 2013.
- 18 J. T. Vogelstein, W. R. Gray Roncal, R. J. Vogelstein, and C. E. Priebe. [Graph classification using signal-subgraphs: applications in statistical connectomics](#). *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 35(7):1539–1551, jul 2013.
- 19 D. Mhembe, W. Gray Roncal, D. Sussman, C. E. Priebe, R. Jung, S. Ryman, R. J. Vogelstein, J. T. Vogelstein, and R. Burns. [Computing Scalable Multivariate Global Invariants of Large \(Brain-\) Graphs](#). *GlobalSIP*, dec 2013.
- 20 W. R. Gray Roncal, J. A. Bogovic, J. T. Vogelstein, B. A. Landman, J. L. Prince, and R. J. Vogelstein. [Magnetic resonance connectome automated pipeline: an overview](#). *IEEE Pulse*, 3(2):42–48, mar 2012.

## Posters

- 1 W. Gray Roncal, M. Encarnación, J. Matelsky, R. Azwoir, C. Dorsey, M. Fredricks, N. Jones, M. Santangelo, H. Trevino, P. Rivlin, and B. Wester. CONFIRMS: Creating Optimized Networks for Informing Reconstruction Metrics and Science. In *Society for Neuroscience*, 2017.
- 2 C. Bishop, E. Atlabachew, M. Cervantes, H. Cowley, M. Fredricks, O. Martinez, E. Zhu, J. Matelsky, J. Downs, B. Wester, and W. R. Gray Roncal. RETINA: Real -time evaluation tools for integrated neuroscience analysis. In *Society for Neuroscience*, 2017.

- 3 J. Matelsky, L. Rodriguez, S. Bannowsky, S. Davis, A. Frazier, K. Porter, P. Manavalan, D. Pryor, R. Hider, T. Gion, W. R. Gray Roncal, and D. Kleissas. Cloud-Native Infrastructure and Accessible Interfaces to Enable Petascale Neuroscience. *Society for Neuroscience*, page 2017, 2017.
- 4 N. Drenkow, D. Hill, J. Li, R. Norman-Tenazas, R. Rais, K. Torgas, B. Wester, and W. Gray Roncal. Toward a Common, Extensible Cloud Architecture for Images to Graphs. *Society for Neuroscience*, page 2017, 2017.
- 5 J. Matelsky, S. Berg, A. Eusman, K. Lillaney, J. T. Vogelstein, G. D. Hager, and W. Gray Roncal. ndio: Neuroscience Discovery Input and Output. In *Society for Neuroscience Abstract*, San Diego, 2016.
- 6 W. Gray Roncal, M. Pekala, D. M. Kleissas, J. T. Vogelstein, and G. D. Hager. ndparse: Tools and Interfaces for Scalable Neuroscience Discovery. In *Society for Neuroscience Abstract*, 2016.
- 7 W. Gray Roncal, A. Simhal, J. Vogelstein, F. Collman, E. L. Dyer, M. Chevillet, R. Burns, G. Sapiro, and G. Hager. Scalable automated (synapse) detection using the Open Connectome Project. In *Society for Neuroscience Abstract*, 2015.
- 8 A. Baden, K. Lillaney, W. Gray Roncal, J. Vogelstein, and R. Burns. Web Visualization of Massive Neuroscience Datasets using the Open Connectome Project. In *Society for Neuroscience Abstract*, 2015.
- 9 A. Simhal, W. Gray Roncal, A. Baden, K. Lillaney, K. Kутten, M. Miller, J. Vogelstein, R. Burns, L. Ye, R. Tomer, K. Deisseroth, and G. Sapiro. Computational statistics for whole brain CLARITY analysis using the Open Connectome Project. In *Society for Neuroscience Abstract*, 2015.
- 10 J. Vogelstein, S. Smith, W. Gray Roncal, R. Vogelstein, R. Burns, K. Lillaney, A. Baden, G. Kiar, and P. Manavalan. Open Connectome Project and NeuroData: Enabling Data-Driven Neuroscience at Scale. In *Society for Neuroscience Abstract*, 2015.
- 11 G. Kiar, W. Gray Roncal, D. Mhembere, E. Bridgeford, D. Clark, R. Millham, Michael Craddock, Cameron Burns, and J. T. Vogelstein. Community Connectomics via Cloud Computing Utilizing m2g - a Reference Pipeline. In *Organization for Human Brain Mapping*, 2015.
- 12 W. Gray Roncal, O. M. Akmal, M. Encarnacion, T. Latchman, A. Baruah, J. T. Vogelstein, D. Dementhon, N. Kasthuri, R. Burns, C. E. Priebe, and G. D. Hager. A Semantic Framework to Guide Computer Vision in (EM) Connectomics. In *Society for Neuroscience*, 2014.
- 13 A. Sinha, W. Gray Roncal, N. Kasthuri, J. W. Lichtman, and R. Burns. Automatic Annotation of 3D Axoplasmic Reticula for Neuron Segmentation. In *Resting State Brain Connectivity*, page 4(9): A26, 2014.
- 14 D. M. Kleissas, W. Gray Roncal, P. Manavalan, K. Lillaney, A. Sinha, J. T. Vogelstein, G. D. Hager, R. Burns, M. A. Chevillet, and R. J. Vogelstein. Automated Neuronal Graph Creation Using the Open Connectome Project RAMON Data Open Connectome Project ( OCP ) Services. *Society for Neuroscience*, page 2, 2014.
- 15 W. R. Gray Roncal and Others. [Towards a Fully Automatic Pipeline for Connectome Estimation from High-Resolution EM Data](#). In *OHBM*, 2013.
- 16 D. M. Kleissas, W. Gray Roncal, P. Manavalan, J. T. Vogelstein, D. D. Bock, R. Burns, R. J. Vogelstein, H. Moreno, M. Perez, and W. Reyes. Large-Scale Synapse Detection Using CAJAL3D. *Neuroinformatics*, 2013.
- 17 W. R. Gray Roncal and Others. [Towards a Fully Automatic Pipeline for Connectome Estimation from High-Resolution EM Data](#). In *Cold Spring Harbor Laboratory, Neuronal Circuits*, 2012.

- 18 J. T. Vogelstein, W. R. Gray Roncal, R. J. Vogelstein, J. Bogovic, S. Resnick, J. Prince, and C. E. Priebe. [Connectome Classification: Statistical Graph Theoretic Methods for Analysis of MR-Connectome Data](#). In *Organization for Human Brain Mapping*, 2011.
- 19 J. T. Vogelstein, W. Gray Roncal, J. G. Martin, G. C. Coppersmith, M. Dredze, J. Bogovic, J. L. Prince, S. M. Resnick, C. E. Priebe, and R. J. Vogelstein. [Connectome Classification using statistical graph theory and machine learning](#). In *Society for Neuroscience*, 2011.
- 20 W. R. Roncal, Gray, J. A. Bogovic, J. T. Vogelstein, C. Ye, B. A. Landman, J. L. Prince, and R. J. Vogelstein. [Magnetic resonance connectome automated pipeline and repeatability analysis](#). In *Society for Neuroscience*, 2011.
- 21 J. T. Vogelstein, J. Bogovic, A. Carass, W. R. Gray Roncal, J. L. Prince, B. Landman, D. Pham, L. Ferrucci, S. M. Resnick, C. E. Priebe, and R. J. Vogelstein. [Graph-Theoretical Methods for Statistical Inference on MR Connectome Data](#). In *Organization for Human Brain Mapping*, 2010.
- 22 W. R. Gray, J. T. Vogelstein, J. Bogovic, A. Carass, J. L. Prince, B. Landman, D. Pham, L. Ferrucci, S. M. Resnick, C. E. Priebe, and R. J. Vogelstein. [Graph-Theoretical Methods for Statistical Inference on MR Connectome Data](#). In *DARPA Neural Engineering, Science and Technology Forum*, 2010.

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## Invited Talks

- 1 BigNeuro 2017: Analyzing brain data from nano to macroscale (co-organizer and moderator). NIPS, 2017.
- 2 Volumetric Evaluation of Synaptic Interfaces using Computer Vision at Large Scale. Hopkins Imaging Initiative, 2015.
- 3 BigNeuro 2015: Making sense of big neural data workshop. NIPS, 2015.
- 4 *Images to Graphs for Inference*, European Research Data Alliance, 2015.
- 5 *Images to Graphs: Techniques and Strategies for Mapping the Brain*, Oxford University, 2015.
- 6 *Machine Intelligence from Cortical Networks (MICRONS) IRAD*, JHUAPL Hart Prize Colloquium, 2015.
- 7 *Graph Inference for Connectomics*, JHUAPL Graphs Seminar Series.
- 8 *Predicting Human Performance from Brain Connectivity*, JHU Lattman Lecture Series, 2011.
- 9 *Connectome Annotation for Joint Analysis of Large 3-Dimensional Data: Research Progress*, Harvard University, 2013.
- 10 *Towards A Fully Automatic Pipeline for Connectome Estimation from High-Resolution EM Data*, Janelia Farm Turning Images to Knowledge Conference.