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## Yeona Kang

Mathematics Department  
Howard University  
Washington, DC 20059

email: yeona.kang@howard.edu

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### **PROFESSIONAL INTERESTS**

The focus of my research is on scientific computing and data analysis of dynamic brain Positron Emission Tomography images, as well as deep learning and machine learning with structural neural network modeling. To describe biological and medical problems, I develop mathematical models using ordinary differential equations, spectral analysis, parameter estimations/optimization among other tools.

### **EDUCATION**

Stony Brook University	Applied Mathematics & Statistics	Ph.D. 2006 Advisor C.M. Fortmann
Pusan National University (Korea Republic)	Department of Mathematics	M.S 2001 Advisor Y. H. Lee
Pusan National University (Korea Republic)	Department of Mathematics	B.S 1999

### **PROFESSIONAL EXPERIENCES**

8/2018-	Assistant Professor Department of Mathematics at Howard University Washington, DC
7/2016 – 8/2018	Instructor of Mathematics in Radiology Radiology Department at Weill Cornell Medical College New York, NY
8/2014 – 6/2016	Research Associate in Radiology Radiology Department at Weill Cornell Medical College New York, NY
9/2012 – 7/2014	Visiting research scientist Department of Chemistry at Brookhaven National Laboratory Upton, NY
1/2012 – 7/2013	Senior Research Scientist Department of Materials Science at Stony Brook University Stony Brook, NY
8/2011 – 7/2013	Senior Mathematical Modeler Idalia Solar Technologies LLC New York, NY
9/2008–12/2011	Research Scientist Department of Materials Science, Stony Brook University Stony Brook, NY

9/2006 – 8/2008

Postdoctoral Research Scientist

Department of Applied Mathematics and Statistics, Stony Brook  
University  
Stony Brook, NY

## **PUBLICATIONS & PATENTS**

### **I. Research Papers**

1. Yanping Ma, **Yeona Kang**, Angelica Davenport, Jennifer Aduamah, Kathryn Link, and Katharine Gurski, Extended-release Pre-Exposure prophylaxis and drug resistant HIV, WIMB spring book chapter for *Mathematical Modeling for Women's Health - Collaborative Workshop for Women in Mathematical Biology* (submitted Feb 2023).
2. Andrew C. Kelleher, Joseph Ramsey, Wenjing Zhao, et al., Quantification of mu-opioid receptors using [ $^{11}\text{C}$ ]carfentanil PET in rat brain: Mass effect and test-retest reproducibility, *EJNMMI* (submitted Oct 2022).
3. Rankins, D. R., Dixon, D., **Kang, Y.**, Kim, S. Analysis of the Convolutional Neural Network Model in Detecting Brain Tumor. *International Journal of Computer and Information Technology*, **2022** 11(4), 125.
4. **Yeona Kang**, K Jamison, A Haywant, K Dams-O'connor, N Kim, N A Karakatsanis, T Butler, N D Schiff, A Kuceyeski, S A Shah. Longitudinal alterations in gamma-aminobutyric acid (GABA<sub>A</sub>) receptor availability over ~ 1 year following traumatic brain injury. *Brain Communications*. **2022** June 4(4); fcacl59.
5. Nina B, Dewayne AD, Seunguk K, and **Yeona K**, Fluorescence Emission Wavelength QSPR Application with Linear Blending Method in Machine Learning Algorithms, *Computational Science and Information Technology*, **2022** 10(2).
6. **Yeona Kang**, O'Connor KA, Kelleher AC, Ramsey J, Bakhoda A, Eisenberg SM, Zhao W, Stodden T, Pearson TD, Guo M, Brown N, Liow JS, Fowler JS, Kim SW, Volkow ND. Naloxone's dose-dependent displacement of [ $^{11}\text{C}$ ]carfentanil and duration of receptor occupancy in the rat brain. *Sci Rep*. **2022** Apr 19;12(1):6429. (***Selected the top 100 Psychology Scientific Reports papers from 2022***) (4 citations)
7. Agaronyan A, Syed R, Kim R, Hsu CH, Love SA, Hooker JM, Reid AE, Wang PC, Ishibashi N, **Kang Y**, Tu TW. A Baboon Brain Atlas for Magnetic Resonance Imaging and Positron Emission Tomography Image Analysis. *Front Neuroanat*. **2022**;15:778769. PubMed Central PMCID: PMC8795914. (***Corresponding author***) (4 citations)
8. Guo M, Bakhoda A, Gao ZG, Ramsey JM, Li Y, O'Connor KA, Kelleher AC, Eisenberg SM, **Kang Y**, Yan X, Javdan C, Fowler JS, Rice KC, Hooker JM, Jacobson KA, Kim SW, Volkow ND. Discovery of Highly Potent Adenosine A<sub>1</sub> Receptor Agonists: Targeting Positron Emission Tomography Probes. *ACS Chem Neurosci*. **2021** Sep 15;12(18):3410-3417. (2 citations)
9. **Yeona Kang**, Pandya S, Zinger N, Michaelson N, Gauthier SA. Longitudinal change in TSPO PET imaging in progressive multiple sclerosis. *Ann Clin Transl Neurol*. **2021** Aug;8(8): 1755-1759. doi: 10.1002/acn3.51431. Epub 2021 Jul 26. PMID: 34310086; PMCID: PMC8351399 (6 citations)

10. **Yeona Kang**, Rúa, S.M.H., Kaunzner, U.W. *et al.* A Multi-Ligand Imaging Study Exploring GABAergic Receptor Expression and Inflammation in Multiple Sclerosis. *Mol Imaging Biol* (2020). (6 citations)
11. Shani Waninger, Chris Berka, Stevanovic Karic, P. David Mozley, Claire Henchcliffe, **Yeona Kang**, Jacob Hesterman, Tommer Mangoubi, and Ajay Verma, 2020, Neurophysiological Biomarkers of Parkinson's Disease. *Journal of Parkinson's Disease*, 10 (2020) 471-480. (27 citations)
12. Eric Ngang Che, **Yeona Kang** and Abdul-Aziz Yakubu, 2019. Risk Structured Model of Cholera Infections in Cameroon. *Math Biosci*, 320 108303. (8 citations)
13. **Yeona Kang** and Susan A Gauthier, 2019. PET is necessary to make the next step forward in understanding MS pathophysiology – commentary. *Multiple sclerosis journal*, Feb 27 1-2. (1 citations)
14. Ulrike W Kaunzner, **Yeona Kang**, et al., 2019. Quantitative susceptibility mapping identifies inflammation in a subset of chronic multiple sclerosis lesions, *Brain*, 142:133-145. (131 citations)
15. **Yeona Kang**, et all., 2018. 18F-FPEB PET/CT Shows mGluR5 Upregulation in Parkinson's Disease, *J Neuroimaging*, 2018;00:1-7. (29 citations)
16. **Yeona Kang**, et al., 2018. Comparison of two different methods of image analysis for the assessment of microglial activation in patients with multiple sclerosis using (R)-[N-methyl-carbon-11]PK11195, *PLoS One*. 13;8:e0201289. (9 citations)
17. **Yeona Kang**, et al., 2018. (R)-[N-methyl-Carbon-11]PK11195: Non-Invasive Image Analysis Techniques Confirm Abnormal Microglial Activation in Patients with Parkinson's Disease, *J Neuroimaging*, 2018;00:1-10. (33 citations)
18. Francesca Zanderigo, **Yeona Kang**, et al., 2018. [<sup>11</sup>C]arachidonic acid incorporation measurement in human brain: optimization for clinical use, *Synapse*. 72(2):e22018. (9 citations)
19. Ulrike W. Kaunzner, **Yeona Kang** et al., 2017. Reduction of PK11195 uptake observed in multiple sclerosis lesions after natalizumab initiation, *Multiple Sclerosis and related Disorders*. 15(2017): 27-33. (*Equal Contributing Author*)
20. Tracy Butler, et al., 2016. Transient and chronic seizure-induced inflammation in human focal epilepsy, *Epilepsia*. 57; 9: e191-e194.
21. Young Jun Seo, **Yeona Kang** et al., 2014. Development of blood-brain barrier permeable HDAC inhibitors and PET radiotracers for CNS applications, *ACS Chemical Neuroscience*. 16; 5(7): 588-596.
22. Sung Won Kim, Joanna S. Fowler, Philip Skolnick, **Yeona Kang**, et al., 2014. Evidence that orally administered buspirone blocks D3 but not D2 receptors in the living non-human primate brain, *The International Journal of Neuropsychopharmacology*. 17; 8(20): 1257-1267.
23. Young Jun Seo, Lisa Muench, Alicia Reid, Jinzhu Chen, **Yeona Kang**, Jacob M. Hooker, Nora D. Volkow, Joanna S. Fowler, Sung Won Kim, 2013. Radionuclide Labeling and Evaluation of Candidate Radioligands for PET Imaging of Histone Deacetylase in the Brain, *Bioorganic & Medicinal Chemistry Letters*. 23(24): 6700-6705.
24. **Yeona Kang** and C. M. Fortmann, 2013. An Alternative Approach to Protein Folding, *Biomed Research International*. 2013: 583045.

25. Ping Lee, **Yeona Kang** and C.M Fortmann, **2011**. Crystal Particle Raman-Scattering and Applications for Improved Solar Cell Performance, Appl. Phys. Lett. 99: 251109.
26. **Yeona Kang** and C. M. Fortmann, **2009**. Physical Markov model for protein structure prediction, Bioinformatics and Biomedicine, 356.
27. **Yeona Kang** and C. M. Fortmann. **2007**. A structural basis for the Hodgkin and Huxley relation, Appl. Phys. Lett. 91: 223903.
28. **Yeona Kang**, E. L. Jean, and C. M. Fortmann. **2006**. Einstein relations for energy coupled particle systems. Appl. Phys. Lett. 88: 112110.

### **Conference Selected Presentation & invited Talks**

1. Society for Mathematical Biology Annual Meeting, Extended-release Pre-Exposure Prophylaxis and Drug Resistant HIV, (Columbus, Ohio, July 2023).
2. The 25th International Symposium of Radiopharmaceutical Sciences, Evaluating the potential of CCR2 for the early detection of head and neck cancer, (Honolulu, Hawaii, May 2023).
3. Kang, Y., Invited talk, Naloxone's displacement of [ $^{11}\text{C}$ ]carfentanil binding and receptor occupancy duration: implications for overdose reversal, Pusan National University, Pusan, South Korea. (August 2022).
4. NIMH/molecular imaging branch/Section on PET Radiopharmaceutical Sciences, Preclinical Evaluation of IV Naloxone: Mu-opioid receptor Occupancy in Rats, (Virtual, May 2022).
5. Joint Mathematical Meeting, Alteration of Neuronal Integrity Underlying Executive Attention Impairments Following Traumatic Brain Injury: PET study utilizing [ $^{11}\text{C}$ ]Flumazenil, (Virtual, Jan 2021).
6. Workshop for Imaging disease Mechanisms of progression in MS: Beyond brain atrophy on North American Imaging in MS Cooperative, Multi-Ligand Imaging of Neuronal Dynamics, and Inflammation in Multiple Sclerosis, (Dallas, TX 2019).
7. ACTRIMS Forum 2019, The impact of CNS inflammation on the GABAergic system: A Multi-ligand PET study Utilizing [ $^{11}\text{C}$ ] Flumazenil and [ $^{11}\text{C}$ ]PK11195, (Dallas, TX 2019)
8. Diversity in Data Science and Machine Learning conference, Howard University, (DC 2019).
9. Society of Nuclear Medicine and Molecular Imaging (SNMMI) Annual Meeting, Alteration of Blood Brain Barrier during Cuprizone-Induced Neuroinflammation using multi-tracers with PET: [ $^{68}\text{Ga}$ ]EDTA, [ $^{11}\text{C}$ ](R)PK11195, and [ $^{11}\text{C}$ ]DPA713. (Philadelphia, PA 2018).
10. European Association of Nuclear Medicine (EANM), PET imaging of mGluR5 with [ $^{18}\text{F}$ ]FPEB in Parkinson's disease. *Elected as a Hot Topics* (Vienna, Austria 2017).
11. European Committee for Treatment and Research in Multiple Sclerosis (ECTRIMS), The impact of CNS inflammation on the GABAergic system: A Multi-ligand PET study utilizing [ $^{11}\text{C}$ ] Flumazenil and [ $^{11}\text{C}$ ] PK11195. *Elected as a Hot Topics* (Paris, France 2017).
12. Society of Nuclear Medicine and Molecular Imaging (SNMMI) Annual Meeting, Dopamine transporter (DaT) imaging using [ $^{11}\text{C}$ ]PE2i-PET in patients with Parkinson

- disease: Estimating test-retest variability based on image derived input functions (IDIFs). (San Diego, CA 2016).
13. American Academy of Neurology (AAN) 64th Annual Meeting, Very Long Term Clinical and Radiological Outcomes of Fetal Tissue Transplant for Parkinson's Disease. (Vancouver, Canada 2016).
  14. Movement Disorder Society (MDS) 20th International Congress of Parkinson's Disease and Movement Disorders, Clinical and Neuroimaging Outcomes up to 18 Years after Fetal Tissue Transplant for Parkinson's Disease. (Berlin, Germany 2016).
  15. Society of Nuclear Medicine and Molecular Imaging (SNMMI) Annual Meeting, Reproducibility of test-retest with [11C]-PK11195 using different input function approaches. *Elected as a Hot Topics* (Baltimore, MA 2015).
  16. Brain2015, In vivo kinetic analysis for WM lesions in multiple sclerosis with [11C]-PK11195. (Vancouver, CA 2015).
  17. American College of Neuropsychopharmacology (ACNP) Annual Meeting, Buspirone Blocks Dopamine D3 Receptors in the Non-Human Primate Brain When Administered Orally. *Elected as a Hot Topics* (FL, USA 2013).
  18. NIMS Workshop Special Highlights on Mathematical Biology, Power of PET for Drug R&D in Neuroscience for Mathematical aspect. (DaeJeon, Korea 2013).
  19. MRS 2012 Spring Meeting, Spectral management in solar cell applications. (CA, USA 2012).

## **Grants (Contracts, Fellowships, Grants and Sponsored Research)**

### **Funded**

1. Kang, Y. (Principal), Lie, Y. (Principal), "Targeted Positron Emission Tomography Imaging of Head and Neck Squamous Cell Carcinoma," Sponsored by Howard University/Siteman Cancer Center Collaborative Research Initiative, Other, \$50,000.00. (January 2023 - December 2023).
2. T.-W. T. (Principal), M. B. (Co-Principal), Kang, Y. (Co-Principal), D. P. (Co-Principal), "Excellence in Research: PathoRadi – an interactive web server for AI-assisted radiologic-pathologic image analysis, correlation and visualization," Sponsored by NSF, Federal, \$651,130.00. (September 1, 2022 - August 31, 2025).
3. Kang, Y.(Principal), "Mathematical modeling in brain dynamic PET image and application with machine learning," Sponsored by Simon Foundation, Private, \$85,000.00. (September 2022 – August 2027).
4. Burge, L. (Principal), Washington, G. (Co-Principal), Kang, Y. (Co-Principal), Shara, N. (Co-Principal), Gail, N. (Co-Principal), Karl, T. (Co-Principal), Okunji, P. (Co-Principal), Southerland, W. (Co-Principal), Ritu, A. (Co-Principal), Liu, C. (Co-Principal), Mcgarvey, P. (Co-Principal), "ML, AI, data Science, Teaching, Education, and Research (MASTER) Consortium on Health Disparities Training Core," Sponsored by NIH, Federal, \$15,000,000.00. (August 8, 2021 - September 7, 2023).
5. Kang, Y., "Cornell Math REU 2021," Sponsored by NSF-Cornell, Private, \$10,000.00. (June 2021 - July 2021).

6. Kang, Y., "Summer Faculty Fellowship," Sponsored by Howard University, Private, \$10,000.00. (2019).

### **Pending**

1. Kang, Y. (Co-Principal), "Longitudinal alterations in GABAA receptor availability and its relationship with structural and functional connectivity in the anterior forebrain mesocircuit following traumatic brain injury," Sponsored by NIH, Federal. (Feb 2023)
2. Kang, Y. (Co-Principal), "Multi-modal assessment of cognitive dysfunction and resilience in Multiple Sclerosis," Sponsored by NIH, Federal, \$131,960.00. (Feb 2023)

### **Not Funded**

1. Kang, Y. (Co-Principal), "Longitudinal alterations in GABAA receptor availability and its relationship with structural and functional connectivity in the anterior forebrain mesocircuit following traumatic brain injury," Sponsored by NIH, Federal. (June 2022)
2. Kang, Y. (Principal), "Multi-modal assessment of cognitive dysfunction and resilience in Multiple Sclerosis," Sponsored by NIH, Federal, \$131,960.00. (June 2022)
3. Kang, Y., "Hybrid Machine Learning Derived Quantitative Structure-Activity Relationship (QSAR) to Predict Functional Activity in well-defined Adenosine A1 Receptor compounds," Sponsored by Northwestern-NSF Pilot grant, Federal. (March 2022).
4. Kang, Y., "Multi-modal assessment of cognitive dysfunction and resilience in Multiple Sclerosis," Sponsored by NIH, Federal. (October 2021).
5. Kang, Y. (Co-Principal), "Altered neuronal integrity underlying executive attention impairments following traumatic brain injury," Sponsored by NIH, Federal. (March 2021).
6. Kang, Y., "Nuclear magnetic resonances as a tool for understanding quantum computing," Sponsored by IBM-HBCU Quantum Center Membership, Howard University. (December 2020).
7. Kang, Y. (Co-Principal), Kim, S. (Principal), "Modeling central-carbon metabolism in photosynthetic unicellular algae: carbon flux analysis by combined NMR and mass spectrometry," Sponsored by NSF, Federal. (October 2020).
8. Kang, Y., "Altered neuronal integrity underlying executive attention impairments following traumatic brain injury," Sponsored by NIH, Federal. (June 2020).
9. Kang, Y., "Network functional integrity underlying executive attention impairments following traumatic brain injury," Sponsored by NIH, Federal. (February 2020).
10. Kim, S. J., Kang, Y., "Modeling central-carbon metabolism in photosynthetic unicellular algae: carbon flux analysis by combined NMR and mass spectrometry," Sponsored by NSF, Federal. (2019).
11. Kang, Y., Tu, T.-W., "The role of Blood Brain Barrier Permeability in Imaging Neuroinflammation with PET," Sponsored by NIH, Federal. (2019).
12. Kang, Y. (Principal), Tu, T.-W. (Principal), "Morphological learning system for neuroglia cell detection, classification and quantification," Sponsored by NIH, Federal, \$200,000.00. (October 2019).
13. Shah, S., Kang, Y., "Network functional integrity underlying executive attention impairments following traumatic brain injury," Sponsored by NIH, Federal. (2018).

### **Teaching**

#### **Teaching Experience**

## Howard University (2018-present)

- Math189 Probability and Statistics I (01) (Instructor) Spring 2023
- Math189 Probability and Statistics I (01) (Instructor) Fall 2022
- Math189 Probability and Statistics I (02) (Instructor)
- Math189 Probability and Statistics I (Instructor) Spring 2022
- Math189 Probability and Statistics I (Instructor), Fall 2021
- Math189 Probability and Statistics I (Instructor),  
Math 241 Mathematical Statistics II (Instructor) Spring 2021
- Math 240 Mathematical Statistics I (Instructor),  
Math 190 Probability and Statistics II (Instructor) Fall 2020
- Math 006 College Algebra (instructor) Spring 2020
- Math190 Probability and Statistics (instructor),  
Math 156 Calculus I (Instructor) Fall 2019
- Math190 Probability and Statistics (instructor) Spring 2019
- Math006 College Algebra I (instructor),  
Math158 Calculus III (instructor). Fall 2018

## Course Development

- **Probability and Statistics for Data Science** – Online asynchronous Data Science Master's program course for students without a mathematics background
- **Probability and Statistics I** – Updated curriculum, incorporating Python-based statistical programming.

## Service

### University Service

#### College

- Committee, Lucy Moten Committee. (September 2022 - August 2024).

#### Department

- Advisor, Applied Math Concentration. (October 2021 - Present).
- Committee, Senior Comp Exam. (September 2021 - Present).
- Committee, Statistics Qualifying Exam. (August 2020 - Present).
- Committee, Curriculum Committee. (September 2021 - August 2024).
- Thesis Committee (3 Ph.D students)
- Hiring Committee member for 5 search (2022 - 2023)

### Professional Service

- Session co-Organizer, Association for Women in Mathematics Research Symposium (Sep 30 – Oct 3 2023).

- Review Editor on the Editor Board of Neuroimaging analysis and protocols (specialty section of Frontiers in Neuroimaging) (June 2023 -).
- Editorial Review Board Member, SIAM undergraduate research online (SIURO), Philadelphia, PA. (January 2023 - December 2025).
- Program Organizer, AMS Eastern sectional meeting in Spring 2024, Washington, DC. (February 2022 – April 2024).
- Project co-leader, Women in Math Biology workshop for research network (June 2022).
- Program Organizer, Series Conference: HU MATH MODELING IN BIOLOGY & MEDICINE. (September 2021-December 2021).
- Program Organizer, Series Conference: HU MATH MODELING IN BIOLOGY & MEDICINE. (January 2022 - May 2022).
- Participant, Workshop on Rules of Life in the Context of Future Mathematical Sciences (November 8 – 10, 2018).