

Kynon Jade Benjamin

K99 POSTDOCTORAL FELLOW · COMPUTATIONAL GENETICIST

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Research Interests: Neurological disorders, neuropsychiatric, health disparities, bioinformatics, computational genetics

Summary

COMPUTATIONAL GENETICIST with expertise in bioinformatics, machine learning, and molecular biology. Authored and/or contributed to 8 publications, 24 presented posters and presentations national, regional, and local meetings, receiving 6 awards including 3 first place. Experience in computational pipeline developed and implementation.

Education & Training

Lieber Institute for Brain Development; Johns Hopkins University, Departments of Neurology and Psychiatry

Baltimore, MD

POSTDOCTORAL FELLOW: "GENETIC AND ENVIRONMENTAL REGULATION OF GENE EXPRESSION IN NEUROPSYCHIATRIC DISORDERS"

Oct 2017 - Present

- Computational analysis in four postmortem brain regions for genetic and epigenetic ancestry (**Python, R, Machine learning**)
 - Identified and characterized ancestry-related expression differences in postmortem brain from AA and EA individuals
 - Designed, developed, and implemented GPU-based eQTL and fine-mapping analysis pipeline
 - Designed, developed, and implemented mash modeling pipelines for differential expression and eQTL analyses
 - Designed, developed, and implemented pipeline for determining genetic bases of ancestry-related expression differences
- Computational analysis in postmortem brain for schizophrenia (**Python, R, Linux, Machine learning**)
 - Identified new insights into the role of the caudate in schizophrenia and potential new lines of treatment
 - Designed, developed, and implemented genotype imputation pipeline for eQTL analysis
 - Designed, developed, and implemented limma-voom differential expression pipeline for post-mortem samples
 - Designed, optimized, and implemented machine learning pipelines with feature reduction and ranking
 - Prioritized genes and genetic variants associated with schizophrenia risk via functional genomics (**TWAS, Colocalization, SMR**)
 - Examined dopamine system and the affect of antipsychotics within the caudate nucleus
 - Designed, developed, and implemented co-expression network analysis (**Autoencoders, WGCNA**)
- Human cell lines and organoids for neurodevelopment (**Python, R, Linux**)
 - Collaborated with bench biologist bulk and single-cell RNA-sequencing and genotyping
 - Designed, developed, and implemented single-cell RNA-sequencing pipeline
 - Designed and preformed genetic verification of postmortem dura-derived induced pluripotent stem cells
- NIH T32 Training Program in Psychiatry
- MOSAIC Postdoctoral Career Transition Award to Promote Diversity (K99/R00): MD0169640

Texas A&M University, Department of Veterinary Pathobiology

College Station, TX

PH.D. IN GENETICS; DISSERTATION: "UNDERSTANDING THE IMPRINTING MECHANISM OF *UBE3A* FOR THERAPEUTIC INTERVENTION"

Aug 2012 - Aug 2017

- Computational and molecular characterization of the expression patterns of long non-coding RNA of *Ube3a/UBE3A* antisense and novel *Ube3a* isoform 4 in the imprinting of *Ube3a*
 - Analyzed more than **5 TB** of RNA-seq, stranded and unstranded, paired- and single-end datasets for mouse and human over a range of tissues and cell types for spatiotemporal regulation (**R, Linux**)
 - My pipeline reduced overall processing time by 90%, decreased storage by 60% by removing unnecessary intermediate conversion files, increased quality control and improved novel isoform detection
 - ANOVA, student's T-test, post-hoc Tukey's HSD statistical analysis conducted in **R** significantly reducing computational time from programs like **PRISM** and **Excel**
 - Utilized quantitative real-time PCR, Sanger sequencing, electrophoresis, and cloning for long non-coding RNA analysis and alternative splicing verification
- Developed interactive **R** script to analyze **1.2 TB** of fluorescent image based high-throughput screening data assay to reactivate paternal *Ube3a* allele in ES cell derived neurons for therapeutic intervention (**Stem cells, ImageJ, R**)
 - Developed **Shiny** web application for automatic high-throughput screen analysis and logistic regression algorithm for hit analysis (**Shiny, Octave, R**)
 - Supervised a team of undergraduates in molecular data acquisition and basic laboratory work
 - Utilized immunofluorescence microscopy and mouse embryonic stem cell technology
- Findings:
 1. Neuron-specific spatiotemporally regulated *Ube3a* antisense is an extensively processed transcript with 5' capping, 3' polyadenylation and alternative splicing
 2. Proposed new model for imprinting mechanism of *Ube3a* involving a temporally regulated novel paternal specific isoform, denoted isoform 4
 3. Developed high-throughput screening assay for drug discovery in ES cell-derived neurons

- Investigated increasing drug loading into nanofibers to determine the mechanical integrity of fibers as a function of percent drug
- Prepared, evaluated, and analyzed electrospun poly(ϵ -caprolactone) and poly(vinyl alcohol) nanofibers via SEM, fluorescence assays, pH change, and mechanical tester
- Developed semi-automatic **MATLAB** script for mechanical tester analysis reducing processing time by $\sim 70\%$
- Developed liquid chromatography mass spectrometry (LC-MS) method for the analysis of naproxen drug release from polymeric scaffolds in media and PBS
- Supervised and trained undergraduate and graduate students on nanofiber technique

Indiana University, Purdue University, Indianapolis

Indianapolis, IN

LIFE-HEALTH SCIENCE INTERNSHIP INTERN

Aug 2009 - Jul 2010

- Investigated cement degradation of dicalcium phosphate dihydrate for cranial implants
- Prepared, evaluated, and analyzed monocalcium phosphate monohydrate(MCPM)/ β -tricalcium phosphate cements and MCPM/nanocrystalline hydroxyapatite cements independently
- Developed skills in degradation analysis using X-ray diffraction, percent mass loss, pH change, and *in vitro* live/dead cell assay

Publications

Published

1. **Benjamin, KJM**, Chen, Q, Jaffe, AE, Stolz, JM, Collado-Torres, L, Huuki, LA, Burke, EE, Arora, R, Feltrin, AS, Barbosa, AR, Radulescu, E, Pergola, G, Shin, JH, Ulrich, WS, Deep-Soboslay, A, Tao, R, the BrainSeq Consortium, Hyde, TM, Kleinman, JE, Erwin, JA, Weinberger, DR, and Apuã CM Paquola. "Analysis of the caudate nucleus transcriptome in individuals with schizophrenia highlights effects of antipsychotics and novel risk genes". *Nature Neuroscience*. 2022. DOI: <https://doi.org/10.1038/s41593-022-01182-7>.
2. D'Ignazio, L, Jacomini, RS, Qamar, B, **Benjamin, KJM**, Arora, R, Sawada, T, Diffenderfer, KE, Pankonin, AR, Hendriks, WT, Bragg, DC, Paquola, ACM, and Jennifer A Erwin. "Variation in TAF1 expression in female carrier induced pluripotent stem cells and human brain ontogeny has implications for adult neostriatum vulnerability in X-linked Dystonia Parkinsonism". *eNeuro*. 2022. PMID: 35868859.
3. Sawada, T, **Benjamin, KJM**, Brandtjen, AC, Tietze, E, Allen, SJ, Paquola, ACM, Kleinman, JE, Hyde, TM, and Jennifer A Erwin. "Generation of four postmortem dura-derived iPS cell lines from four control individuals with genotypic and brain-region-specific transcriptomic data available through the BrainSEQ consortium". *Stem Cell Research*. 2020. PMID: 32446240.
4. Sawada, T, Chater, TE, Sasagawa, Y, Yoshimura, M, Fujimori, N, Tanaka, K, **Benjamin, KJ**, Paquola, ACM, Erwin, JA, Goda, Y, Nikaido, I, and Tadafumi Kato. "Developmental Excitation-Inhibition Imbalance Underlying Psychoses Revealed by Single-Cell Analyses of Discordant Twins-Derived Cerebral Organoids". *Molecular Psychiatry*. 2020. PMID: 32764691.

Submitted

1. **Benjamin, KJM**⁺, Arora, R⁺, D'Ignazio, L, Hyde, TM, Kleinman, JE, Weinberger, DR, Paquola, ACM, and Jennifer A Erwin. "Effects of sex on transcriptional associations with schizophrenia across dorsolateral prefrontal cortex, hippocampus, and caudate nucleus". [pre-print]. 2022. DOI: <https://doi.org/10.1101/2022.09.30.22280452>.
2. **Benjamin, KJM**, Katipalli, T, and Apuã CM Paquola. "dRFtools: Dynamic recursive feature elimination for 'omics". [pre-print]. 2022. DOI: <https://doi.org/10.1101/2022.07.27.501227>.
3. Sawada, T, Barbosa, A, Araujo, B, McCord, AE, D'Ignazio, L, **Benjamin, KJM**, Feltrin, A, Arora, R, Brandtjen, A, Kleinman, JE, Hyde, TM, Weinberger, DR, Paquola, ACM, and Jennifer A Erwin. "Ventral forebrain organoids derived from individuals with schizophrenia recapitulate perturbed striatal gene expression dynamics of the donors' brains". [pre-print]. 2022. DOI: <https://doi.org/10.1101/2022.05.26.493589>.
4. Tietze, E, Barbosa, AR, Euclides, V, Cho, HJ, Lee, YK, Feltrin, A, van de Leemput, J, Di Carlo, P, Sawada, T, **Benjamin, KJ**, Brentani, H, Kleinman, JE, Hyde, TM, Weinberger, DR, Ursini, G, McKay, R, Paquola, ACM, Shin, JH, and Jennifer A Erwin. "Single-cell analysis of human trophoblast stem cell specification reveals activation of fetal cytotrophoblast expression programs including coronavirus associated host factors and human endogenous retroviruses". [pre-print]. 2020. DOI: <https://doi.org/10.1101/2020.08.29.273425>.

Scholarship

Extramural Funding

NIMHD K99MD0169640: MOSAIC

COMPREHENSIVE COMPUTATIONAL ANALYSIS OF GENETIC AND REGULATORY DIFFERENCES BETWEEN INDIVIDUALS WITH AFRICAN AND EUROPEAN ANCESTRIES ACROSS FOUR BRAIN REGIONS; \$947000

Baltimore, MD

Dec 2021 - Nov 2023

NIMH T32MH015330: Fellowship

ANALYSIS OF THE CAUDATE NUCLEUS TRANSCRIPTOME IN INDIVIDUALS WITH SCHIZOPHRENIA HIGHLIGHTS EFFECTS OF ANTIPSYCHOTICS AND NOVEL RISK GENES; SUPPORTS NIH LEVEL SALARY AND PROFESSIONAL DEVELOPMENT

Baltimore, MD

Jun 2019 - May 2021

Great Lakes STEM Scholarship

\$2500 AWARD

College Station, TX

July 2014

Intramural Funding

CVM Advanced Developmental Training Travel Award

UPTO \$2500 FOR TRAVEL EXPENSIVES

College Station, TX

May 2015

CVM Graduate Student Research Trainee Grant

\$5000 SEED MONEY RESEARCH AND SUPPLIES TO GENERATE PRELIMINARY DATA

College Station, TX

May 2014

Texas A&M Institute for Genome Sciences and Society (WSGI) Graduate Traineeship

COMPUTATIONAL ANALYSIS OF 50 IDIOPATHIC ANGELMAN SYNDROME PATIENTS; SUPPORTS HALF OF SALARY

College Station, TX

Sep 2013 - Aug 2014

Presentations

Invited Talk/Oral Presentations

International Conference on Intelligent Biology and Medicine

ORAL: "DRFETOOLS: DYNAMIC RECURSIVE FEATURE ELIMINATION FOR OMICS"

Philadelphia, PA

August 2022

MERIT Emerging Leaders Symposium

INVITED TALK: "LARGE-SCALE COMPUTATIONAL GENOMICS: NEW, REUSE, AND DEVELOP"

New York, NY

July 2022

Johns Hopkins Postdoctoral Conference

ORAL: "COMPUTATIONAL ANALYSIS OF GENETIC AND TRANSCRIPTIONAL LANDSCAPES OF THE CAUDATE NUCLEUS IN SCHIZOPHRENIA"

Baltimore, MD

April 2019

Defense Threat Reduction Agency

INVITED TALK: "UNDERSTANDING THE IMPRINTING MECHANISM OF *Ube3a* FOR THERAPEUTIC INTERVENTION"

Fort Belvoir, VA

July 2017

Center for Computational Biology & Bioinformatics (UCSD)

INVITED TALK: "UNDERSTANDING THE IMPRINTING MECHANISM OF *Ube3a* FOR THERAPEUTIC INTERVENTION"

San Diego, CA

June 2017

Inova Translational Medicine Institute

INVITED TALK: "THE *Ube3a* ANTISENSE TRANSCRIPT UNDERGOES EXTENSIVE PROCESSING AND IS SPATIOTEMPORALLY REGULATED IN THE BRAIN"

Falls Church, VA

June 2017

Laboratory of Molecular Virology & Pathogenesis (MHRP)

INVITED TALK: "THE *Ube3a* ANTISENSE TRANSCRIPT UNDERGOES EXTENSIVE PROCESSING AND IS SPATIOTEMPORALLY REGULATED IN THE BRAIN"

Silver Spring, MD

June 2017

Texas A&M Student Research Week

ORAL: "INVESTIGATING NOVEL *Ube3a* ISOFORM 4 IN THE IMPRINTING OF *Ube3a*"

College Station, TX

March 2016

Genetics and Genomics (G2) Seminar Series

INVITED TALK: "INVESTIGATING NOVEL *Ube3a* ISOFORM 4 IN THE IMPRINTING OF *Ube3a*"

College Station, TX

February 2016

College of Veterinary Medicine (CVM) Neuroscience

INVITED TALK: "NEURODEVELOPMENTAL DISORDERS: INSTABILITY OF CHROMOSOME 15Q11-Q13"

College Station, TX

April 2015

Texas A&M Student Research Week

ORAL: "DEVELOPMENT OF EMBRYONIC STEM CELL-DERIVED NEURONAL CULTURES FOR HIGH-THROUGHPUT DRUG SCREENING"

College Station, TX

February 2014

Poster Presentations

American Society of Human Genetics

POSTER: "GENETIC AND ENVIRONMENTAL REGULATION OF CAUDATE NUCLEUS TRANSCRIPTOME IN SCHIZOPHRENIA"

Los Angeles, CA

October 2022

Society of Neuroscience

POSTER: "COMPUTATIONAL ANALYSIS OF GENETIC AND TRANSCRIPTIONAL LANDSCAPES OF THE CAUDATE NUCLEUS IN SCHIZOPHRENIA"

San Diego, CA

November 2018

Texas A&M Imaging Sciences Spotlight Series

POSTER: "HIGH-THROUGHPUT DRUG SCREENING OF MOUSE EMBRYONIC STEM CELL-DERIVED NEURONS"

College Station, TX

January 2016

College of Veterinary Medicine (CVM) Symposium

POSTER: "HIGH-THROUGHPUT DRUG SCREENING OF MOUSE EMBRYONIC STEM CELL-DERIVED NEURONS"

College Station, TX

January 2016

Texas A&M Health Science Center Symposium

POSTER: "DEVELOPMENT OF EMBRYONIC STEM CELL-DERIVED NEURONAL CULTURES FOR HIGH-THROUGHPUT DRUG SCREENING"

College Station, TX

April 2014

Texas A&M Genetics Graduate Student Recruiting Symposium

POSTER: "DEVELOPMENT OF EMBRYONIC STEM CELL-DERIVED NEURONAL CULTURES FOR HIGH-THROUGHPUT DRUG SCREENING"

College Station, TX

February 2014

National Society of Black Engineers Fall Regional Conference

POSTER: "DRUG LOADING OF NAPROXEN SODIUM ON THE DEGRADATION CHARACTERISTICS OF POLYCAPROLACTONE"

Rochester, NY

October 2011

Biomedical Engineering Society Annual Meeting

POSTER: "DRUG LOADING OF NAPROXEN SODIUM ON THE DEGRADATION CHARACTERISTICS OF POLYCAPROLACTONE"

Hartford, CT

October 2011

NSF LSAMP/RPI SURP

POSTER: "DRUG LOADING OF NAPROXEN SODIUM ON THE DEGRADATION CHARACTERISTICS OF POLYCAPROLACTONE"

Troy, NY

August 2011

Walter Lincoln Hawkins '32 Graduate Research Conference

POSTER: "COMPARISON OF MCPM-TCP AND MCPM-HA CEMENT DEGRADATION"

Troy, NY

April 2011

Purdue Biomaterials Research Symposium

POSTER: "COMPARISON OF MCPM-TCP AND MCPM-HA CEMENT DEGRADATION"

West Lafayette, IN

April 2010

Life-Health Sciences Internship Poster Session

POSTER: "COMPARISON OF MCPM-TCP AND MCPM-HA CEMENT DEGRADATION"

Indianapolis, IN

April 2010

Annual Glenn Research Center Summer Poster Session

POSTER: "BIOFUELS AS AN ALTERNATIVE FUEL SOURCE FOR AVIATION"

Cleveland, OH

August 2009

Panels

Hopkins URM Accepted Applicants Virtual Visit

PANEL: "HOPKINS GRADUATE ACCEPTED APPLICANTS VISIT FACULTY/FELLOWS PANEL"

Virtual

March 2021

Johns Hopkins, School of Medicine; Second Look Visit

PANEL: "JOHNS HOPKINS GRADUATE BIOMEDICAL EDUCATION PROGRAMS ACCEPTED APPLICANTS, FACULTY AND POSTDOCTORAL FELLOWS PANEL"

Baltimore, MD

March 2019

Johns Hopkins, School of Medicine; Biomedical Scholars Association Event

PANEL: "NAVIGATING AND PREPARING FOR A CONFERENCE"

Baltimore, MD

November 2018

Teaching

LIBD rstats Club

JOURNAL CLUB SESSION LEADER

- Suggested R programming related topics for discussion
- Developed lesson plan for R programming topics in bioinformatics
- Lecture history of session: <https://bit.ly/30gpcZk>

Baltimore, MD

Apr 2020 - Currently

Summer Undergraduate Research Virtual Exchange (SURVE)

LECTURER

- Development learning objectives and activities for SURVE
- Collaborative virtual lecturer

Baltimore, MD

Jul 2020 - Aug 2020

Basic Science Institute (BSI)- Summer Internship Program (SIP)

JOURNAL CLUB GROUP LEADER

- Primary instructor for virtual journal club, where I helped development 8-week journal club curriculum
- Development activities for article critique, and demonstrated and evaluated presentations.

Baltimore, MD

Jun 2020 - Jul 2020

Texas A&M University, Department of Biochemistry

GRADUATE TEACHING ASSISTANT

- Laboratory instructor for Genetics course
- Primary instructor for one class and assisted with second class each semester
- Gave introductory lecture, followed by hands-on supervising of student experiments
- Evaluated student performance and assigned grades

College Station, TX

Aug 2012 - Jun 2013

Graduate Teaching Association/Academy for Future Faculty

STEERING COMMITTEE MEMBER

College Station, TX

Jan 2014 - Jul 2016

- Worked collaboratively in the committee, where I helped run workshops and seminars for professional development, including but not limited to:
 - Philosophy of Teaching Statement
 - Teaching in Large Classes
 - Teaching with Technology
 - Developing Assessments
- Maintained and troubleshoot Blackboard, including but not limited to:
 - Generating assessments
 - Transferring **15 GB** of data between website platforms
 - Troubleshooting any computer technological issues experienced by other committee members

Honors & Distinctions

- 2022 **Recipient**, International Conference on Intelligent Biology and Medicine: Travel Award
- 2021 **MOSAIC (K99/R00) Fellow**, NIMHD, Lieber Institute for Brain Development
- 2019 **T32 Postdoctoral Fellow**, Johns Hopkins School of Medicine, Department of Psychiatry
- 2019 **1st Place**, Johns Hopkins Postdoctoral Conference: Oral Presentation
- 2017 **Scholar Finalist**, Data Incubator
- 2016 **Nomination**, Excellence in Research at Texas A&M Student Research Week
- 2016 **Honorable Mention**, Texas A&M Imaging Sciences Spotlight Series
- 2015 **Recipient**, CVM Advanced Developmental Training Travel Award
- 2015 **Recipient**, Cold Spring Harbor *Drosophila* Neurobiology Course
- 2014 **Recipient**, Great Lakes STEM Scholarship
- 2014 **4th Place**, Texas A&M Genetics Graduate Student Recruiting Symposium Poster Presentation
- 2014 **Recipient**, CVM Graduate Student Research Trainee Grant
- 2013 **Recipient**, Texas A&M Institute for Genome Sciences and Society (WSGI) Graduate Traineeship
- 2011 **Recipient**, NSF funded LSAMP Research Experience for Undergraduates at RPI
- 2011 **1st Place**, Walter Lincoln Hawkins '32 Graduate Research Conference: Poster Presentation
- 2011 **1st Place**, National Society of Black Engineers Fall Regional Conference: Poster Presentation
- 2011 **Recipient**, Rensselaer's Professional Leadership Program
- 2009 **Recipient**, NASA Science Technology Institute Summer Scholars Program
- 2009 **Recipient**, Life Health Science Internship

Service

Professional Activities

Lieber Institute for Brain Development Postdoctoral Association (LIBD-PDA)

Baltimore, MD

PRESIDENT

Apr 2020 - Current

- Established LIBD-PDA
- Obtained universal transportation benefit for all LIBD employees
- Obtained pipeline for joint appointments for all LIBD postdoctoral fellows
- Managed, planned, and organized first LIBD-PDA Virtual Retreat

Johns Hopkins Postdoctoral Association

Baltimore, MD

CO-PRESIDENT

Aug 2019 - Jul 2020

- Advocated for postdoc interests during COVID19 pandemic
- Secured funding for Annual Postdoctoral Conference
- Advocated for inclusion of postdocs in Faculty Learner Misconduct Policy
- Secured improvements for LGBTQ+ health insurance
- Advocated and advised JHU university wide postdoctoral database

JHPDA Policy and Advocacy Committee

CO-CHAIR

- Advocated for minority mental health support
- Organized annual postdoctoral survey
- Organized seminars on domestic and international financial wellness
- Advocated and secured improvements for postdoc childcare options

Baltimore, MD

Aug 2018 - Jul 2019

Genetics Graduate Student Association

TREASURER

- Organized meetings and annual symposium
- Managed and maintained budget

College Station, TX

Jul 2013 - Jul 2015

CVM Graduate Student Association

TREASURER

- Organized meetings and yearly outreach event
- Managed and maintained budget

College Station, TX

Jul 2014 - Jul 2015

National Society of Black Engineers

TREASURER

- Lead and managed the transition from on-campus to off-campus banking system
- Developed system for reimbursements and invoicing
- Wrote the inaugural handbook for the new treasurer position
- Managed and maintained \$70000 annual budget

Troy, NY

Jun 2011 - Jun 2012

Rensselaer's Professional Leadership Program

FELLOW

Selective leadership program designed to bridge the gap between school and the workplace.

Troy, NY

Aug 2011 - May 2012

Journal Reviewer

Schizophrenia Bulletin

ONE REVIEW

2021

Professional Activities

2020–	President , Lieber Institute for Brain Development Postdoctoral Association	Baltimore, MD
2019–2020	Co-President , Johns Hopkins Postdoctoral Association	Baltimore, MD
2019–2020	Postdoctoral Representative , Faculty Senate; Johns Hopkins, School of Medicine	Baltimore, MD
2019–2020	Postdoctoral Representative , Postdoctoral Affairs Advisory Board	Baltimore, MD
2019–2020	Postdoctoral Representative , Institute for Excellence in Education Board of Directors	Baltimore, MD
2018–	Member , JHPDA Diversity Postdoctoral Alliance Committee	Baltimore, MD
2018–2019	Member/Co-Chair , JHPDA Policy and Advocacy Committee	Baltimore, MD
2018–2019	Postdoc Member , JHU University Health Services Committee	Baltimore, MD
2013–2016	Member , Graduate Teaching Association/Academy for Future Faculty Steering Committee	College Station, TX
2015–2016	Student Member , Genetics Graduate Student Association Academics Committee	College Station, TX
2014–2015	Student Member , Genetics Graduate Student Association Awards Committee	College Station, TX

Professional Memberships

International Conference on Intelligent Biology and Medicine

MEMBER

2022–

American Society of Human Genetics

MEMBER

2022–

Society for Neuroscience

MEMBER

2017–

National Society of Black Engineers

MEMBER/CHAPTER TREASURER

2010–2016