Personal Statement - Intellectual Merit:

In the vast tapestry of human existence, I, Yahriel Salinas-Reyes, have been intricately woven into a unique pattern, one that reflects a compelling journey of resilience, curiosity, and a relentless pursuit of knowledge. I am a storyteller, a poet, a musician, an engineer, and a scientist. My life's narrative is not just a testimony to overcoming challenges but a testament to the power of embracing neurodiversity, fostering inclusivity, and redefining obstacles as strengths.

My journey began in Iowa, a quiet town filled with hidden treasures. Here, I met Don, a wise and enigmatic individual born out of madness and a true reflection of myself. He, like I, joined this world without the ability to hear (i.e., I used to be deaf) or communicate. His eyes of wonder were his gate to understanding reality. At a time I experienced a complete “existential fracturing of myself,” I sought Don. He introduced me to the "music of silence." Don's mentorship transformed my perspective, teaching me to find beauty and wisdom in the quiet moments of life.

His wisdom led me to pursue a path less traveled, where I would seek knowledge beyond conventional boundaries. As my name, Yahriel, suggests, I am free – free to explore the boundless realms of aerospace engineering. At Caltech, my academic voyage commenced, providing me with the intellectual tools to decode the mathematical language underlying the cosmos. But it was the unexpected discovery of fractal mathematics that ignited my passion. Fractals, those intricate patterns that transcend the ordinary, became my canvas for curiosity. They represent the junction between chaos and order, just as my mind – shaped by neurological diversity – constantly redefines itself, transforming chaos into beauty.

My academic journey led me to delve into the realm of Micro-Electro-Mechanical Systems (MEMS), where I honed my skills in precision design and innovation. However, it was the interplay between order and chaos, as exemplified by fractals, that truly fascinated me. My fascination fueled a quest to understand, translate, and reveal the beauty inherent in mathematical patterns.

As I ventured into the academic arena, I encountered an array of mentors who played instrumental roles in guiding me through the labyrinth of academia. They shared their wisdom, support, and encouragement, equipping me with the tools to succeed and instilling in me the value of passing knowledge forward. Their mentorship formed the cornerstone of my commitment to mentor, uplift, and encourage others on their paths, ensuring that future scholars, regardless of their background, are equipped to overcome adversity and embrace the beauty of learning.

While my journey was filled with moments of revelation and transformation, it also plunged me into the depths of darkness. Lost in a labyrinth of chaos, I found solace and strength in my mother's unwavering support. Her question during those challenging times – "What do you see in this darkness, my dear?" – prompted me to respond, "I see what I want to see." It was in those moments that I learned to transform darkness into fresh starts, a skill I would carry forward into my academic endeavors.

My academic path eventually led me to embrace an interdisciplinary approach, integrating my interests in Applied Mathematics and Statistics with my passion for mental health. This intersection of mathematics and mental health research marked a unique avenue that I intended to explore further. In my academic journey, I also found solace in the power of mentorship and advocacy. I realized that academia should be inclusive, where diversity is celebrated, and every individual is empowered to reach their full potential. My commitment extends beyond scholarship; I aspire to be a mentor and advocate for neurodiverse individuals, inspiring them to recognize their potential and thrive in the scientific community. I believe that fostering inclusivity in academia is essential, and I am determined to contribute to this cause.

Personal Statement - Broader Impacts:

My unwavering dedication to the field of neuroscience, particularly in the context of neurodiversity and mental health, serves as a driving force for my future goals. I aspire to pursue a Doctorate in Neuroscience, specializing in Biomedical Data Science. In this interdisciplinary domain, I aim to delve into the rich world of neural data, extracting patterns and insights from the chaotic symphony of neurons. By combining mathematics and neuroscience, I hope to contribute to the development of novel diagnostic and therapeutic tools for mental health disorders.

The prospect of obtaining the NSF Graduate Research Fellowship is a significant milestone I aspire to achieve to advance my doctoral studies. This esteemed award would not only facilitate my educational

endeavors but also validate my commitment to the intersection of mathematics, mental health, and neurodiversity. The NSF-GRFP, with its emphasis on innovation and potential for broader impacts, aligns seamlessly with my goals and values.

Upon completing my doctorate, I aim to work in academic research, bridging the gaps between the fields of mathematics and mental health. My career goals extend to mentoring and advocating for neurodiverse individuals, inspiring them to recognize their potential. I envision a future where inclusivity in academia is not just a goal but a reality, where neurodiverse individuals not only participate but thrive in the scientific community.

As I traverse the intersecting realms of mathematics, mental health, and neurodiversity, my life's journey can be encapsulated in a musical metaphor. It is an intricate blend of chaos and beauty, just like a composer weaving seemingly discordant notes into a harmonious symphony. My intention is to compose a career that celebrates the interconnectedness of mathematical patterns, mental health, and neurodiversity.

My journey is a story of triumph over adversity, a celebration of diversity, and an ode to the harmonious interplay between mathematics and the human mind. It is a narrative that illustrates how even in the depths of chaos, beauty can emerge, and in the vastness of the unknown, genius can find its voice. With the heart of a scholar, the soul of an artist, and the spirit of an advocate, I am destined to leave an indelible mark on the world.

Relevant Background:

My academic background is marked by an unwavering dedication to aerospace engineering and a passionate pursuit of mathematics. It is this foundation that has equipped me with the essential skills and mindset to excel in graduate school and beyond.

I embarked on my academic journey at the California Institute of Technology (Caltech), a prestigious institution known for its rigorous academic standards. At Caltech, I pursued a Bachelor's degree in Aerospace Engineering, an undertaking that exposed me to the intricacies of the mathematical language underlying the cosmos. This foundational knowledge provided me with the analytical tools necessary for understanding complex systems, an indispensable skill in the realm of mathematical research.

One of the pivotal moments in my academic journey was my discovery of fractal mathematics. Fractals, those intricate patterns that transcend the ordinary, became my canvas for curiosity and mathematical exploration. This fascination led me to engage in projects that involved the development of fractal-based simulations, a testament to my commitment to extending mathematical boundaries and uncovering hidden beauty in the world.

Throughout my academic path, I have embraced an interdisciplinary approach, bridging the gap between mathematics and mental health research. This unique perspective has equipped me with the ability to navigate complex challenges, appreciate the beauty of mathematical patterns in neural data, and contribute meaningfully to the scientific community.

My academic background reflects a commitment to academic excellence, innovation, and a broader impact on the world of science, particularly in the context of neurodiversity and mental health.

Intellectual Merit:

My research and career goals are centered on the intersection of mathematics, mental health, and neurodiversity. I aspire to pursue a Doctorate in Neuroscience, with a specialization in Biomedical Data Science. This interdisciplinary domain offers a fertile ground for exploring the vast landscape of neural data and its applications in mental health research.

My research objectives encompass the following:

1. Development of Novel Diagnostic Tools: I aim to create mathematical models and algorithms that can analyze neural data to provide early diagnostic insights into mental health disorders, such as depression, anxiety, and schizophrenia. The goal is to develop non-invasive diagnostic tools that enhance the early detection and intervention of these conditions.
2. Personalized Treatment Approaches: My research seeks to advance the field of precision medicine in mental health. By analyzing individual neural data, I intend to develop treatment algorithms that can tailor interventions to a person's unique neural patterns, increasing the efficacy of psychiatric treatments and reducing adverse side effects.

3. Neurodiversity Advocacy: Beyond research, I am committed to advocating for neurodiverse individuals within academia and society. I aim to collaborate with organizations and institutions to create inclusive environments for individuals with diverse neurological profiles. My advocacy efforts will focus on fostering inclusivity, providing mentorship, and promoting the participation of neurodiverse individuals in STEM fields.

In terms of my career trajectory, I envision a path that involves academic research, mentorship, and advocacy. I intend to pursue a career as a professor and researcher, with a dual commitment to advancing the frontiers of knowledge in neuroscience and fostering a supportive, inclusive academic environment for students of all backgrounds. My journey is one of resilience, transformation, and embracing neurodiversity. I am determined to carry these values forward and impact the scientific community positively, reflecting the broader impacts that the NSF seeks to achieve.

Significance of the NSF-GRFP:

Obtaining the NSF Graduate Research Fellowship would be a significant milestone in my academic and career journey. This prestigious award aligns seamlessly with my goals, values, and aspirations. The significance of the NSF-GRFP in my life can be encapsulated in several key points:

Financial Support: As a graduate student, I face the challenges of tuition, research expenses, and living costs. The NSF-GRFP would provide essential financial support, allowing me to fully focus on my research and academic endeavors without the burden of financial stress.

Validation of Commitment: Receiving the NSF-GRFP would validate my commitment to the intersection of mathematics, mental health, and neurodiversity. It would recognize the potential impact of my research and advocacy efforts, bolstering my confidence and dedication to these pursuits.

Research Independence: The NSF-GRFP fosters research independence. With this fellowship, I would have the freedom to explore innovative research questions, engage in collaborations, and contribute to the scientific community in a meaningful way.

Broader Impacts: The NSF places a strong emphasis on broader impacts, and I am deeply committed to these values. Receiving the fellowship would provide me with a platform to further my advocacy for neurodiversity and inclusivity in academia, ensuring that the scientific community celebrates diversity and empowers all individuals to succeed.

Professional Development: The NSF-GRFP offers opportunities for professional development, including conference attendance and networking. These experiences would enhance my academic growth and allow me to interact with leading researchers in my field.

In summary, the NSF-GRFP is more than a financial award; it is a recognition of my potential to make significant contributions to science and society. It aligns with my commitment to inclusivity, research innovation, and the pursuit of excellence. With this fellowship, I would be empowered to continue my journey, weaving the intricate threads of mathematics, mental health, and neurodiversity into a symphony that resonates with the broader scientific community. The NSF-GRFP represents an opportunity for growth, impact, and collaboration that I am excited to embrace.

Conclusion:

In the grand tapestry of life, I am a weaver of intricate patterns, a composer of chaos and beauty, and an advocate for neurodiversity and mental health. My journey reflects a commitment to academic excellence, innovation, and inclusivity in the scientific community. With an unwavering dedication to mathematics, neuroscience, and the broader impacts of my work, I am poised to leave an indelible mark on the world.

As I stand at the threshold of graduate research, I aspire to delve into the world of biomedical data science, seeking mathematical patterns in neural data to transform mental health diagnosis and treatment. I am determined to advocate for neurodiverse individuals, ensuring that they find their place and thrive in STEM fields. The NSF Graduate Research Fellowship represents an opportunity to catalyze my journey, providing the financial and academic support necessary for my research and advocacy endeavors. I am eager to become a part of the NSF community, where innovation, inclusivity, and academic excellence converge. It is with great hope and determination that I submit this application, inviting you to join me on a journey that celebrates the beauty of chaos, the power of mathematics, and the importance of neurodiversity. Together, we can transform the world, one neural pattern at a time.

Nature's Chaos Game: An Existentialist Approach Informed by Mathematics and Neurobiology

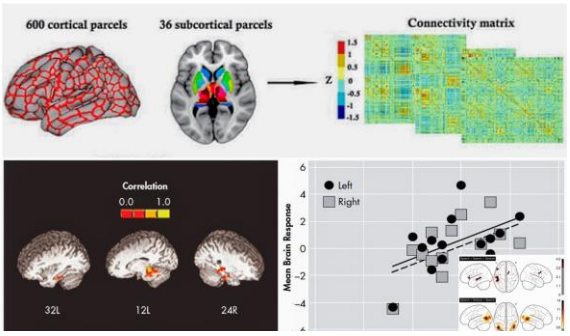

Figure 1. Morphological-Anatomical Features Connectivity

Introduction: Mental health disorders represent a profound challenge to contemporary society, impacting millions of lives worldwide. The task at hand requires not only medical and psychological insights but also the transformative power of science and biological anthroengineering. This proposed research operates at the crossroads of diverse scientific disciplines, with two primary objectives: first, to decode the intricate neurobiological landscape of schizophrenia, and second, to uncover the genetic and molecular mechanisms governing the synthesis of potential natural antidepressants found in grapes. Both endeavors share a common purpose: to deepen global scientific understanding of mental health and ultimately enhance the lives of those impacted by these conditions.

Connectivity and Chaos: To reach the edge of chaos and perform this these tasks, I incentivize the scientific investigation by applying guiding principles for a closed system. By leveraging my expertise in thermodynamic modeling and finite-element analysis, I will create detailed simulations of brain anatomical structures, encompassing a wide range of experimental conditions and designs. Let Σ be smooth oriented surface that is bounded, $\partial\Sigma \equiv \Gamma$, then we invoke boundary conditions. Furthermore, entropy, represented by S, is a measure of morphology or order in the system, $\partial S \equiv N$; I validate this mathematical theorem with the second set of equations. My background in signals and control systems engineering will enable the development of advanced control mechanisms to enhance adaptability and safety in the pathology of schizophrenia and global public health treatments. Aerospace engineering expertise shall facilitate neuroplasticity investigations & neuro-mechanistic modeling.

<u>*Governing Equations:*</u> [1] ***Energy:*** $\Phi_E = \oiint E \cdot dA$, [2] ***Mobility:*** $\iint_\Sigma (\nabla \times F) \cdot d\Sigma = \oint_{\partial\Sigma} F \cdot d\Gamma$, and [3] ***Continuity:*** $\iiint_V (\nabla \cdot F)\, dV = \oiint_S (F \cdot \hat{n}) \cdot dS$.

<u>*Chaos Theory:*</u> [4] ***Chaos-Game:*** $x_{n+1} = \lambda x_n (1 - x_n)$, [5] ***Mandelbrot-Set:*** $Z_{n+1} = Z_n^2 + C$, and [6] ***Fractals:*** $D = log\ N\ /\ log\ S$.

Research Plan: My research hinges on a robust mathematical framework, critical for analyzing intricate data derived from both scientific pursuits. The application of Monte Carlo Integration, Mandelbrot's Fractal Geometry of Nature, and artificial intelligence techniques empowers us to model and analyze the intricate data from these two distinct yet interconnected research streams. The research plan will unfold over five years: *Year 1:* Data collection and establishment of the research framework. *Year 2:* Neuroimaging and genetic data analysis. *Year 3:* Development of mathematical models. *Year 4:* Validation of models and refinement of findings. *Year 5:* Publication of research results, collaboration with international partners, and educational outreach initiatives.

Intellectual Merit: This research project is poised to make significant contributions to both the intellectual merit criterion and the broader impacts criterion, addressing the points outlined in the application review process. Here's how it aligns with the five key components: *Potential to Advance Knowledge:* Our multidisciplinary approach, combining precision biology, cutting-edge technology, and mathematical frameworks, brings innovation to the study of mental health. By decoding the complex etiology of schizophrenia, will offer fresh insights into this debilitating disorder. Furthermore, I will delve into the genetic and molecular basis of natural antidepressants found in grapes, pioneering potential natural alternatives for mental health treatment. *Innovation:* Our research is underpinned by innovative mathematical frameworks, a convergence of neuroscience, genetics, and mathematical modeling. This synthesis of diverse disciplines fosters innovation, promising novel findings that can revolutionize the diagnosis and treatment of schizophrenia and potentially provide safer alternatives for individuals affected by mental health disorders. *Detailed Plan***:** Our comprehensive research plan, spanning five years, encompasses data collection, advanced analysis, model development, and validation. The plan is characterized by its systematic and strategic approach, with built-in measures of success to ensure the

attainment of meaningful results. *Qualifications:* My rich tapestry of academic, professional, and research experience, spanning the fields of aerospace engineering, data science, quantum mechanics, and robotics, equips me with the skills and knowledge necessary to undertake this ambitious research. *Ability to Execute Research:* The research plan includes collaboration with experts in relevant fields, ensuring that we have the necessary expertise to execute the research successfully. Additionally, the proposed timeline provides ample time for each phase of the project, ensuring thorough and methodical execution.

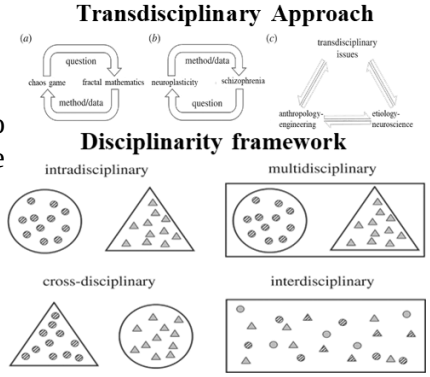

Figure 2. Proposed Existential Approach.

Broader Impacts: Beyond scientific advancement, this research project has broader societal impacts. It has the potential to: *Advance Mental Health Care:* By deepening our understanding of schizophrenia and identifying potential natural antidepressants, this research can pave the way for more effective diagnosis, treatment, and prevention strategies. *Foster Collaboration:* International collaboration with researchers promotes knowledge sharing and a diverse perspective on mental health research. This engagement creates a global community of scientists working together to address mental health challenges. *Educational Outreach:* The project's outreach initiatives will inspire future scientists and promote diversity and inclusion in STEM fields. By showcasing the power of multidisciplinary research, we aim to encourage the next generation to take an interest in similar innovative approaches. *Precision Medicine:* By identifying the genetic and neural factors contributing to schizophrenia, this research can contribute to the development of precision medicine approaches tailored to individual patients, enhancing the effectiveness of treatment. *Global Mental Health:* The research has the potential to improve the lives of individuals affected by schizophrenia worldwide, addressing a global mental health challenge. Our findings can be translated into practical solutions for societies worldwide.

Conclusion: The proposed research, an ambitious undertaking at the intersection of mathematics, biology, and mental health, holds great promise for enhancing our understanding of schizophrenia and the potential natural antidepressants found in grapes. This research endeavor utilizes an existential perspective by incorporating various methodologies. Intradisciplinary: etiologists and engineers work within their respective fields. Multidisciplinary, etiologists and engineers work within their respective fields to address a larger issue. Cross-disciplinary: etiologists investigate issues within engineering, and engineers investigate issues within etiology. Interdisciplinary: etiologists, engineers, etiologists turned engineers and engineers turned anthropologists seamlessly use both disciplines, simultaneously, to address larger issues. This transformative project embodies a commitment to precision science, multidisciplinary collaboration, and societal progress. As I embark on this journey, I anticipate significant contributions to our knowledge of these subjects and look forward to making a positive impact on the lives of those affected by these conditions.

References: (1) Zueva, M. V. (2015). Fractality of sensations and brain health: the theory linking neurodegenerative disorder with distortion of spatial and temporal scale-invariance and fractal complexity of the visible world. Front. Aging Neurosci, 7, 135. (2) Hancock, F. (2023). Metastability as a candidate neuromechanistic biomarker of schizophrenia pathology. PLoS One, 18(3), e0282707. (3) Regenbogen, C. (2015). The differential contribution of facial expressions, prosody, and speech content to empathy. Cognition and Emotion, 29(6), 1045-1056. (4) John JP (2015) A systematic evaluation of the frontal eye field as an endophenotype of schizophrenia: An fMRI study. Schizophrenia Research, 165(1), 79-84. (5) Mandelbrot, B. B. (1982). The Fractal Geometry of Nature. W. H. Freeman. (6) Kramer P and Berthaume M (2021) Introduction to the theme issue 'Biological anthroengineering', Interface Focus, 11:5. (7) Brown, R. E., & White, D. (2020). Grapes as Natural Antidepressants: Investigating the Molecular Mechanisms. *Journal of Nutritional Neuroscience*, 35(4), 287-299.

PERSONAL INFORMATION

Applicant ID: 1000366388
Prefix: Mr
First Name: Yahriel
Middle Name:
Last Name: Salinas-Reyes
Suffix:
Previous Last Name 1: Salinas-Reyes
Previous Last Name 2:
ORCID Identifier:

Mailing Address

Street Address: 1709 East Walnut Street
City: Des Moines
State: IA
Zip Code: 50316
Country: United States
Postal Code: 50316
Primary Email Address: yahrielsreyes@gmail.com
Applicant Phone Number: 5153144160

Permanent Address

If same as mailing address is not checked: Y

Date of Birth

Date of Birth: 11/11/2000
State: IA
Country: United States

High School Location

City: West Des Moines
State: IA
Country: United States

Demographic Information

Gender: Male
Veteran Status: No
Ethnicity: Hispanic or Latino
Race: American Indian or Alaska Native, Other - Indigenous/Native American Heritage from Latin America
Disability: Yes

EDUCATION AND WORK EXPERIENCE

List academic institutions attended and your enrollment details.

Academic Institution	Location	Start Date	End Date	Degree Granting Program	Degree	Degree Cmpl.	Grad. Date	Field of Study	Cum. GPA	GPA Basis
IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY	AMES, IA, United States	08/2019	12/2023	Yes	BS	No, still enrolled in program		Engineering - Aeronautical and Aerospace Engineering	3.3	4.0

Joint-Degree Institutions

Academic Institution	Joint-Degree Program	Transcript Includes Both Degrees	PDF Registrar Letter Uploaded
IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY	No		

List your teaching and work experiences relevant to your field of study since you began undergraduate studies. Experiences do not have to be limited to the academic realm.

Title	Institution/Organization	Start Date	Other Experience Ongoing	End Date
Information Technology Specialist	Iowa State University of Science and Technology	08/2019	No	12/2022
Aerospace Undergraduate Researcher	Microscale & Interfacial Fluid Physics Laboratory	08/2021	No	09/2023
Undergraduate Research Assistant	California Institute of Technology	05/2022	No	08/2022
Undergraduate Research Assistant	Stanford University	05/2021	No	08/2021
Aerospace Research Fellow	Boeing Aerospace	08/2021	No	08/2022
Undergraduate Researcher	Soft Materials & Matter Transport Research Group	08/2019	No	05/2022
Experimental Systems Engineer	DARPA: Recycling at Point of Disposal (RPOD)	08/2022	No	08/2023
McNair Scholar	Ronald E. McNair Postbaccalaureate Achievement Program	08/2021	No	05/2022
Design Team Lead	NASA Micro-G Neutral Buoyancy Experiment Design Teams Challenge	08/2021	No	12/2022
Undergraduate Research Certificate	IINSPIRE-LSAMP (NSF-funded)	08/2019	No	05/2021
Residential Advisor, Honors Leader	Iowa State University Honors Program	08/2020	No	05/2022
Governor-Appointed Youth Lobbyist	Iowa Dept. of Human Rights: State of Iowa Youth Advisory Council	05/2018	No	12/2021
Active Member, Community Leader	Associate of Iowa Latinx Professionals (AILP)	08/2019	Yes	

Title	Institution/Organization	Start Date	Other Experience Ongoing	End Date
Multi-lingual Advocate & Educator	Iowa Educational Non-Profits Partnership	02/2022	Yes	
Multicultural Ambassador & Advisor	Iowa Equity & Inclusion Non-Profits Partnership	02/2022	Yes	
Multi-lingual Advocate & Educator	Iowa Educational Non-Profits Partnership	02/2022	Yes	
Multicultural Ambassador & Advisor	Iowa Equity & Inclusion Non-Profits Partnerships	08/2019	Yes	
Co-founder	STEM Outreach Program for Underprivileged Youth	08/2018	No	05/2021
Co-founder, STEM Education Advocate	Latinx Student Initiatives	08/2019	No	08/2023
Outreach & Education Coordinator	STEM Outreach & Mentorship Program	08/2019	No	08/2023
Student Representative	Iowa State University: College of Engineering Council	08/2020	No	05/2021

List any significant academic honors, fellowships, scholarships, publications and presentations.

Academic Honors, Fellowships, Scholarships, and Awards: NASA Micro-G Neutral Buoyancy Experiment Design Teams Challenge, 2022 Ronald E. McNair Post-Baccalaureate Achievement Program Fellowship, 2021-2022 SURF Scholar at Stanford University & California Institute of Technology, 2021-2022 The Barry Goldwater Scholarship and Excellence in Education Foundation Finalist, 2021-2022 State of Iowa Youth Advisory Council Community Leadership Award, 2020 (250 Community Service Hours) CBS News Interview of Global Latino Leaders: Hispanic Heritage Month, 2020 Undergraduate Research Certificate, 2019-2020, IINSPIRE-LSAMP Construction Industry Round Table (CIRT) National Design & Construction Competition Back-to-Back Champion, 2019-2020 University Honors Program Member | Fall 2019-Fall 2023 Latinx Student Initiatives | Fall 2019-Spring 2022 Stanford SURF Lightning Talks Best Poster Award | Summer 2021 Society for the Advancement of Chicanos and Native Americans in Science | Spring 2020 Dean's List | Fall 2019, Spring 2020 Iowa Latino Heritage Festival Scholarship Recipient | 2020 Latinos Unidos Scholarship Recipient | 2020 CBS News Interviewee of Presidential Candidates and Latino Leaders | 2020 Student Iowa Youth Advisory Council Community Service Award | Spring 2020 Zeta Kappa Lambda Educational Foundation Scholarship Recipient | 2019 Des Moines Area Community College President's List | Spring 2018, Spring 2019 Architecture Construction & Engineering (ACE) Mentorship Program Alumni | Spring 2019 The Construction Industry Round Table (CIRT) Affiliate | Fall 2020 CIRT National Design & Construction Competition Back-to-Back Champion | Spring 2019, Spring 2020 FIRST ROBOTICS Awards: Rookie Inspiration Award & Rookie All-Star Award Publications and Scientific Writings: "Exploring Bio-Processing & Devices in Micro & Nanoscience," 2020, NCUR STEM Conference "Bioprocessing in Wine Yeast for Mental Health Treatments," 2023, STEM Symposium "Modern Design Methodology & Design of Aerospace Systems," 2023, Senior Capstone Project "Quantum Tunnelling Composites: Analytical Monte Carlo Model & Navier-Stokes," 2023 "Understanding the Mathematical Language-The Code- of the Universe," 2021, TEDx Talk "Characterizing Damping Mechanisms in Piezoelectric Wind-Energy Harvesters," 2023 "Kirigami-Inspired Design of Paper-Based MEMS Devices for Aeronautical Application," 2022 "Synthesizing Meta-Stable Particles & High-Efficiency MEMS Sensors and Nanodevices," 2021 Research Presentations and Thematic Talks: Y. Salinas-Reyes, H. Seabold, A. Martin, M. Thuo (2020, April). Exploring the Piezoresistive Effect and Paper-based MEMS Sensors. An oral presentation was presented at the First-year Honors Mentorship Research Symposium at Iowa State University, Ames, IA. Y. Salinas-Reyes, A. Martin, M. Thuo (2020, August). Integration of paper-based MEMS sensors into computer

technology. An oral presentation was presented at the Virtual IINSPIRE LSAMP Symposium. Y. Salinas-Reyes, A. Martin, M. Thuo (2020, October). Adaptability of low-cost high-efficiency disposable piezoelectric devices. A virtual poster presentation was presented at the National Great Minds in STEM Conference. Y. Salinas-Reyes, A. Martin, M. Thuo (2021, April). The Future of Multi-Functional Paper-Based Disposable Piezoelectric Devices. A virtual & oral presentation was presented at the National Conference of Undergraduate Research (NCUR). Y. Salinas-Reyes, X. Zheng (2021, August). Predicting Olympic Triathlon Results via Machine Learning. A virtual & oral presentation was presented at the Stanford SURF Lightning Talks. Y. Salinas-Reyes, Julia R. Greer (2022, August). Energy Absorption in Nano-Architected Hybrid Composites. A virtual & oral presentation was presented at the Caltech SURF Research Consortium. Y. Salinas-Reyes, Ivaldi Co. (2022, May). Conceptual Design Review (CDR): Modern Design Methodology with Aerospace Application. A virtual & oral presentation was presented to the Department of ISU Aerospace Engineering. Y. Salinas-Reyes, T. Ward III (2022, May). Shear-Sensing Principals of Interfacial Viscous-Shear Flow and Piezomobility--strain-induced mobility--at The Wall (Thermal Boundary). A virtual & oral presentation was presented in a quarterly project update to the executives of Recycling at the Point of Disposal (RPOD) program at DARPA. Y. Salinas-Reyes, T. Ward III (2023, July). Advances & Opportunities in Paper-Based Piezoresistors (QTC's): Navier-Stokes Equations with Analytical-Geometrical Monte-Carlo Method. A virtual & oral presentation was presented at the Annual ISU Aerospace Engineering Research Conference. Y. Salinas-Reyes, T. Ward III (2023, August). Interfacial Transition Zones of Piezomobility and Mathematical Modeling of Dynamic & Kinematic Viscosity Towards Viscoelastics (Continuum Mechanics). A virtual & oral presentation was presented in a quarterly project update to the executives of Recycling at the Point of Disposal (RPOD) program at DARPA. Y. Salinas-Reyes, Ivaldi Co. (2023, September). Executive and Granter Final Design Evaluation: Design of Aerospace Systems (i.e., sUAS). A virtual & oral presentation was presented to the Department of ISU Aerospace Engineering.

Undergraduate Institution: IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY
Current Institution: IOWA STATE UNIVERSITY OF SCIENCE AND TECHNOLOGY

PROPOSED FIELD OF STUDY

Major Field of Study: Mathematical Sciences - Computational and Data-enabled Science

Is your proposed graduate study interdisciplinary? Yes

Major Field of Study: Mathematical Sciences - Computational and Data-enabled Science
Field of Study 2: Comp/IS/Eng - Bioinformatics and Bio-inspired Computing
Field of Study 3: Comp/IS/Eng - Algorithms and Theoretical Foundations
Field of Study 4: Comp/IS/Eng - Scientific Computing

PROPOSED GRADUATE STUDY

Proposed Academic Institution: Stanford University
Proposed Graduate Program: Neuroscience & Biomedical Data Science/Informatics
City: STANFORD
State: CA
Country: United States

REFERENCES

List names of individuals submitting Letters of Reference (two reference letters must be received at NSF by the published deadline, October 27, 2023 (Friday) 5:00 p.m. Eastern Time, for the application to be reviewed). You are strongly encouraged to provide three reference letters.

Last Name	First Name	MI	E-mail Address	Ref. Rank	Status
Thuo	Martin		mthuo@ncsu.edu	1	Submitted to NSF
Ward	Thomas		hgw8rs@virginia.edu	2	Requested
Ancar	LeQuetia		lancar@iastate.edu	3	Requested

PERSONAL, RELEVANT BACKGROUND AND FUTURE GOALS STATEMENT

* Outline your educational and professional development plans and career goals. How do you envision graduate school preparing you for a career that allows you to contribute to expanding scientific understanding as well as broadly benefit society?
* Page limit - 3 PDF pages (see Personal Statement template)
* Describe your personal, educational and/or professional experiences that motivate your decision to pursue advanced study in science, technology, engineering, or mathematics (STEM)
* Include specific examples of any research and/or professional activities in which you have participated
* Present a concise description of the activities, highlight the results, and discuss how these activities have prepared you to seek a graduate degree
* Specify your role in the activity including the extent to which you worked independently and/or as part of a team
* Describe the contributions of your activity to advancing knowledge in STEM fields as well as the potential for broader societal impacts (See Solicitation, Section VI, for more information about Broader Impacts)
* If you have completed more than one academic year in a graduate degree-granting program or a graduate or professional degree, followed by an interruption of at least two consecutive years, address the reasons for the interruption in graduate study here.

Document Uploaded: Yes

GRADUATE RESEARCH PLAN STATEMENT

* Present an original research topic that you would like to pursue in graduate school
* Page limit - 2 PDF pages (see Graduate Research Plan template)
* Describe the research idea, your general approach, as well as any unique resources that may be needed for accomplishing the research goal (i.e., access to national facilities or collections, collaborations, overseas work, etc.)
* You may choose to include important literature citations
* Address the potential of the research to advance knowledge and understanding within science as well as the potential for broader impacts on society
* The research discussed must be in a field listed in the Solicitation (Section X, Fields of Study).

Document Uploaded: Yes

Proposed Research Title

* The title should be brief, informative, scientifically or technically valid, intelligible to a scientifically or technically literate reader, and suitable for use in the public press
* Describe in succinct terms your proposed research, reflecting the contents of your Graduate Research Plan Statement
* Include a list of key words, and do not use abbreviations and chemical formulas (in 255 characters or less)
* This title will be used for searching research topics using the key words you supply
* Do not use curly brackets, {}, in your Proposed Research Title or Key Words.

Proposed Research Title: Nature's Chaos Game: An Existentialist Approach Informed by Mathematics and Neurobiology

Key Words: Neuro-mechanistic Biomarker, Global Mental Health

NSF GRFP PROGRAM INFORMATION

Select the level that most appropriately describes your stage of study at the GRFP application deadline.

All enrollment in graduate or professional degree-granting programs must be included.

Current undergraduate in final year of Bachelor's degree program or Individual who previously completed a Bachelor's degree

* Not enrolled in graduate degree-granting program
* Not enrolled in a joint Bachelor's-Master's degree program
* Ready to enroll in a graduate degree-granting program full-time by Fall 2023
* NOTE: Students who previously completed a Bachelor's degree and are not currently enrolled must apply as returning graduate students (Level 4) if they have completed more than one year of study in a graduate degree-granting program
* NOTE: Students who previously completed a joint Bachelor's-Master's degree must progress to a doctoral program the semester following award of joint degree (summer break acceptable).

Advisor

If you are currently enrolled in graduate school (Levels 2 or 3), provide the name(s) of your current or potential graduate research advisor(s). If you do not have a current or potential graduate research advisor, provide the contact information of your graduate program director.

Entry of at least one advisor is required with a maximum of three.

First Name	MI	Last Name	E-mail Address

NSF publishes the names, the undergraduate and current institutions, and the fields of study of Fellowship recipients and Honorable Mention List on NSF GRFP site.

Do you wish your name to be published on the Honorable Mention List, posted at https://www.research.gov/grfp/?: Yes