Emmanuel Tetteh
Doctoral Candidate
Physical Ergonomics and Biomechanics Lab
Department of Industrial and Manufacturing Systems Engineering
Iowa State University

December 11th, 2020
Search Committee
Black Trailblazers in Engineering

Dear Search Committee,

Black Trailblazers in Engineering

Kindly accept this letter as an expression of my interest in a spot in the Black trailblazers in Engineering virtual four-day workshop to be held in February of 2021. I am a doctoral candidate and a Preparing Future Faculty at Iowa State University of Science and Technology and currently preparing to graduate in the spring of 2021. After graduation, my goal is to be a tenure-track faculty member, teaching and advancing the field of human factors through research and service. Participating in this program will enhance my knowledge about the faculty application process and also create the opportunity for me to receive constructive feedback on my faculty application materials.

I have always been passionate about engaging students from underrepresented backgrounds and helping them navigate the academic landscape. This influenced my decision to take on a role as a student mentor in a summer undergraduate research program at the North Carolina Agricultural and Technical State University in 2017. I mentored an African American student to complete a finite element simulation project of the interaction between an orthopedic fixation screw and host bone. His research project was one of the few selected for presentation at the Annual Biomedical Research Conference for Minority Students in Phoenix, AZ. Since the fall of 2019, I have been mentoring another African American high school student in the Minneapolis area via the "Why You" initiative, a non-profit program. This program was founded by Dr. Renaldo Blocker of the Mayo Clinic and Dr. Antonio Daniels of the University of Wisconsin Madison to eradicate barriers students and young professionals from minority groups face. As a mentor, I remotely meet with my mentee twice every month to discuss his long- and short-term goals in life and also develop plans to achieve them. Furthermore, I served as an organizing committee member for the spring 2020 "Why You" Biannual Confab, which unfortunately couldn't happen due to the COVID-19 pandemic. Nonetheless, the team I worked with organized a virtual version of this conference this past September, where I served as a graduate and young professional representative. In my role, I identified topics relevant to graduate students and identified speakers to address such issues. Working with these students makes me realize that with an inclusive environment, the United States will increase the number of minority students in STEM and other fields and have great minds leading cutting-edge innovations in the future. My goal is to leverage the experience that I have garnered in these engagements to enhance my teaching, research, and service as a future STEM faculty member.

A chance to participate in this program will be beneficial to me for several reasons. First, I will get the opportunity to interact with experienced professors who have been through the tenure track process and have succeeded. One particular topic of interest is finding and applying for grants to fund research as a young faculty member. I will get first-hand knowledge from meeting and interacting with program managers from the National Science Foundation, National Institute of Health, etc. who will discuss various research grants and their application processes. Secondly, I have a complete faculty application package that I plan to pitch to a panel of experienced professors to get feedback for improvement. Of particular interest to me are my teaching and research statements. Finally, I want to attend the "Success Strategies for New Faculty Members" workshop to learn how to succeed in my career's teaching, research, and service aspects. Hence, I will welcome the opportunity to be a part of this career-enlightening workshop.

Sincerely,
Emmanuel Tetteh

Research and Education Plan

As a future faculty trailblazer, my mission is to commit to a life of continuous service influenced by active learning through teaching and research.

My current work on exoskeletons seeks to identify a potential solution to a longstanding problem that is inevitable in the field of surgery. Surgeons are plagued with numerous musculoskeletal disorders due to the physically demanding nature of their work. Of particular interest to me are the shoulders, neck, and low back disorders that arise from fatigue due to awkward quasi-static segment postures while operating. My work on exoskeleton interventions uses machine learning algorithms such as linear and quadratic discriminant analysis to develop a classification model that identifies surgeries that will benefit from exoskeleton intervention based on input variables derived from surgeons' segmental kinematics data. To assess the predictive model's validity, I am currently conducting a laboratory simulation study of physically demanding surgeries to estimate the reduction in biomechanical demand on body segments using electromyography. When completed, this research can significantly reduce work-related musculoskeletal disorders in surgeons, translating to improved patient care.

In 2021, I plan to graduate with my doctoral degree in Industrial and Systems Engineering and secure a postdoctoral position in a lab that researches in the field of physical or cognitive ergonomics related to healthcare or driving. As postdoctoral positions offer more autonomy and teach skills necessary to succeed as a potential faculty member, my goal will be to hone some of the skills that I learned in graduate school but did not practice. For example, I have taken grant-writing courses and written background sections to grants with a team of professors that got funded, but I haven't written and submitted a complete grant as a principal investigator before. Hence, I will explore grant opportunities such as the National Institute of Health's Pathway to Independent Award for outstanding postdoctoral researchers to enable a transition to an independent research faculty member.

My goals as a faculty member can be grouped into research and teaching/service. In terms of research, I aim to develop a robust externally-funded Human Factors research program focusing on developing interventions for low back, shoulder, and neck disorders due to work-related postures in healthcare. A vital part of this will be expanding my current work on exoskeletons in the operating room to include other industries such as automobile assembly and construction. I will focus on using similar machine learning techniques to develop automated methods to identify work-related factors that predispose workers to injuries and assess how exoskeletons can alleviate such problems. In terms of teaching/service, I plan to create an inclusive environment that fosters learning for students from all backgrounds. Furthermore, I will continue to serve as a mentor for organizations empowering minorities to consider STEM education careers.

EMMANUEL TETTEH

2529 Union Drive, Black Engineering Building, Rm 0049, Ames, IA, 50011 | (336) 392-8800 | teemashkelin64@gmail.com

EDUCATION

Ph.D. Industrial & Manufacturing Syst. Eng. With minor in Statistics — **Iowa State University of Science and Technology** – Ames, IA — *Exp. May 2021*
Dissertation: *Using Segmental Kinematics Data to Explore the Usability of Exoskeleton Technology in the Operating Room*

M.S. Bioengineering — **North Carolina Agricultural and Technical State University** – Greensboro, NC — *August 2017*
Thesis*: Impact of Screw Thread Shape on Stress Transfer in Cancellous Bone: A Finite Element Study*

B.S. Biomedical Eng. — **University of Ghana, Legon –** Accra, Ghana — *May 2013*
Capstone Project: *Design of an Automatic Volume Control Device for Medical Aspirators*

RESEARCH EXPERIENCE

Kern Graduate Intern (Human Factors and Systems Integration Team) — *May 2018-Present*
Center for the Science of Health Care Delivery, Mayo Clinic, Rochester, MN
Faculty Mentor: *M. Susan, Hallbeck, Ph.D.*

Project Title: *Influencing Factors of Workload in Hybrid Vascular Surgery* — *Summer 2019*
- Developed research protocol and survey materials to facilitate physical and cognitive workload studies
- Collaborated with lead surgeons to define standardized sub-tasks that occur during hybrid vascular surgery
- Wrote the specific aims and approach section of a grant that aimed at securing research funds to explore the utility of exoskeletons in the operating room

Project Title: *Intra-operative Workload in Vascular Surgery.* — *Summer 2018*
- Analyzed postural data from Inertial Measurement Units (IMU) using custom-developed algorithm
- Created MATLAB algorithm that captures joint angle data from Inertial Measurement Units (IMU) and automatically generates Rapid Upper Limb Assessment (RULA) risk report for surgeons
- Automated statistical analysis by creating algorithms in R-studio which reduced analysis time by over 50%
- Co-authored manuscript for scientific publication

Graduate Research Assistant — *August 2017-Present*
Physical Ergonomics and Biomechanics Lab, Iowa State University of Sci. and Tech. Ames, IA
Faculty Mentor: *Gary A. Mirka, Ph.D.*

Project Title: *Exploring the Usability of exoskeletons in the Operating Room Using Segmental Kinematics* — *Fall 2019*
- Created a logistic regression model that identified postural kinematic variables that predicted the appropriateness of exoskeleton intervention for different surgeries
- Collaborated with a team member from the Mayo Clinic to identify physically demanding surgical tasks
- Created and revised Institutional Review Board materials for study approval
- Developed a biomechanical model to estimate cumulative postural fatigue development

Project Title: *Effect of Personal Radiation Protection Equipment on Back Muscle Fatigue* — *Spring 2019*
- Conceptualized research idea and conducted literature review to define scope of study
- Designed experimental procedure and conducted pilot studies to ensure expected results were obtained
- Created a MATLAB program to perform spectral and time domain EMG analysis
- Co-authored manuscript for scientific publication in ***Applied Ergonomics***
- Presented results at the 63rd Human Factors and Ergonomics Society annual meeting

Project Title: *Fatigue Assessment of Farm Machinery Seating Systems* — *Spring 2019*
- Evaluated quantitative metrics to assess fatigue from muscular tremor data
- Assisted with assembly of seating system and performed subjective and objective fatigue data collection

Project Title: *Inter-individual Variability of Trunk Kinematics.* — *Spring 2018*
- Spearheaded experimental design and pilot data collection
- Analyzed kinematic data from Lumbar Motion Monitor using a custom-developed algorithm in MATLAB

Project Title: *Intra-individual Variability of Trunk Kinematics in the early phase of repetitive lifting* *Fall 2017*

- Conducted pilot studies and modified research protocol for successful implementation
- Developed algorithm in MATLAB to automate kinematic analysis
- Assisted with participant recruitment, data collection and analysis

Graduate Research Assistant *October 2015-July 2017*
BIOFABB Lab, NSF-ERC for Revolutionizing Metallic Biomaterials, North Carolina A&T State University
Faculty Mentor: *Matthew B. A. McCullough, Ph.D.*

Project Title: *Finite Element Analysis of Stress Transfer in Magnesium Screw* *Spring-Summer 2017*

- Quantified Stress transfer in magnesium fixation screw using finite element analysis.
- Integrated CAD model of femoral implant and CT image of femur in +CAD and exported the mesh into Abaqus for Finite Element Analysis.
- Developed a simplified computational model of femoral screw and implant using Solidworks and Abaqus for stress pull-out simulation.
- Segmented and reconstructed region of interest around biodegradable Mg screw based on Hounsfield Unit thresholding for elastic modulus analysis.
- Mentored two high school students to develop computational models of femoral screw and implants for stress analysis.

SCHOLARLY WORK

Google Scholar Profile: https://scholar.google.com/citations?user=K1tsfLcAAAAJ&hl=en

Peer-Reviewed Research Articles

- **Tetteh, E**., & Mirka, G. (**In Press**). Trunk kinematics Variability as a Function of Time During the early Phase of a repetitive lifting task. *Human Factors and Ergonomics in Manufacturing and Service Industries*
- Norasi, H., **Tetteh, E**., Money, S., Davila, V., Meltzer, A., Morrow, M., Fortune, E., Mendes, B., & Hallbeck, M., S. (**In Press**). Intraoperative Posture and Workload Assessment in Vascular Surgeons. *Applied Ergonomics*
- **Tetteh, E.**, & McCullough M. B. A. (2020). Impact of Screw Thread Design on Stress Transfer in Cancellous Bone: A finite element study. *Computer Methods in Biomechanics and Biomedical Engineering. 23(9), 518-523.* https://doi.org/10.1080/10255842.2020.1743980
- **Tetteh, E.,** Sarker, P., Radley, C., Hallbeck, M. S., & Mirka, G. (2020). Effect of Surgical Radiation Personal Protective Equipment on EMG-based Measures of Back and Shoulder Fatigue: A Laboratory Study on Novices. *Applied Ergonomics, 84.* https://doi.org/10.1016/j.apergo.2019.103029
- Amissah, Q.R.**,** Atchurey, K.A., Appiah, L., Fiakuma, K. E., Gyapong-Korsah, E., Boadu, J., **Tetteh, E.**, Offei, E., & Kaufmann, E. E. (2013). Biomedical Engineering in Ghana, *European Scientific Journal, 9, 171-182.* https://eujournal.org/index.php/esj/article/view/915/957

Refereed Conference Proceedings

- **Tetteh, E**., Hallbeck, M. S., Mirka, G. (2019). Lead Vest/Apron and Back Pain in Interventional Radiology and Endovascular Surgery: A Scoping Review. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 63*(1), 1367–1368. https://doi.org/10.1177/1071181319631162
- **Tetteh, E**., & Mirka, G. (2018). Effect of Time on the Variability of Lifting Kinematics in a Repetitive Lifting Task. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 62*(1), 910-914. https://doi.org/10.1177/1541931218621209

In Review

- Norasi, H., **Tetteh, E**., Sarker, P, Mirka, G., Hallbeck, M., S., *Exploring the Relationship between Neck Flexion and Neck Problems in Occupational Populations: A Systematic Review of the Literature.* Submitted to: Applied Ergonomics
- **Tetteh, E.,** Mettler, J., Fales, C., Sarker, P., & Mirka, G. *Variability in a Lumbar Kinematics Repetitive Lifting Tasks.* Submitted to Human Factors and Ergonomics in Manufacturing and Service Industries

In Preparation

- **Tetteh, E.,** Norasi H., Law, K., Morrow, M., & Hallbeck, M., S., *An algorithm for informing the utility of exoskeleton intervention in the operating room (1).* Target Journal: Applied Ergonomics
- **Tetteh, E.,** Norasi H., Law, K., Morrow, M., & Hallbeck, M., S., *Exoskeleton reduces muscle fatigue in simulated surgical task.* Target Journal: Applied Ergonomics
- **Tetteh, E.,** Norasi H., Law, K., Morrow, M., & Hallbeck, M., S., *An algorithm for informing the utility of exoskeleton intervention in the operating room (2).* Target Journal: Applied Ergonomics

- **Tetteh, E.,** Norasi H., Law, K., Morrow, M., & Hallbeck, M., S., *Influencing factors of physical and cognitive workload in hybrid vascular surgery.* Target Journal: Applied Ergonomics
- Mendes, B., Erben, Y., DeMartino, R., Oderich, G., Davila, V., **Tetteh, E**, Norasi, H., & Hallbeck, S (In Review). *NASA Task Load Index Assessment of Physical and Mental Demands on Vascular Surgeons During Open and Endovascular Procedures.* Vascular Annual Meeting, Society of Vascular Surgery

RESEARCH PRESENTATIONS & POSTERS

- **Tetteh, E.** "*Ergonomics in Vascular Surgery: A Clinical and Laboratory Perspective." Talk delivered at the Iowa State University Department of Industrial and Manufacturing Systems Engineering Seminar Series. Ames, IA.* February 2020
- **Tetteh, E**., Hallbeck, M., S., & Mirka, G. *"Lead Vest/Apron and Back Pain in Interventional Radiology and Endovascular Surgery." Poster presentated at the 63rd Human Factors and Ergonomics Society International Annual Meeting. Seattle, WA.* November 2019
- **Tetteh, E**. *"Enterprise-wide workload in Vascular Surgery: A NASA-TLX Survey"*. Mayo Clinic Kern Center presenstations, *Rochester, MN.* August 2019
- **Tetteh, E.,** Mettler, J., Fales, C., Sarker, P., & Mirka, G. "*Inter-Individual Variability in a Repetitive Lifting Task." Poster Presented at the 7th Industrial and Manufacturing Systems Engineering Annual Research Symposium. Ames, IA.* April 2019
- **Tetteh, E**., & Mirka, G. *"Effect of Time on the Variability of Lifting Kinematics in a Repetitive Lifting Task." Podium presentation delivered at the 62nd Human Factors and Ergonomics Society International Annual Meeting. Philadelphia, PA.* October 2018
- **Tetteh, E., Norasi, H.** *"Musculoskeletal disorders among vascular surgeons: Risk factors and assessment tools"*. Mayo Clinic Kern Center presenstations, *Rochester, MN.* August 2018
- **Tetteh, E.,** Koenig J., & Mirka, G. "*Effect of time on variability of lifting kinematics in a repetitive lifting task." Poster Presented at the 6th Industrial and Manufacturing Systems Engineering Annual Research Symposium. Ames, IA.* April 2018
- Surratt, T., **Tetteh, E.**, & McCullough, M. "*In-silico study of thread design and its interconnection with stress on host bone." Poster presented at the Annual Biomedical Research Conference for Minority Students. Phoenix, AZ.* Nov 2017
- **Tetteh, E.,** McCullough, M. "*Impact of Screw Thread Shape on Stress Transfer in cancellous bone: A finite Element Study." Poster presented at the 6th NCAT Annual College of Engineering Poster Competition. Greensboro, NC.* April 2017
- **Tetteh, E.,** McCullough, M. "*Impact of Design Parameters on Stress Distribution in Fixation Screws*". Department of Chemical, Biological and Biological Engineering weekly seminars, Greensboro, NC. March 2017
- **Tetteh, E.,** Asimeng, B., & Srinivasan B. "*Design of Automatic Volume Control Device for Medical Aspirator*." *Podium presentation delivered at the Ghana Science Association Biennial Conference. Legon, Ghana.* June 2013

TEACHING

Experience

Graduate Teaching Assistant *January 2020- May 2020*
Department of Industrial and Manufacturing Systems Engineering, Ames IA.

IE 271, Applied Ergonomics and Work Design *Spring 2020*
- Organized virtual office hours using Zoom platform to tutor students during the coronavirus pandemic
- Evaluated and graded homework assignments and quizzes, and provided feedback to students
- Co-developed exam questions with instructor for mid-semester and final exams
- Provided constructive feedback to students for each homework assignment and in-class examinations
- Provided constructive feedback to students for each homework assignment and in-class examinations

Graduate Teaching Assistant *August 2015-May 2016*
Bioengineering Department, North Carolina A&T State University, Greensboro, NC.

BMEN 223, Biochemical Design Lab *Spring 2016*
- Instructed laboratory sessions on application of fluid flow concepts to blood rheology
- Graded laboratory reports and offered feedback to improve students' understanding of blood rheology

BMEN 220, Introduction to Biomedical Engineering *Fall 2015*

- Evaluated and graded undergraduate homework assignments and quizzes, and organized make-up sessions enabling students to improve their problem-solving skills
- Delivered tutorials on 3D CAD modelling using SolidWorks, enabling students to create CAD models of a simplified femur
- Conducted two minute brain-dump sessions after tutoring students during office hours

Development

Writing Consultant Trainee *June 2020-August 2020*

Center for Communication Excellence, Iowa State University, Ames, IA.

- Identified the general purpose of sub-sections of research articles from a variety of disciplines using the IMRAD format
- Employed move analysis to identify the role of sentences in the introduction, methods and discussion sections section of research articles
- Observed experienced consultants at work and identified their use of "read-aloud technique to identify grammatical and spelling errors in essays
- Performed two mock writing consultation sessions with two graduate student to review the theme of their research paper's introduction

Preparing Future Faculty Fellow *May 2019-Present*

Center for Excellence in Learning and Teaching (CELT), Iowa State University, Ames, IA.

- A two to three-semester professional development program that prepares doctoral students and post-doctoral researchers for academic careers in higher education through a blend of mentoring, lectures, service experience and in-class strength assessment activities
- Interacted with current tenure track faculty on the balance between teaching, service and research
- Developed a sample assignment that was intended to assess different levels of bloom's taxonomy
- Understood the importance of using evidence-based teaching techniques to enhance student learning
- Learned best practices for successful mentoring of graduate students

Teaching Inclusively and Equitably Online: Course Outcomes and Storyboarding *April 2020*

NSF INCLUDES Aspire Alliance

- Identified factors to consider when choosing synchronous or asynchronous online content delivery
- Developed storyboards to deliver content during online education

Teaching Mentee *Spring 2020*

ASPIRE-NSF INCLUDES Teaching Practicum, Des Moines Area Community College, Ankeny, IA
Faculty Mentor: Julie Hartzler, Ph.D.

- Created a lesson plan and taught a mathematics chapter on plane geometry
- Observed class interactions between students and professor using a pedagogical observation protocol
- Provided feedback to students to enhance their metacognition of class materials
- Drafted a monthly teaching reflection notes for monthly round-table discussion

Science Communication Fellow December 2019-May 2020

Reiman Gardens, Iowa State University of Science and Technology, Ames, IA.

- Created a hands-on activity to demonstrate Methods Engineering and Work Content
- Communicated the concept of Methods Engineering using a self-created five-minute video
- Developed communication skills in presenting scientific concepts to a non-science audience
- Participated in workshops focused on exploring effective science communication skills

Preparing Future Faculty as Change Leaders Toward Inclusive Stem Higher Education *October 2019*

Center for Research, Teaching and Learning (CIRTL), Drexel University, *Philadelphia, PA*

- Identified current barriers that impede diversity and inclusion in current learning environments
- Brainstormed ideas to facilitate inclusive pedagogical practice in the classroom
- Interacted with experts in STEM education whose research are currently revolutionizing STEM education

Using Qualitative Methods to Enrich Teaching and Learning *September 2019*

Center for Research, Teaching and Learning (CIRTL)

- Understood research techniques that can be used explore ways in which culture affects learning
- Developed good interviewing techniques as a way of acquiring qualitative data from students

Transforming Your Research into Teaching *Summer 2019*
Center for Research, Teaching and Learning (CIRTL)
- Developed a half-semester introductory course in physical ergonomics for new surgical interns
- Created formative and summative assessments for the introductory course in physical ergonomics
- Delivered a 15 minutes presentation of developed class to an audience of non-engineers

Certifications
- Graduate Student Teaching Certificate (Iowa State University of Science and Technology) *Exp Spring 2021*
- Certified Communication Consultant (Center for Communication Excellence, Iowa State University) *Fall 2020*

INDUSTRIAL EXPERIENCE

Clinical Engineer *October 2013-September 2014*
Brong-Ahafo Regional Hospital, Sunyani, Ghana
- Collaborated with three other team members to develop Protocols for quality-check of medical equipment
- Assisted in the installation of Toshiba Aquilion 16 Computed Tomography Scanner
- Trained five medical personnel on proper and efficient use of medical aspirators and defibrillators reducing the cost in repair due to human errors
- Created inventory of medical equipment using (ECRI-AIMS) Equipment management system enabling hospital to keep real-time records of the status of equipment within the hospital
- Cooperated with three other team members to develop and implement corrective and preventive maintenance protocols enhancing lifespan of medical equipment

Engineering Intern *June 2012-August 2012*
Ridge Hospital, Accra, Ghana
- Performed routine preventive maintenance of medical equipment
- Diagnosed and corrected problems with basic patient monitoring systems
- Maintained a database of equipment in the medical facility

Engineering Intern *June 2011-August 2011*
Center for Radiation Therapy, Korle-bu Teaching Hospital. Accra, Ghana
- Assessed routinely, operational performance of the Cobalt-60 Teletherapy machine for cancer treatment to avoid unexpected break-down.
- Performed quality-check of electrical power systems, reducing the chances of power surge

PROFESSIONAL AFFILIATIONS

- National Society of Black Engineers (NSBE), Membership ID: 428282 *May 2020-Present*
- Institute of Industrial and Systems Engineers (IISE), Membership ID:8800221055 *September 2019-Present*
- American Society of Biomechanics (ASB), Membership ID: 06143 *August 2018-Present*
- Human Factors and Ergonomics Society (HFEs), Membership ID 51758 *January 2018-Present*

HONORS AND AWARDS

- **Principal Financial 2020/2021 Graduate Scholarship Award** *October 2020*
  Department of Industrial and Manufacturing Systems Engineering, Iowa State University. Ames, IA. $2500
- **Antonio D. Rooks Memorial Scholarship and Book Award** *March 2019*
  (The "Why You?" Initiative, Inc.), Minneapolis, MN. $500
- **First Year Student Travel Award** *October 2018*
  Human Factors and Ergonomics Society Council of Technical Group, Washington, DC. $599
- **Best Graduate Poster Award** *April 2018*
  The 6th Annual Industrial and Manufacturing Systems Engineering Research Symposium. *Effect of time on variability of lifting kinematics in a repetitive lifting task.* Iowa State University, Ames, IA. $150

SERVICE

Peer Reviewer: **https://publons.com/researcher/3013465/emmanuel-tetteh/**
- Ergonomics
- Human Factors
- Archives of Sports Medicine

Peer Reviewer and Volunteer *September 2018-October 2020*
Human Factors and Ergonomics Society (HFES)

- Reviewed submitted video presentations for quality and length conformance for the 2020 virtual conference
- Provided head count information for attendees for the driver attention and hazard perception session at the 2019 conference in Seattle, WA.
- Served as peer reviewer for research proposal submissions
- Reviewed nominated papers for Healthcare technical group Bogner student paper award
- Managed access to computers at the e-Message center on the first day at the Annual International meeting held in October 2018 in Philadelphia, PA.

Facilities Subcommittee Member
U.S. North Central 2020 Regional Conference Planning Team, IISE, Ames, IA *October 2019-April 2020*

- Generated a list of possible venues on campus to host conference research paper competition
- Collaborated with facilities on campus management to reserve venue for conference paper competition
- Invited the director of graduate education to deliver a talk session on life as a graduate student

The "Why You?" Initiative, Inc. Scholar *January 2019-Present*
The "Why You?" Initiative, Inc., Minneapolis, MN

- Served as graduate representative for the organizing committee for the fall 2020 virtual conference
- Assist with organization of career development webinars for high school and college students
- Created custom emails for newly accepted mentees for easy communication
- Mentor high school students to define career goals and develop plans for achievement

Usher *August 2018*
American Society of Biomechanics (ASB)

- Provided on-site registration guide to conference attendees
- Served as liaison between facilities management and conference organizers

Transportation Team Member
Engineering Research Center, NCA&T

- Spearheaded a team of three van drivers to transport attendants for the 2017 National Science Foundation-Engineering Research Center site visit at NCA&T, Greensboro, NC.
- Conducted visual inspection of Vehicles before assigning to team members

Career Ambassador *September 2016*
Office of Career Services, North Carolina A&T State University

- Assisted with company booth set-up
- Directed companies to their respective booths for the fall career fair

SKILLS

Computing Skills:	MATLAB, R, Python, JMP, SolidWorks, Microsoft Excel, Visual Graphics (VG) Studio, ScanIP, +CAD, Abaqus, AIMS
Laboratory Skills:	Lumbar Motion Monitor (LMM), Electromyography (EMG), Inertial Measurement Units (IMU), Fundamentals of Laparoscopic Surgery (FLS), GE-Phoenix Micro CT Scanner, Blood Rheometry
Engineering Courses:	Musculoskeletal Biomechanics, Occupational Biomechanics, Human Factors, Quantitative Human Movement, Injury Biomechanics, Musculoskeletal Modeling, Spine Biomechanics, Applied Ergonomics and Work Design, Engineering Economics, Statistical Theory for Researchers, Applied Multivariate Statistics, Finite Element Method, CAD modeling, Statistical Analysis and Design of Experiments, Design of Mechanical Systems, Cardiovascular Mechanics, Biomaterials and compatibility, Engineering Mechanics
Pedagogical Courses:	Teaching and Learning in Veterinary Medical Education, Preparing Future Faculty Teaching Practicum, Preparing Future Faculty Intermediate Seminar, Preparing Future Faculty Special Topics , Preparing Future Faculty Introductory Seminar

REFERENCES

- Gary A. Mirka, Ph.D.
  John Ryder Professor of Engineering
  Department of Industrial and Manufacturing Systems Engineering
  Iowa State University Ames, IA
  mirka@iastate.edu
  (515) 294-8661
- Susan Hallbeck, Ph.D., PE., CPE.
  Scientific Director
  Kern Center for the Science of Healthcare Delivery
  Mayo Clinic Rochester, MN
  Hallbeck.Susan@mayo.edu
  (507) 538-7944
- Renaldo C. Blocker, Ph.D.
  Associate Consultant of Healthcare Research
  Kern Center for the Science of Healthcare Delivery
  Mayo Clinic
  Blocker.Renaldo@mayo.edu
  (651) 964-9505

MAYO CLINIC

January 5, 2021

Purdue University,
610 Purdue Mall,
West Lafayette, IN, 47907

Dear Black Trailblazers in Engineering (BTE) Committee:

This communiqué serves to articulate my sincere support of Mr. Emmanuel Tetteh's application for consideration into the Purdue University's Black Trailblazers in Engineering program. It is my understanding that your BTE program wants to select and prepare the best and brightest black scholars nearing the completion of the PhD degrees and postdoctoral appointments at US universities for a career in engineering academia; therefore, I posit Mr. Tetteh, incontestably, to be the person considerably worthy of a position within the BTE Program.

Mr. Emmanuel Tetteh is currently a doctoral candidate in the Department of Industrial and Manufacturing Systems Engineering at Iowa State University. I had the distinct pleasure of working with Emmanuel at the Mayo Clinic's Center for the Science of Healthcare Delivery. He sincerely demonstrated his commitment to research, teaching and mentoring—for two summers he directly (unofficially) mentored my undergraduate summer interns. He taught the students human factors principles, methodology and assisted the students with research projects and literature reviews. I am thoroughly impressed with Emmanuel's willingness to help me with summer interns—who were all underrepresented students. The students connected with him instantly.

As indicated on his curriculum vitae, Mr. Tetteh has participated in various projects throughout his graduate career and, therefore, has valuable and evolving research experiences. He has engaged in research related to muscle fatigue and cognitive workload here at Mayo Clinic with my colleagues, Dr. Susan Hallbeck, Dr. Katherine Law and Dr. Missy Morrow. Throughout his academic career, Emmanuel has engaged in several professional development opportunities/activities to improve and/or enhance his skills and to train him for the professoriate. He's currently a Preparing Future Faculty Fellow at Iowa State University. He was also a Science Communication Fellow at Iowa State University. He participated in the Preparing Future Faculty as Change Leaders Toward Inclusive Stem Higher Education program at Drexel University. It is evident that Mr. Tetteh is destined to be a great academician.

He has made notable contributions in service and leadership. He has been a peer reviewer for high impact Human Factors journals and conferences as shown on his CV. He's also served on committees for Human Factors and Ergonomics Society (HFES), American Society of Biomechanics (ASB) and etc. I am certainly astounded by Mr. Tetteh innate ability and desire to constantly contribute meaningfully to academic research and not allow unforeseen circumstances to derail his ambitious goals.

Mr. Tetteh's character is exceptional, he is able to connect and work with people from all nationalities and backgrounds, which I posit to be an important element for any budding scholar and leader, especially as a researcher in human factors. Therefore, it is with great admiration and

honor to recommend Mr. Tetteh Emmanuel for the position within the BTE Program. He is feverishly a future academic scholar of this great nation and world.

Sincerely,

Dr. Renaldo Blocker

Renaldo Blocker, Ph.D. | Associate Consultant I | Health Sciences Research | Mayo Clinic Robert D. and Patricia E. Kern Center for the Science of Health Care Delivery | Assistant Professor | Healthcare Systems Engineering | College of Medicine | 507-538-1532 | Fax: 507-284-1731 | blocker.renaldo@mayo.edu
Mayo Clinic | 200 First Street SW | Rochester, MN 55905 | mayoclinic.org

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December 11, 2020

Review Committee
Black Trailblazers in Engineering Program
Purdue University

Review Committee:

It is my pleasure to write this letter of reference for Mr. Emmanuel Tetteh who is applying to the Black Trailblazers in Engineering Program. I am currently serving as Mr. Tetteh's co-major professor (with Dr. Susan Hallbeck from Mayo Clinic) as he pursues his Ph.D. degree. Mr. Tetteh joined my laboratory (The Physical Ergonomics and Biomechanics Laboratory) in the Fall of 2017 as a Ph.D. student in the Iowa State University Department of Industrial and Manufacturing Systems Engineering. Mr. Tetteh became a PhD candidate on June 11, 2020 and appears to be on schedule for a late spring (2021) completion of his degree requirements. For the last three years I have served as the supervisor for his graduate assistantship (mostly as a research assistant, but one semester he served as my teaching assistant to provide him some classroom experience). Through all of my interactions with Mr. Tetteh, I have found him to be inquisitive, energetic, and diligent.

Mr. Tetteh has performed very well in the traditional classroom and has been a productive researcher. Much of his research effort, including his dissertation research, has been focused in the area of ergonomics of healthcare workers. He has spent two summers at Mayo Clinic working under the supervision of Dr. Susan Hallbeck as an engineering researcher intern exploring the ergonomics of surgeons and other personnel in the operating room. There is no doubt that Mr. Tetteh has benefitted greatly from our on-going collaborations with researchers at the Mayo Clinic. It has not only led to his specific dissertation idea (utility of exoskeleton technology in the surgical theatre), but these collaborations have broadened his research perspective and have made him a much stronger scholar. He has recently contributed to the development of an R01-level research proposal submitted to the National Institute for Occupational Safety and Health (NIOSH - part of the CDC). His expanded knowledge of the healthcare systems and how a physical ergonomist might impact this environment will likely shape his research trajectory for years to come. It would be my assessment after a short period as a post-doctoral research fellow, Emmanuel will be well-positioned to take a faculty position at a Research I institution. Broadening the discussion to his potential as a professor in the classroom, I would note that Mr. Tetteh is an articulate individual with the ability to clearly explain complex topics in an understandable way – a strong endorsement for a teacher. I would rate his potential as a scholar to be very high.

Over the three-plus years that I have worked with Mr. Tetteh, I have noted a strong improvement in his aptitude for academic scholarly work, both in terms of his research skills and his writing ability. He has been the lead author/researcher on one published paper from my laboratory (*Applied Ergonomics)* and the lead author on his master's thesis work (*Computer Methods in Biomechanics and Biomedical Engineering*). He is also a contributing co-author on two additional journal publications that are currently in review (one with him as lead author) and several publications arising from presentations at the Annual Meeting of the Human Factors and Ergonomics Society. Through these many and varied research

experiences, he has solidified his empirical research skills, his biomechanical modeling skills as well as his writing capability. I would rate Mr. Tetteh's aptitude for academic research to be one his greatest areas of progress through his graduate studies.

Finally, I would characterize Mr. Tetteh's motivation for scholarly success as very strong. I think that his many experiences as a graduate student at North Carolina A&T State University as well as his time here at Iowa State University, have only intensified his desire for a career in academia. He is always searching for additional ways that he can enhance his resume and make himself a stronger faculty candidate. He has participated in a number of graduate student professional development opportunities made available through they the ISU Graduate School to prepare graduate students for a career in academe.

On a more personal note, Mr. Tetteh is pleasant, gregarious, very easy to work with, and has proven himself to be an excellent collaborator. In summary, Emmanuel Tetteh receives my highest recommendation. If I can provide any additional information, please do not hesitate to contact me at (515) 294 8661 or mirka@iastate.edu.

Sincerely,

Gary Mirka
University Professor
John Ryder Professor of Engineering
Director of Graduate Education
Director of Research
Department of Industrial and Manufacturing Systems Engineering
Iowa State University

IOWA STATE UNIVERSITY
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December 18, 2020

Dear Review Committee,

I am writing this letter of recommendation in enthusiastic support of Mr. Emmanuel Tetteh, who is applying for the Black Trailblazers in Engineering program. I am an Associate Professor and the Director of Graduate Education for the Department of Kinesiology at Iowa State University in the research/teaching area of biomechanics.

I know Emmanuel as a student, mentee, and researcher. He was a student in my injury biomechanics and musculoskeletal modeling classes, which are challenging graduate-level courses. In injury biomechanics, Emmanuel demonstrated his oral communication skills during presentations on anterior cruciate ligament injuries and tibial shaft fractures. In musculoskeletal modeling, he displayed critical thinking skills when programming in Matlab and when leading research article discussions. In addition, I served as a Preparing Future Faculty mentor for Emmanuel. He was always prepared for our meetings with thoughtful questions. Our discussions ranged from teaching strategies to balancing teaching/research/service responsibilities to mentoring graduate students. I have also worked with Emmanuel during the preparation of a National Institute for Occupational Safety and Health federal grant. He actively participated in our grant development meetings, including faculty from Iowa State University and Mayo Clinic. Emmanuel was able to provide supportive information under tight deadlines and clearly communicate his thoughts to a research group with a variety of backgrounds.

Emmanuel is motivated to pursue a career as a professor. He is personable and will work well with students. Emmanuel has gained valuable training and experience as a Kern Graduate Intern in the Center for the Science of Health Care Delivery at Mayo Clinic and through the National Science Foundation INCLUDES Aspire Alliance. I am confident that he will continue on his path of excellence in his future academic and professional endeavors, and I have no reservations supporting his application for the Black Trailblazers in Engineering program. If you have any questions regarding my support for Emmanuel, please contact me by phone at (515) 294-8310 or by email at gillette@iastate.edu.

Sincerely,

Jason C. Gillette, PhD
Associate Professor, Director of Graduate Education
Department of Kinesiology