

Taiwo R. Oyedare

website | toyedare@vt.edu | (615) 299-6712 | linkedIn

The Committee,
Black Trailblazers in Engineering (BTE)
Purdue Engineering

January 16, 2021

Dear BTE Committee,

I believe that the BTE program is well positioned to advance diversity in engineering thereby helping black faculties to blaze new trails with scientific discoveries and innovations so as to serve as distinctive role models for the next generation of engineers. I wanted to take this opportunity to expound upon my general background and how it relates to the Black Trailblazers in Engineering (BTE) fellows program's goals and objectives. Specifically, I hope this cover letter will serve to illustrate how my career goals and vision aligns perfectly with that of the BTE fellow program.

Right from my undergraduate days, I have been fascinated by the art of teaching, so much so that I started teaching and mentoring my peers and juniors while still in college. I found myself gravitating towards exemplary professors and instructors who had the heart of a teacher. After bagging a first class degree in Electrical and Electronics Engineering in 2012, I was awarded a one-year honorarium for a teaching assistant (TA) position at Afe Babalola University Ado-Ekiti (ABUAD), a leading private university in Africa. Shortly before the end of my stint as a TA, I accepted a full-time offer as an Assistant Lecturer with the department of Electrical and Computer Engineering at ABUAD. I thoroughly enjoyed my time at ABUAD and then decided to pursue a graduate degree abroad. Fortunately, I got a fully funded graduate teaching assistantship (GTA) position to complete my master's degree in Computer and Information Systems Engineering at Tennessee State University (TSU) in Nashville, Tennessee. This was a life-changing experience for me since the US is renown for its cutting-edge research and the fast-paced technological advancement.

During my master's program, I got the opportunity to work on a National Science Foundation (NSF) collaborative research project on real-time opportunistic spectrum access in cloud based cognitive radio networks for which I published three publications in reputable journals and conferences. Based on the presentation of the results from the NSF project, I won an award at the 38th Annual Symposium Award for Oral Presentation at Tennessee State University. I also won a one-thousand dollars National Society of Black Engineers (NSBE) Graduate Student Scholarship award in recognition of my academic performance. I observed an unfavorable trend while at TSU, not only was there no black faculty in the historically black university (HBCU), I was also a minority student in the STEM department. It was at this point that I started yearning for a change in minority representation in STEM at both the student and faculty level. I completed my master's degree in August 2016 and then immediately proceeded to Virginia Tech to start my PhD in Electrical Engineering. Currently, I am a fifth year PhD student at the Virginia Tech Research Centre, Arlington, VA, advised by Prof. Jeff Reed, the founding director of Wireless @ Virginia Tech.

During a Virginia Tech Black Alumni Summit (BAS) held two years ago, I had the opportunity of interacting with faculty members, alumni and staff members in the university about the dearth of black faculty members that can mentor both graduate and undergraduate students of color like myself. I was invited to give a short talk on this issue and I expressed how one of my mentors (one of two black faculty members out of over 100 faculty members in my department) has been a source of inspiration during difficult times in my program. This issue became more concerning when I discovered that black students at both undergraduate and graduate level only account for about 4.03% of Virginia Tech's student population. Similar trend can be found in many predominantly white institutions across the country. Some of the reasons for this include: lack of access to minority teachers and mentors, high rate of childhood poverty, lack of racial or economic integration in schools, lack of access to tutors for students from low-income families, lack of access to advanced level courses, etc. Having grown up in an African country, I can appreciate, firsthand, the impact of mentors from my racial group in my career advancement and success. Therefore, I strongly believe that having more Black faculty members would improve both enrollment and graduation rates of minority (Black) students in STEM. Such students can be inspired and mentored to attain greater heights that may have seem elusive because of their background. These interactions and discussions with my mentors have further ignited my passion to become a Black STEM faculty member so as to contribute my quota to promoting diversity in STEM education.

My PhD research interests have primarily focused on the investigation of innovative methods for spectrum enforcement and how interference impacts communication fidelity. Because wireless spectrum is a finite resource, efficient schemes need to be developed to share these resources with legacy incumbent users in a systematic manner. This effort has also resulted in my contribution, as a co-author, to a book chapter on spectrum sharing. The book was requested by Wiley as part of their efforts to disseminate quality information on spectrum sharing techniques to a wider audience. Details of my past and ongoing research activities can be found in my website. Based on my personal experience in STEM, it has become my life goal to promote a climate that engenders diversity and inclusion through my research, teaching and engagement.

In applying for the Black Trailblazers in Engineering (BTE) program, I have set myself to yet another major challenge, which is, to be one of the best and brightest Black scholars in engineering academia. In all my experience as a teaching assistant and an instructor over the past 8 years, I have always sought to be an epitome of intellectual sagacity and a beacon of hope to my students, colleagues and even professors. I consider myself to be a good candidate for the BTE fellow program because I will continue to work on cutting-edge research that would make our society better while also mentoring the upcoming minority students.

I look forward to my application being favorably considered.

Sincerely,

Taiwo R. Oyedare

Taiwo R. Oyedare

Research & Education Statement for the BTE Fellow Application

Previous Research Experience

My previous research interest investigated innovative methods for spectrum management. A major gap in the literature that my research explored is the unavailability of rigorous analysis on how much training data is needed for an optimal classification accuracy using deep learning techniques, this phenomenon is also referred to as sample complexity. Understanding sample complexity is very important in spectrum management as the outcome of this research has the potential of improving the speed at which spectrum offenders are identified and prosecuted, and thus positively creating a more ideal dynamic spectrum access environment. My work addressed fundamental issues in sample complexity in transmitter classification applications. As a result of this experience, my interests in understanding how interference impacts some key wireless communication tasks such as transmitter classification, modulation recognition, amongst other interesting research problems, has also become crucial.

Research Goals

As a future faculty trailblazer in the wireless communication research, I have observed with keen interest the pressing need to identify and classify interference in order to ensure communication fidelity. With the recent emergence of IoT and 5G technology, not only are we observing the growth in number of devices, these devices also need to share a very finite resource: the wireless spectrum. Because of this limitation, many of these devices intentionally or unintentionally cause interference to one another. The need to identify, classify and mitigate this interference sources is very important in ensuring quality communication. Traditional interference mitigation approaches usually investigate optimal physical (PHY) layer schemes with baseline methods (such as heuristic models, optimization techniques, greedy algorithms, etc). However, it is not clear if these approaches would work when multiple devices cause interference. Model-free methods like deep learning, usually perform better than traditional modeling approaches that use adaptive filters. Therefore, part of my immediate goal is to leverage deep learning to estimate, predict and mitigate time-varying interference to strengthen interference resilience of the PHY layer.

As a future faculty, my aim to leverage my understanding of deep learning and interference mitigation to develop robust spectrum sharing techniques to counter existential threats in dynamic spectrum access. To do this, I plan to use state-of-the-art deep learning techniques to further develop the spectrum sharing ecosystem. Spectrum forensics, a cybersecurity component of spectrum sharing, is technique for gathering actionable evidence that can be used in adjudication in the court of law in order to prosecute wireless spectrum offenders. Using PHY layer attribute of transmitting devices in wireless environments that are stochastic, noisy and vulnerable to interference from other devices, can result in poor classification performance. Hence, proffering useful solutions has never been more important. Further, I am also interested in detecting spectrum anomalies using federated

learning. Federated learning is a decentralized learning approach where model training is performed over a federation of distributed learners rather than local learning.

To be a successful faculty trailblazer, I plan to start from simple unit problems where I can explore the influence of noise, interference, fading and the stochastic nature of the wireless environments on transmitted signals to developing deep learning algorithms that can help to alleviate these issues. After demonstrating success there, I will move to investigate how to detect spectrum anomalies using federated learning. I also plan to leverage my connections at my current research lab (Wireless @ VT) to continue a relationship of data sharing, publishing, and collaboration. Furthermore, as a future faculty, I recognize the importance of recruiting and mentoring graduate students to make my research plans a success. I would strongly ensure that my future research team safely conducts research while also exemplifying a diverse pool of students including minority students. I strongly believe that a positive working and mentoring relationship is necessary in ensuring the collective success of both my own and my students.

Education Goals

In the past, I have taught and assisted in teaching a wide array of electrical engineering courses such as physical electronics, circuit laboratory, engineering professionalism, telecommunication networks, basic electrical engineering, amongst others. I can boldly say that all of my teaching assignments have been very rewarding because I have had the privilege of sharing my knowledge while also learning from students.

To succeed as a faculty trailblazer, I believe that I can continue to teach students in my core competencies such as wireless communications, circuit theory, telecommunications and electronics engineering. In addition, since I have been certified as a CompTIA Security+ expert, I am well qualified to teach or assist in teaching cybersecurity related classes at both undergraduate and graduate levels. I thoroughly enjoy interactions with students, and look forward to inviting undergraduates from the classroom into the research lab. As an aspiring faculty, my utmost desire is to create an atmosphere where students can meet their full potentials. This type of environment provides students with a platform to share ideas and take risks. To achieve this, I believe I will act as a guide in such a way as to allow my students to have choices while letting their curiosity direct their learning. I also plan to incorporate technology in a safe environment so that my students can experience hands-on learning. Additionally, student who complete a course work or research with me would be able to exhibit audience driven communication strategies, establish sound environmental, ethical and social reasoning. This would strongly encourage such students to think long term and not just short term. Thus, my personal educational philosophy has always been that education is a lifelong process where I learn new strategies, new ideas, and new philosophies from my students, colleagues and community.

Finally, it is important that I support student learning by being available during office hours, responding to e-mails in a timely manner, and providing feedback within a respectable timeline. I believe this will provide an opportunity for my students to also understand the value in proper, effective communication. Since education levels the playing field for minorities and underrepresented groups, I would be a teacher who promotes an atmosphere that makes learning exciting and rewarding for all my students. As a trailblazer, I look forward to seeing all my students have an equal opportunity in the classroom and have equal access to the resources they need to excel irrespective of their race, sex and cultural background.

Taiwo R. Oyedare

TAIWO R. OYEDARE

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<https://sites.google.com/vt.edu/taiwooyedare>

EDUCATION

- Virginia Tech** *December 2021*
PhD Electrical Engineering
Overall GPA: 3.85
- Tennessee State University** *August 2016*
MS Computer & Information Systems Engineering
Overall GPA: 4.00
- Ekiti State University Ado-Ekiti** *May 2012*
BEng Electrical & Electronics Engineering
Overall GPA: 3.73

EXPERIENCE

- Virginia Tech** August 2018 - Present
Graduate Research Assistant *Arlington, VA*
- Studied sample complexity for wireless transmitter classification applications
Result: IEEE DySPAN publication as first author
 - Investigating innovative methods for spectrum enforcement via the application of deep learning techniques for distinguishing transmitters based on their distinct hardware impairments.
 - Collaborated on out-of-distribution data detection for transmitter classification.
Result: Submitted a paper to Infocomm as 2nd author.
 - Collaborated on a Wiley book chapter titled *Policy Enforcement in Dynamic Spectrum Sharing*
Result: Wiley Book chapter published as third author
- Virginia Tech** August 2016 - July 2018
Graduate Research Assistant *Blacksburg, VA*
- Participated in UAV-SDR project to network multiple UAVS fitted with SDRs (B200 minis) for application in search rescue and emergency situations. Testing was done in both outdoors and indoor scenarios.
 - PHY layer authentication for IoT devices.
 - Participated in DARPA Spectrum Collaboration Challenge Competition by proposing messages to be exchanged for inter-network collaboration protocol during the developmental stage. Also assisted in developing intra-network and inter-network collaboration protocols using python.
 - Assisted in grading and teaching telecommunications engineering class for seniors and circuit theory for sophomores.
- Tennessee State University** August 2014 - August 2016
Graduate Research/Teaching Assistant *Nashville, TN*
- Developed a game-theoretic approach to detect and prevent insider jamming attacks in mobile ad-hoc networks.
Result: Published a paper as first author at IFIP 2016 Wired/Wireless International Conference, Thessaloniki, Greece

- Implemented a cross layer attack on GSM control channels by passively scanning the network and data link layer to launch a jamming attack.
Result: Published a paper in 14th IEEE Annual Consumer Communication Networking Conference, United States.
- Used software defined radios (USRP and GNU Radio) to jam a robot formation.
- Prepared, monitored and developed experiments in circuit laboratory class for undergraduate student using PSPICE and the Digilent Analog Discovery device for three consecutive semesters.

Afe Babalola University Ado-Ekiti

August 2012 - August 2014

Assistant Lecturer

Ado-Ekiti, Nigeria

- Co-taught fundamental electrical engineering classes and simultaneously conducted laboratory classes for undergraduates with a focus on using PSPICE for circuit simulation and then gained hands-on bread-boarding skills via building simple complex electrical circuit.
- Engaged in scholarly research in intelligent systems alongside faculty members. *Result:* Published three papers in reputable international journals
- Evaluated teaching activities, identified and implemented novel teaching strategies designed to improve outcomes for students.

Green Power Overseas Limited

January 2011 - April 2011

Intern

Ikeja, Lagos

- Carried out the design, installation and maintenance of 6KVA and 12 KVA online inverters to provide power backup for clients.
- Carried out other duties assigned by my supervisor.

TECHNICAL STRENGTHS

Computer Languages	Python, MATLAB, LateX
Software	MS Office (Word, Excel, Access, Project, Visio, Paint)
Tools	Vim, GNU Radio, Wireshark, Python Notebook, Spectrum Analyzer
Operating Systems	Windows, Linux, MAC

CERTIFICATIONS

CompTIA Security+ ce (*Expires Aug. 2023*)

SELECTED PUBLICATIONS

Park, J. M., Kumar, V., **Oyedare, T.** (2020). Policy Enforcement in Dynamic Spectrum Sharing. *Spectrum Sharing: The Next Frontier in Wireless Networks*, 341-359.

Oyedare, T., Park, J. M. J. (2019, November). Estimating the Required Training Dataset Size for Transmitter Classification Using Deep Learning. *In 2019 IEEE International Symposium on Dynamic Spectrum Access Networks (DySPAN) (pp. 1-10). IEEE.*

Imoize, A. L., **Oyedare, T. R.**, Ezekafor, C. G., Shetty, S. (2019). Deployment of an energy efficient routing protocol for wireless sensor networks operating in a resource constrained environment. *Transactions on Networks and Communications*, 7(1), 41-41.

Oyedare, T., Al Sharah, A., Shetty, S. (2016, May). A Reputation-Based Coalition Game to Prevent Smart Insider Jamming Attacks in MANETs. *In International Conference on Wired/Wireless Internet Communication (pp. 241-253). Springer, Cham.*

Hasan, K., Shetty, S., **Oyedare, T.** (2017, January). Cross layer attacks on GSM mobile networks using software defined radios. *In Consumer Communications Networking Conference (CCNC), 2017 14th IEEE Annual (pp. 357-360). IEEE.*

Al Sharah, A., **Oyedare, T.**, Shetty, S. (2016). Colluding Jamming Attack on a Grand Coalition by Aggrieved Nodes. *Communications and Network, 8(02), 57.*

Adekanmbi, O. O., Omitola, O. O., **Oyedare, T. R.**, Olatinwo, S. O. (2015). Performance Evaluation of Common Encryption Algorithms for Throughput and Energy Consumption of a Wireless System. *Journal Of Advancement In Engineering And Technology” Voume3/Issue1.*

RELEVANT GRADUATE CLASSES

Data Analytics I (S20)	Introduction to Deep Learning (F19)
Advanced Foundation of Networking (S18)	Digital Communication (F17)
Software Radios (F17)	Cellular Communications (S17)
Random Processes (S17)	Fundamentals of Information Security (F16)
Computer Communications and Networks (S15)	Computer Architecture and Operating Sys (F15)
Probability, Statistics and Risk Analysis (S15)	Modern Signal Processing (F14)

TEACHING EXPERIENCE

Basic Electrical Engineering I (Ass. Lecturer)	Basic Electrical Engineering II (Ass. Lecturer)
Physical Electronics I (TA)	Physical Electronics II (TA)
Circuits Laboratory (TA-F14, S15)	Electric Circuit Analysis Lab (T.A-F16)
Engineering Professionalism (T.A – F16)	Telecommunications Networks (T.A-S17)

AWARDS/HONORS

Winner	NSF Travel Grant for IEEE DySPAN Symposium, New Jersey (Oct. 2019)
Winner	NSBE Graduate Student Scholarship (S16)
Third Place	38th Annual Symposium Award for Oral Presentation, TSU. (S16)
Awardee	Afe Babalola Honorarium, Afe Babalola University, Ado-Ekiti. (2012-2013)
Recipient	First Class Honors (Top 2% of Graduating Class), Ekiti State University (2012)

COMMUNITY SERVICE

Volunteer	IEEE DySPAN Symposium, New Jersey (Oct. 2019)
Volunteer	IEEE CNS Conference, Washington DC (June 2019)
Volunteer	Science Olympiad for Tennessee High School Students (S16)
Volunteer	Hands on Nashville, Home Energy Savings Project (Jul.2015 - Aug. 2015).
President	Global Harvest Singles Ministry. Global Harvest Church, Ado-Ekiti. (2014)
Staff Advisor	Advised 30 EE Freshmen student at Afe Babalola University (2013-2014)

EXTRA-CURRICULAR ACTIVITIES

Member	African Graduate Student Organization (AGSO), Virginia Tech Chapter
Member	Phi Kappa Phi, Virginia Tech Chapter
Member	Golden Key International Honor Society (GK), TSU Chapter
Member	National Society of Black Engineers (NSBE), TSU Chapter

HOBBIES

Camera Operator, Video Production (Live Streaming), Tennis.



Virginia Modeling, Analysis and Simulation Center
1030 University Blvd.
Suffolk, Virginia 23435



01/19/2020

Dear BTE Fellowship Selection Committee,

Letter of Recommendation for Taiwo Oyedare

I am writing to you regarding the BTE Fellowship application of Mr. Taiwo Oyedare, one of my former advisees at Tennessee State University. Mr. Oyedare is currently undergoing his PhD in Electrical Engineering program at Virginia Tech. In our work together, I experienced his well-rounded approach to research firsthand, and as a result of my intimate familiarity with his research contributions as well as his impressive academic performance, I strongly recommend him for the BTE fellows program.

I am presently an Associate Professor in the Virginia Modeling, Analysis and Simulation Center at Old Dominion University in Virginia, where I also received my PhD in modeling and simulation in 2007. As mentioned above, I came to know Mr. Oyedare through my prior position at Tennessee State University, where I was an Associate Professor in Electrical and Computer Engineering as well as Associate Director of the Tennessee Interdisciplinary Graduate Engineering Research and Director of the Cyber Security Laboratory. In addition to my current work at Old Dominion, I am also an Engineer at the Naval Surface Warfare Center in Indiana. I conduct research on topics pertaining to network security, computer networking, and machine learning.

I worked with Mr. Oyedare directly from August 2014 through August 2016 while he completed his master's research in my laboratory at Tennessee State University. During this time, he conducted research on using game theory to detect and prevent jamming attacks on mobile ad-hoc networks as well as demonstrated a novel cross layer attack on GSM networks. Before joining my lab, he completed a Bachelor of Engineering in Electrical and Electronics Engineering at Ekiti State University in Nigeria, where he focused on research pertaining to intelligent systems.

Mr. Oyedare has shown himself to be a proven leader who works well with both students and administrators. Likable and assertive, he is poised to make a strong impact in his future career as a black faculty in the years to come. While I was an associate professor at Tennessee State University, I led a diversified and inclusive lab that hired students and postdoctoral associates from different countries all over the world. I remember one of my numerous sendforth activities that was organized by Mr. Oyedare, he was able to clearly demonstrate his ability to collaborate and work well with people whose cultural background differed from his.

Mr. Oyedare's robust background has allowed him to develop a suite of skills in software and programming and a particularly broad perspective that has heavily informed his approach to research. During his master's degree program, one hallmark of much of Mr. Oyedare's research is his "big picture" approach to wireless security where he identified key structural or other flaws in wireless networks that leave them vulnerable to attack and develop countermeasures to better secure the system, in contrast to simpler but less comprehensive security solutions. I do not have a doubt in my mind that he is well positioned to succeed as a black faculty in the US.

Mr. Oyedare has proven his abilities as a respectable researcher and competent future faculty several times over, and for that I recommend him for the BTE fellows program so as to continue his pivotal research.

Yours respectfully,

Sachin Shetty

Sachin Shetty, Ph.D.

Associate Professor

Virginia Modeling, Analysis and Simulation Center

Old Dominion University



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Jeff Reed
reedjh@vt.edu

January 15th, 2021

Dear BTE Committee:

It is my pleasure to provide a recommendation in support of Taiwo Oyedare for the Black Trailblazers in Engineering Fellow program offered by Purdue Engineering. First, a little information about myself. I am the Willis G. Worcester Professor of Electrical and Computer Engineering (ECE) in the Bradley Department of Electrical and Computer Engineering at Virginia Tech. I am the Founding Director of Wireless @ Virginia Tech, one of the largest wireless research groups in the United States, and the previous Interim Director and now CTO for the Commonwealth Cyber Initiative for the State of Virginia. In 2010, I founded the Ted and Karyn Hume Center for National Security and Technology and also served as its interim director. My current areas of expertise are in software-defined radios (SDRs), AI-enabled 5G wireless, wireless security/information assurance, interference analysis, and vehicular communications. As Taiwo's advisor and instructor, I have witnessed his contributions to the wireless field and capability as an academic researcher. I have known Taiwo for the last four years and can truthfully state that he is a deserving candidate that you will be proud to have as an example of your ideal trailblazer.

I first came to know Taiwo when he took my Cellular Communications graduate course. The course consisted of understanding basic principles of cellular networks with studies into the various 3GPP standards. Taiwo distinguished himself in his leadership and research for the final group project, and I was impressed by the overall academic depth and rigor he and his peers instilled into their work. I encouraged him that with a bit more refining, the work could be published. I find each time Taiwo has been in a class with me, he has shown himself to be a very conscientious and diligent student. He is committed to his research and responsibilities, as well as seeking out ways to help his colleagues. He goes well beyond first solutions and makes sure his research is sound and applicable to his area of focus. Throughout his time with me, he has demonstrated great perseverance and initiative. Not only is he invested in and motivated to learn the material, he also puts great work into assimilating it into his own research interests and projects' development.

As his advisor, I am also very familiar with Taiwo's past and current research in wireless communications. During his master's program, Taiwo completed influential work on the security of GSM networks. This type of network, developed prior to LTE and 4G, is still one of the most frequently used types of wireless network in the world. He developed a type of cross-layer attack that uses techniques that consume very little power to eavesdrop on control messages sent

between base stations and mobile devices. His work not only represents significant improvements in the security of GSM networks used today, but also is pertinent to improving the design of security features for next-generation network structures.

His most recent research efforts have focused on dynamic spectrum enforcement, thus helping to address a looming problem in the wireless industry. To put it simply, wireless spectrum is not an infinite resource. Adding more devices to a network utilizes more of the available spectrum. The proliferation of bad actors within a network further complicates the issue, especially considering that many sensitive entities, such as government organizations, also utilize the same spectrum. Taiwo is working particularly on finding methods for preventing bad actors from exploiting these shared connections and for identifying the bad actors when such attacks do occur, allowing them to be shunted from the network. Further, Taiwo is currently investigating efficient ways of identifying and mitigating wireless interference.

In addition to having a firsthand knowledge of Taiwo's academic commitment and talent, I am also familiar with his educational goals. Taiwo has discussed with me his plans to pursue academia based on his love for teaching and mentoring. His desire to impart knowledge is second to none. Based on my review of the eligibility requirements for the BTE fellow program, I am convinced that Taiwo is the type of candidate that will further promote diversity and inclusion as an aspiring faculty member.

Taiwo is unquestionably an exceptional candidate for this program. Given his work ethic and strong interpersonal skills, I believe he has a bright future in wherever his research takes him. He has proven himself to have the initiative, technical skills, and strategic thinking necessary to be a leader within the wireless community. I would therefore highly recommend Taiwo Oyedare. I feel confident that you will be just as impressed with Taiwo as I am. As an academic who is committed to promoting quality research and mentorship, I strongly encourage you to consider Taiwo for the Black Trailblazers in Engineering fellowship.

If I can be of any further assistance, or provide you with any further information, please do not hesitate to contact me. My Virginia Tech office number is (540) 231-02972.

Sincerely,

A handwritten signature in black ink that reads "Jeffrey Reed". The signature is written in a cursive, flowing style.

Jeffrey Reed, Ph.D.
CTO for CCI
Willis G. Worcester Professor
Virginia Tech

January 20, 2021

To the BTE Committee:

I am writing this letter to give my highest recommendation for **Taiwo Oyedare**, an applicant to your BTE program. I first met Taiwo in the hallway at Virginia Tech's Blacksburg campus. I was particularly fascinated by Taiwo's story of persistence, dedication and sheer grit in his journey from Nigeria to Blacksburg. He impressed me with his struggle and pursuit of a better life. After losing his father at a very young age, Taiwo managed to recruit mentors who have provided the necessary advice along the way, working with him on this intriguing journey. He has certainly motivated himself to achieve success in his academic career.

I'm a professor of Electrical and Computer Engineering and co-director of the Advanced Research Institute at Virginia Tech, Arlington, Virginia. As an academic, I fully appreciate Taiwo's dedication to excellence and rigor demonstrated in the manner in which he has carried out his research work. Taiwo has worked on numerous research topics in wireless communication. In fact, he received a travel grant to present his findings at the 2019 IEEE Dynamic Spectrum Access Networks (DySPAN) symposium. Because of his dedication to service, Taiwo also volunteered at the IEEE Computer Network Security (CNS) conference in Washington DC two years ago. The IEEE CNS conference is an annual conference that focuses on all things cybersecurity including wireless network security. To combat rising threats in network vulnerabilities, the field of cybersecurity is focused on finding better methods to prevent and mitigate the damage caused by malicious cyberattacks, making the research of individuals such as Taiwo valuable to many sectors of the global economy, including business, military, and healthcare operations.

Taiwo has already developed an impressive presence in the wireless communications research community, with over half a dozen articles appearing in major conference proceedings and industry journals over the past several years. These include proceedings of the IEEE Dynamic Spectrum Access Networks (DySPAN) symposium, International Conference on Wired/Wireless Internet Communication as well as the IEEE Consumer Communications & Networking Conference, in addition to journals such as Communications and Network, Innovative Systems Design and Engineering, and a book chapter requested by Wiley. The frequent appearance of Taiwo's work in such conferences is indicative of the innovative nature of his findings. Furthermore, his research has also been extensively cited, with Google Scholar recording at least 54 citations of his work. This record reflects the significant influence and reach of Taiwo's accomplishments.

Invent the Future

I am impressed with Taiwo's extraordinary way of relating with students and building rapport based on mutual respect. I have observed his unique way of managing his teaching assistantship duties, research work and course work. Many of his students have expressed profound appreciation of his talents as a teaching assistant. Even though his academic achievements are outstanding, it is his professional acumen that clearly distinguishes him from his peers. He inspires others with his friendly demeanor and positive attitude. His background in systems engineering has resulted in a highly holistic approach to his research endeavor. His ongoing contributions to his research area have been critical in maintaining the integrity of wireless communication systems.

In addition to Taiwo's academic activities, I am also aware of his extra-curricular activities such as teaching and mentoring middle school students at his home church. Taiwo volunteers on a weekly basis to help teach these middle schoolers biblical principles of honesty, hard work, diligence and conscientiousness. Taiwo's impact in his community can also be seen in his dedication to ensure that international students understand how to navigate the immigration process. Taiwo has given several presentations on how he was able to qualify for the EB2 National Interest Waiver program through which he became a permanent resident of the United States even before completing his PhD program. I believe that you will agree with me that not only do these qualities set Taiwo apart, but they also show his determination and commitment to helping people.

Given the extent of his successes so far, it is reasonable to expect that his future work will be of at least equal merit. His approach to securing wireless networks is not just highly innovative but also in fact unique, making his professional insight and skills much sought-after within the field. Being an African American professor, I understand the need for mentoring students of color to become faculty members. I believe there's a pressing need to also mentor people like Taiwo who would carry the torch and influence the younger generation of black students to continue to strive for unparalleled success. Given his impressive background and career goals, I hope that his application would receive the most favorable outcome.

Sincerely,

A handwritten signature in black ink, appearing to read "Paul A. [unclear]". The signature is written in a cursive style with a horizontal line underneath.