July 26, 2022

USCIS

Attn: I-140

2501 S. State Highway 121 Business

Suite 400

Lewisville, TX 75067

RE: Immigrant Petition for Alien Worker

Petitioner/Beneficiary: Mudasar Latif MEMON, PhD

Type of Petition: I-140

Classification Sought: INA §203(b)(2)(B)

National Interest Waiver

This letter is respectfully submitted in support of Dr. Mudasar Memon’s immigrant petition for classification as a member of the professions holding an advanced degree requesting a national interest waiver of the requirement of a job offer. The submitted evidence demonstrates that Dr. Memon qualifies for a national interest waiver under the analytical framework set forth in Matter of DHANASAR, 26 I&N Dec. 884 (AAO 2016). Specifically, the submitted evidence will prove:

1. Dr. Memon is a member of the professions holding an advanced degree;
2. Dr. Memon’s proposed endeavor has both substantial merit and national importance;
3. Dr. Memon is well positioned to advance the proposed endeavor; and
4. On balance, it would be beneficial to the United States to waive the requirements of a job offer and thus of a labor certification.

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{{intro}}

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As an expert in the field of electrical engineering, Dr. Memon’s proposed endeavor is to continue his research on designing state-of-the-art green wireless networks and preventive healthcare systems in order to create energy-efficient 5G wireless networks that support various healthcare systems such as glucose monitoring in diabetic patients (Exhibit 7).

This petition waives the job offer requirement, and the petitioner's proposed endeavor is separate from their proposed employment. However, we are submitting Dr. Memon’s plans for employment in the field to confirm their commitment and capacity to advance their proposed endeavor. Based on his education and research background, Dr. Memon plans to be employed as a researcher in the Bradley Department of Electrical and Computer Engineering at Virginia Tech or a similar employer (Exhibit 7). Dr. Memon intends to continue his research on the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems. Specifically, he will design energy efficient algorithms and protocols for 5G and next generation wireless networks which are compatible for real-time applications such as smart cities and Internet of Medical Things (Exhibit 7). This said, the focus of this prong should be on the proposed endeavor itself rather than Dr. Memon’s employment.

# Dr. Memon’s proposed endeavor of the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems has both substantial merit and national importance

Dr. Memon’s research related to the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems has great substantial merit and national importance. Among other applications, Dr. Memon’s research is relevant to the design of innovative new healthcare systems and the implementation of 5G networks (Exhibits 1-4, 8-18).

## Dr. Memon’s proposed endeavor has substantial merit

Dr. Memon’s research advancing his proposed endeavor is of great importance because it allows for improved healthcare to global communities. It is estimated that there are currently 463 million individuals afflicted with diabetes globally, or 9.3% of the world’s population. That number is projected to grow to approximately 700 million by 2045. Health officials encourage diabetics to monitor their blood sugar daily. Finger sticks, in which the individual pricks his or her fingertip to provide blood for analysis by a portable sensor, remains the primary method for this test. However, finger sticks have several limitations, including the pain of repeated jabs to fingertips, as well as difficulty of application on individuals whose hands are swollen, cold, cyanotic, or edematous. Additionally, the Centers for Disease Control and Prevention calls out the danger of infection through the misuse of finger sticks. Solutions that address these limitations benefit millions of individuals worldwide. Dr. Memon’s development of a personalized glucose monitoring system (PGMS) not only addresses these issues but provides personalized blood sugar analysis through the use of artificial intelligence methods, and is, therefore, of great merit to the world (Exhibits 1-4, 23, 24). Dr. Memon’s proposed research on the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems, including his future research at Virginia Tech or a similar employer, therefore, has substantial merit (Exhibit 7). Fellow experts in the field provide additional insight into the merit of this endeavor:

* “Dr. Memon's project has many applications to preventive medicine, but his personalized glucose monitoring system is particularly notable for its global benefits. The World Health Organization has stated that the number of people worldwide with diabetes in 2014 was 422 million. For diabetic patients, monitoring blood glucose levels is critical. 2.2 million people died in 2012 because of high blood glucose. Though it is essential, monitoring glucose levels is also difficult, as it is often painful and the calculations involved are complex. Dr. Memon's system is non-invasive, and the calculations have already been done and are personalized to a patient's unique ideal targets. Dr. Memon's system therefore has major implications for efforts to reduce diabetes-related deaths around the world.” (Exhibit 2. Dr. Pradeep Anand, Director of Customer Experience, Samsung Healthcare, South Korea)
* “In conclusion, Dr. Memon presented the field with a novel artificial intelligence-based discontinuous reception (DRX) algorithm and a recurrent neural network (RNN) that sufficiently addresses 5G-enabled wireless network devices’ rapid energy drain problem. Such a dramatic improvement in 5G technology has a significant global reach. The Global System for Mobile Communications (GSMA) reports that technology companies are currently undergoing a massive global 5G rollout. By 2025, 5G networks will cover one third of the world’s population, providing customers with increased availability, more reliability, higher data speeds, and a large network capacity. Dr. Memon’s work has greatly improved 5G capable devices by moving past energy-draining beam searching and toward a more energy-efficient DRX approach, ensuring that devices properly support rapidly expanding 5G networks.” (Exhibit 3. Dr. Kazuki Maruta, Specially Appointed Associate Professor, Tokyo Institute of Technology, Japan) (Independent Advisory Opinion)

## Dr. Memon’s proposed endeavor has national importance

Dr. Memon’s proposed endeavor also has broad implications for the United States. In an analysis, the Boston Consulting Group (BCG) recently characterized the actions and policies of governments relating to 5G technology as a “a global race to 5G.” 5G technologies enable a wide range of advanced applications, from remote monitoring and control of devices in hostile environments to bringing medical diagnosis and treatment to remote areas. The U.S. has recognized the importance of 5G in the development of a “National Strategy to Secure 5G Implementation Plan” by the U.S. Department of Commerce. Yet, constraints to full deployment remain, including solving the problem of increased energy requirements of 5G towers. In a recap of Mountain Consulting’s analysis of 5G energy requirements, Fierce Wireless notes key issues, including insufficient AC power supply and insufficient battery capacity provided by traditional lead-acid batteries. These limitation result in an inability to support long-distance transmission, thereby limiting the transmission distance. Dr. Memon’s research, with its innovative use of neural networks to predict incoming data packets, enabling the deactivation of certain units and thereby saving power, directly addresses these limitations (Exhibits 1-4, 25-27).

Dr. Memon’s proposed research on the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems, including his future research at Virginia Tech or a similar employer, is therefore also nationally important (Exhibit 7). Fellow experts in the field have provided further detail on the importance of this endeavor to the United States:

* “His work on reducing energy loss in 5G-enabled devices is essential to the United States, as the burgeoning 5G market is a significant source of American job growth. The Morning Consult reports that the rapid buildout of 5G technologies in the United States between April 2019 and May 2020 created 106,000 new jobs. They further state that 5G technologies are expected to create 4.6 million in total by 2034. In order for job growth to continue, the United States must remain a global leader in 5G. Dr. Memon’s novel algorithm, which I explain later in this letter, has allowed for devices to more efficiently access 5G networks without losing battery power. The United States must allow his research to continue, as investing in 5G technology development is a critical to making sure that the nation profits from its inevitable advance.” (Exhibit 1. Dr. Dong Ryeol Shin, President of Sungkyunkwan University and Professor in the Department of Software, South Korea)
* “Modern technology features many Internet of Things devices that perform complex and dangerous tasks such as controlling heavy machinery or performing remote surgery. 5G technology enables these devices to work in real-time, but providing constant connectivity is a major source of energy drainage. This has placed pressure on American companies and manufacturers, who are now aiming to build 1oT devices that can withstand these demands. Dr. Memon's method of using BackCom to harvest power from radio signals and communicate over remaining signals has drastically reduced power consumption in the billions of 1oT devices currently in circulation. According to CRN, the average number of connected devices in an American household is 10. This year, the number of 1oT devices has reached 35.82 billion. Not only do Dr. Memon's power improvements enhance the daily user experience of in-home devices for American households, but they also allow for ongoing advancements in the field by the American companies leading the 5G movement without being hindered by excessive power consumption. Dr. Memon's success in developing his method represents his superior level of achievement in promoting electrical engineering research and advances in telecommunications technology.” (Exhibit 4. Dr. Sadiq Mohammed Sait, Professor and Director, Center of Communications and IT Research, King Fahd University of Petroleum and Minerals, Saudi Arabia) (Independent Advisory Opinion)

Because Dr. Memon’s proposed endeavor has both substantial merit and national importance, he satisfies this prong.

# Dr. Memon is well positioned to advance the proposed endeavor of the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems

Dhanasar indicates that the second prong of the analysis must consider whether the petitioner is well positioned to advance the proposed endeavor (Dhanasar, at 890). This multifactorial assessment includes an evaluation of the petitioner’s education, skills, knowledge, and record of success in related efforts; a model or plan for future activities; any progress made toward achieving the proposed endeavor; and the interest of potential customers, users, investors, or other relevant entities or individuals (Id.). Importantly, Dhanasar points out the inherent difficulty in “forecasting feasibility or future success,” even in the presence of a cogent plan and competent execution; therefore, petitioners are not required to show that their proposed endeavor is more likely than not to succeed (Id.) (Exhibit 28).

Based on this multifactorial assessment, it is clear that Dr. Memon’s education, experience, expertise, documented record of success, influence in his field, and his future plan have altogether well positioned him to advance the proposed endeavor of the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems.

## Education, Skills, and Knowledge

Dr. Memon earned his M.E. in telecommunication and control engineering from Mehran University of Engineering in Pakistan and his PhD in electrical engineering from Sungkyunkwan University in South Korea. He is currently the head of technical education at the Sukkur Institute of Business Administration Community College in Pakistan. He has published significant research on the application of advanced technologies to issues in 5G and preventive healthcare (Exhibits 5, 6). Based on this background, Dr. Memon plans to pursue a position with Virginia Tech or a similar employer, where he will continue his research into the design of state-of-the-art green wireless networks and preventive healthcare systems, utilizing his extensive experience with artificial intelligence, backscatter communication, and machine learning, in order to create energy-efficient 5G wireless networks that support various healthcare systems such as glucose monitoring in diabetic patients (Exhibit 7). Fellow experts have described the importance of Dr. Memon’s background and experience in more detail in letters of support (Exhibits 1-4).

## Record of Success in Related or Similar Efforts and Interest of Relevant Individuals

Throughout his time working in the field, Dr. Memon has built an impressive record of success. As detailed below, Dr. Memon’s original research on nationally important topics like the application of artificial intelligence heuristics for improved 5G power efficiencies, the use of backscatter communication to harvest energy for battery-free communications, and artificial intelligence-based solutions in preventive healthcare has been his development of optimization techniques applied to discontinuous reception to improve energy efficiency in 5G networks (Exhibits 1-20). This is an unusually strong record of success for a researcher in electrical engineering and demonstrates Dr. Memon’s ability to continue pursuing his proposed endeavor of designing state-of-the-art green wireless networks and preventive healthcare systems, utilizing his extensive experience with artificial intelligence, backscatter communication, and machine learning, in order to create energy-efficient 5G wireless networks that support various healthcare systems such as glucose monitoring in diabetic patients.

1. Dr. Memon’s research has been published in authoritative peer-reviewed journals in his field

Dr. Memon’s research has resulted in 14 peer-reviewed journal articles (four of them first-authored) (Exhibits 8-18). Moreover, these papers have been published in the top journals in Dr. Memon’s field, reflecting his peers’ recognition of the value of this research (Exhibits 8-18). Experts in the field have submitted letters confirming that Dr. Memon’s record of successful research has well positioned him to continue advancing the proposed endeavor (Exhibits 1-4).

1. Researchers from around the world have relied upon Dr. Memon’s research to further their own investigations in the field

Not only has Dr. Memon successfully completed and published the results of his research in the field, but his research has also gone on to influence his peers. That is, Dr. Memon’s publications have been cited a total of 57 times according to Google Scholar, thereby demonstrating that these publications are widely recognized and relied upon in the field of electrical engineering (Exhibit 19a).

Upon reviewing Dr. Memon’s citation record, it is clear that he has had a major influence on other scholars’ understanding of topics such as energy efficiency in 5G networks, lowering the carbon footprint of 5G, and enabling developing technologies such as 6G. Illustrative examples of how others in the field have directly benefited from Dr. Memon’s research include (Exhibit 20):

* Dr. Memon’s research into methods of optimization of discontinuous reception to improve energy efficiency in 5G networks was highlighted by Maruta (Exhibit 3) and Falcone (Electronics, 2020) The authors call out Dr. Memon’s contributions to energy efficiency in massive multiple-input multiple-output (MIMO) technology fundamental to 5G. The authors specifically note his innovative use of neural networks to adapt dynamic sleep cycles, thereby optimizing energy efficiency. Dr. Memon’s unique approach to this real-life problem in the implementation of 5G has influenced other researchers in the field.
* Dr. Memon’s research into optimizing energy efficiencies in 5G technology also advances lowering the carbon footprint of 5G. This aspect is called out by Gonçalves et al. in their analysis of methods to reduce this carbon footprint (Electronics, 2020). The authors also note that these methods enable other communication technologies, including device to device communication, thereby expanding the use of AI to make more eco-friendly technology. This citation highlights that Dr. Memon’s methods are applicable across multiple domains.
* Dr. Memon’s research is also applicable to developing technologies such as 6G and the internet of things (IoT), as highlighted by Sheth et al. in their survey of advanced technologies applied to 6G networks (Computer Communications, 2020). The authors cite Dr. Memon’s contributions to battery-free communications as significantly underpinning the feasibility of these new application areas. Their citation clearly demonstrates the value of Dr. Memon’s research as enabling new technologies.

Among the researchers who have turned to Dr. Memon’s research is his recommender, Dr. Sadiq Mohammed Sait:

“My research team is one of the many who have used Dr. Memon's work to bolster their own findings. In this case, our team published a study on 5G-related non-orthogonal multiple access technologies and used Dr. Memon's discussion of BackCom as a foundation. Dr. Strinati led yet another team that utilized Dr. Memon's findings. In their article on revolutionary 6G technology, the authors claimed that Dr. Memon's work is essential to decreasing power consumption in 6G communication. As wireless network technology develops, it requires increasingly high amounts of energy. As a result, Dr. Memon's wok is increasingly relevant to the field.” (Exhibit 4. Dr. Sadiq Mohammed Sait, Professor and Director, Center of Communications and IT Research, King Fahd University of Petroleum and Minerals, Saudi Arabia) (Independent Advisory Opinion)

Thus, Dr. Memon has provided independent researchers from around the world with useful approaches to the study of complex topics within the field of electrical engineering. That other researchers consistently look to his methods and findings to inform and guide their own studies indicates that he is well positioned to make further useful discoveries in the field of electrical engineering.

Other noted experts have confirmed that Dr. Memon’s citation record indicates a demonstrated impact on the field that has well positioned him to continue to advance the proposed endeavor (Exhibits 1-4).

1. At least three of Dr. Memon’s papers are among the most highly cited in the field of Engineering for their years of publication

In addition to being widely cited in general, many of Dr. Memon’s papers have in fact been among the most highly cited in the field, indicating both the originality and significance of his methods and results (Exhibits 19a, 19b):

* Dr. Memon’s article, “Backscatter communications: Inception of the battery-free era—A comprehensive survey,” published in 2019 in Electronics, has received 22 citations to date. For all articles published in the category of Engineering in 2019, the average number of citations is only 5.35. This article is thus one of the top 10% most-cited articles published in Engineering in 2019.
* Dr. Memon’s article, “Artificial intelligence-based discontinuous reception for energy saving in 5G networks,” published in 2019 in Electronics, has received 9 citations to date. For all articles published in the category of Engineering in 2019, the average number of citations is only 5.35. This article is thus one of the top 20% most-cited articles published in Engineering in 2019.
* Dr. Memon’s article, “Ambient backscatter communications to energize IoT devices,” published in 2020 in IETE Technical Review, has received 5 citations to date. For all articles published in the category of Engineering in 2020, the average number of citations is only 1.97. This article is thus one of the top 20% most-cited articles published in Engineering in 2020.

   Citation percentiles reflect the influence of a particular article without the biases introduced by time and field on citation count. In fact, the utility of citation percentiles for evaluating the impact of research is widely accepted in the practice of bibliometrics. For example, Dr. Kevin Boyack of Sandia National Laboratories has clarified the validity of percentile rankings for evaluating the impact of published research, arguing that rankings provide “normalization across time such that papers from different years can be directly compared” (Exhibit 22).

            Citation percentiles thus facilitate objective comparison between articles published in different years within the same field, negating the misleading variability of time-dependent citations during impact analysis. Dr. Memon’s citatory history clearly demonstrates the major impact of his original contributions in the field of electrical engineering (Exhibits 19a, 19b).

Dr. Memon has thus authored one paper that ranks among the top 10% and two papers that rank among the top 20% most-cited articles across the entire field of Engineering for their respective years of publication (Exhibits 8-18, 19a, 19b). Since citations in scientific literature denote use of a researcher’s work in pursuit of other investigations, it follows that a higher rate of citation indicates a researcher’s greater impact in their field. Moreover, the different citation climates in each discipline and the time-dependent nature of citation rates make percentiles based on both field and year the ideal measure of an author’s influence. The outstanding rates at which Dr. Memon’s papers have been cited indicate that others in his discipline have relied on his results to an exceptional degree. Other noted experts confirm that Dr. Memon’s citation record indicates a demonstrated impact on the field that has well positioned him to continue to advance the proposed endeavor (Exhibits 1-4).

1. Dr. Memon’s research is highly novel and influential in his field

Below, detailed descriptions of four of Dr. Memon’s key projects have been included as evidence of his contributions to and expertise in the field of electrical engineering. These project summaries are complemented by expert commentaries that highlight Dr. Memon’s use of innovative methodologies, the nature of his breakthroughs, and the ways that his unique findings have been applied throughout the field:

##### 1. Artificial Intelligence for Energy Efficiency in 5G Wireless Networks

5G wireless technology requires significant power in order to search for the best available beam pairs prior to establishing communications, leading to rapid power drain in the equipment. Dr. Memon researched the application of artificial intelligence (AI) techniques to optimize beam searching. He developed an AI-based discontinuous reception (AI-DRX) heuristic that predicts the next packet’s arrival time. This enables the radio circuitry to be turned off until the arrival of the packet, thereby saving energy. Dr. Memon’s algorithm was shown to enable a 70% improvement in energy efficiency for certain types of packets (Exhibits 1-4, 8-18). Dr. Dong Ryeol Shin and Dr. Kazuki Maruta have described this research in further detail (Exhibits 1, 3).

Dr. Memon’s work on artificial intelligence heuristics for improved 5G power efficiencies has resulted in a total of two peer-reviewed papers, which are all detailed below (Exhibits 8-18, 19a, 19b):

* “Artificial Intelligence-Based Discontinuous Reception for Energy Saving in 5G Networks,” Electronics, 2019 – 9 citations (top 20% in Engineering).
* “Deep‐DRX: A framework for deep learning–based discontinuous reception in 5G wireless networks,” Transactions on Emerging Telecommunications Technologies, 2019 – 8 citations.

The publication of Dr. Memon’s work in such authoritative venues, and the substantial attention this work has received, serve as testament to the value of his research on artificial intelligence heuristics for improved 5G power efficiencies. Dr. Memon’s research has already driven additional important advances in the field. Some examples of his impact are detailed below (Exhibit 20):

* Ari et al., in their development of a resource allocation scheme for 5G radio access networks (C-RAN) (Computer Networks, 2019), cite Dr. Memon’s finding that 15-20% of tower sites in current C-RANs consume more than 50% of the power. The authors reference Dr. Memon’s results, stating that “[i]n traditional architectures only about 15-20% of BSs operating in the current RAN architecture are loaded more than 50% [19, 20].”
* In their review article (Electronics, 2020), Maruta (Exhibit 3) and Falcone highlight Dr. Memon’s work on energy efficiency in massive multiple-input multiple-output (MIMO) technology for 5G. The authors especially call out his use of AI as a mechanism for energy use regulation. They note that “[d]iscontinuous reception can also contribute to improve the energy efficiency. Authors in [23] introduced an artificial intelligence (AI) approach, i.e., recurrent neural network (RNN), to adapt sleep cycles of user terminals.”
* Gonçalves et al., in their analysis of methods to reduce the carbon footprint of 5G (Electronics, 2020), cite Dr. Memon’s research into improving the energy efficiency of 5G technologies. The authors call out his findings on energy efficiency for mobile devices. They also propose that his work on energy efficiency be extended to device to device communication. The authors note that, “[c]onsidering, for example, the data exchange between two users which are geographically close to each other, which represents an ever-increasing reality, the possibility of having such data exchange directly between the devices in a D2D fashion can represent several enhancements in power consumption reduction. D2D can be used as a mechanism to decrease power consumption [59,60], by reducing the network hops to only one with the immediate advantage of lower latency; better quality of service and experience; and, from the core network perspective, decrease signaling and overall backbone traffic.”

It is evident from these citations that Dr. Memon’s research into artificial intelligence heuristics for improved 5G power efficiencies is actively advancing his field.

Furthermore, Dr. Memon’s study has received funding from the National Research Foundation of Korea (Exhibit 21a). This funding supports projects that contribute to the advancement of knowledge and improvement of quality of life through supporting creative research (Exhibit 21b). Therefore, Dr. Memon’s research clearly advances these goals through the reduction in the carbon footprint of rapidly growing 5G technology.

In sum, Dr. Memon's work on artificial intelligence heuristics for improved 5G power efficiencies serves as evidence that he has already made progress toward his larger effort to advance the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems.

##### 2. Green and Emerging Wireless Networks

In this research, Dr. Memon investigated the use of radio frequency (RF) signals as an energy source for battery-free communications. He specifically studied the use of backscatter communication (BackCom) to harvest energy from incident RF. Dr. Memon detailed various types of BackCom, including ambient BackCom (Amb-BackCom), its evolution and architecture, and its modes, including half-duplex and full-duplex. He then examined range extension and security considerations. Dr. Memon’s research provides a comprehensive guide to BackCom, enabling researchers to evaluate its suitability within the context of their particular investigations and designs (Exhibits 1-4, 8-18). Dr. Sadiq Mohammed Sait has recounted Dr. Memon’s accomplishments in supporting letter (Exhibit 4).

Dr. Memon has described his findings related to his analysis of backscatter communication and emerging wireless networks in three peer-reviewed papers, which are detailed below (Exhibits 8-18, 19a, 19b):

* “Backscatter communications: Inception of the battery-free era—A comprehensive survey,” Electronics, 2019 – 22 citations (top 10% in Engineering).
* “Ambient Backscatter Communications to Energize IoT Devices,” IETE Technical Review, 2020 – 5 citations (top 20% in Engineering).
* “Femtocell: What, Why, and How?” IJCSNS International Journal of Computer Science and Network Security, 2019.

Dr. Memon’s successful publication of his work demonstrates its value in the field. Dr. Memon’s peers have been significantly influenced in their own work by his prior findings regarding his analysis of backscatter communication and emerging wireless networks. Some examples include (Exhibit 20):

* Maraqa et al., in their survey of optimal power domains for future wireless networks (IEEE Communications Surveys & Tutorials, 2020), cite Dr. Memon’s work on backscatter communication. The authors discuss his research in the context of their own focus, the rate-optimal power domain non orthogonal multiple access (NOMA). They note that, “[s]ome other surveys identified in Table I(b) [including Dr. Memon’s] discuss rate-optimal Non orthogonal multiple access (NOMA). Scattered discussion (i.e., rate-optimal NOMA works were mentioned alongside the NOMA works that considered optimizing other metrics, such as power minimization and energy efficiency maximization as well as the NOMA works that investigated performance analysis metrics, such as BER, SER, and outage probability. Hence, rate-optimal NOMA works were discussed in a scattered fashion within those survey papers.”
* In their analysis on the applicability of artificial intelligence to 6G communication networks (Computer Communications, 2020), Sheth et al. cited Dr. Memon’s research on battery-free communications. The authors posit that, as per Dr. Memon’s findings regarding device to device communications via backscatter communication, the same is applicable to 6G technologies. The authors state that “Enhanced Energy Efficiency: It is the most important service provided by the 6G network. Energy consumption plays a vital role in sustainable development. 6G also have productive communication strategies for enhancing energy efficiency [45]. The vision is to accomplish without battery communication wherever conceivable, focusing on communication efficiency on the request of 1 pJ/b [46].”
* Guo et al., in their research into resource allocation for symbiotic radio systems (IEEE Access, 2019), cite Dr. Memon’s research into backscatter communication to harvest energy. The authors highlight Dr. Memon’s analysis on harvesting incident radio signals to provide power to the internet of things (IoT) devices. The authors note, “[i]n particular, the IoT device in symbiotic radio system, also referred to as the backscatter device (BD), transmits information over the incident primary signal via backscatter modulation without requiring active radio-frequency (RF) components [4]–[7].”

As demonstrated by these uses of his findings regarding his analysis of backscatter communication and emerging wireless networks, Dr. Memon has served as an active contributor to the field.

Dr. Memon’s study has been supported by funding from the National Research Foundation of Korea (Exhibit 21a). The National Research Foundation of Korea funds projects that promote the advancement of knowledge and improvement of quality of life through supporting creative research (Exhibit 21b). This support of Dr. Memon’s research therefore serves as evidence that it provides for greener sources of energy in communication devices.

Dr. Memon’s analysis of backscatter communication and emerging wireless networks has advanced the field and the work of his peers. Consequently, this work represents progress toward his larger goal of advancing the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems.

##### 3. Intelligent Solutions for Preventive Healthcare Systems

In this research, Dr. Memon investigated several unique, artificial intelligence-based solutions to be used for preventive healthcare, including a machine learning (ML) based architecture for a personalized glucose monitoring system (PGMS). Using both samples acquired through invasive and non-invasive methods, the ML model was trained and repeatedly refined using a unique adaptive boosting algorithm. Once trained, the model was personalized for individual patients’ characteristics. Dr. Memon then analyzed the performance of the system, finding that his PGMS significantly reduced the error rate as measured against previously measured data using non-invasive glucose values. Continuing his research into ML based solutions in preventive healthcare, Dr. Memon developed a wearable system for health monitoring using a unique event similarity search algorithm. Dr. Memon’s research has provided several intelligent solutions for use in preventive healthcare (Exhibits 1-4, 8-18). Dr. Memon’s research has been described in more detail by Dr. Pradeep Anand (Exhibit 2).

Dr. Memon’s research on has resulted in a total of five peer-reviewed papers. These include (Exhibits 8-18, 19a):

* “Adaptive Boosting Based Personalized Glucose Monitoring System (PGMS) for Non-Invasive Blood Glucose Prediction with Improved Accuracy,” Diagnostics, 2020 – 1 citation.
* “Personalized Non-Invasive Blood Glucose Monitor Using Machine Learning Models,” Test Engineering and Management, 2020.
* “A CNN based Automated Activity and Food Recognition using Wearable Sensor For Preventive Healthcare,” Electronics, 2019 – 6 citations.
* “Accelerated Reliability Growth Test for Magnetic Resonance Imaging System Using Time-of-Flight Three-Dimensional Pulse Sequence,” Diagnostics, 2019.
* “MRI Gradient Subsystem Accelerated Reliability Test Using Nominal Day Usages,” Test Engineering and Management, 2020.

This publication record serves as clear evidence of the relevance of Dr. Memon’s work on AI-based solutions in preventive healthcare in the field. Many other researchers have been significantly influenced in their own work by Dr. Memon’s prior findings, as exemplified below (Exhibit 20):

* Ali et al., in their research applying social media data to a framework for intelligent healthcare monitoring (Future Generation Computer Systems, 2021), cite Dr. Memon’s research on the algorithm he used to train his healthcare solutions. The authors note that “[c]onvolution neural network (CNN): CNN has been applied for various classification tasks using sensors and textual data [86–88].”
* In their research into ML-based algorithms for use in classifying personal data (International Journal of Environmental Research and Public Health, 2020), Park and Kim cite Dr. Memon’s work on ML applied activity recognition. Regarding Dr. Memon’s research, the authors note, “[l]ike most human activity-pattern research, this paper attempted to recognize the activity patterns of children in very limited scenarios, where the classification was done only for the data collected in advance. Unlike most related research associated with acquiring training data for activity-pattern recognition [5,35], we aim to relieve the inconvenience of manual handwriting work.”
* Bahador et al., in their investigation into ML techniques for use in wearable sensors (JMIR mHealth and uHealth, 2021), cite Dr. Memon’s research into classification techniques for use in wearables. The authors refer to his results derived from the use of trainable neural networks, noting that “[t]he obtained results showed an overall validation accuracy comparable to the approaches proposed earlier in the literature (Table 4) ([38] uses Piezoelectricity and Convolutional neural network with accuracy 91.9%).”

These citations reflect Dr. Memon’s status as a key driver of progress in the field of electrical engineering.

The National Research Foundation of Korea has supported Dr. Memon’s study (Exhibit 21a). This organization is dedicated to funding projects that promote the advancement of knowledge and improvement of quality of life through supporting creative research, so their endorsement of Dr. Memon’s work is a reflection of its clear importance in advancing technologies that improve preventive healthcare (Exhibit 21b).

Dr. Memon’s research on AI-based solutions in preventive healthcare stands out in the field due to its innovative application of ML techniques and neural networks to improve the performance of these systems. Furthermore, his success here serves as evidence that Dr. Memon has already made progress toward advancing his proposed endeavor.

##### 4. Image Recognition and AI for Real-Life Applications

In this research, Dr. Memon explored the use of convolutional neural networks (CNNs) for two image recognition applications: satellite detection of ships and automated recognition of human actions. In the first, he trained a CNN to recognize ships from satellite data that improved the accuracy of existing systems, particularly when operating on noisy data due to weather conditions or the presence of high waves. Dr. Memon validated this performance against open source datasets that provided exhaustive scenarios. The second topic to which Dr. Memon applied CNNs was recognition of human actions. After training the CNN, he measured its performance using the stanford40 dataset, obtaining an 87.3% accuracy (Exhibits 1-4, 8-18).

Dr. Memon has published three peer-reviewed papers based on his work on machine learning techniques to improve automated image recognition. These are noted below (Exhibits 8-18, 19a):

* “Ship Detection in Satellite Imagery by Multiple Classifier Network,” IJCSNS International Journal of Computer Science and Network Security, 2019 – 3 citations.
* “Feature Fusion Based Human Action Recognition in Still Images,” IJCSNS International Journal of Computer Science and Network Security, 2019 – 2 citations.
* “Finger-vein Image Dual Contrast Enhancement and Edge Detection,” IJCSNS International Journal of Computer Science and Network Security, 2019 – 1 citation.

Dr. Memon’s successful publication of his work makes it clear that his discoveries are relevant in the field. Others in the field have directly benefited from these discoveries (Exhibit 20):

Cañas et al., in their research into image recognition (Proceedings of the 16th International Conference on Computer Vision Theory and Applications, 2021), cite Dr. Memon’s research into the use of CNN-based approaches. The authors reference his approach, noting that “[s]ome of the strategies involve human pose estimation, human and/or object detection to find human object interactions and combinations with general scene understanding (Chan et al., 2019).”

Dr. Memon’s work on machine learning techniques to improve automated image recognition is unique in the field due to its application of neural network approaches to image recognition. His success here also demonstrates that he has the necessary experience in AI and ML technologies to advance the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems and serves as further evidence of his success in electrical engineering to date.

While these specific research contributions represent only a subset of Dr. Memon’s most successful endeavors, these projects are indicative of the overall quality of his research and illustrate his particular expertise and ability to continue contributing significantly to his field and to advancing the proposed endeavor.

Thus, as the above shows, the significance of Dr. Memon’s research in his field is corroborated by evidence of peer interest in his research. Dr. Memon’s education, experience, and expertise in his field, the significance of his contributions, and his past record of success position him well to continue to advance his proposed endeavor of the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems. Dr. Memon therefore satisfies this prong.

## Progress Toward Achieving the Proposed Endeavor & Plan for Future Activity in the Field

Dr. Memon has pursued research directly related to his proposed endeavor of the design of state-of-the-art green wireless networks and preventive healthcare systems, utilizing his extensive experience with artificial intelligence, backscatter communication, and machine learning, in order to create energy-efficient 5G wireless networks that support various healthcare systems such as glucose monitoring in diabetic patients for five years (Exhibits 5-7). This work has been circulated throughout the research community through the publication of peer-reviewed journals, including Dr. Memon’s paper, “Backscatter communications: Inception of the battery-free era—A comprehensive survey,” published in Electronics in 2019 and his paper, “Deep‐DRX: A framework for deep learning–based discontinuous reception in 5G wireless networks,” published in Transactions on Emerging Telecommunications Technologies in 2019 (Exhibits 8-18). Dr. Memon is currently extending his work into innovative artificial intelligence-based solutions in preventive healthcare through the application of multilayer perceptron (MLP) techniques to further improve and personalize his PGMS (Exhibit 18).

Dr. Memon plans to conduct research in the field of electrical engineering as a researcher at Virginia Tech or a similar employer. At Virginia Tech or a similar employer, he will continue to utilize his extensive experience with artificial intelligence, backscatter communication, and machine learning to create energy-efficient 5G wireless networks that support various healthcare systems, including designing energy efficient algorithms and protocols for 5G and next generation wireless networks which are compatible for real-time applications such as smart cities, and Internet of Medical Things (Exhibit 7). It should be noted that Dr. Memon’s research into the creation of energy-efficient 5G wireless networks that support various healthcare systems will continue to be circulated to others in the field through the publication of papers in peer-reviewed journals and conference proceedings (Exhibit 7).

Thus, Dr. Memon’s education and training, his documented record of scholarly publication, the recognized influence of his research in the field, and his clear future research plans demonstrate that he is well positioned to advance research focused on the design of state-of-the-art green wireless networks and preventive healthcare systems, utilizing his extensive experience with artificial intelligence, backscatter communication, and machine learning, in order to create energy-efficient 5G wireless networks that support various healthcare systems such as glucose monitoring in diabetic patients. Dr. Memon therefore satisfies this prong.

# On balance, it would be beneficial to the United States to waive the requirements of a job offer and thus of a labor certification

As discussed above, Dr. Memon holds an advanced degree in a field tied to the proposed endeavor, and the submitted evidence demonstrates that he possesses considerable experience, expertise, and a documented record of success in a highly specialized field. Additionally, while he is applying for a waiver of the job offer requirement and his proposed endeavor is not tied to any specific position, the documentation submitted herewith makes clear that Dr. Memon plans to hold a position that is narrowly tailored to his unique skillset related to the design of state-of-the-art green wireless networks and preventive healthcare systems, utilizing his extensive experience with artificial intelligence, backscatter communication, and machine learning, in order to create energy-efficient 5G wireless networks that support various healthcare systems such as glucose monitoring in diabetic patients (Exhibits 5-7).

The evidence also shows that Dr. Memon’s research on the design of state-of-the-art green wireless networks and preventive healthcare systems, utilizing his extensive experience with artificial intelligence, backscatter communication, and machine learning, in order to create energy-efficient 5G wireless networks that support various healthcare systems such as glucose monitoring in diabetic patients holds significant value for U.S. telecommunications and healthcare (Exhibits 25-27).

Considering his record of successful research in an area that significantly furthers U.S. interests, Dr. Memon offers contributions of such value that, on balance, they would benefit the United States even assuming other qualified U.S. workers are available. Dr. Memon’s proposed endeavor on the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems directly addresses critical issues related to the implementation and rollout of 5G networks, as well as improving healthcare in the U.S. through artificial intelligence-based approaches. This is clearly demonstrated by his successful investigations into artificial intelligence heuristics for improved 5G power efficiencies, backscatter communication to harvest energy for battery-free communications, and artificial intelligence-based solutions in preventive healthcare (Exhibits 8-18). Dr. Memon is also uniquely well positioned to pursue this work considering the breadth of his many years’ experience as well as his leadership and expertise in the field (Exhibits 1-28).

Considering the above factors and the evidence presented therein, Dr. Memon satisfies this prong.

# Conclusion

As the documentary evidence and corroborating testimony from experts in the field establish, Dr. Memon is a member of the professions holding an advanced degree. He proposes to continue his research on the design of green wireless networks and preventive healthcare systems to create energy-efficient 5G wireless networks that support various healthcare systems, which is clearly an endeavor with substantial merit and national importance. His education, experience, and expertise, record of publication and citation, and history of successful research in the field all indicate that Dr. Memon is well positioned to advance the proposed endeavor. These facts establish that it is beneficial to the United States to waive the requirements of a job offer and labor certification. Dr. Memon has therefore established eligibility for and otherwise merits a national interest waiver, and his petition should be approved.

INDEX OF EXHIBITS

Letters of Recommendation

1. Letter & CV from Dr. Dong Ryeol Shin, President of Sungkyunkwan University and Professor in the Department of Software, South Korea
2. Letter & CV from Dr. Pradeep Anand, Director of Customer Experience, Samsung Healthcare, South Korea
3. Letter & CV from Dr. Kazuki Maruta, Specially Appointed Associate Professor, Tokyo Institute of Technology, Japan (Independent Advisory Opinion)
4. Letter & CV from Dr. Sadiq Mohammed Sait, Professor and Director, Center of Communications and IT Research, King Fahd University of Petroleum and Minerals, Saudi Arabia) (Independent Advisory Opinion)

Academic and Professional Background

1. Dr. Memon’s CV
2. Copies of Dr. Memon’s PhD diploma, transcript, and degree evaluation
3. Signed statement confirming Dr. Memon’s proposed endeavor and describing his future plans for research and employment

Peer-reviewed Publications and Citations

1. Peer-reviewed journal article first-authored by Dr. Memon, “Backscatter communications: Inception of the battery-free era—A comprehensive survey,” Electronics, 2019
2. Peer-reviewed journal article first-authored by Dr. Memon, “Artificial intelligence-based discontinuous reception for energy saving in 5G networks,” Electronics, 2019
3. Peer-reviewed journal article first-authored by Dr. Memon, “Deep‐DRX: A framework for deep learning–based discontinuous reception in 5G wireless networks,” Transactions on Emerging Telecommunications Technologies, 2019
4. Peer-reviewed journal article first-authored by Dr. Memon, “Ambient backscatter communications to energize IoT devices,” IETE Technical Review, 2020
5. Peer-reviewed journal article co-authored by Dr. Memon, “A CNN based automated activity and food recognition using wearable sensor for preventive healthcare,” Electronics, 2019
6. Peer-reviewed journal article co-authored by Dr. Memon, “Ship Detection in Satellite Imagery by Multiple Classifier Network,” IJCSNS International Journal of Computer Science and Network Security, 2019
7. Peer-reviewed journal article co-authored by Dr. Memon, “Feature Fusion Based Human Action Recognition in Still Images,” IJCSNS International Journal of Computer Science and Network Security, 2019
8. Peer-reviewed journal article co-authored by Dr. Memon, “Adaptive Boosting Based Personalized Glucose Monitoring System (PGMS) for Non-Invasive Blood Glucose Prediction with Improved Accuracy,” Diagnostics, 2020
9. Peer-reviewed journal article co-authored by Dr. Memon, “Finger-vein Image Dual Contrast Enhancement and Edge Detection,” IJCSNS International Journal of Computer Science and Network Security, 2019
10. Peer-reviewed journal article co-authored by Dr. Memon, “Accelerated Reliability Growth Test for Magnetic Resonance Imaging System Using Time-of-Flight Three-Dimensional Pulse Sequence,” Diagnostics, 2019
11. Evidence of Dr. Memon’s other published articles (4)
12. a) Dr. Memon’s Google Scholar citation record  
    b) ESI citation averages and percentiles for Engineering
13. Notable citations of Dr. Memon’s work (Maruta and Falcone; Gonçalves et al.; Sheth et al.; Ari et al.; Maraqa et al.; Guo et al.; Ali et al.; Park and Kim; Bahador et al.; Cañas et al.)

Other

1. a) Evidence of Dr. Memon’s major funding sources (National Research Foundation of Korea)  
   b) “NRF of Korea” official webpage describing mission and goals
2. Paper from Dr. Kevin Boyack (Sandia National Laboratories) describing the utility of citation percentiles in evaluating the impact of research
3. Statista’s “Diabetes - Statistics & Facts” (2021) provides statistics diabetes worldwide
4. Centers for Disease Control and Prevention’s “Infection Prevention during Blood Glucose Monitoring and Insulin Administration” (2011) enumerates the dangers of infection while testing blood sugars of diabetics
5. Boston Consulting Group’s “Building the US 5G Economy” (2020) details the importance of 5G to the U.S. economy
6. The United States Department of Commerce’s “National Strategy to Secure 5G Implementation Plan” (2021) discusses the national strategy for implementing 5G
7. Fierce Wireless’ “5G base stations use a lot more energy than 4G base stations: MTN” (2020) lists the energy constraints limiting 5G
8. Matter of Dhanasar