

WELCOME ADDRESS

It gives me great pleasure to welcome you to the fourth edition of the KEEP Bulletin.

I am glad to announce to you that the Endowment Fund is now fully operational. This means a key milestone has been reached in ensuring the sustainability of KEEP. Those who wish to contribute can do so using the information below:

Account Name: **KNUST COLLEGE OF ENGINEERING
ENDOWMENT FUND**

Account Numbers: **904 000 824 8502 (Cedis Account)**
904 000 952 7588 (US Dollar Account)

Bank Name: **STANBIC**

Swift Code: **SBICGHAC**

Bank Address: **P. O. Box CT 2344 Cantonments, Accra**

Branch: **KNUST**

Also, the Gap Assessment exercise to identify and remedy gaps in postgraduate education and training at the College of Engineering (CoE) and bring it up to good international practices is expected to be completed before the end of the year. International Accreditation of postgraduate programmes at the CoE being undertaken by the Agency for Quality Assurance (AQAS) in Germany is also moving on well.

KEEP sincerely appreciates all alumni who have filled the alumni google form. If you have not, please follow the link (<https://forms.gle/xnP5NC-JXDC28s7kU8>) to complete the google form on basic biodata; this should not take more than 2 minutes of your time.

A Communications Officer has been engaged to ensure constant communication with our cherished alumni.

We welcome contributions and suggestions from stakeholders and readers to help improve future editions. Please send contributions and suggestions to keep@knust.edu.gh.

Cheers!



Prof. Kwabena Biritwum Nyarko
(Project Lead, KEEP)

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KNUST Engineering Students Build an Automatic Hand Washing Station



Source: University Relations Office (URO) [Share Tweet](#)

Students of the Innovation Centre of the College of Engineering (CoE) of the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, have manufactured a solar-powered Automated Handwashing Station. The Project, which began in 2020 with funding from Strengthening Engineering Ecosystem in Sub-Saharan Africa (SEESA), has been accomplished under the office of the Provost.

The project team comprised Miss Elizabeth Oduro-Koranteng (A third-year student reading Bsc. Electrical/Electronic Engineering), Mr. Max Otuteye (A second-year

student reading Bsc. Computer Engineering), and Mr. Obeng Okofo Dartey (A first-year student reading MPhil. Computer Engineering).

The team developed the Hand Washing Station, under the supervision of Dr. Selorm Klogo, a faculty member, as part of providing technical support and capacity building towards the implementation and strengthening of the World Health Organization's (WHO) safety standards on COVID 19.



*Prof. Mark Adom-Asamoah
(Provost, College of
Engineering)*

Prof. Mark Adom-Asamoah, the Provost of the CoE, iterated during the commissioning of the handwashing station that the core mission of the Innovation Centre is to come up with technologies

Production Team

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that can be applied to make life easier. He encouraged the group to continue working to further develop more projects to address societal issues.

According to Prof. Adom-Asamoah, the Innovation Centre has worked on several projects, including the development of drones. He intimated that the College's Innovation Centre has over 800 student members who are empowered to develop creative ideas. However, the global difficulties of dealing with COVID-19 and its related challenges have hampered many of its operations, with academic activity, for example, being halted for over eight months.

Briefing the gathering on the Project, a member of the project team, Miss Elizabeth Oduro-Koranteng, said the touch-free, solar-powered handwashing station was designed and built to facilitate handwashing as part of enforcing the COVID-19 protocols in KNUST. The system uses an ultrasonic sensor to reduce or

eliminate human contact during handwashing.

She explained that the traditional hand washing procedure allows for more secondary contact among persons, as taps are opened and closed to access the source of running water. The Hand Washing Station, she said, is thus designed to eliminate the challenges associated with traditional hand washing methods since touching surfaces has been identified as one of the modes through which the COVID 19 virus spreads.

The Hand Washing Station also combines two washing stations in one setup to allow for more individuals to wash their hands at a time. An installed battery saves up energy for use during nighttime. It has a reservoir that stores water. The reservoir also senses and dispenses water when users bring their hands close to the Handwashing unit. An outlet drain is connected to a pipe, allowing used water to flow out.

In coming up with the Project, artisans such as metallurgists and plumbers were consulted and collaborated to aid with the fabrication and testing of the handwashing station to ensure high efficacy. The team was happy with the opportunity for collaboration among students, Faculty, and industry, indicating how such partnerships could yield fruitful results, aside emphasising KNUST's efforts in leading the country's innovation drive.

The Project was funded by the International Development Research Centre (IDRC) in Canada through SEESA. Prof. Kwaku Adjei, a Faculty member and a representative of the Funding Partners, further stressed the need for funded projects to be transitioned into business ideas or ventures upon completion. He said that the Hand Washing Station is one of thirteen innovation projects funded by the IDRC, with other projects in the pipeline. He, therefore, encouraged students with business-oriented projects or ideas to apply for funding. ☞



The automated Hand Washing Station in use by some students and Faculty for the first time.

The Gambian Minister of Higher Education visits KNUST



Source: [University Relations Office \(URO\)](#) [Share](#) [Tweet](#)

The Minister for the Ministry of Higher Education, Research, Science and Technology (MoHERST), Gambia, Hon. Badara A. Joof, together with a delegation from the Gambia Technical Training Institute (GTTI), paid a courtesy call on the Vice-Chancellor of the Kwame Nkrumah University of Science and Technology (KNUST) on Tuesday, 1st June 2021, to discuss various areas of the collaboration with KNUST. The delegation included the Director General of GTTI, Edward C. Mansal.

Areas of collaboration discussed included offering short courses, training and mentorship for PhD students, enrolling mature students, offloading students, marketing GTTI programmes at KNUST,

and training of MSc students to serve as Research Assistants and Laboratory Technicians.



Hon. Badara A. Joof

The visit was used to finalise the contractual agreement between GTTI and KNUST and serve as an opportunity to tour the College of Engineering (CoE) and other parts of the University.

The Director-General of the GTTI, Edward C. Mansal, in his remarks, revealed that GTTI is undergoing a transformational process to become the University of Science, Engineering and Technology (USET) and hence seeks continuous mentoring by KNUST to grow.



Prof. Mrs. Rita Akosua Dickson (Vice-Chancellor, KNUST)

Receiving the delegation, the Vice-Chancellor, Prof (Mrs.) Rita Akosua Dickson noted that both institutions could successfully carry out their responsibilities by effectively implementing the terms of the partnership. According to her, every partnership has challenges. However, it takes parties' commitment, dedication, and willingness to sit together and proffer solutions to such challenges to achieve success.

Prof. Dickson assured the delegation of KNUST's commitment to the outlined areas of the collaboration. She added that the KNUST team would work with GTTI to provide the requisite technical support to train staff and provide the best mentorship programmes.

The delegation was expected to have further discussions with the College of Engineering (CoE) Provost and interact with some PhD students from the Gambia.



Prof. Mark Adom-Asamoah (Provost, College of Engineering)

Meanwhile, Prof Mark Adom-Asamoah, Provost of the CoE, KNUST, later on in a meeting with the delegation, indicated that per the agreement between KNUST

and GTTI, the former would assist in setting up administrative and teaching faculties for USET in addition to its mentorship support.

KNUST was selected from among other top universities, by the World Bank, to mentor GTTI to transition the Institute to a fully-fledged University of Science, Engineering and Technology (USET) in the Gambia. A total of forty-seven (47) undergraduate and ten (10) PhD students from the Gambia had already been enrolled in the Departments of Civil, Electrical and Electronic, and Mechanical Engineering in KNUST, with plans to accept more students.

In addition, the University Information Technology Services (UITS), the KNUST Main Library, the Quality Assurance and Planning Unit (QAPU), the University Relations Office (URO), and the Admissions and Academic offices would all assist and mentor GTTI to put in place systems and structures to enhance their capacity in academic, library services and visibility for prospective students.

Hon. Badara A. Joof was accompanied by the permanent secretary to the MoHERST, Mod A.K. Secka, the deputy secretary for programmes, Yusupha Touray, the Project Manager, Abdoulie Sowe, the Chief Financial Officer, Endora Taylor Thomas, and the Deputy Director of Academics, Alieu Secka.✂

KEEP HANGS OUT WITH DR. BEN K. D. ASANTE, CEO OF THE GHANA NATIONAL GAS COMPANY



Dr. Ben K.D. Asante, CEO, Ghana Gas Company

represented the country in that sport at both the junior and senior national teams. I also used to play soccer and table tennis throughout those formative periods. And currently, I'm a university teacher and a civil servant, the CEO of the Ghana National Gas Company. I love plantain and beans and fufu. And I'm also an ardent fan of the Chelsea Football Club. So that's me, in a nutshell. It's been fun. It's been worthwhile.

KEEP: Are there any values or belief systems that have influenced you in your profession and your career to help you climb higher and higher?

Dr. ASANTE: Thank you very much. I have worked in both the private and public sectors in North America and back home here in Ghana. But I believe the values and beliefs required for success are the same for private and public environments. Firstly, my specific values and beliefs are hard work; [there's] no doubt that one ought to work hard. My professor in Canada always used to say that hard work doesn't kill. But beyond that, I also try to see the ultimate conclusion of tasks I'm assigned to. So whatever tasks I'm assigned, I make sure I devote the time and necessary resources to complete them. I go all out in applying my basic training in solving problems. And lastly, I believe in teamwork. When you are a part of a team, you are better together than the sum of your parts. You can always learn something from someone. So

KEEP: Hello, Dr. Thank you for making time with us. Could you please tell us a bit about yourself?

Dr. ASANTE: Ok. Thank you for the opportunity. Let's see. Where do I start? I'm a professional chemical and petroleum engineer specialising in oil and gas infrastructure design and operation. I'm from Juansa in the Ashanti Akim district of the Ashanti region. But I grew up in Bantama and Asokwa areas in Kumasi. I attended Asokwa Presby, State Experimental School, and City of Kumasi Preparatory School at the primary level. Oh, those were good times! Then to Mfantshipim

School in Cape Coast for my secondary education. My Bachelor's in Chemical Engineering was from KNUST, very proud of that, and my Master's also in Chemical Engineering was from the University of Calgary.

I also completed a joint PhD program at Imperial College and the University of Calgary, also in Chemical Engineering, with a thesis on the Multi-phase flow of oil and gas in pipelines. So that's just my academic life. I was quite prominent in sports as well, both at the secondary and tertiary levels. I loved hockey, field hockey. I used to be the hockey team captain at the secondary and university levels, and I also

these have guided me through both my private and public career.

KEEP: Could you tell us a bit about the Ghana Gas Company and the four awards amassed last year?

Dr. ASANTE: Yes. So Ghana Gas is a relatively young company. We've been in operation for barely five years. The main task of Ghana Gas is to take raw gas that currently is coming from offshore fields and process them. And by processing, we do two things: we separate the oil and the gas; when the gas is coming from offshore, it's usually wet with heavy hydrocarbons, making up natural gas liquids like propane, butanes, pentanes and hexanes and other heavier hydrocarbons. So the role of Ghana Gas really is to strip these heavy hydrocarbons off the lean part of the raw gas and then take this bulk liquid and then fractionate them. That means we put them in the various commercial fractions for sale. So we have things like LPG condensates and pentanes. And Ghana Gas account for almost 50% of the LPG that is sold domestically in the country. The natural gas liquids account for about 10% of the inlet raw gas; and the remaining 90% is lean gas which is taken to producers of power, such as the Volta River Authority (VRA) and other independent producers, to produce the thermal power that we all see today.

So Ghana Gas plays a very critical role in both power generation [for the country] and the production of Liquefied Petroleum Gas (LPG) for domestic consumption. The awards we've received over the years are how others recognise the company's contributions to life. And no doubt, the men and women at the operations sites

and administrative offices have been doing a fantastic job. I would also emphasise that if you go to our plant site over in Atuabo, all the Engineers and Technicians there are Ghanaians. Before March 2017, the plant was being run by Chinese contractors, but we felt it was time to indigenise. So if you go there now, all the Engineers and Technicians, those in the control room, the processing areas, those who are managing the storage facilities, are all Ghanaians, and we are very, very proud of that. To put it in context, it took Nigeria 50 years to indigenise fully. But it took us only four years to do that. So we are very proud of that. Yeah. So it shouldn't come as a surprise that we've been winning some of the awards, and we accept them in all humility.

KEEP: Why did you choose to study Engineering?

Dr. ASANTE: Honestly, um, I had wanted to be a medical doctor because of family pressure. But I realised I liked and was very good at math, much more than I was in biology. And here I am! And trust me, I have absolutely no regrets. I know I made the right decision. Engineering allows you to think and apply your knowledge and training to address societal and industrial challenges. I believe engineering training doesn't necessarily give you textbook answers or solutions to problems. But it gives you the platform or tools to solve those problems. And that's exactly what we're doing [here at Ghana Gas]. Engineering training also helps in making everyday decisions. For instance, if I have to decide on some issue, first, I identify the options available, then I identify the knowledge base and tools that I have to use and apply to each of

the options available, then I identify the best choice if you will. It's a pretty quantitative approach, you know, to decision making, and I wouldn't advise using this method in choosing a husband or wife. But it has helped me greatly. So it's guided me in making better decisions by appreciating all the options available and applying the relevant criteria to select what option really fits my purpose or goal.

KEEP: What challenges have you encountered in your profession as an Engineer so far? Have you ever at some point, felt like giving up?

DR. ASANTE: No, not at all. I think engineering has really challenged me. Yeah, it's been an incredible, professional journey for me. And I continue to be grateful and thankful for that, having no regrets at all. And I think professionally, probably, in Canada, and probably in the US, and it was a bit challenging, sometimes to settle into a system and profession predominantly dominated by whites. But I tell you, it was a very good experience. It is still very good. I recall there are times that I've felt that I couldn't have done anything else except this, and I'm eternally grateful that I am an Engineer.

KEEP: Do you think that your international exposure in education speaks directly to your abilities and experiences both in Ghana and offshore?

Dr. ASANTE: Yes, yes, I think it has been a wonderful marriage between our local training and international training. The training I received at KNUST set me up very well for a better experience in Calgary and at the Imperial College. And so the building

blocks were well laid right here at KNUST. I wouldn't say that it was just a smooth sail, but I was amply prepared to obtain my masters and my doctorate degrees, and of course, set me up for a worthwhile professional career.

KEEP: On that point, in your opinion, are we doing enough to encourage postgraduate education in Ghana?

Dr. ASANTE: Okay, that's a good one. First of all, I believe those who are better positioned to encourage postgraduate education are few. There aren't that many. And these few are mostly people who have postgraduate education themselves. It's difficult when you have very few people. I estimate just about 25%, of Ghanaians, for instance, have postgraduate education. And most of these are also in academia. So they are, you know, professors and lecturers practising in academic institutions. Personally, I think sometimes academics in academia have a way of insulating themselves from the general population. So you have a lot of professors and teachers in academic institutions, who would be the perfect conduit to encourage people to do postgraduate education, but the various structures insulate them in academia from the rest of the population. So two things [are happening] here: the very people who could encourage postgraduate education are structurally insulated from the rest of the population. And there aren't enough advocates of postgraduate education in Engineering. But I think I see some signs of change. For instance, I recall that the government has been teaming up with academia to encourage Science, Technology, Engineering and Mathematics (STEM) education,

particularly among young women. And corporations are also providing scholarships for postgraduate education in the sciences and engineering. So I see that there's quite some hope, but I believe more can also be done. So we need some cooperation between academia and, of course, industry.

KEEP: What more can be done, in addition to scholarships and cooperations, to encourage postgraduate education in engineering in Ghana?

Dr. ASANTE: First, I think postgraduate education should be driven more by corporate entities collaborating with academic institutions by encouraging more students' internships. I know that is happening. Moreover, they need to sponsor specific research and advanced training in areas that can address societal challenges. We also need a mindset change. And, I want to just delve into that a little bit more, postgraduate education. You know, I think postgraduates, particularly those with doctorate degrees, should be looked at as people who are only better placed to provide services at a higher level in their areas of expertise, rather than some superior beings. I see most people in Ghana, and I will say Nigeria scrambling to get their academic doctorates or even some ceremonial doctorates. Basically, because society sometimes sees them as some superior beings, children of some higher God, who kind of belong to some exclusive club reserved for only a few. If we disabuse our minds of that and see it as a call for higher professional service, I think it would encourage more people to think differently. And I'm also painfully aware of that gap that exists between postgraduate education

in engineering and what really is required in the real world.

KEEP: How can we strengthen industry-academia linkage?

Dr. ASANTE: Yeah, I think I would; I would say a few things about the previous question you asked, which had to do with those gaps. And then, I'll go ahead and talk about the academia-industry linkage.

Um, first of all, you know, people say that sometimes some students do not really perform well as expected when they are employed in the real world. And I would answer it both ways; yes, it's true, they don't, and no, it's not true.

Yes, because there's still that significant gap I mentioned between the corporate entities' requirements and the outputs from academic institutions. There's a perceived significant misalignment, if you will, of respective institutional objectives. But I also believe that assertion is overstated – that they don't do well. Because we can't really expect an instant contribution to the corporate bottom line from someone who arrives at the corporate gate, with nothing more than their laminated degrees or diplomas, they need to be trained, and they require our collective patience.

Now, I think, to strengthen that linkage, industry and academia need to harmonise their goals, their individual goals, as much as possible for the good of the rest of us. And I say as much as possible because corporate institutions or corporations and schools have fundamentally different objectives. As you know, schools tend to build intellectual capacity, while corporations are measured, generally by their

financial balance sheets, their profits, if you will. So we need to bring these two objectives closer: schools need to recognise the importance of societal relevance to their academic curricula. And similarly, corporations need to appreciate the importance of intellectual discourse to the sustenance of their corporations or entities. So they need each other. And this can be achieved through continuous engagement, starting with extended internships. And I'm very particular about these extended internships of students to industry.

And we can also encourage academic upgrades of industry workers through appropriate institutions or schools and platforms such as work-study programs. So we can do these things hand in hand.

Now, also the periods of internship. As I work at Ghana Gas, I see quite a lot of people come for internships. But they only come for about two months or three months; that is woefully inadequate. I'd suggest at least a year; at least a year will be more meaningful. And it should be part of that academic curriculum, I humbly suggest. Bringing someone to come and just do an internship for two months does not do them any good at all. By the time they are oriented in the organisation, their time is up. You know, so if you have a four-year degree program, it should be made five years, and a whole year should be dedicated to internship. And they can come back and complete their final year [after the internship]. That is my humble suggestion.

KEEP: Dr, about your suggestion to extend the student internship to a year, how do we practicalise this considering the

high number of students enrolled and the limited number of engineering companies that could enrol them?

Dr. ASANTE: I think we have enough, and it's going to be a symbiotic relationship. We're able to absorb more students, say at the third year. So I'm talking about a five-year programme, and the fourth year will be for the internship. Now, this will be no different in some sense from the National Service Scheme, just that the intern will be paid by the institution they'd be working with. I'll take Ghana Gas, for example. This year, we admitted about 103 national service persons, which is about 25% of our total population here, about 500. So if we can foster some relationships with other engineering corporations and institutions, we'll be able to do this. We just haven't tried it. Sometimes it seems insurmountable. We're looking at how we will absorb all these students into national service in the same vein. If there's a will, I believe it can be done.

KEEP: Thank you very much for your suggestions on the duration of student internships; it's a good one. Now, Dr, please tell us, what does the future hold for the energy sector in Ghana?

Dr. ASANTE: Thank you very much. I think the world's energy sector is changing rapidly and has seen significant evolution over the last century. There's a significant change, as you may have noticed, from the dependence on fossil fuels, and I'm talking about coal, oil and gas as the primary sources of energy, to renewables such as solar, wind, geo-thermal, biothermal, and you can even say nuclear, in addition to the hydrological sources. Thus the world

is gradually moving towards a decarbonised energy portfolio, and in 50 years, the transition is expected to be complete.

Specifically, in Ghana, I think we would be following suit; we'll be following where the rest of the world is going. And I believe our energy mix, our energy portfolio, will see a significant contribution from renewables from less than 5% currently to over 20% renewables mix in the next 10 years. So we're all shifting from fossil fuels to renewables, although I envisage that natural gas will be a transition fuel for a long time because of its lower carbon footprint. That is the big headline for the energy industry.

KEEP: Dr, you mentioned nuclear energy as one alternative source for the country. But do you think Ghana is or will be ready for nuclear energy?

Dr. ASANTE: Yes. If you go to the Ghana Atomic Energy Commission, they seem well prepared. But when you mention nuclear, people always think of nuclear accidents and how to handle them. If we can talk about what happened in Russia and Japan, I think we would be reminded of situations that seemed unpleasant. But nuclear energy, you know, as the technology really develops, can be a very reliable source of energy. And I'm hopeful that Ghana would get to the point where we'll be able to rely on available technology and be able to arrest any planned or unplanned accidents with the necessary security and safety measures.

KEEP: So Dr, how can we then position ourselves as a country and as engineers to take advantage of the opportunities in the energy sector?

Dr. ASANTE: The energy sector, when you look at the value chain and opportunities for engineers, right from the design stage, through the construction of infrastructure, to operations and maintenance of them, there are tremendous opportunities for all of us. But I want to talk specifically about three things. The first really is that we need to build the necessary infrastructure to facilitate that transition from hydrocarbon-based energy sources to renewable sources. And then, we also need to create an economic environment to attract investment for that transition. And then lastly, and I think I, I am very excited about this one, we need to build the intellectual capacity to sustain the new industry. The only way to sustain any new industry, such as a renewable industry, as we tried to do with the fossil fuel industry, is to build the local intellectual capacity. And it'd be a partnership between academia and industry.

So these are the things that I think we can do to position ourselves to take advantage of the opportunities that these changes would present.

KEEP: Great. Coming back to industry-academia linkage, how do we engage the alumni to strengthen the collaborative efforts?

Dr. ASANTE: In most academic institutions, alumni associations have been instrumental in providing the necessary financial impetus for the institutions in most academic institutions. And they also sometimes come back to share experiences with the students who are coming through. And, if you look at the KNUST alumni who have come back to teach, they form a critical group in trying to bequeath their experiences and knowledge to the student population. They would also be a critical group, particularly in the energy sector, where most graduates are from KNUST. So they will be a good bridge between academia and the industry. And if you take a couple of us, and of course, some of my friends, we are trying our very best not only to provide financial assistance to the university's programmes but also to be a worthwhile bridge to link industry to academic institutions.

KEEP: Is there any other thing you'd like to say before we wrap up our conversations?

Dr. ASANTE: Oh, yeah. I think it's been a great opportunity really, to visit with you. I have been trying to see how I can contribute, both in my area of expertise in the energy sector and a bit in academia. So I'm very excited about any

opportunity that is offered to me to do just that.

KEEP: Do you have any advice for up and coming Engineers?

Dr. ASANTE: Yeah. A couple of pieces of advice. The first one is that for the students, you have to be committed to your course of study. And commitment really means devoting time and effort to whatever it is you are doing. And you have to remember; there are no shortcuts to sustainable success. And the keyword there is *sustainable*.

And for those who are about to graduate and make career decisions, remember these three things: interests - first, you have to ensure that you are interested in your chosen field. And then secondly, you have the ability in your chosen area. And the third consideration is the relevance of that choice in the community you find yourself in. You know you can't, for instance, study engineering and then go into a musical community or vice versa. As you step out after graduation, and this is for those who are just about to graduate, a couple of things. You have to be adventurous and dare to make mistakes; your own mistakes and learn from them. Secondly, you have to respect other people's views; opinions vary. You may learn something from someone else's viewpoint. And lastly, but not the least, do not prejudge people or events. Find out things yourself. Thank you very much.

KEEP: Thank you very much Dr Asante for your time, and the valuable advice given us.

Dr. ASANTE: Thank you too for having me. Stay safe. ☹



COVID-19 AWARENESS

Delta Strain of COVID-19

The Delta variant, also known as B.1.617.2 and first identified in India, is more contagious and resistant to vaccines than the dominant Alpha (U.K.) strain circulating in the U.S. and also carries a greater risk of hospitalization

Signs and symptoms: Fever or chills, cough, difficulty in breathing, cold, headache, diarrhoea, loss of taste/smell, and several non-specific symptoms.

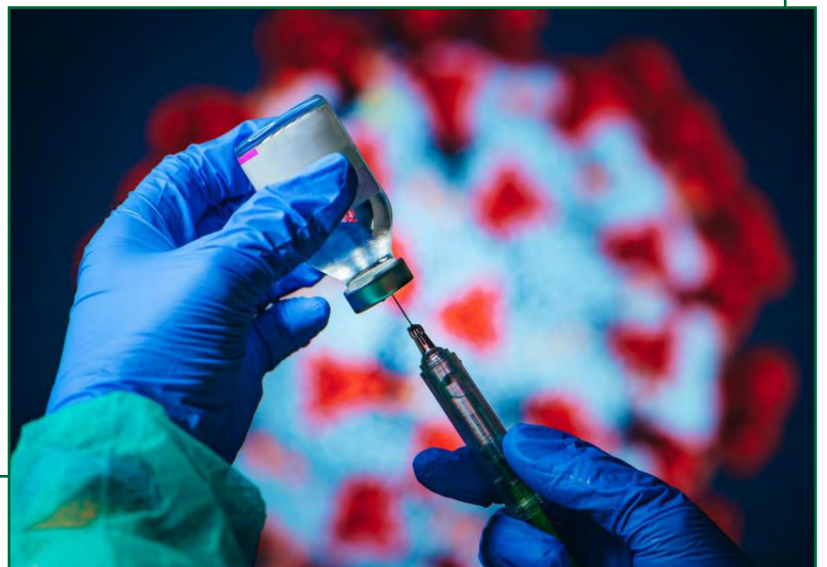
Transmission: Respiratory droplets, airborne, contaminated surfaces.

Prevention: Adhere to the Delta Strain of COVID-19 safety protocols.

Respiratory hygiene: Wear a nose mask, cough etiquettes Hand hygiene-. Frequent hand washing, hand sanitizing Maintain 'safe' physical distancing Avoid crowds and confined/poorly ventilated spaces

Confirmed Cases: In Ghana, from 3 January 2020 to 4:06pm CEST, 18 August 2021, there have been 11 2,378 confirmed cases of COVID-19 with 945 deaths reported.

The virus is changing itself with even more serious ramifications, so it is important we all adhere to the safety protocols



KEEP FUNDS SIX PROJECTS UNDER THE COLLEGE OF ENGINEERING INNOVATION FUNDING PROGRAMME

A key objective of KEEP is to encourage entrepreneurship and innovation among students. In line with this direction, KEEP called on students to team up and submit proposals on innovative project ideas in digitalisation and energy sectors. Seventeen proposals were received, and after a very rigorous shortlisting process, which included a review of the proposals by experts in the industry and oral defence session of the proposals, six proposals emerged successful.

The successful projects were:

- Characterisation of Palm Oil Effluent (POME) as Feedstock for Biofuel Production
- Production of Magnesia Cupels from Pumpkin Seeds and Waste Magnesium Oxide (MgO) Cupels

- Internet of Things (IOT) Control and Monitoring System for Egg Incubators
- Molten salt synthesis of nitrogen-doped hierarchical porous carbon from plantain peels for high-performance supercapacitor
- Smart Power monitoring and energy conservation system using Wireless Sensor Networks
- Human Proximity Sense Interface (Autoswitch)

KEEP applauds all teams who participated in this exercise. We also express our profound gratitude to Prof. Nana Kwaku Adjei (Quality Assurance and Innovations Coordinator) for the hard work he put into the exercise. KEEP also acknowledges and appreciates

the commitment and hard work of the review team in the capacities of Mr. Sam Yaw Akomea, Head of KNUST's Centre for Business Development (CBD), Prof. Ahmed Abdul-Rahman (Dean, Faculty of Electrical and Electronic Engineering), Mr. Edmund Fianko (Deputy Director, National Communications Authority), Mr. Jabesh Amissah-Arthur (Arthur Energy Advisors), Mrs Ida Padikuor Na-Tei (Automation Ghana Group), Mrs. Juliana Ametorwogo (Vodafone Ghana) and Mr. Stephen Kanor-Kudaya for their review of the proposals.

The successful teams have been allotted an incubation period of eight months to make their proposals functional and operational in industry and commerce. ✂



Mr Akwasi Adu-Poku, the Team Lead for the Characterisation of Palm Oil (POME) as Feedstock for Biofuel Production, defending his proposal in front of a panel of experts. Seated are his team members



RESEARCH CORNER

A key output of KEEP is for students to come out with quality research which will be very beneficial to stakeholders such as Industry and Government. Some sample works of one of our postgraduate students are listed below:

RESEARCH PROFILE

Justice Owusu Agyemang

(PhD Telecommunication Engineering candidate)



Preamble:

Internet of Things (IoT) is one of the promising technologies that has attracted much attention in both industrial and academic fields these past years. It aims to seamlessly integrate both physical and digital worlds into one ecosystem that makes up a new intelligent era of the Internet. This technology offers a huge business value for organisations and provides opportunities for many existing applications in energy, healthcare and other sectors. However, as a new emerging technology, IoT suffers from several security issues which are most challenging than those from other fields regarding its complex environment and resource constraints.

The core focus of my research work is to address the security issues in IoT by providing lightweight security solutions.

SAMPLE RESEARCH WORKS



Research Title: Lightweight and host-based denial of service (DoS) detection and defence mechanism for resource-constrained IoT devices


Authors: Jerry John Kponyo, Justice Owusu Agyemang, Griffith Selorm Klogo, Joshua Ofori Boateng

Abstract: The Internet of Things (IoT) is an intelligent network that connects smart objects to the Internet. Many IoT devices connect to the Internet, yet many of these devices are insecure, exposing them to

several security threats. Most IoT devices are resource-constrained hence making them difficult to secure using conventional security techniques. Some researchers have proposed intrusion detection mechanisms implemented at IoT gateways. IoT devices become vulnerable when the security mechanisms put in place at the gateway fails. This has opened new research into how conventional security measures can be applied to IoT devices by developing lightweight and host-based security measures. This paper presents a lightweight and host-based detection and defence mechanism to

address DoS attacks on IoT devices. We propose an anomaly DoS detection technique based on heuristics to tackle SYN, ICMP and UDP flood attacks through the application of machine learning. We evaluate the performance of the proposed technique based on CPU and memory utilisation efficiency, power consumption, time taken to detect and defend against a DoS attack. The proposed technique achieves promising results with respect to the key performance indicators used: an efficient CPU utilisation, an average of 23 megabytes of memory usage, a power consumption rate of 35.8mW and an average detection and mitigation time of 0.10 and 0.22 seconds, respectively.

<https://doi.org/10.1016/j.iot.2020.100319>


 **Research Title:** Lightweight rogue access point detection algorithm for WiFi-enabled Internet of Things (IoT) devices

Authors: Justice Owusu Agyemang, Jerry John Kponyo, Griffith Selorm Klogo, Joshua Ofori Boateng

Abstract: The Internet of Things (IoT) is a new paradigm that enables the convergence of smart objects and the Internet. This convergence has led to creating an intelligent network that

connects all things to the Internet to exchange information. The direct connection of IoT devices to the Internet makes them susceptible to several security threats. Several techniques have been proposed by researchers in enhancing the security of IoT devices. Currently, most IoT products use WiFi as their medium of communication. This makes them prone to conventional WiFi attacks, of which one is rogue access points. The lightweight nature of most IoT devices makes it difficult to implement conventional security solutions. This study presents a real-time and lightweight algorithm based on an information-theoretic approach that enables rogue access point detection for embedded IoT devices. This is to ensure that wifi-enabled IoT devices can intelligently distinguish between legitimate and rogue access points. We evaluate the performance of the proposed algorithm on the CPU utilisation efficiency and the time taken in identifying the rogue access point.

<http://dx.doi.org/10.1016/j.iot.2020.100200>

 **Research Title:** Detecting End-Point (EP) Man-In-The-Middle (MITM) Attack based on ARP Analysis: A Machine Learning Approach

Authors: Jerry John Kponyo, Justice Owusu Agyemang, Griffith Selorm Klogo

Abstract: End-Point (EP) Man-In-The-Middle (MITM) attack is a well-known threat in computer security. This attack targets the flow of information between endpoints. An attacker can eavesdrop on the communication between two targets and perform active or passive monitoring; this affects the confidentiality and integrity of the data flow. Researchers have developed several techniques to address this kind of attack. With the current emergence of machine learning (ML) models, we explore the possibility of applying ML in EP MITM detection. Our detection technique is based on Address Resolution Protocol (ARP) analysis. The technique combines signal processing and machine learning in detecting EP MITM attacks. We evaluated the accuracy of the proposed technique using linear-based ML classification models. The technique proved itself to be efficient by achieving a detection accuracy of 99.72%.

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