



# NEWSLETTER

Issue N° 013 | Dec-February 2023

## African Centres of Excellence



### Headlines



#### ACEDS, Cenfri partner to build data-talent pipeline

Building the right data talent starts when a person is still in school preparing to dive deeper into the data science profession. This is well grasped by both the African Centre of Excellence in Data Science (ACEDS) and Cenfri, which is implementing the Rwanda Economy Development Programme funded by the Mastercard Foundation. **Page 5**

#### ACEIoT launches incubator project to promote AI

The African Center of Excellence in Internet of Things (ACEIoT) launched 'IoT and AI Applied Research Results Commercialization through Incubation Hub' project on January 24, following a \$326,000 grant secured to implement it. **Page 2**

#### Meet Julien Dushimimana, an innovator making impact in energy sector

Jean Marie Julien Dushimimana, is one of 5 innovative ideas' owners whose innovative ideas were incubated at ACE-ESD's Grid Innovation and Incubation Hub (GIH) and got coaching, mentorship and support to have their ideas finetuned to become business ventures. **Page 3**

#### Elders from Rwanda Advisory Forum urge UR to materialize research findings

Members of the Rwanda Elders Advisory Forum have commended the research and innovations being carried out by University of Rwanda staff, demanding that more effort be put in to materialize their findings for actual community benefit. **Page 9**

#### 6 PhD candidates, 22 Masters students successfully defend their theses

6 PhD and 22 master students from African Centre of Excellence for Innovative Teaching and Learning Mathematics and Science (ACEITLMS) have successfully defended their theses making a round of graduands to graduate this year. **Page 7&8**

## ACEIoT launches incubator project to promote AI

The African Center of Excellence in Internet of Things (ACEIoT) launched 'IoT and AI Applied Research Results Commercialization through Incubation Hub' project on January 24, following a \$326,000 grant secured to implement it.

The project aims at establishing an Internet of Things (IoT) and Artificial Intelligence (AI) based applied research incubator which is expected to facilitate the transfer of applied research prototypes and knowledge from IoT lab to market and commercialization through academia-industry collaboration.

IoT refers to physical devices around the world that are connected to the internet, all collecting and sharing data. AI refers to the simulation of human intelligence in machines that are programmed to think and act like humans.

According to Assoc. Prof. Damien Hanyurwimfura, Acting Director of ACEIoT and Project Investigator the Center as well as UR in general have realized that different research that was done by their students was remaining in the school instead of being implemented in the community to solve different challenges, hence the need for the project to connect the students with industry.

He said that through the project, they aim to train 40 students; 20 for the first cohort and the rest for the second.

"Among them," he added, "33 per cent will be females, 30 per cent will be youth and 13 per cent will be persons with disabilities. The students will be on the level of undergraduate and masters."

Hanyurwimfura also noted that the \$326,000 grant secured for the project will be used to buy equipment for the incubation hub and help the trainees to develop their AI and IoT based solutions and avail them on the market.



*Participants to the launch posed for a group photo*

He declared that the project, which is funded by Research and Innovation Systems for Africa (RISA), a program of the UK Foreign, Commonwealth, and Development Office that aims to strengthen the research and innovation ecosystem in Africa, will see 24 prototypes developed and eight solutions commercialized, ready to respond to problems society has, especially in agriculture.

**"the project, which is funded by Research and Innovation Systems for Africa (RISA), a program of the UK Foreign, Commonwealth, and Development Office that aims to strengthen the research and innovation ecosystem in Africa, will see 24 prototypes developed and eight solutions commercialized, ready to respond to problems society has, especially in agriculture."**

Hanyurwimfura also disclosed that the project will run for a year, adding that they plan to submit other two projects to sustain it in the long term before it ends.

Gender equality and social inclusion (GESI) is one of the important key performance indicators (KPI) to be considered in the project.

GESI beneficiaries who will be enrolled in the project represent 76 per cent – the reason why the launch of the project was comingled with a GESI awareness workshop.

According to Christine Musanase, a lecturer at the University of Rwanda who is in charge of GESI for the project, the reason why they included GESI part is that they found out that some people were excluded in the STEM sector.

Those, she explained, include women, persons with disabilities as well as youth.

Tackling women involvement in the project, 33 per cent, Musanase said they are working with a stakeholder who will coach women beneficiaries, helping them to embrace their capabilities, boost their confidence and increase their participation.

"Through the awareness workshop, we raised awareness about GESI and spread information", asserted Musanase. The project will be implemented through collaboration with NARADA Electronics, FabLab and KEEP from KNUST, ICT Chamber and other stakeholders who have interest in the project.

## Meet Julien Dushimimana, an innovator making impact in energy sector



*The innovator installing the device*

I kept on contacting different experts in energy sector, and they told me that all renewables have intermittent, and are not predictable sources. Renewable sources cannot be reliable without power electronic technology integration”, he explained.

Thereafter, through research he came up with a device which is alternative to a national grid and has a very little switching time, so even the television cannot switch off during switching from one source to another, “Right Lamp Automatic Changeover Switch (RLACS)”

**“ Dushimimana’s idea was to come up with a switch which automates the process of switching between the solar power to national power grid. “**

Under a company he called, RLSG Limited (Right Lamp Shine Group Ltd), he is now producing these devices and are sold to different users mainly high schools. A Kw-capacity device costs USD 35.

“So far, users who have acquired these devices are saving more than 80% of energy from the national Utility”, Dushimimana confirmed, adding that after the extension of users, the country would be having enough energy to run different strong loads like industries and people will shift from traditional cooking processes to electrical cooking processes, which will be the environmental destruction solution.

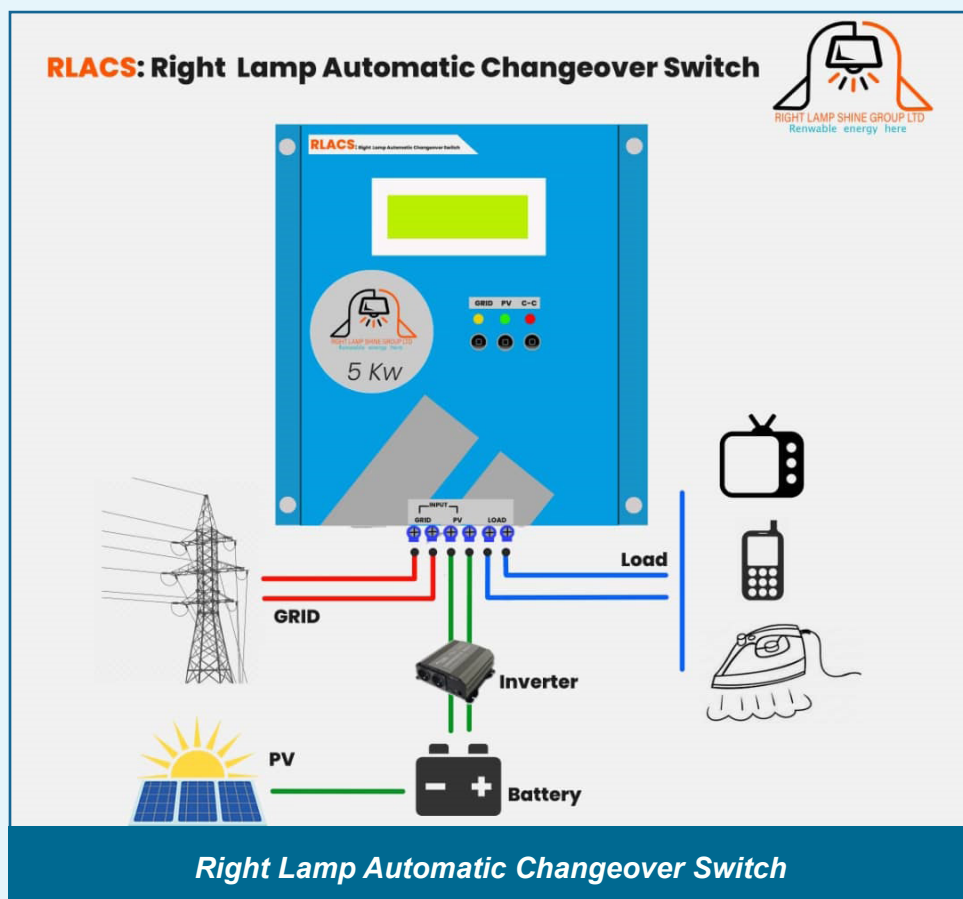
The demand is so high but the production capacity is a challenge. “To produce more devices, I need different machines but I have no capital to purchase these machines”, he noted. The innovation has got a patent certificate from Rwanda development Board.

**J**ean Marie Julien Dushimimana, is one of 5 innovative ideas’ owners whose innovative ideas were incubated at ACE-ESD’s Grid Innovation and Incubation Hub (GIH) and got coaching, mentorship and support to have their ideas finetuned to become business ventures.

Dushimimana’s idea was to come up with a switch which automates the process of switching between the solar power to national power grid. This is intended to promote the use of solar power as an alternative in urban settings by reducing the cost of installing alternative power (solar) in the urban homes.

The idea came during his academic research in which he learnt that the energy generated is less than the energy demand for many African countries, but the sun’s rays are enough for solar technology.

“From there, I asked myself why we suffer from electrical power shortage. Can’t the sun be an alternative solution?



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## ACEIoT showcases its innovative projects during the PASET meeting



ACEIoT students during the exhibition

The African Centre of Excellence in Internet of Things has showcased its innovative project during PASET's Governing Council Meeting held in Kigali on 2<sup>nd</sup> Feb 2023.

Partnership for skills in Applied Sciences, Engineering and Technology (PASET) which is established by the governments of Rwanda, Ethiopia, and Senegal in 2013 aims to support African countries to build a skilled labour force by focusing on the continuum of skills from foundational skills to upper, secondary, technical, vocational training as well as higher education, scientific research and innovation.

The Centre exhibited their innovative projects funded by PASET which are meant to advance technology to address different societal challenges.

There are 'Smart bees Hiving Technology', 'Real time Assessment of the indoor air pollution in Sub-Saharan households (Case study: Rwanda rural and urban areas', 'Infectious Diseases Outbreak Prediction using Geolocation Data with Machine Learning', 'Agriculture Data from Acoustic Monitoring', 'Electromagnetic Compatibility Monitoring and Prediction Models for Biomedical Devices', 'Tools for Evaluating African Lakes',

**“ Africa can't achieve its desired development without skilled workforce in science and technology. It's one of the reasons why PASET was established and now it has 11 member states “**

In her remarks, Minister of Education Dr Uwamariya Valentine noted that Africa can't achieve its desired development without skilled workforce in science and technology.

African countries still have a few graduates on the level of doctorate, she said, adding that it's one of the reasons why PASET was established and now it has 11 member states namely Ethiopia, Rwanda and Senegal as founding members while other 8 members Benin, Cote d'Ivoire, Burkina Faso, Ghana, Kenya, Nigeria, Mozambique, and Tanzania joined later.

ACEIoT has 19 students pursuing PhD studies under PASET scholarship.

## ACEDS, Cenfri partner to build data-talent pipeline



*Participants during the public lecture*

**B**uilding the right data talent starts when a person is still in school preparing to dive deeper into the data science profession. This is well grasped by both the African Centre of Excellence in Data Science (ACEDS) and Cenfri, which is implementing the Rwanda Economy Development Programme funded by the Mastercard Foundation.

On January 25<sup>th</sup> 2023, they both organised a public lecture which focused on “Building the right data talent pipeline”. This was attended by different data science practitioners as well as data science students.

Ekow Duker, a tech start-up co-founder highlighted that there is a high demand for data science professionals, suggesting demand increased threefold in 2021.

Duker urged the students in the audience to develop a commercial mindset and learn the underlying business to better understand the issues for which a data solution is required.

“The next step is to partner with the business and not to be an ‘order taker’,” he continued. “Be technically proficient

by knowing the underlying math, building a project repository, testing yourself in competitions, and by being part of the wider data community.”

**“I am using the knowledge i have acquired from school (including data mining, data manipulation, Python, as well as machine learning) in my work, although i am aware that the data science domain requires one to keep learning.”**

Hanjo Odendaal, another experienced data scientist warned, “It is not all about big data, administrative social science data can also be particularly valuable.” He encouraged the audience not to fixate on machine learning and advised people to learn SQL so they can work with large databases.

Olivia Rutayisire, an alumna of ACEDS declared that she is using the knowledge

she has acquired from school (including data mining, data manipulation, Python, as well as machine learning) in her work, although she is aware that the data science domain requires one to keep learning.

She urged organisations to share data on trust, declaring that the number one goal of data scientists is to help them make data-driven decisions instead of basing decisions on gut feelings.

Rutayisire called those who are passionate about data science to pursue it because it is a golden field considering today’s world, adding that they must be willing to help institutions to get the right data and then analyze it by finding insights that are going to impact those institutions.

Dr Ignace Kabano, Head of Training at ACEDS, found the session very useful and insightful, given that it bridges the need of the industry through the education and training that are offered at the university.

He asserted that at the ACEDS, they train students to become data scientists who can not only develop models but also develop solutions to the challenges that industries are facing.



*Participants posed for group photo*

“Data scientists can’t only be studying theories; we want them to come up with solutions, especially when you consider the data revolution and data engineering perspective. We want them to be working on a specific project in the industry and come up with a solution to the challenges observed,” he said.

## Newly admitted Master & PhD students get introduced to the Centre



*New students during introduction*

**O**n 18<sup>th</sup> January 2023, the Centre officially welcomed Master and PhD students who are admitted to the Centre to pursue different internet of things programs in the academic year 2022/2023.

In his presentation, the Centre Ag. Director Prof. Damien Hanyurwimfura took them through the historical background of the Centre and some key achievements the Centre has registered from its establishment in 2016 to date.

Students were briefed on different services that they are likely to get from

the Centre and the entire College and the rules and regulations they are requested to abide by during their stay in the College of Science and Technology.

**“Hardwork & teamwork are key for everyone to successfully complete any program you are pursuing”**

Students who have already completed their courses have tipped new comers some behaviors that would help them successfully complete their programs.

“Hardwork & teamwork are key for everyone to successfully complete any program you are pursuing”, testified Marie Ritha Umutoni who has already successfully defended her thesis.

This academic year, 50 Masters and 18 PhD students were admitted to the Centre. Also present in the event were the Director of the Library, the Dean of Students and Registrar from the College of Science and Technology (UR-CST).

## 6 PhD candidates, 22 Masters students successfully defend their theses

**6** PhD and 22 master students from African Centre of Excellence for Innovative Teaching and Learning Mathematics and Science (ACEITLMS) have successfully defended their theses making a round of graduands to graduate this year.

They are from the four specialisations namely Biology education, Mathematics education, Physics education and Chemistry education.

Here are details about PhD theses:

**PhD Candidate: Mrs. Josiane Mukagihana**

**Title: Effect of Resource-Based instructions on Pre-service biology teacher's attitudes, motivation, and academic achievement in the higher-learning institution in Rwanda**



**PhD Candidate: Mrs. Jeannette Musengimana**

**Title: Effect of task-based learning on students' achievement and attitude in chemistry at lower secondary schools, Rwanda.**



**PhD Candidate: Mr. Emmanuel Bizimana**

**Title: Effects of concept mapping and cooperative mastery learning on students' achievement, attitudes, and concept retention in biology among secondary schools of Nyamagabe District, Rwanda.**



**PhD Candidate: Mr. Edwin Byusa**

**Title:** Effect of activity-based techniques on teaching and learning chemistry in Gasabo secondary schools, Rwanda.

**PhD Candidate: Mr. Sibomana Aimable (Rwandan)**

**Title of thesis:** Effects of Cooperative Learning on Students' Achievement, Knowledge Retention and Attitude towards Chemistry among Upper Secondary Schools, Rwanda.



**PhD Candidate: Mr. David Opanga (Tanzanian)**

**Title of thesis:** Effect of English as a language of instruction on teaching and learning of invertebrates in Tanzania: Case of secondary schools in Dodoma Region



## Elders from Rwanda Advisory Forum urge UR to materialize research findings



*Elders and some UR senior managers posed for a group photo*

**M**embers of the Rwanda Elders Advisory Forum have commended the research and innovations being carried out by University of Rwanda staff, demanding that more effort be put in to materialize their findings for actual community benefit.

The call was made on Thursday 12<sup>th</sup> December 2022, while the REAF members visited the UR African Centre of Excellence in Data Science. They were on a mission to acquaint themselves with the University's contribution towards national development, particularly in the area of data science, eagerly wanting to figure out its role.

This is one in a series of fact-finding visits to different public institutions REAF is conducting to fully understand their specific individual roles in helping Rwanda position itself strategically on the fourth industrial revolution map

After getting briefed on different innovative academic and research activities being undertaken by UR researchers and students, REAF members appreciated what they saw and heard. They advised the University to scale up the effort in making results known to the wider public.

**“ I can see you are doing great things but strangely the public is not well aware of what exactly you are doing. There is need for more publicity for visibility purposes. ”**

On UR structure, the elders commended the institution's new look, saying it is now more aligned with standards of other international academic organizations.

They however observed that there are some almost similar programs scattered across different colleges which could be merged and taught from one place to further consolidate efficiency and convenience.

Further on a positive note, the REAF members were impressed by innovations in data science that have direct impact on society which should not be taken for granted

“As you develop these great innovations, please make sure they are registered for protection purposes to ensure they will forever remain our own properties”, emphasized RAEF member Abdulkarim Hareriminana. His fear was that one day these invaluable innovations might be stolen by some scrupulous people, yet they are UR property. Members of the forum concluded their visit by touring the Centre facilities.

## THE RESEARCH PAPERS PUBLISHED IN SCOPUS-INDEXED JOURNALS IN 2022

**F** For the implementation of its mission of strengthening human capacity to deliver research-based quality teaching and learning of mathematics and science, ACEITLMS students and associate members published 234 research papers in different international journals, since its establishment, and among them, 117 were published in journals indexed by Scopus. During the last year 2022, one hundred nineteen papers were published and 65 of them were published in journals indexed by Scopus. The following is the list of papers that were published in journals indexed by Scopus during the last year 2022.

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2. Banda, H. J., & Nzabahimana, J. (2022). The impact of Physics Education Technology (PhET) interactive simulation-based learning on motivation and academic achievement among Malawian physics students. *Journal of Science Education and Technology*, 32(1), 127–141. <https://doi.org/10.1007/s10956-022-10010-3>
3. Manishimwe, H., Shivoga, W. A., & Nsengimana, V. (2022). Exploring the impact of inquiry-based instructional strategies on students' attitudes towards biology. *International Journal of Learning, Teaching and Educational Research*, 21(12), 21-43. <https://ijlter.org/index.php/ijlter/article/view/6114>
4. Nkaizirwa, J. P., Aurah, C. M., & Nsanganwimana, F. (2022). An empirical investigation of environmental knowledge and attitudes as the correlates of environmental identity among pre-service biology teachers in Tanzania. *Sustainability*, 15(1), 669. <https://www.mdpi.com/2071-1050/15/1/669>
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7. Wakhata, R., Mutarutinya, V., & Balimuttajjo, S. (2022). Secondary school students' attitude towards mathematics word problems. *Humanities and Social Sciences Communications*, 9(1), 1-11. <https://link.springer.com/content/pdf/10.1057/s41599-022-01449-1.pdf>
8. Mapulanga, T., Nshogoza, G., & Yaw, A. (2022). Teachers' perceived enacted pedagogical content knowledge in biology at selected secondary schools in Lusaka. *International Journal of Learning, Teaching and Educational Research*, 21(10), 418-435. <https://ijlter.org/index.php/ijlter/article/view/6065/pdf>
9. Kirya, K. R., Mashood, K. K., & Yadav, L. L. (2022). Development of a circular motion concept question item inventory for use in Ugandan science education. *Journal of Turkish Science Education*, 19(4), 1312-1327. <https://www.tused.org/index.php/tused/article/view/2111>
10. Munezero, V., Yadav, L.L., & Bugingo, J. B. (2022). Representation of nature of science in physics textbooks of cycle 4 fundamental schools in Burundi. *European Journal of Educational Research*, 11(4), 2487- 2496. <https://www.eu-jer.com/representation-of-nature-of-science-in-physics-textbooks-of-cycle-4-fundamental-schools-in-burundi>

11. Beichumila, F., Bahati, B., & Kafanabo, E. (2022). Computer simulations and animations in the teaching and learning of chemical kinetics, equilibrium, and energetics: Assessing teachers' pedagogical skills in Tanzania secondary schools. *Eurasia Journal of Mathematics, Science and Technology Education*, 18(11). <https://doi.org/10.29333/ejmste/12498>
12. Byukusenge, C., Nsanganwimana, F., & Tarmo, A. P. (2023). Enhancing students' understanding of nerve cells' structures and their symbiotic functioning by using technology-enhanced instruction incorporating virtual labs and animations. *Journal of Science Education and Technology*, 32(1), 13–25. <https://link.springer.com/article/10.1007/s10956-022-10002-3>
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22. Kanyesigye, S. T., Uwamahoro, J., & Kemeza, I. (2022). The Effect of professional training on in-service secondary school physics' teachers' motivation to use problem-based learning. *International Journal of Learning, Teaching and Educational Research*, 21(8). <http://ijlter.org/index.php/ijlter/article/view/5732>

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# Our respective programs

## African Centre of Excellence in Data Science (ACEDS) based at UR-College of Business and Economics, Gikondo



### We have Day and evening Programs:

- Master/PhD of Science in Data Science in Data Mining
- Master/PhD of Science in Data Science in Econometrics
- Master/PhD of Science in Data Science in Biostatistics
- Master/PhD of Science in Data Science in Demography
- Master/PhD of Science in Data Science in Actuarial Sciences

**N.B: All PhD programs are by research.**



**In partnership with Data Science Council of America (DASCA), we also offer certified professional Short courses:**

- a. Associate Big Data Engineer (ABDE)
- b. Senior Big Data Engineer (SBDE)
- c. Associate Big Data Analyst (ABDA)
- d. Senior Big Data Analyst (SBDA)
- e. Senior Big Data Analyst (SBDA)

**More details:** [www.aceds.ur.ac.rw](http://www.aceds.ur.ac.rw)

## African Centre of Excellence for Innovative Teaching and Learning Mathematics and Sciences (ACEITLMS) based at UR-College of Education, Rukara



### We have Day and Weekend Programs:

- Master of Education in Biology Education
- Master of Education in Chemistry Education
- Master of Education in Physics Education
- Master of Education in Mathematics Education
- PhD in Biology Education
- PhD in Chemistry Education
- PhD in Physics Education
- PhD in Mathematics Education

**N.B: All PhD programs are by research.**

**More details:** [www.aceitlms.ur.ac.rw](http://www.aceitlms.ur.ac.rw)



## African Centre of Excellence in Internet of Things (ACEIoT) based at UR-College of Science and Technology, Nyarugenge



### We have the following Programs:

- Master/PhD in Embedded Computing Systems (ECS)
- Master/PhD in Wireless Sensor Networking (WSC)

**N.B: All PhD programs are by research.**

### **Short courses:**

- Rapid Prototyping
- Blockchain Fundamentals and Applications
- Drone fundamentals and applications
- LoRA technologies
- IEEE GRSS Drone Sensor Deployment

**More Details:** [www.aceiot.ur.ac.rw](http://www.aceiot.ur.ac.rw)

## African Centre of Excellence in Energy for Sustainable Development (ACEESD) based at UR-College of Science and Technology, Nyarugenge



### We have the following Programs:

- Master/PhD of Science in Energy Economics
- Master/PhD of Science in Renewable Energy
- Master/PhD of Science in Electrical Power Systems

**N.B: All PhD programs are by research.**

### **Short courses:**

Power Engineering, Smartgrid, Microgrid

**More Details:** [www.aceesd.ur.ac.rw](http://www.aceesd.ur.ac.rw)

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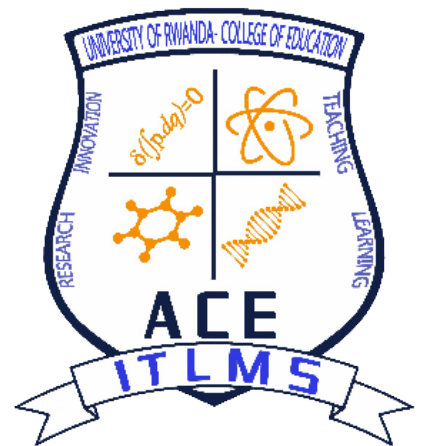
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