

Ibrahim Aliyu | Curriculum Vitae

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🔗 Google-scholar

Education

Chonnam National University

Computer Science and Engineering,

Doctor of Philosophy (Ph.D.), CGPA: 4.46/4.50

Yeosu, South Korea

Aug. 01, 2018–Feb. 25, 2022

Federal University of Technology

Computer Engineering,

Master of Engineering (M. Eng.), CGPA: 4.87/5.00

Minna, Nigeria

Dec. 01, 2015–Jan. 24, 2018

Federal University of Technology

Computer Engineering,

Bachelor of Engineering (B. Eng.), CGPA: 4.15/5.00

Minna, Nigeria

Dec. 01, 2008–May 7, 2014

Immaculate Conception Secondary School

Senior Secondary School Certificate,

Bauchi, Nigeria

Dec. 01, 2002–July 7, 2008

Thesis/Dissertation

PhD. Dissertation.....

Title: *Blockchain and Federated Learning Framework for SDN-enabled Intrusion Detection System Architecture in Smart City: A Case Study of In-vehicle Networks*

Supervisor: Prof. Chang Gyoong Lim,

Description: The dissertation addresses enhancing network security in smart cities, focusing on using citizen-generated data with strict confidentiality and resilience against AI adversarial threats. It explores three critical research questions: developing privacy-preserving IDS training algorithms, leveraging big data to bolster IDS resilience, and evaluating the threat of adversarial examples in federated learning-based IDS in smart cities

Masters Thesis.....

Title: *Development of Catfish Recognition and Counting Algorithm Using ANN and Size Geometry*

Supervisors: Prof. Jonathan Gana Kolo & Prof. Abiodun Musa Aibinu

Description: The thesis addresses the problem of noise and overlapping in fish counting in digital image processing and proposes a new counting method based on fish geometry, effectively determining fish numbers regardless of size and efficiently managing overlaps.

Bachelor Project.....

Title: *Design and construction of Human Body Temperature Based Air Conditioning Control System*

Supervisors: Mr.Micheal Akogbe & Dr. Folorunso A. Taliha

Description: The project addresses the issue of high energy consumption and health concerns linked to air conditioners by optimizing air conditioning efficiency by adjusting to occupants' comfort using skin temperature sensors and a microcontroller, reducing utility costs and enhancing health safety.

Experience

Postdoc Research.....

Chonnam National University, South Korea

Gwangju

Postdoc Researcher

Feb. 2022–present

The research focuses on distributed computing for massive metaverse deployment, digital twin networks, and digital twin for energy systems.

Achievements include:

- Designed segment routing (SR)-based in-network computing (COIN) architecture for the metaverse
 - Developed an SR-enabled COIN for 5G PDU set integrated and differentiated handling
 - Joint optimization for task offloading and resource allocation based on SR-enable COIN for Metaverse
- Distributed computing for the metaverse
 - Dynamic partial computation offloading for the metaverse in in-network Computing using game theory and reinforcement learning
 - Dynamic redundancy-aware blockchain-based partial computation offloading for the metaverse in in-network computing using game theory and reinforcement learning
 - XDN-Based network framework design to communicate interaction in virtual concerts with metaverse platforms
- Digital twin network
 - Network traffic prediction model in a data-driven digital twin network architecture
 - Digital twins temporal dependencies-based on time series using multivariate long short-term memory
 - Nuclear power plant digital twining of human actions and partial computation offloading in in-networking computing-assisted multi-access edge computing using probabilistic graphic model, game theory and reinforcement learning

Research Assistant.....

Chonnam National University, South Korea

Yeosu

Research Assistant

Sept. 2018–Jan. 2022

Aside from my dissertation topic, I worked on other projects as follows:

- Development of hybrid electric power operation service platform for intelligent demand response (DR)
 - Design of smart grid energy consumption prediction framework using CNN-LSTM
 - Proposed a Soft Actor-Critic (SAC) as a control algorithm to optimize the load control strategy in (DR), reducing both the peak load demand of power and the operation costs on the premise of regulating voltage to the safe limit
 - Addressed large dimensional problems from high-time resolution daily customer load profiles, decreasing the computational complexity of the clustering algorithm. The representative load patterns could help to design appropriate demand response schemes.
- Hyperledger system design for poultry product information management system
 - The main functions of the system include the recording of the information associated with poultry rearing (from a hatchery to a grow outhouse), status report of the farm activities monthly, tracking the movement of product through the supply chain until delivery to the

- final consumer through a retail outlet.
- EEG classification- Emotion, epilepsy and neurodegenerative diseases Detection in EEG Signal
 - Epileptic EEG: Selection of optimal wavelet features for epileptic EEG signal classification with LSTM. The proposed method significantly reduces the number of trainable LSTM parameters required to attain high accuracy
 - Emotion EEG: We investigated emotion EEG feature reduction and classification using Stack AutoEncoder (SAE) and LSTM/RNN classification, respectively. The proposed method reduced the complexity of the model and significantly enhance the performance of the classifiers
 - Neurodegenerative diseases EEG: Deep learning for multiclass classification of Alzheimers, mild cognitive impairment and Health control
 - Project Proposal: Participated in project application include
 - Development of deep reinforcement learning demand response as a service (DRAS) systems in virtual power plant (VPP) environments
 - Development of smart autonomous underwater vehicle
 - SDN-enable architecture for energy trading in vehicle to grid (V2G) using blockchain

Intl. Telecommunication Union Focus Group on Autonomous Networks (ITU FG-AN)

ITU FG-AN

Online

Volunteer

Jan 2021–present

Intent-Driven Closed Loops for Autonomous Networks.

Bauchi State Water Board, Nigeria.....

Billing Unit

Bauchi

Computer Analyst

Aug. 2015–August 2017

PC maintenance, Billing System maintenance, National Urban Water Sector Reform Project (World Bank Assisted) IT support staff.

Intenship: Intent-Driven Closed Loops for Autonomous Networks.....

Prof. Iya, Community Resource Center

Bauchi

Technical Unit

Sept.-Nov. 2011, May –Nov. 2012

As part of my bachelor graduation criteria, I did an internship for a cumulative period of 9 months at the Center. My main tasks include teaching general computer operations and Microsoft office package. I was Part of the team that developed the student management system for the center. My main contribution includes system requirement analysis to manage student information, result computation, instructor allocation, class schedules etc

Teaching and Supervising Experience

- Graduate student supervision, HiIoP Lab, Chonnam National University, Feb. 2022 - present
- Master Thesis: guided a student on his thesis title “Day-ahead Energy Generation Prediction in Blockchain-based P2P Energy Trading system”, Chonnam National University, 2019-20
- Tutorial Class (undergraduate): “Guide to Apache Spark in Python” (Prof. Chang Gyoong Lim), Chonnam National University, Fall semester, 2019
- Tutorial Class (Graduate): “Data Preprocessing” (Prof. Chang Gyoong Lim), Chonnam National University, Fall semester. Fall semester, 2018

Languages

Hausa 1: Very good

English 2: Very good

Korean 3: Limited

Skill matrix

	Level	Skill	Years	Comment
Language:	■■■■■	Python	5	
	■■■■■	Matlab	2	
	■■■■■	C, Java	2	
	■■■■■	Tensorflow, Keras, Pytorch	5	
	■■■■■	Solidity	2	

Interests

Distributed computing, computation offloading, game theory, federated learning, reinforcement learning, deep learning, and blockchain.

Awards AND Scholarship

- Best Paper Award, NCS International Conference on Communications & E-systems for Economic Stability, 10 Aug. 2023
- Mentors Encouragement Award Certificate, ITU AI/ML in 5G Challenge, 14 Dec. 2021
- Graduate Research Award, Chonnam National University, South Korea, 2018-2020
- Korean Government Scholarship Program award (KGSP 2017). Best nominee, Embassy Track (Aug 2017-Aug 2021)
- TETFUND Institution-Based Research Intervention Fund, Federal University of Technology, Nigeria,2016-2017

Publications

Most Relevant Journal Publications.....

- [1] **I. Aliyu**,CR Yu, TW. Um, JS. Kim. "Dynamic Redundancy-aware Blockchain-based Partial Computation Offloading for the Metaverse in In-network Computing." arXiv preprint [arXiv:2311.01914](#) (2023) (**Under review at IEEE Transactions on Dependable and Secure Computing**)
- [2] **I. Aliyu.**, Ko, N., Um, T. W., & Kim, J. . A Dynamic Partial Computation Offloading for the Metaverse in In-Network Computing. arXiv preprint [arXiv:2306.06022](#) (2023) (**Under review at IEEE access**)
- [3] S. Oh,K. Chung,**I. Aliyu**, M. Hahn, I-K Jeong, C-R Yu, T-W Um, J. Kim “XDN-Based Network Framework Design to Communicate Interaction in Virtual Concerts

- with Metaverse Platforms,” *Applied Sciences*, vol. 13, no. 17, p. 9509, Aug. 2023, doi: <http://dx.doi.org/10.3390/app13179509>
- [4] H. Shin, S. Oh, A. Isah, **I. Aliyu**, J. Park, and J. Kim, “Network Traffic Prediction Model in a Data-Driven Digital Twin Network Architecture,” *Electronics*, vol. 12, no. 18, p. 3957, Sep. 2023, doi: <http://dx.doi.org/10.3390/electronics12183957>.
- [5] A. Isah, H. Shin, S. Oh, S. Oh, **I. Aliyu**, T. W. Um, J. Kim, "Digital Twins Temporal Dependencies-Based on Time Series Using Multivariate Long Short-Term Memory." *Electronics*, Vol 12 no. 19, 4187. 2023 doi:<https://doi.org/10.3390/electronics12194187>.
- [6] J. Isuwa, M. Abdullahi, Y. Sahabi Ali, H.Y. Hassan, J.R. Buba, **I. Aliyu**, JS. Kim, O.N. Oyelade, "Optimizing microarray cancer gene selection using swarm intelligence: Recent developments and an exploratory study", *Egyptian Informatics Journal*, Vol. 24, no. 4, pp. 100416, 2023, doi:<https://doi.org/10.1016/j.eij.2023.100416>
- [7] JF Fuente, ÁP Recondo, P Harvey, ..., **I. Aliyu**, JS Kim, R. Vishnu "Build your own closed loop: Graph-based proof of concept in closed loop for autonomous networks" *ITU Journal on Future and Evolving Technologies*, Vol. 4, no. 3, 503-536, 2023, doi:<https://doi.org/10.52953/OPDK5666>
- [8] **I. Aliyu**, T. Um, S. Lee, C. G. Lim and J. Kim, "Deep learning for multivariate prediction of building energy performance of residential buildings," *Computers, Materials & Continua*, vol. 75, no.3, pp. 5947–5964, 2023. doi:<https://doi.org/10.32604/cmc.2023.037202>
- [9] B. Guda, B.K.Nuhu, J. Agajo, **I. Aliyu**, "Performance Evaluation of Keyword Extraction Techniques and Stop Word Lists on Speech-To-Text Corpus", *The International Arab Journal of Information Technology (IAJIT)* ,Vol. 20, no. 01, pp. 134 - 140, 2023, doi: <https://doi.org/10.34028/iajit/20/1/14>
- [10] **I. Aliyu**, S. Van Engelenburg, M. B. Mu’azu, J. Kim, and C. G. Lim, "Statistical Detection of Adversarial examples in Blockchain-based Federated Forest In-vehicle Network Intrusion Detection Systems," *IEEE Access*, vol. 10, pp. 109366-109384, 2022. doi:<https://doi.org/10.1109/ACCESS.2022.3212412>
- [11] B. Guda, **I. Aliyu** et al., "Network Resource Allocation for Emergency Management Based on Closed-Loop Analysis," *ITU Journal on Future and Evolving Technologies*, vol. 3, no. 2, pp. 175-201, 2022. doi:<https://doi.org/10.52953/HVPI8935> doi:<https://doi.org/10.1109/ACCESS.2022.3212412>
- [12] **I. Aliyu**, M. C. Feliciano, S. Van Engelenburg, D. O. Kim and C. G. Lim, "A Blockchain-Based Federated Forest for SDN-Enabled In-Vehicle Network Intrusion Detection System," in *IEEE Access*, vol. 9, pp. 102593-102608, 2021, doi:<https://doi.org/10.1109/ACCESS.2021.3094365>
- [13] I. Aliyu and C. G. Lim, "Selection of optimal wavelet features for epileptic EEG signal classification with LSTM," *Neural Computing and Applications*, vol. 35, pp. 1077–1097, 2021. doi:<https://doi.org/10.1007/s00521-020-05666-0>

- [14] B. K. Nuhu, **I. Aliyu**, M. A. Adegboye, J. K. Ryu, O. M. Olaniyi, and C. G. Lim, "Distributed network-based structural health monitoring expert system," *Building Research & Information*, vol. 49, no. 1, pp. 144-159, 2021. doi: <https://doi.org/10.1080/09613218.2020.1854083>
- [15] **I. Aliyu**, K. J. Gana, A. A. Musa, M. A. Adegboye, and C. G. Lim, "Incorporating Recognition in Catfish Counting Algorithm Using Artificial Neural Network and Geometry," *KSII Transactions on Internet & Information Systems*, vol. 14, no. 12, 2020. doi: <http://doi.org/10.3837/tiis.2020.12.014> doi: <http://doi.org/10.3837/tiis.2020.12.014>
- [16] M. A. Adegboye, A. M. Aibinu, J. G. Kolo, **I. Aliyu**, T. A. Folorunso, and S.-H. Lee, "Incorporating intelligence in fish feeding system for dispensing feed based on fish feeding intensity," *IEEE Access*, vol. 8, pp. 91948-91960, 2020. doi: <https://doi.org/10.1109/ACCESS.2020.2994442>

Other Journal publications.....

- [1] B. K. Nuhu, I. A. Dauda, Y. Zurmi, N. S. Banwat, S. Oh, and **I. Aliyu**, "RF energy harvesting system for charging mobile phones," *The Journal of Contents Computing* vol. 4, no. 1, pp. 401 - 415, 2022. doi:<http://dx.doi.org/10.9728/jcc.2022.06.4.1.401>
- [2] **I. Aliyu**, U. Kamoliddin, J. Yoo, C. G. Lim, and J.-C. Jeong, "Blockchain-based Poultry Information Management System Design and Implementation using Hyperledger Fabric," *Journal of the Chosun Natural Science*, vol. 14, no. 3, pp. 107-115, 2021. doi: <https://doi.org/10.13160/ricns.2021.14.3.107>
- [3] I. M. Abdullahi, P. N. Gambo, M. Ake, **I. Aliyu**, S. Oh, and J. Kim, "A Novel Interactive IoT-Based Smart Electricity Power Consumption Management System," *The Journal of Contents Computing*, vol. 3, no. 2, pp.
- [4] I. M. Abdullahi, O. M. Olaniyi, J. O. Irefu, S. Oh, and **I. Aliyu**, "Intelligent Offline Multi-Object Recognition Walking Stick for The Blind," *The Journal of Contents Computing*, vol. 3, no. 2, pp. 351-363, 2021. doi:<http://dx.doi.org/10.9728/jcc.2021.12.3.2.351>
- [5] **I. Aliyu** and C.-G. Lim, "EEG Dimensional Reduction with Stack AutoEncoder for Emotional Recognition using LSTM/RNN," *The Journal of the Korea institute of electronic communication sciences*, vol. 15, no. 4, pp. 717-724, 2020. doi:<https://doi.org/10.13067/JKIECS.2020.15.4.717>
- [6] **I. Aliyu**, R. M. Mahmood, and C.-G. Lim, "LSTM Hyperparameter Optimization for an EEG-Based Efficient Emotion Classification in BCI," *The Journal of the Korea institute of electronic communication sciences*, vol. 14, no. 6, pp. 1171-1180, 2019. doi:<https://doi.org/10.13067/JKIECS.2019.14.6.1171>
- [7] C. Y. Lee, **I. Aliyu**, and C. G. Lim, "Optimal EEG Locations for EEG Feature Extraction with Application to User's Intension using a Robust Neuro-Fuzzy System in BCI," *J. Chosun Natural Sci.*, vol. 11, no. 4, pp. 167- 183, 2018. doi: <https://doi.org/10.13160/ricns.2018.11.4.167>
- [8] Y. Tong, **I. Aliyu**, and C.-G. Lim, "Analysis of Dimensionality Reduction Methods Through Epileptic EEG feature Selection for Machine Learning in BCI," *The Journal of the Korea institute of electronic communication sciences*, vol. 13, no. 6, pp. 1333-1342, 2018. doi:<https://doi.org/10.13067/JKIECS.2018.13.6.1333>

- [9] **I. Aliyu**, Kolo, J. G., Aibinu, B. M., James, A., Abdullahi, M. O. Folorunso, T. A. & Adegboye, M. A. "A Proposed Fish Counting Algorithm using Digital Image Processing Technique" ATBU, Journal of Science, Technology & Education (JOSTE); Vol. 5, no. 1, 2017. ISSN: 2277-0011. [URL](#)
- [10] Adegboye, M.A.Aibinu, A.M., Kolo, J.G., Oire, A. M., Folorunso, T.A., **I. Aliyu**, (2017). "A Vibration Processing Analysis Approach to the Development of Fish Feeding Regime System" Computing, Information Systems, Development Informatics & Allied Research Journal. Vol. 8 No.1, March, 2017 Vol. 8 No.1, March, 2017 [URL](#)
- [11] J. Agajo, J. G. Kolo, M. Adegboye, B. Nuhu, L. Ajao, and **I. Aliyu**, "Experimental performance evaluation and feasibility study of 6lowpan based internet of things," Acta Electrotech. Inform, vol. 17, pp. 16-22, 2017. [doi:https://doi.org/10.15546/aei-2017-0011](https://doi.org/10.15546/aei-2017-0011)
- [12] A.A. Michael, F.T. Abiodun, OM Olaniyi, **I. Aliyu**. "Human Body Temperature Based Air Conditioning Control System". International Journal of Engineering Research & Technology (IJERT). ISSN: 2278-0181. Vol. 3 Issue 5, May – 2014. [URL](#)

Conferences.....

- [1] **I. Aliyu**, S. Oh, S. Oh, H. Shin, K. Chung, T.-W. Um, Y.-A. Jung, M. Hahn and J. Kim, "Toward a Dynamic Tasks Offloading and Resource Allocation for the Metaverse in In-network Computing," presented at the 2023 Fourteenth International Conference on Ubiquitous and Future Networks (ICUFN), Paris, France, 2022. [doi:https://doi.org/10.1109/ICUFN57995.2023.10200119](https://doi.org/10.1109/ICUFN57995.2023.10200119)
- [2] **I. Aliyu**, I. M. Abdullahi, S.-j. Lee, T.-W. Um, and J. Kim, "Towards Joint Optimization Problem for Computing and Resource Allocation in In-network Computing for Metaverse," 2022 Korea Digital Content Association Summer Conference, Jeju, 322-323, 2022. [URL](#)
- [3] **I. Aliyu**, H. Shin, S.-j. Lee, T.-W. Um, and J. Kim, "Towards In-network Computing for Metaverse: Communication, Computing and Cost Modeling," 2022 Korea Digital Content Association Summer Conference, Jeju, 323-328, 2022. [URL](#)
- [4] **I. Aliyu**, U. Kamoliddin, S. J. Seong, S. Cen, Y. Zhao, and C. G. Lim, "Development of blockchain-based duck history and distribution management system," ICC 2021 International Conference on Convergence Content ICC , Ramada Plaza , Jeju, South Korea, pp. 25-26, 2021. [URL](#)
- [5] **I. Aliyu**, U. Kamoliddin, S. J. Seong, S. Cen, Y. Zhao, and C. G. Lim, "CNN-LSTM for Smart Grid Energy Consumption Prediction," ICC 2021 International Conference on Convergence Content ICC , Ramada Plaza , Jeju, South Korea, pp. 29-30, 2021. [URL](#)
- [6] Y. Zhao, S. Cen, S. J. Seong, **I. Aliyu**, And C. G. Lim, "Real-Time Demand Response Management for Controlling Load using Deep Reinforcement Learning," ICC 2021 International Conference on Convergence Content ICC , Ramada Plaza , Jeju, South Korea, pp. 27-28, 2021. [URL](#)
- [7] S. Cen, Y. Zhao, Y. M. Kim, **I. Aliyu**, J. Hur, and C. G. Lim, "Electricity Load Pattern Analysis using Fuzzy C-Means Clustering Algorithm," ICC 2021 International Conference on Convergence Content ICC , Ramada Plaza , Jeju, South Korea, pp. 23-24, 2021. [URL](#)

- [8] **I. Aliyu**, S. Cen, K. Usmonov, H. K. Ju, O. Akromjon, and C. G. Lim, "Hyperledger Fabric for Livestock Traceability: Addressing the impact of poultry supply chain on Human Health and Climate Change," in KSII The 12th International Conference on Internet (ICONI) 2020, Jeju Shinhwa World, Korea, 2020, pp. 261-266. [URL](#)
- [9] **I. Aliyu**, Y. B. Lim, and C. G. Lim, "Epilepsy Detection in EEG Signal using Recurrent Neural Network," in Proceedings of the 2019 3rd International Conference on Intelligent Systems, Metaheuristics Swarm Intelligence, Male, Maldives, 2019, pp. 50-53: ACM. [doi:https://doi.org/10.1145/3325773.3325785](https://doi.org/10.1145/3325773.3325785)
- [10] Y. B. Lim, **I. Aliyu**, and C. G. Lim, "Air Pollution Matter Prediction Using Recurrent Neural Networks with Sequential Data," in Proceedings of the 2019 3rd International Conference on Intelligent Systems, Metaheuristics & Swarm Intelligence, Male, Maldives, 2019, pp. 40-44: ACM. [doi:https://doi.org/10.1145/3325773.33257885](https://doi.org/10.1145/3325773.33257885)
- [11] C. G. Lim, **I. Aliyu**. "Design and Implementation of a Cloud-based Small Scale Energy Trading System" 2018 Fall Conference. The Korea Institute of Electronic Communication Sciences, Seoul, South Korea, Vol (12), Issue 2, November 2018, pp.62-64 [URL](#)
- [12] C. G. Lim, S. Lim, **I. Aliyu**, "Blockchain for Small Scale Energy Trading" 2018 Fall Conference. The Korea Institute of Electronic Communication Sciences, Seoul, South Korea, Vol (12), Issue 2, November 2018, pp. 59-61 [URL](#)
- [13] M. A. Adegboye, L. A. Ajao, T. A. Badmus, **I. Aliyu** "Intelligent Pavement Crack Inspection And Speed Bumps Status Estimation System using Fuzzy Controller". 1st Fouye International Engineering Conference, 2018, pp. 467-476