

## Ernest Bonnah, Ph.D.

Assistant Professor  
Baylor University  
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### Research Interests

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Formal Verification of autonomous cyber-physical systems, Security in edge computing paradigms, Explainable AI in safety-critical systems

### Education

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- 2020–2024 **Ph.D. in Electrical & Computer Engineering**  
University of Missouri, Columbia, MO  
*Dissertation: Formal approaches to Security-Aware Robotic Motion Planning using Hyperproperties*  
Advisor: Prof. Khaza Anuarul Hoque
- 2020–2024 **M.S. in Computer Science**  
University of Missouri, Columbia, MO  
*Project: Runtime Monitoring of Time Window Temporal Logic*  
Advisor: Prof. Khaza Anuarul Hoque
- 2014–2016 **MSc. in Telecommunication Engineering**  
Kwame Nkrumah University of Science & Technology, Ghana  
*Thesis: IMT Usage and auction of Digital Dividend (Case Study of Ghana)*  
Advisor: Dr. Imoro Adam

### Appointments

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- 2024–present **Assistant Professor**  
Department of Electrical and Computer Engineering  
*Baylor University, Waco, TX.*
- 2020–2024 **Graduate Research Assistant**  
Department of Electrical and Computer Engineering  
*University Missouri, Columbia, MO*  
Research Advisor: Prof. Khaza A. Hoque
- 2017–2020 **Research Assistant**  
School of Computer Science & Communication Engineering  
*Jiangsu University, P.R. China*  
Research Advisor: Prof. Ju Shiguang
- 2015 – 2017 **Automation & IT Engineer**  
*Olam Cocoa Processing Ltd., Kumasi, Ghana*
- 2012 – 2015 **Network Infrastructure Officer**  
*GCB Bank (formerly UT Bank), Accra, Ghana*

### Teaching

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- **Course Instructor, Baylor University**  
ELC 4313/5313 Advanced Computer Architecture, Fall 2024  
ELC 4396/5396 Verification and Validation of Digital Systems, Spring 2024
- **Graduate Teaching Assistant, University of Missouri-Columbia**  
ECE 4270/7270 Computer Architecture,

## Professional Affiliation

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- Member – Institute of Electrical and Electronics Engineers (IEEE)
- Member – IEEE Computer Society

## Selected Peer Reviewed Journals and Conferences

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1. Bonnah Ernest, Luan Nguyen, Khaza Anuarul Hoque, "*Motion Planning using Hyperproperties for Time Window Temporal Logic*." IEEE Robotics and Automation Letters 8.8 (2023): 4388-4393
2. Bonnah Ernest, Khaza Anuarul Hoque, "*Runtime Monitoring of Time Window Temporal Logic*." IEEE Robotics and Automation Letters 7.3 (2022): 5888-5895
3. Amponsah, Alfred Adutwum, et al. "*An improved multi-leader comprehensive learning particle swarm optimisation based on gravitational search algorithm*." Connection Science 33.4 (2021): 803-834.
4. Bonnah, Ernest and Ju Shiguang. "*DecChain: A decentralized security approach in Edge Computing based on Blockchain*," Future Generation Computer Systems Journal Future Generation Computer Systems 113 (2020): 363-379.
5. Bonnah, Ernest and Ju Shiguang. "*Privacy enhancement scheme (PES) in a blockchain-edge computing environment*." IEEE Access 8 (2020): 25863-25876.
6. Bonnah, Ernest, Shiguang Ju, and Wenpeng Cai. "*Coverage maximization in wireless sensor networks using minimal exposure path and particle swarm optimization*." Sensing and Imaging 21 (2020): 1-16.
7. Bonnah Ernest, Luan Nguyen, Khaza Anuarul Hoque, "*Model Checking Time Window Temporal Logic for Hyperproperties*." 23rd ACM-IEEE International Symposium on Formal Methods and Models for System Design, 2025 MEMOCODE.
8. Bonnah Ernest, Luan Nguyen, Khaza Anuarul Hoque, "*Hyperproperty-Constrained Secure Reinforcement Learning*." 26th International Conference on Formal Engineering Methods, 2024 ICFEM.
9. Roshan Lal Neupane, Ernest Bonnah, Bishnu Bhusal, Kiran Neupane, Khaza Anuarul Hoque, Prasad Calyam "*Formal verification for blockchain-based insurance claims processing*." 2024 IEEE Network Operations and Management Symposium. NOMS 2024.
10. Bonnah Ernest, Luan Nguyen, Khaza Anuarul Hoque, "*Model Checking Time Window Temporal Logic for Hyperproperties*." 21st ACM-IEEE International Symposium on Formal Methods and Models for System Design, 2023 MEMOCODE. (**Best Paper Award candidate**)
11. Bonnah Ernest, Khaza Anuarul Hoque, "*Quality Aware Time Window Temporal Logic for Performance Monitoring*." 21st ACM-IEEE International Symposium on Formal Methods and Models for System Design, 2023 MEMOCODE.
12. Bhamidipati, Naga Ramya, et al. "*ClaimChain: Secure Blockchain Platform for Handling Insurance Claims Processing*." 2021 IEEE International Conference on Blockchain (Blockchain). IEEE, 2021.

## Conference Presentations

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1. Bonnah Ernest, Luan Nguyen, Khaza Anuarul Hoque, "*Hyperproperty-Constrained Secure Reinforcement Learning*." 23rd ACM-IEEE International Symposium on Formal Methods and Models for System Design, 2025 MEMOCODE, Taipei, Taiwan.
2. Bonnah Ernest, Luan Nguyen, Khaza Anuarul Hoque, "*Efficient SMT-Based Model Checking for HyperTWTL*." 26th International Conference on Formal Engineering Methods, 2024 ICFEM, Hiroshima, Japan.
3. Bonnah Ernest, Luan Nguyen, Khaza Anuarul Hoque, "*Model Checking Time Window Temporal Logic for Hyperproperties*." 21st ACM-IEEE International Symposium on Formal Methods and Models for System Design, 2023 MEMOCODE, Hamburg, Germany.

## Professional Service

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- Reviewer – IEEE Robotics and Automation (Letters RA-L)
- Reviewer – Springer Journal of Supercomputing
- Reviewer – Springer Peer-to-Peer Networking and Applications

## Professional Experience

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- 2020–2024      **Graduate Research Assistant**  
*Department of Electrical and Computer Engineering, University of Missouri, Columbia, MO*  
Research Advisor: Prof. Khaza A. Hoque
- Leveraged formal methods to design and implement efficient mechanisms for verifying and monitoring security operations of time-bounded autonomous systems.
  - Proposed a novel hyper-temporal logic for specifying complex information-flow security policies such as side-channel attacks, non-interference, observational determinism, secrecy protection etc. in autonomous systems
  - Assisted my advisor in drafting and submitting grant proposals to National Science Foundation (NSF)
- 2017–2020      **Research Assistant**  
*Department of Electrical and Computer Engineering, University of Missouri, Columbia, MO*  
Research Advisor: Prof. Ju Shiguang
- Designed and implemented an efficient decentralized authentication scheme DecChain, for edge computing paradigms based on permissioned blockchain technology.
  - Proposed a novel privacy-aware scheme for users of blockchain-edge computing environment
  - Mentored 2 Masters students
  - Provide regular progress updates via email or in-person research meetings
- 2015–2017      **Automation and IT Engineer**  
*Olam Cocoa Processing Ltd., Kumasi, Ghana*
- Monitored and maintained all instrumentation and sensors on the process line
  - Monitored networks and network devices to resolve technical problems quickly resulting in minimum downtime in the plant by 60%
  - Implemented an efficient client support system to ensure 100% of user support is responded to on time
  - Demonstrated familiarity with latest hardware, software and networking technology, as well as industry trends
  - Oversaw IT department operations and training
  - Designed, evaluated, and monitored WAN and LAN networks
- 2012–2015      **Network Infrastructure Officer**  
*GCB Bank (formerly UT Bank) Accra, Ghana*
- Worked in a team of 3 to design and implement WAN/LAN connections for 30 branches of the bank all over Ghana
  - Installed a monitoring tool to monitor downtime of branches and ATMs thereby increasing the response time by 85%
  - Offered client support services to staff of bank on a day-to-day basis