# Curriculum Vitae


## Dr. Wooyeon Jo

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## Education and Research History

- *July. 2022 – Current* : Postdoctoral Research Associate, Virginia Commonwealth University
  PI: Prof. Irfan Ahmed
  Department: Computer Science

- *Mar. 2015 – Feb. 2022* : Ph.D. in Computer Engineering, Ajou University ICS Lab (Integrated Ph.D. Program)
  PI: Prof. Taeshik Shon
  Major: Computer Engineering

- *Mar. 2011 – Feb. 2015* : B.S. in Computer Engineering, Ajou University
  Major: Computer Engineering

## Honors

- Future Computing Scholarship 2014
- Information Computer Scholarship 2013
- Student Scholarship from DFRWS USA 2019
- Graduate Student Representative on February, 2022

## Graduated Thesis

- Doctor of Philosophy
  - Smart Digital Forensics:
    An Application of Supervised Learning to Industrial Network and System
  - Committee: Dr. Manpyo Hong(Chair), Dr. Taeshik Shon, Dr. Jin Kwak. Dr. Tae-Sun Chung(Ajou University), Dr. Changhoon Lee(Seoul National University of Science & Technology)

## Research Interests

- Cyber Security
  - Industrial Network Security
    - Industrial Control System Security
    - In-Vehicle Network Security
    - IIoT Security
  - Digital Forensics
    - PLC Memory Forensics
    - Filesystem Forensics
  - Abnormal Behavior Detection
  - Artificial Neural Network, Deep Learning

## Publications

### International Journals (SCI/E)

- **(Accepted!)** Adeen Ayub, **Wooyeon Jo**, Syed Ali Qasim, Irfan Ahmed. “How are industrial control systems insecure by design? A deeper insight into real-world PLCs”, IEEE Security and Privacy (2023).

- **Wooyeon Jo**, et al. “Automatic Whitelist Generation System for Ethernet based In-Vehicle Network”, Computers in Industry. (2022).

- **Wooyeon Jo**, et al. "Packet Preprocessing in CNN-Based Network Intrusion Detection System." Electronics 9.7 (2020): 1151.

- **Wooyeon Jo**, et al. "Digital forensic practices and methodologies for AI speaker ecosystems." Digital Investigation 29 (2019): S80-S93.

- Kim, HyunJin , **Wooyeon Jo**, et al. "Unknown Payload Anomaly Detection Based on Format and Field Semantics Inference in Cyber-Physical Infrastructure Systems." IEEE Access (2021).

- Shin, Yeonghun , **Wooyeon Jo**, et al. "Certificate Injection-Based Encrypted Traffic Forensics in AI Speaker Ecosystem." Forensic Science International: Digital Investigation 33 (2020): 301010.

- Kim, SungJin, **Wooyeon Jo**, and Taeshik Shon. "APAD: autoencoder-based payload anomaly detection for industrial IoE." Applied Soft Computing 88 (2020): 106017.

- Kim, Myungjong, **Wooyeon Jo**, Taeshik Shon. "Visualization for internet of things: power system and financial network cases." Multimedia Tools and Applications 78.3 (2019): 3241-3265.

- Lee, Seokjun, **Wooyeon Jo**, Taeshik Shon. "ExtSFR: scalable file recovery framework based on an Ext file system." Multimedia Tools and Applications (2019): 1-19.

- **Wooyeon Jo**, Hyunsoo Chang, and Taeshik Shon. "Digital forensic science approach by file recovery research." The Journal of Supercomputing 74.8 (2018): 3704-3725.

**International Conference**

- Syed Ali Qasim, **Wooyeon Jo**, Irfan Ahmed. “PREE: Heuristic Builder for Reverse Engineering of Network Protocols in Industrial Control Systems”, DFRWS USA 2023.

- Adeen Ayub, Nauman Zubair, Hyunguk Yoo, **Wooyeon Jo,** Irfan Ahmed. "Gadgets of Gadgets in Industrial Control Systems: Return Oriented Programming Attacks on PLCs.", IEEE International Symposium on Hardware Oriented Security and Trust (IEEE HOST 2023), 2023.

- **Wooyeon Jo**, et al. "Digital forensic practices and methodologies for AI speaker ecosystems." DFRWS USA 2019, 2019

- **Wooyeon Jo**, Hyunsoo Chang, and Taeshik Shon. "Digital forensic approach for file recovery in Unix systems: Research of data recovery on Unix file system." 2016 IEEE Information Technology, Networking, Electronic and Automation Control Conference. IEEE, 2016.

- Shin, Yeonghun , **Wooyeon Jo**, et al. "Certificate Injection-Based Encrypted Traffic Forensics in AI Speaker Ecosystem." DFRWS USA 2020, 2020

- Kim, Hyungchan, **Wooyeon Jo**, et al. "Digital Forensic Analysis using Android Application Cache Data." 2019 International Conference on Platform Technology and Service (PlatCon). IEEE, 2019.

- Shin, Yeonghun, **Wooyeon Jo**, et al. "An Security Analysis of Ext Filesystem metadata." 2019 4th Technology Innovation Management and Engineering Science International Conference (TIMES-iCON). IEEE, 2019.

- Jeong, Jaehan, **Wooyeon Jo**, et al. "Backtracking and Visualization Techniques for Financial Network Security." 2018 IEEE International Conference of Safety Produce Informatization (IICSPI). IEEE, 2018.

- Kim, Hyunjin, **Wooyeon Jo**, et al. "A novel security framework for industrial iot based on isa 100.11 a." International conference on heterogeneous networking for quality, reliability, security and robustness. Springer, Cham, 2018.

- Kim, SungJin, **Wooyeon Jo**, and Taeshik Shon. "A novel vulnerability analysis approach to generate fuzzing test case in industrial control systems." 2016 IEEE Information Technology, Networking, Electronic and Automation Control Conference. IEEE, 2016.

- Eo, Soowoong, **Wooyeon Jo**, et al. "A phase of deleted file recovery for digital forensics research in Tizen." 2015 5th International Conference on IT Convergence and Security (ICITCS). IEEE, 2015.

## Patents(Korea)

- [Granted] METHOD AND APPARATUS FOR VISUALIZING ANOMALY DETECTION IN NETWORK FORENSICS, 10-1976395, 2019.05.02, doi:10.8080/1020170022915

- [Granted] METHOD FOR MANAGING DATA OF FILE SYSTEM AND COMPUTING SYSTEM USING THE SAME, 10-1836380, 2018.03.02, doi:10.8080/1020160063614

- [Granted] METHOD FOR MANAGING DATA OF FILE SYSTEM AND COMPUTING SYSTEM USING THE SAME, 10-1769778, 2017.08.14, doi:10.8080/1020160055566

- [Granted] APPARATUS AND METHOD FOR DIGITAL FORENSIC FOR IOT SYSTEM BASED ON CLOUD, 10-2156174, 2020.09.09, doi:10.8080/1020190075441

## Programming Skills

- Expert in Python/C/JAVA programming with network-related project experiences.
- Experienced in programming with Web with network security visualization project experiences.
- Experienced in programming with C++ on Windows and Linux environments.

## Teaching Experience

As a graduate student in the doctoral program, I took one or more TAs every semester. The following describes a case where I gained teaching experience by taking lab classes for the entire semester during the course. I have provided these hands-on lectures to not only undergraduate students of Ajou University, but also military personnel and gifted education.

- Fall 2017 in Ajou University as TA, Software application security

- Fall 2018 in Ajou University as TA, Software application security

## Projects

- File system forensic analysis tool development, Supreme Prosecutors' Office Republic of Korea, 2012.10.01 ~ 2017.08.31.
- BK21 Plus, National Research Foundation of Korea, 2013.09 ~ 2020.08
- SG heterogeneous protocol gateway security module development, KEPCO(Korea Electric Power Corporation) KDN (Knowledge, Data and Network), 2014.12 ~ 2015.05
- A Study on Vulnerability Analysis Technology in Implementation of Control Protocol, National Security Research Institute, 2015.04 ~ 2015.11
- Development of digital evidence analysis and restoration software based on open platform file system in IoT environment, Ajou University LINK Project Team, 2015.07 ~ 2016.01
- Control system network forensic architecture study, National Security Research Institute, 2016.4. ~ 2016.10.
- Industrial IoT target vulnerability fuzzing and digital forensic technology development, Ajou University LINK Project Team, 2016.07. ~ 2017.01.
- ISA 100.11a based power control system wireless security technology development, KEPCO(Korea Electric Power Corporation) Research Institute, 2016.12 ~ 2017.12.
- Industrial wireless communication protocol security threat analysis study, National Security Research Institute, 2018.04 ~ 2018.10
- Preemptive recognition of manufacturing process abnormalities to solve the problem of smart factory shutdown due to cyber attacks, Institute for Information & Communication Technology Planning & Evaluation (IITP), 2018.04 ~ 2020.12
- Development of digital forensic integrated platform, Institute for Information & Communication Technology Planning & Evaluation (IITP), 2018.05 ~ 2020.12
- A study on the storage data system of cloud server-based artificial intelligence assistants and devices, Supreme Prosecutors' Office Republic of Korea, 2018.06 ~ 2018.12

- Advancement of power control system abnormal behavior detection algorithm and research on detection equipment development, KPX(Korea Power Exchange), 2018.07 ~ 2020.07

- AI Speaker Forensic Analysis, Korea Institute of Information Security & Cryptology, 2019.03~2019.11

- Deep Learning-based Abnormal Behavior Detection Technology Research in Vehicle Ethernet Environment, HYUNDAI Research Project for Future Technology, 2019.08~2020.02

- A study on how to completely delete data in Android OS (9,10), National Security Research Institute, 2020.04 ~ 2020.10

- A study on analysis techniques for wearable devices (smart watches and bands). Korean National Police Agency, 2020.09 ~ 2020.12

- Reliable intelligent threat detection engine research for national infrastructure cybersecurity, National Security Research Institute, 2018.06 ~ 2023.02

- Vehicle Infotainment Forensic Analysis, Korea Institute of Information Security & Cryptology, 2020.03 ~ 2021.11

- Ethernet Communication Diagnostics, HYUNDAI, 2021.06 ~ 2022.06

## Professional References

- Dr. Taeshik Shon, Ajou University, tsshon@ajou.ac.kr
- Dr. Seokjun Lee, Kennesaw State University, slee235@kennesaw.edu
- Dr. Hyunguk Yoo, University of New Orleans, hyoo1@uno.edu
- Dr. Irfan Ahmed, Virginia Commonwealth University, iahmed3@vcu.edu

## Personal References available upon request

I hereby declare that the above information is true and correct in every respect to the best of my knowledge.

05/2023

Wooyeon Jo