# Byung-Gun Joung

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## • Career Summary

As a research assistant funded by the Wabash Heartland Innovation Network (WHIN) project which aims to provide technical support for Indiana manufacturing companies, my primary research focuses on developing predictive models with Machine Learning and AI as well as deploying sensors and IoT technology to mainstream the data pipelining for predictive maintenance (PdM). Data pipelining includes the identification of sensors, sensor deployment considering the environment in which the sensor will be deployed, development of a reliable and secure database to efficiently utilize the collected data, data visualization/interpretation using data visualization tools (e.g., Power BI, Grafana, etc.). I'm also actively working with project partners to provide technical support for identifying/solving real-world manufacturing problems (e.g., Anomalies/failures of manufacturing machines and improving maintenance scheduling based on the data-driven techniques, etc.). During master program, I mainly studied analog circuit design for power management integrated circuit. Through the master program, I have gained knowledge on how the memory works with processor. In my undergraduate, I studied computer science and computer engineering. My acquired skills based on computer science includes programming languages such as Python and C, and mathematical tools (e.g., MATLAB). Also, I developed a couple of applications through some projects as stated below.

## • Education

B.S. Computer Communication Engineering, Korea University, 2016, (**GPA: 3.43/4.5**)
Engineering Visiting Program, Hong Kong Univ. of Sci. & Tech, 2015
M.S. Electrical Engineering, Korea University, 2016 - 2017, (**GPA: 3.93/4.5**)

Advisor: Chulwoo Kim, Ph.D. in Electrical and Computer Engineering, Head of Department of Semiconductor-System Engineering (Ph.D. received from University of Illinois at Urbana–Champaign)

Ph.D. Environmental and Ecological Engineering, Purdue University, 2018

Advisor: John William Sutherland, the head of Environmental and Ecological Engineering at Purdue University

## • Research Projects

Purdue University, Research Assistant, From Aug 2018 to present, I am working to:

- Research activities dedicated to WHIN project including DAQ, data analysis for Predictive maintenance of rotating machinery
- Develop machine learning/AI algorithms for anomaly detection, anomaly scoring, remaining useful life of equipment with regression, etc.
- Assistive work to prepare materials for academic sessions or presentations
- Become professional to machine learning algorithm and smart manufacturing system

Korea University, SK-Hynix Research Assistant, from Feb 2016 to Feb 2018. I have worked to

- Design integrated circuits in Cadence environment and do digital logic coding via Verilog language and MATLAB
- Become familiar with wireline data transmission and power management system
- Verify manufactured IC through experimental work and validate the predicted performance of simulation result
- Subsidiary work to create materials for conferences and forums
- Prepare publication in journal paper

Research Proposal, Korea University, Jun 2016

- National R & D Project Research Plan for Multidimensional Smart IT Convergence System Research, Development for Smart IT Convergence Platform, Cooperative research with Korea Advanced Institute of Sci. & Tech., Sungkyunkwan Univ., Korea Univ., developing a self-powered sensor node platform and commercializing it. The total R & D cost supported is 12.4 billion KRW (11.4 M in US Dollar) for 5 years

Bank Teller Project, Korea University, April 2013
Conducted as a course project in Data structure course. Used five different queues to handle the random banking of clients arriving in chronological order and terminates the banking work at a set time. Mainly used C language.

Airplane shoot simulator, HKUST, April 2015
Conducted as a course project in Java computing course. Designed a target simulator that generates nine random targets with given data and allows the user to shoot down the targets. Object-based design on every action and event-driven process. Mainly Used Java and some of Java Script language.

Bamboo Grove Project, HKUST, June 2015
Conducted as a course project in Java computing course. Extracted 100 spread-worthy posts among 207, 787 posts from anonymous Facebook pages named 'Bamboo grove'. Numerically calculated value of how spread-worthy those Facebook posts are based on their inter-relationship with users who either like or leave comments. Used Java language. Made a hardcopy of top 100 valuable posts into a booklet.

## Publication

[1] B. G. Joung, Y. Seo and C. Kim, "A Digital Low-Dropout (DLDO) regulator with -14 dB PSR enhancement technique," IEEE SoC Design Conference (ISOCC), Oct 2016, pp. 353-354
[2] Byung Gun Joung, Wo Jae Lee, Aihua Huang, John W. Sutherland, "Development and Application of a Method for Real Time Motor Fault Detection", Procedia Manufacturing, Volume 49, 2020, pp. 94-98
[3] Dheeraj Peddireddy, Xingyu Fu, Haobo Wang, Byung Gun Joung, Vaneet Aggarwal, John W. Sutherland, Martin Byung-Guk Jun, "Deep Learning Based Approach for Identifying Conventional Machining Processes from CAD Data", Procedia Manufacturing, Volume 48, 2020, pp. 915-925
[4] Dheeraj Peddireddy, Xingyu Fu, Anirudh Shankar, Haobo Wang, Byung Gun Joung, Vaneet Aggarwal, John W. Sutherland, Martin Byung-Guk Jun, "Identifying manufacturability and machining processes using deep 3D convolutional networks", Journal of Manufacturing Processes, Volume 64, 2021, pp.1336-1348

## Professional Experience

1/10/11 - 1/09/13 Sergeant, Republic of Korea Air Force based in Seoul
(1) Military service ROKAF (Republic of Korea Air Force). Selected Koreans have the privilege of working as the Republic of Korea Air Force Special Forces through screening process including an interview
(2) Voluntarily operated the chairman's duties in commemoration of the Republic of Korea Armed Forces Day
(3) Responsible for computer security-based military security systems
(4) Conducted on intranet security, coding, compilation to administrative work

10/23/16 - 10/26/16 Visiting IEEE International SoC Design Conference 2016 (ISOCC 2016), Jeju, Korea.
(1) ISOCC is in process of getting technical co-sponsorship from IEEE CAS Society
(2) Searching for novel SoC solutions to provide ways to cooperate with automotive, robot, and IT industries

2/05/17 - 2/09/17 Visiting IEEE International Solid-State Circuits Conference 2017 (ISSCC 2017), San Francisco, CA, USA.
(1) ISSCC is foremost global forum for solid-state circuits and systems-on-a-chip
(2) Experienced technical papers and educational events related to integrated circuits, including analog, digital, data converters, memory, RF, communications, imagers, medical and MEMS IC's

## Honors and Awards

- Korean National Sci. & Eng. and Honors Scholarship, two times, between 2009 and 2015
- SK-Hynix scholarships awarded to industry-academy scholars, four times, between 2016 and 2018

## Coursework (Completed - Undergraduate)

Data Structure, Logic Circuit Design and Practice, Computer Architecture, Digital Signal Processing, Java Computing, Computer Science and Practice, Computer Language and Practice, Linear Algebra, Electronic Circuit, Communication circuit, Electromagnetic field , Communication engineering design, Sys Model, Analysis & Control

## Coursework (Completed - graduate)

Design of Analog Integrated Circuit, Power Conversion Circuits, Low Noise Circuit Design, Design of Micro-Semiconductor, Digital Integrated Circuit Design, Design of Memory Interface Circuit and Semiconductor Material, Design and Control of Production and Manufacturing Systems, Theory and Design of Control Systems, Machine Learning, Artificial Intelligence