Jung Yun Won

Ph.D. Candidate

Department of Materials Science and Engineering

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Personal Information

- Date of birth: Feb. 12th, 1998
- Nationality: Korean (Republic of)
- Family Status: Single
- Language: First language Korean, fluent in English
- Military service: Currently serving as a **research specialist** (Sep. 2023 **~ Feb. 2027**)

Education

09/2020 – present Integrated M.S.-Ph.D. course in Materials Science and Engineering
Seoul National University, Republic of Korea
Advisor: Prof. Myoung-Gyu Lee

03/2016 – 08/2020 Bachelor of Engineering in Materials Science and Engineering
Korea University, Republic of Korea

Research Interests

- Mechanics of materials
  - Advanced constitutive modeling and finite element (FE) analysis
  - Experimental mechanics and full-field measurements
- Tribology and wear
  - Friction and wear in automotive brake system
  - Multi-scale contact and friction modelling in FE simulations
  - Surface roughness and topology of materials (metals, composites, etc.)
- Failure models
  - Ductile fracture criterion and damage models
  - Interfacial damage models
- AI-assisted material characterization
  - Surrogate modelling using neural networks
  - Machine learning for solving inverse problems

Publications

As a first author

[*Submitted*] **Won J. Y.**, Lee M.-G., *"Topology evolution-based wear model for brake pads in iterative finite element analysis with neural network surrogate of multi-scale friction model"*, SSRN 5391584, submitted to Friction

[*In preparation*] **Won J. Y.,** Moon C., Lee M.-G., "*Identification of mixed-mode cohesive zone model for interfacial fracture of corrosion resistant alloy cladded sheet using integrated finite element method – neural network*"

[1] **Won J.Y.**, Seo H., Kim Y., Jeong H., Kyeong J., Oh W., Lee M.-G., *"Multi-scale friction model for automotive brake system incorporating tribological effects of surface asperities"*, **Mater. Des.**, 256, 114239 (2025)

[2] **Won J.Y.**, Kim C., Hong S., Yoon H.-S., Park J.K., Lee M.-G., *"Evaluation of crush performance of extruded aluminum alloy tubes based on finite element analysis with ductile fracture modeling"*, **Thin-Walled Struct.**, 200 (July) 111937 (2024)

[3] **Won J.Y**., Hong S., Nam B., Jung J.B., KimY., Lee M.-G., *"Identification of plasticity and fracture models for automotive extruded aluminum parts using finite element model updating algorithm"*, **JOM** (The Journal of The Minerals, Metals & Materials Society (TMS)), 75, 5479-5493 (2023)

[4] Moon C.M., **Won J.Y.**, Lee K., Lee J.W., Kim S.-W., Lee M.-G., *"Mechanical behavior and interface damage of carbon steel-stainless steel corrosion resisted-alloy (CRA) cladded plate: hybrid analysis based on experiment and finite element modeling"*, **Mater. Sci. Eng. A**, 852, 143697 (2022)

As a co-author

[*Under review*] Min K.M., **Won J.Y.**, Hu X., Bong H.J., *"Unraveling Deformation Mechanisms in CP-Ti via Crystal Plasticity: Direction-Dependent Surface Roughness Evolution"*, submitted to Int. J. Plas.

[*Under review*] Hong S., Lee J., Kyeong J., **Won J.Y.**, Oh W., Lee M.-G., *"Integrated Experimental and Numerical Investigation of Fracture Onset in Automotive Components Using Finite Element Analysis"*, submitted to Mater. Des.

[*Under review*] Baek M., **Won J.Y.**, Shin G., Lee S.J., Kang M., Lee M.-G., "*Relationship Between Tensile/Bending Properties and Crush Performance Indicators of Automotive 6000-Series Aluminum Extrusions*", submitted to Trans. Mater. Proc.

[*In preparation*] Lee J.-H., Lee W.-J., Kang S., **Won J.Y.**, Lim E.-S., Hwang W.-Y., Lee M.-G., Kang S.-K., "*Highly sensitive mechanical monitoring with geometry optimization of meta-crack strain sensor*", invited paper in Small Struct.

[1] Kim Y., Kim T., Kim H., **Won J.Y.**, Sim G.-J., Lee M.-G., *"Constitutive modeling of nonlinear, anisotropic, time-dependent polymer friction composites"*, **Int. J. Mech. Sci**., 305, 110737 (2025)

[2] Jo S.Y., Sim G-J, Park E., Kim H., **Won J.Y.**, Park J., Lee M.-G., *"Effect of solder void on mechanical and thermal properties of flip-chip light-emitting diode: statistical analysis based on finite element modeling"*, **HELIYON**, 10 (12), e33242 (2024)

[3] Jeong Y.M., Hong S.J., **Won J.Y.**, Kim C., Lee M.-G., *"A practical inverse identification of Johnson-Cook parameters at intermediate strain rates using Split Hopkinson Pressure Bar test"*, **Met Mater Int.**, 30, 2093-2109 (2024)

Awards and Honors

12/2024	**Best Paper Award** for *"The Finite Element Modeling of Multi-Scale Friction and Wear in Automotive Brake System",* at the 7th International Conference on Materials and Reliability (ICMR-2024), organized by the Korean Society of Mechanical Engineers (KSME)
10/2024	**Excellence Paper Award (first place)** for *"A novel multi-scale friction model: application to FE simulation of automotive brake system"*, at Fall Conference of the Korean Tribology Society (KTS)
10/2023	**Student Oral Presentation Excellence Award** for *"Plasticity and fracture modeling of automotive aluminum extrusion parts using an inverse engineering approach"*, at Fall Conference of the Korean Institute of Metals and Materials (KIM)
10/2021	**Poster Presentation Excellence Award** for *"Experiment and numerical analysis of cohesive interface in corrosion resistance alloy clad plate"*, at Fall Conference of the Korean Institute of Metals and Materials (KIM)
03,09/2025	BK21 scholarship, SNU
09/2024	BK21 scholarship, SNU
03/2023	Research assistant scholarship (100%), SNU
03/2022	Academic excellence scholarship (10%), SNU
03,09/2021	BK21 scholarship, SNU
09/2020	BK21 scholarship, SNU

Participated Research Projects

In Seoul National University (P.I.: Prof. M.-G. Lee)

04/2024 ~ *Numerical modeling of slurry flow in CMP process*
(Supported by Samsung Electronics)
- Developing CFD simulation (ANSYS Fluent) to demonstrate the slurry flow during the CMP process under various conditions

04/2024 ~ *Relationship between mechanical properties and crushing performance of aluminum alloy extrusions*
(Supported by Hyundai Motors Company)
- Constructing experimental database and finite element analysis to define relationships between material properties and crush performance

08/2023 – 12/2024 *Multi-scale friction model in consideration of surface roughness and corrosion environment*
(Supported by Hyundai Mobis)
- Proposing a novel multi-scale friction model and characterization method based on topography measurements and braking tests

03/2022 – 06/2023 *Inverse engineering for obtaining material plasticity and ductile fracture*
(Supported by Hyundai Motors Company)
- Developing GUI tool for finite element model updating to achieve plasticity and fracture properties from component-scale bending tests

09/2020 – 12/2022 *Finite element modeling of STS-Steel/Ni alloy-Steel Clad sheets for line pipe and pressure vessel*
(Supported by grants from Korea Planning & Evaluation Institute of Industrial Technology (KEIT))
- Material property characterization of Clad sheets and finite element analysis for manufacturing pipe and pressure vessel

09/2020 – 12/2021 *Construct material database of extruded Al alloys for crash performance evaluation*
(Supported by Hyundai Motors Company)
- Experimental characterization of plasticity and fracture of aluminum extrusions and investigation of crush performance

03/2021 – 02/2023 *Graduate Educational Traineeship Program for Future Steels/Metals*
(Supported by grants from Korea Institute for Advancement of Technology (KIAT))
- Education, training, and industry-academia research presentation in the field of steels & metals

Conference proceedings / presentations *(oral only)*

International conferences

[1] **Won J.Y.**, Seo H., Kim Y., Jeong H., Kyeong J., Lee K.Y., Lee M.-G., *"Multi-scale friction model for finite element analysis of automotive brake pad-disc components"*, Tribology International Conference (Tribology 2025), Albufeira/Algarve, Portugal, April 2025.

[2] **Won J.Y.**, Kim Y., T.-H. Kim, Jeong H., Kyeong J., Lee K.Y., Lee M.-G., *"Finite element modeling of multi-scale friction and wear in automotive brake system"*, 7th International Conference on Materials and Reliability (ICMR-2024), Busan, Korea, December 2024.

[3] **Won J.Y.**, Hong S., Kim C., Yoon H., Lee M.-G., *"Evaluation of crushing performance for extruded aluminum alloy tubes based on finite element simulation with ductile fracture"*, the 4th Asian Pacific Symposium on Technology of Plasticity (APSTP), Gangneung, Korea, October 2023.

[4] **Won J.Y.**, Moon C., Han H.N., Kim S.-W., Lee M.-G., *"Identification of mixed-mode cohesive zone model for predicting interfacial fracture of clad sheet using integrated finite element simulation and neural network"*, the 14th International Conference on Numerical Methods in Industrial Forming Processes (NUMIFORM), Krakow, Poland, June 2023.

[5] **Won J.Y.**, Moon C., Kim S.-W., Lee M.-G., *"Characterization of interfacial mechanical properties of carbon steel-stainless steel corrosion resistant clad plate"*, the 19th International Conference on Strength of Materials (ICSMA), Metz, France, June 2022.

Domestic conferences

[1] **Won J.Y.**, Jeong H., Kyeong J., Oh W.J., Lee M.-G., "*Finite Element Analysis of Automotive Brake Pads Using Topology-Evolution Wear Model and Neural Network Surrogate Friction Model*", Fall Conference of the Korean Tribology Society (KTS), Jeju, Korea, October 2025.

[2] **Won J.Y.**, Seo H., Kim Y., Jeong H., Kyeong J., Oh W.J., Lee M.-G., *"Multi-scale friction model for automotive brake disc-pad system considering surface characteristics and mechanical properties"*, Spring Conference of the Korean Society of Automotive Engineers (KSAE), Jeju, Korea, May 2025.

[3] **Won J.Y.**, Kim Y., T.-H. Kim, Jeong H., Kyeong J., Oh W.J., Lee M.-G., *"A novel multi-scale friction model: application to FE simulation of automotive brake system"*, Fall Conference of the Korean Tribology Society (KTS), Yeosu, Korea, October 2024.

[4] **Won J.Y**., Hong S., Nam B., Jung J.B., KimY., Kim C., Lee M.-G., *"Plasticity and fracture modeling of automotive aluminum extrusion parts using an inverse engineering approach"*, Fall Conference of the Korean Institute of Metals and Materials (KIM), Daegu, Korea, October 2023.

[5] **Won J.Y.**, Moon C., Kim S.-W., Lee M.-G., *"An integrated finite element analysis – neural network for identifying interface properties of hot-rolled corrosion resistance alloy (CRA) cladding plate"*, 36th Conference on Advanced Structural Materials by the Korean Institute of Metals and Materials (KIM), Gyeongju, Korea, November 2022.

[6] **Won J.Y.**, Moon C., Park J., Paik M., Kim S.-W., Lee M.-G., *"Hybrid Experiment-Numerical Method to Identify the Interface Properties of a Clad Plate Using Integrated FE Analysis and Machine Learning"*, Fall Conference of the Korean Institute of Metals and Materials (KIM), Jeju, Korea, October 2022.

[7] **Won J.Y.**, Hong S., Kim C., Lee M.-G., *"Determination of Hosford-Coulomb ductile fracture model parameters and evaluation of crush characteristics of automotive aluminum extrusions"*, Spring Conference of the Korean Society for Technology of Plasticity and materials processing (KSTP), Yeosu, Korea, May 2022.

[8] **Won J.Y.**, Moon C., Kim S.-W., Lee M.-G., *"Mechanical properties and microstructural analysis for finite element modeling of clad piping process"*, Fall Conference of the Korean Society for Technology of Plasticity and materials processing (KSTP), Yeosu, Korea, May 2021.

Skills

- Coding skills: FORTRAN (for ABAQUS user subroutines such as UMAT, VUMAT, UINTER, FRIC, UEXTERNALDB, etc.), Python (including TensorFlow, Pytorch, NumPy, etc.), Matlab
- GUI development experiment using Matlab App Designer
- Simulation software:
  - FEM: ABAQUS, LS-DYNA
  - CFD: Ansys Fluent
- Experiments: Reduced-scale brake dynamometer test, confocal laser microscope, various tensile/bending/compression tests using Universal Testing Machine (UTM), Digital Image Correlation (DIC), Forming Limit Diagram (FLD) test, etc.