NAMWOO KANG (강남우)

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RESEARCH INTERESTS

- **AI-based Design** / Generative Design / Data-driven Design / Deep Learning/ Machine Learning
- **Design Optimization**/ Multidisciplinary Design Optimization/ Simulation-based Optimization
- **Design for Market Systems**/ Consumer Preference Models/ Big Data Analysis
- **Smart Mobility**/ Shared Autonomous Electric Vehicle/ Personal Mobility
- **Human-Computer Interaction**/ User Experience

EDUCATION

University of Michigan — Ann Arbor, MI
Ph.D. Design Science (Mechanical Engineering + Marketing) — 2011 – 2014
Co-advisors: Prof. Panos Papalambros, Prof. Fred Feinberg

Seoul National University — Seoul, Korea
M.S. Technology and Management — 2005 – 2007
B.S. Mechanical and Aerospace Engineering — 2000 – 2005

ACADEMIC APPOINTMENTS

Sookmyung Women's University — Seoul, Korea
Assistant Professor, Mechanical Systems Engineering — 2018 – Present

KAIST — Daejeon, Korea
Assistant Professor, K-School — 2016 – 2018

University of Michigan — Ann Arbor, MI, USA
Research Fellow and Adjunct Lecturer, Mechanical Engineering — 2014 – 2016

INDUSTRIAL EXPERIENCE

Hyundai Motor Company — Jeonbuk, Korea
Research Engineer, R&D Center — 2007 – 2010

TEACHING EXPERIENCES

Sookmyung Women's University — 2018 - Present
- Solid Mechanics (Undergraduate course)
- Engineering Design and Practice (Undergraduate course)
- Automotive Engineering (Undergraduate course)
- Engineering Mathematics (Undergraduate course)
- Programming Basics and Practice (Undergraduate course)
- Deep Learning and Engineering Design (Graduate course)
- Design Optimization (Graduate course)
- Multidisciplinary Design Optimization (Graduate course)
- Advanced Intelligent Vehicles: Deep Learning I (Graduate course)
- Mechanical Engineering Seminar: Deep Learning II (Graduate course)

KAIST 2016 - 2018

- Advanced Multidisciplinary Capstone Design (Graduate course)
- Multidisciplinary Capstone Design I (Undergraduate course)
- Multidisciplinary Capstone Design II (Undergraduate course)
- Design Thinking for Startup (Undergraduate and graduate course)
- Startup Management Practice (Graduate course)
- Entrepreneurship (Graduate course)
- Capstone Design I (Undergraduate course) - Guest
- Capstone Design II (Undergraduate course) - Guest

University of Michigan 2012 – 2016

- Design Optimization (Graduate course)
- Analytical Product Design (Graduate course) - Guest
- Product Design Process (Graduate course) - Guest
- Design and Manufacturing (Undergraduate course) - Guest

AWARDS

- 미래기술상, 한국전산구조공학회 2019
- Dow Distinguished Award, Dow Sustainability Fellows, University of Michigan 2014

MEMBERSHIPS

- Korean Society of Mechanical Engineers (KSME) – **CAE 및 응용역학부문 편집이사**
- Korean Institute of Information Scientists and Engineers (KIISE) – **인공지능소사이어티 이사**
- Computational Structural Engineering Institute of Korea (COSEIK)
- Korean Society for Design Optimization (KSDO)
- Korean Society for Prognostics and Health Management (KSPHM)
- American Society of Mechanical Engineers (ASME)
- International Society for Structural and Multidisciplinary Optimization (ISSMO)
- Design Society

PUBLICATIONS (Downloads are available at the web: www.SmartDesignLab.org)

*corresponding author

Journal Papers under Review

[3] **Kang, N.**, Ren, Y., Feinberg, F. M., and Papalambros, P. Y. "Form + Function: Optimizing Aesthetic Product Design via Adaptive, Geometrized Preference Elicitation", *Marketing Science*

[2] Jung, Y., Lee, J., Lee, M., **Kang, N.***, and Lee, I. "Probabilistic Analytical Target Cascading using Kernel Density Estimation for Accurate Uncertainty Propagation", *Structural and Multidisciplinary Optimization*

[1] Lee, U., **Kang, N.***, and Lee, I. "Choice Data Generation using Usage Scenarios and Discounted Cash Flow Analysis", *Journal of Choice Modelling*

Journal Papers (International)

[17] Lee, U., **Kang, N.***, and Lee, I. "Shared Autonomous Electric Vehicle Design and Operations Under Uncertainties: A Reliability-based Design Optimization Approach", *Structural and Multidisciplinary Optimization* (accepted)

[16] Oh, S., Jung, Y., Kim, S., Lee, I., and **Kang, N.*** (2019) "Deep Generative Design: Integration of Topology Optimization and Generative Models", *Journal of Mechanical Design*, Vol. 141, No. 11, 111405.

[15] Kim, S., Chang, J., Park, H. H., Song, S. U., Cha, C. B., Kim, J. W., **Kang, N.*** (2019) "Autonomous Taxi Service Design and User Experience", *International Journal of Human-Computer Interaction* (accepted)

[14] **Kang, N.**, Feinberg, F. M., and Papalambros, P. Y. (2019) "Designing Profitable Joint Product-Service Channels", *Design Science* , Vol. 5, e12.

[13] Koh, S. R., Hur, S. H., and **Kang, N.*** (2019) "Feasibility Study on the Korean Government's Hybrid Conversion Project of Small Diesel Trucks for Parcel Delivery Services", *Journal of Cleaner Production,* Vol. 232, pp.559-574.

[12] Lee, U., **Kang, N.***, and Lee, I. (2019) "Selection of Optimal Target Reliability in RBDO through Reliability-based Design for Market Systems (RBDMS) and Application to Electric Vehicle Design", *Structural and Multidisciplinary Optimization*, Vol. 60, No. 3, pp.949–963.

[11] **Kang, N.**, Bayrak, A., and Papalambros, P. Y. (2018) "Robustness and Real Options for Vehicle Design and Investment Decisions under Gas Price and Regulatory Uncertainties", *Journal of Mechanical Design*, Vol. 140, No. 10, 101404.

[10] Jung, Y., **Kang, N.**, and Lee I. (2018) "Modified Augmented Lagrangian Coordination and Alternating Direction Method of Multipliers with Parallelization in Non-hierarchical Analytical Target Cascading", *Structural and Multidisciplinary Optimization*, Vol. 58, No. 2, pp. 555-573.

[9] **Kang, N.**, Burnap, A., Kim, K. H., Reed, M. P., and Papalambros, P. Y. (2017) "Influence of Seat Form and Comfort Rating on Willingness to Pay", *International Journal of Vehicle Design*, Vol. 75, Nos. 1/2/3/4, pp.75-90.

[8] **Kang, N.**, Feinberg, F. M., and Papalambros, P. Y. (2017) "Autonomous Electric Vehicle Sharing System Design", *Journal of Mechanical Design*, Vol. 139, No. 1, 011402.

[7] D'Souza, K., Bayrak, A. E., **Kang, N.**, Wang, H., Altin, B., Barton, K., Hu, J., Papalambros, P. Y., Epureanu, B. I., and Gerth, R. (2016) "An Integrated Design Approach for Evaluating the Effectiveness and Cost of a Conventional and Modular Fleet", *Journal of Defense Modeling and Simulation*, Vol. 13, No. 4, pp. 381-397.

[6] Bayrak, A., **Kang, N.***, and Papalambros, P. Y. (2016) "Decomposition Based Design Optimization of Hybrid Electric Powertrain Architectures: Simultaneous Configuration and Sizing Design", *Journal of Mechanical Design*, Vol. 138, No. 7, 071405

[5] **Kang, N.**, Ren, Y., Feinberg, F. M., and Papalambros, P. Y. (2016) "Public Investment and Electric Vehicle Design: A Model-based Market Analysis Framework with Application to a USA-China Comparison Study", *Design Science*, Vol. 2, e6.

[4] **Kang, N.**, Feinberg, F. M., and Papalambros, P. Y. (2015) "Integrated Decision Making in Electric Vehicle and Charging Station Location Network Design", *Journal of Mechanical Design,* Vol. 137, No. 6, 061402.

[3] **Kang, N.**, Kokkolaras, M., Papalambros, P. Y., Park, J., Na, W., Yoo, S., and Featherman, D. (2014) "Optimal Design of Commercial Vehicle Systems Using Analytical Target Cascading", *Structural and Multidisciplinary Optimization*, Vol. 50, No. 6, pp. 1103-1114.

[2] **Kang, N.**, Kokkolaras, M., and Papalambros, P. Y. (2014) "Solving Multiobjective Optimization Problem Using Quasi-separable MDO Formulations and Analytical Target Cascading", *Structural and Multidisciplinary Optimization*, Vol. 50, No. 5, pp. 849-859.

[1] **Kang, N.**, Kim, J. and Park, Y. (2007) "Integration of Marketing Domain and R&D Domain in NPD Design Process", *Industrial Management & Data Systems,* Vol. 107, No. 6, pp. 780-801.

Journal Papers (Korean)

[2] **Kang, N.** (2019) "제너레이티브 디자인과 인공지능 기반 설계 자동화", 기계저널, Vol. 59, No. 8, pp. 24-28.

[1] Kwon, Y., Byun, J., and **Kang, N.** (2019) "소형 경유 트럭에 대한 친환경 트럭으로의 개조 기술 선택에 관한 연구", 대한교통학회지, Vol. 37, No. 2, pp. 135-147.

Conference Proceedings (International)

[14] Kim, S., Lee, S., and **Kang, N.*** (2019) "AI-based Design Automation: Generative Design + Generative Models", *KSME-JSME Joint Symposium on Computational Mechanics & CAE*, Kawagoe, Japan, Sep 17-18.

[13] Yoo, S., Lee, S., Kim, S., and **Kang, N.*** (2019) "Gender Differences in User Experience of Autonomous Taxi Service", *The 3rd Cultural DNA Workshop 2019*, Daejeon, Korea, June 25.

[12] Oh, S., Jung, Y., Lee, I., and **Kang, N.*** (2018) "Design Automation by Integrating Generative Adversarial Networks and Topology Optimization", *Proceedings of the ASME 2018 International Design & Engineering Technical Conferences*, Quebec City, Quebec, Canada, Aug 26-Aug 29, DETC2018-85506.

[11] Lee, U., **Kang, N.***, and Lee, I. (2017) "Reliability-based Design Optimization (RBDO) for Electric Vehicle Market Systems", *Proceedings of the ASME 2017 International Design & Engineering Technical Conferences*, Charlotte, Aug 6-Aug 9, DETC2017-68045.

[10] Jung, Y., **Kang, N.**, and Lee I. (2017) "Convergence Strategy for Parallel Solving of Analytical Target Cascading with Augmented Lagrangian Coordination", *Proceedings to the 12th World Congress on Structural and Multidisciplinary Optimization*, Braunschweig, Germany, June 5-June 9.

[9] Min, D. A., **Kang, N.**, Rhim, J., and Lee, J. H. (2017) "A Sense of Dichotomy in Household Space and Smartphone", *The 2nd Cultural DNA Workshop 2017*, Daejeon, Korea, Jan 13.

[8] **Kang, N.**, Bayrak, A., and Papalambros, P. Y. (2016) "A Real Options Approach to Hybrid Electric Vehicle Architecture Design for Flexibility", *Proceedings of the ASME 2016 International Design & Engineering Technical Conferences*, Charlotte, Aug 21-Aug 24, DETC2016-60247.

[7] **Kang, N.**, Feinberg, F. M., and Papalambros, P. Y. (2015) "Autonomous Electric Vehicle Sharing System Design", *Proceedings of the ASME 2015 International Design & Engineering Technical Conferences*, Boston, Aug 2-Aug 5, DETC2015-46491 (*Dow Distinguished Award*)

[6] Bayrak, A., **Kang, N.***, and Papalambros, P. Y. (2015) "Decomposition Based Design Optimization of Hybrid Electric Powertrain Architectures: Simultaneous Configuration and Sizing Design", *Proceedings of the ASME 2015 International Design & Engineering Technical Conferences*, Boston, Aug 2-Aug 5, DETC2015-46861 (*corresponding author)

[5] **Kang, N.**, Emmanoulopoulos, M., Ren, Y., Feinberg, F. M., and Papalambros, P. Y. (2015) "A Framework for Quantitative Analysis of Government Policy Influence on Electric Vehicle Market", *Proceedings of the 20th International Conference on Engineering Design*, Milan, Italy, Jul 27-Jul 30, ISBN: 978-1-904670-68-1.

[4] **Kang, N.**, Feinberg, F. M., and Papalambros, P. Y. (2014) "Integrated Decision Making in Electric Vehicle and Charging Station Location Network Design", *Proceedings of the ASME 2014 International Design & Engineering Technical Conferences*, Buffalo, Aug 17-Aug 20, doi:10.1115/DETC2014-35270.

[3] **Kang, N.**, Feinberg, F. M., and Papalambros, P. Y. (2013) "A Framework for Enterprise-driven Product Service Systems Design", *Proceedings of the 19th International Conference on Engineering Design*, Seoul, Korea, Aug 4-Aug 7, ISBN: 978-1-904670-47-6.

[2] **Kang, N.**, Kokkolaras, M., and Papalambros, P. Y. (2013) "Solving Multiobjective Optimization Problem Using Quasi-separable MDO Formulations and Analytical Target Cascading", *Proceedings to the 10th World Congress on Structural and Multidisciplinary Optimization*, Orlando, May 19-24.

[1] **Kang, N.**, Kokkolaras, M., Papalambros, P. Y., Park, J., Na, W., Yoo, S., and Featherman, D. (2012) "Optimal Design of Commercial Vehicle Systems Using Analytical Target Cascading", *Proceedings of the 14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Indianapolis, Sep 17-19, AIAA 2012-5524.

Conference Proceedings (Korean)

[14] Jang, S., Youn, Y., and Kang, N.* (2019) "강화학습을 이용한 제너레이티브 디자인", 대한기계학회 2019년 학술대회

[13] Yoo, S., Lee, S., Kim, S., Kim, E., and Kang, N.* (2019) "자율주행 불안감 해소를 위한 Human-AI Interaction 설계", 대한기계학회 2019년 학술대회

[12] Lee, S., Yoo, S., Kim, S., Kim, E., and Kang, N.* (2019) "사용자 경험 데이터 주도의 자율주행 택시 기술 수용성 분석",

대한기계학회 2019년 학술대회 (포스터)

[11] Kim, S. and Kang, N.* (2019) "서울시 자율주행 택시 서비스 디지털트윈 설계를 위한 사전 연구: 딥러닝과 빅데이터를 이용한 승객 수요 예측", 대한기계학회 2019년 학술대회 (포스터)

[10] Yoo, S. and Kang, N.* (2019) "3D CNN을 이용한 CAD 모델의 제조 단가 예측", 대한기계학회 2019년 학술대회 (포스터)

[9] Kim, S., Lee, S., Yoo, S., Kim, E., and **Kang, N.*** (2019) "Generative Design: Engineering Design + Deep Learning", The AI Korea 2019 컨퍼런스 (포스터).

[8] Kim, S., Lee, S., and **Kang, N.*** (2019) "딥러닝 기반 제너레이티브 디자인", 대한기계학회 CAE 및 응용역학부문 2019년도 춘계학술대회.

[7] Kim, S. and **Kang, N.*** (2019) "이상치 탐지를 위한 오토인코더와 CNN의 비교", 한국PHM학회 정기학술대회 (포스터).

[6] **Kang, N.** (2019) "최적 설계 분야의 딥러닝 연구 동향", 한국전산구조공학회 정기학술대회.

[5] Lee, U., **Kang, N.**, and Lee, I. (2018) "Improving the Accuracy of Consumer Preference Estimation Using Economic Simulation Model", 한국전산역학회.

[4] Lee, U., **Kang, N.**, and Lee, I. (2017) "전기차 시장을 고려한 신뢰성 기반 최적 설계", 대한기계학회, pp. 89-90.

[3] Jung, Y., **Kang, N.**, and Lee, I. (2017) "Augmented Lagrangian Coordination을 이용한 Analytical Target Cascading 에서의 Parallelization 도입 및 수렴전략 개발", 대한기계학회, pp. 188-189.

[2] Kim, J., **Kang, N.**, and Park, Y. (2009) "컨조인트와 트리즈의 통합에 관한 연구", 기술경영경제학회, pp. 627-647.

[1] **Kang, N.**, Kim, J. and Park, Y. (2006) "신제품 개발 프로세스에서 마케팅 영역과 제조 영역의 통합적 설계 : Conjoint 분석과 Taguchi 방법의 순차적 결합", 한국경영과학회, Vol. 2006, No. 5, pp. 365-372.

Book Chapters

[2] Min, D. A., **Kang, N.**, Rhim, J., and Lee, J. H. (2018) "A Sense of Dichotomy in Household Space and Smartphone", Computational Studies on Cultural Variation and Heredity, pp. 95-105, Springer, Singapore.

[1] Papalambros, P. Y. and **Kang, N.** (2015) "Systems Design - Chapter 8", Principles of Optimal Design (3rd Edition), Cambridge University Press, New York.

PATENTS

[6] "전기자동차의 운전자를 위한 배터리의 충전 및 교체 정보 제공 방법 및 시스템", 출원번호: 10-2019-0063430.
[5] "무인 택시 시스템을 이용한 지역 광고 시스템 및 그 방법", 출원번호: 10-2018-0120545.
[4] "가상 정거장을 이용한 무인 택시 시스템 및 그것을 이용한 무인 택시 매칭 방법", 출원번호: 10-2018-0120544.
[3] "향수 제조 시스템", 출원번호: 10-2018-0013024.
[2] "스마트 디퓨저 시스템", 출원번호: 10-2018-0013023.
[1] "프로젝트 과정 공유시스템 및 방법", 출원번호: 10-2017-0098077.

INVITED PRESENTATIONS

- ETRI, Intelligent Manufacturing Convergence Lab, "AI based Product Design and Research Trend" Nov, 2019
- Hyundai Motor Company, Chassis CAE Team, "Vehicle Design and Deep Learning Research Trend", Nov, 2019
- Korean Society for Computational Mechanics, "Intelligent Design Automation: AI-based Generative Design" Nov, 2019
- KAIST, Center for Anthropocene Studies, "Future Mobility Design by AI" Nov, 2019
- KAIST, Mechanical Engineering, "ME based AI: Generative Design" Oct, 2019
- Korea Institute of Machinery & Materials, KIMM AI Summer School, "Generative Models: Theory and Practice" Aug, 2019
- Korean Society of Mechanical Engineers, 2019 Artificial Intelligence Summer School, "Generative Design" Aug, 2019
- Korea Institute of Machinery & Materials, "Generative Design and AI-based Design Automation" (2nd) July, 2019
- Hyundai Motor Company, "Deep Learning based Design Optimization and Generative Design" Jun, 2019

- Korea Institute of Machinery & Materials, Industry 4.0 R&D Center, "Generative Design and AI-based Design Automation" Jun, 2019
- Computational Structural Engineering Institute of Korea, "Deep Learning based Generative Design" Apr, 2019
- Korean Society for Design Optimization, "Generative Design by Deep Learning" Jan, 2019
- Korea Software Congress, "Form + Function: Product Design by Machine Learning" Dec, 2018
- Society for Computational Design and Engineering, AI+Engineering Tutorial, "Design Automation by Deep Learning" Nov, 2018
- University of Michigan, Design Science, Ann Arbor, "What is a Good Mechanical Design?" Sep, 2018
- Computational Structural Engineering Institute of Korea, New Technology Tutorial, "Design Optimization" Aug, 2018
- KAIST, Advanced Leadership Program for Future Transport and Urban Development, "Creative Design Thinking" Jun, 2018
- KAIST, Institution of Startup KAIST, "Design Thinking for Startup" Mar, 2018
- KAIST, Industrial Design, "Enterprise-driven Multidisciplinary Design" Apr, 2017
- KAIST, Advanced Leadership Program for Future Transport and Urban Development, "Design for EV Market Systems" Apr, 2017
- KAIST, Industrial & Systems Engineering, "Enterprise-driven Design Thinking" Dec, 2016
- INFORMS, Annual Meeting, Philadelphia, "Design for EV Market Systems" Nov, 2015
- Seoul National University, Mechanical Engineering, Korea, "Design Science" May, 2015
- Seoul National University, Industrial Engineering, Korea, "Design Science" May, 2015
- KAIST, Mechanical Engineering, "Design Science" May, 2015
- KAIST, Graduate School of Culture Technology, "Design Science" Jun, 2015
- Hanyang University, Mechanical Engineering, "Design Science" Jun, 2015
- Altair Engineering, Symposium, Ann Arbor, "Optimal Design of Commercial Vehicle Systems Using Analytical Target Cascading and HyperWorks" Apr, 2015

PROFESSIONAL SERVICE

Reviewer

- Journal of Mechanical Design
- Structural and Multidisciplinary Optimization
- Journal of Mechanical Engineering Science
- Design Science
- Research in Engineering Design
- Systems Engineering
- Journal of Manufacturing Science and Engineering
- International Journal of Vehicle Design
- Journal of Mechanical Science and Technology
- Computers in Human Behavior
- Transactions of the KSME A
- Journal of the HCI Society of Korea
- ASME International Design Engineering Technical Conference (IDETC)
- International Conference on Engineering Design (ICED)