

NAMWOO KANG (강남우)

Assistant Professor, Department of Mechanical Systems Engineering, Sookmyung Women's University

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RESEARCH INTERESTS

- **Data-driven Design**/ AI-based Design Automation/ Generative Design/ Deep Learning/ Machine Learning
- **Design Optimization**/ Multidisciplinary Design Optimization/ Simulation-based Optimization
- **Design for Market Systems**/ Consumer Preference Models/ Big Data
- **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
<ul style="list-style-type: none">• 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

- | | |
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| • 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* (conditionally 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., Yoon, 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

- | | |
|---|------------|
| • 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” (2 nd) | 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)