Yi Ren, Ph.D.

Postdoctoral Research Fellow

Optimal Design Lab, Univ. of Michigan
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Education

University of Michigan, Ann Arbor, MI 2012
Ph.D. , Mechanical Engineering
Advisor: Panos Y. Papalambros
Committee members: Richard Gonzalez, Noboru Kikuchi, George Michailidis
Dissertation: *Design Preference Elicitation, Identification and Estimation*

University of Michigan, Ann Arbor, MI 2009
Master of Science, Mechanical Engineering
Thesis: *An Interactive Modeling Environment For Automotive Exterior Design*

Tsinghua University, Beijing, China 2007
Bachelor of Engineering, Automotive Engineering

Research Interests

Design optimization, product design, configuration design, human-computer interaction, machine learning

Research Experiences

University of Michigan, Ann Arbor, MI 2012 - present
Research Fellow, Optimal Design Laboratory
I work with Professor Papalambros on design crowdsourcing and optimal configuration design. My current research projects include: (1) optimal design and control of hybrid powertrain architectures; (2) developing learning mechanisms to enhance automatic design creation by using crowd-generated designs; and (3) discovering consumer perceptual tradeoffs between product styling and functions through active statistical learning.

University of Michigan, Ann Arbor, MI 2008 - 2011
Research Assistant, Optimal Design Laboratory
Introduced machine learning and evolutionary computation to study quantitatively crowd-scale interactive design preference elicitation.

Tsinghua University, Beijing, China 2003
Undergraduate Research Assistant, Department of Automotive Engineering
Developed material models for honeycomb structures used in vehicle crush simulations.

Publications

Journal Articles

[1] **Ren, Y.** and Papalambros, P. Y., "A Design Preference Elicitation Query as an Optimization Process", *ASME Journal of Mechanical Design*, volume 133, issue 11, 2011.

[2] Burnap, A., **Ren, Y.**, Papalambros, P. Y., Gonzalez, R. and Gerth, R., "A Study of Crowd Ability and its Influence on Crowdsourced Evaluation of Design Concepts", *ASME Journal of Mechanical Design* (submitted).

[3] Bayrak, A. E., **Ren, Y.,** and Papalambros, P. Y., "Optimal Architecture Design of Dual-Mode Hybrid-electric Powertrain", *IEEE Transactions on Vehicular Technology* (submitted).

[4] **Ren, Y.**, Scott, C. and Papalambros, P. Y., "A Scalable Preference Elicitation Algorithm Using Group Generalized Binary Search", *IEEE Transactions on Knowledge and Data Engineering* (submitted).

Conference Papers

[5] **Ren, Y.** and Papalambros, P. Y., "Design Preference Elicitation, Derivative-Free Optimization and Support Vector Machine Search", *In Proceedings of the ASME International Design Engineering Technical Conferences*, DETC2010-28475, 2010.

[6] **Ren, Y.** and Papalambros, P. Y., "Design Preference Elicitation: Exploration and Learning", *In Proceedings of the 18th International Conference on Engineering Design*, volume 10, page 149-158, 2011.

[7] **Ren, Y.** and Papalambros, P. Y., "Design Preference Elicitation Using Efficient Global Optimization", *In Proceedings of the ASME International Design Engineering Technical Conferences*, DETC2011-48316, 2011.

[8] **Ren, Y.** and Papalambros, P. Y., "On the Use of Active Learning in Engineering Design", *In Proceedings of the ASME International Design Engineering Technical Conferences*, DETC2012-70624, 2012.

[9] **Ren, Y.** and Papalambros, P. Y., "On Design Preference Elicitation with Crowd Implicit Feedback", *In Proceedings of the ASME International Design Engineering Technical Conferences*, DETC2012-70605, 2012.

[10] **Ren, Y.**, Scott, C. and Papalambros, P. Y., "A Scalable Preference Elicitation Algorithm Using Group Generalized Binary Search", *In Proceedings of the ASME International Design Engineering Technical Conferences*, DETC2013-13059, 2013.

[11] Burnap, A., **Ren, Y.,** Papalambros, P. Y., Gonzalez, R. and Gerth, R., "A Simulation Based Estimation of Crowd Ability and its Influence on Crowdsourced Evaluation of Design Concepts", *In Proceedings of the ASME International Design Engineering Technical Conferences*, DETC2013-13020, 2013.

[12] Bayrak, A. E., **Ren, Y.,** and Papalambros, P. Y., "Optimal Design of Hybrid-Electric Vehicle Architectures Using Auto-Generation of Feasible Driving Modes", *In Proceedings of the ASME International Design Engineering Technical Conferences*, DETC2013-13043, 2013.

[13] **Ren, Y.,** Burnap, A. and Papalambros, P. Y., "Quantification of Perceptual Design Attributes Using a Crowd", *In Proceedings of the 19th International Conference on Engineering Design*, 2013.

In Preparation

[14] Kang, N., **Ren, Y.,** Feinberg, F., and Papalambros, P. Y., "Eliciting Complex Consumer Preferences through Adaptive Questionnaires", to be submitted to Marketing Science.

[15] Bayrak, A. E., **Ren, Y.,** and Papalambros, P. Y., "Optimal Architecture Design of Dual-Mode Hybrid-electric Powertrain under uncertain driving conditions", to be submitted to ASME 2014 International Design Engineering Technical Conferences.

Teaching Experiences

***Instructor,* Design Optimization** (ME555) 2013
University of Michigan, Ann Arbor
I covered theoretical foundations of nonlinear programming and numerical methods, including both gradient-based and derivative-free algorithms. I also provided tutorials on modeling and optimization using Matlab, AMESim and Optimus.

***Guest lecturer and consultant,* Analytical Product Design** (ME455) 2009-2012
University of Michigan, Ann Arbor
I gave lectures on Kansei engineering, conjoint analysis, evolutionary computation and basic machine learning. I also guided student design projects.

***Teaching assistant,* Design Optimization** (ME555) 2009, 2011
University of Michigan, Ann Arbor
I gave lectures on design of experiments and derivative-free optimization, consulted course projects, and helped developing course exams.

***Teaching assistant* , Design and Manufacturing** (ME350) 2010
University of Michigan, Ann Arbor
I guided student teams in the design competition and held discussion sessions and ADAMS labs.

Grants and Awards

Co-author of funded NSF grant titled "Creativity through Collaborative Human-Machine Interactions: A Formal Approach to Design Crowd Sourcing." **$642,574 USD** (2013)
Outstanding Undergraduate Thesis, Tsinghua University (2007)
National "Challenge Cup" Award, Third Prize, Tsinghua University (2006)
Honeywell Scholarship, Tsinghua University (2004)

Service

Reviewing

ASME Journal of Mechanical Design
Journal of Engineering Design
IEEE Transactions on Vehicular Technology

ASME International Design Engineering Technical Conference (2010-present)
International Conference on Engineering Design (2011, 2013)

Membership

Member of the American Society of Mechanical Engineers (2009 - present)
Member of IEEE (2012 - present)

Presentations

[1] An Interactive Modeling Environment for Automotive Exterior Design. 15th Automotive Research Center Conference, Ann Arbor, MI, May. 13 2009.
[2] Design Preference Elicitation, Derivative-Free Optimization and Support Vector Machine Search. ASME International Design Engineering Technical Conferences, Montreal, Canada, Aug. 18 2010.
[3] Design Preference Elicitation. Design Science Colloquium, University of Michigan, Ann Arbor, MI, Sept. 15, 2010.
[4] Design Preference Elicitation: Exploration and Learning. ASME International Design Engineering Technical Conferences, Washington DC, Aug. 28, 2011.
[5] HEV Powertrain Architecture Exploration Using Bond Graphs. 18th Automotive Research Center Conference, Ann Arbor, MI, May. 21, 2012.
[6] On Design Preference Elicitation with Crowd Implicit Feedback. ASME International Design Engineering Technical Conferences, Chicago, IL, Aug. 14, 2012.
[7] On the Use of Active Learning in Engineering Design. ASME International Design Engineering Technical Conferences, Chicago, IL, Aug. 15, 2012.
[8] A Simulation Study of Crowd Abilities on Crowdsourced Evaluation of Design Concepts. 19th Automotive Research Center Conference, Ann Arbor, MI, Apr. 19, 2013.
[9] A Scalable Preference Elicitation Algorithm Using Group Generalized Binary Search. ASME International Design Engineering Technical Conferences, Portland, OR, Aug. 6, 2013.
[10] Crowd-Driven Design, Northwestern University, Oct. 7, 2013.

References

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