ZHU, YONGXIAN

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Professional and Education Experience

Jan 2022 - present	**University of Michigan, Ann Arbor, MI** **Post-doc** on material and vehicle life cycle system design for recycling
Dec 2021 (GPA 4.0 & 4.0)	**University of Michigan, Ann Arbor, MI** **Ph.D.** in Mechanical Engineering, Specialization in Environmental Sustainability. *Dissertation: Carbon Abatement Options for U.S. Transport and Industry* **M.S.E.** in Electrical & Computer Engineering, Signal and Image Processing and Machine Learning.
2015 & 2017 (GPA 3.91 & 4.0)	**Purdue University, West Lafayette, IN** **M.S.** in Mechanical Engineering in 2017. **B.S.** with Academic Distinction in Mechanical Engineering in 2015.

Research Experience

University of Michigan, Ann Arbor, MI

2022 – present   **Material and vehicle life cycle system design for recycling (Funded by DOE)**
- Developed a dynamic material flow model to forecast the scale and chemistry compositions of 2022-2050 U.S. steel and aluminum demand and end-of-life scrap using scenario-based analysis.
- Organized model peer review sessions with 12 reviewers from Aluminum Association, Constellium, Ford, ISRI, Novelis, Nucor, Realalloys and the University of Michigan. Reviewers confirmed the model reliability and appraised it being comprehensive and of great interests for the industry.
- The results are pending submission to *Resources, Conservation and Recycling.*

2019 – present   **Recycling of end-of-life aluminum scrap (Funded by the National Science Foundation)**
- Developed a linear programming model to minimize the energy consumption and maximize recycling for U.S. reverse aluminum supply chain.
- The model will be used to probe emerging aluminum scrap separation and refining technologies that can improve aluminum recycling considering predicted technology cost, performance, and emissions.
- Technology predictions are based on extensive literature review and semi-structured interviews with industry experts.
- Preliminary results of the project are presented and published on CIRP LCE 2019 and form the technical basis for a 2-million DOE project on material and vehicle life cycle system design for recycling.

2021 – 2022   **Ductile cast iron life cycle analysis (Jointly funded by American Foundry Society and Ductile Iron Society)**
- Developed an excel-based parametric life cycle assessment model to characterize the energy consumption and greenhouse gas emissions for ductile cast iron applications.

- Organized semi-structured interviews with 16 stakeholders from industry associations and foundries to collect and analyze foundry and company operation data and inform parametric model developing.
- Invited to present the work at American Foundry Society's Metalcasting Congress and Environmental, Health & Safety Conference.
- According to the industry reviewers, the analysis "clearly provides a roadmap for the ductile iron industry to continue improving its sustainability".
- The results are published on *Resources, Conservation and Recycling.*

2019 – 2021 **U.S. light duty vehicle fleet emission analysis and reduction project (Funded by the University of Michigan Mcubed program)**

- Combined detailed dynamic material flow analyses with dynamic vehicle lifecycle assessments to estimate the temporal annual and cumulative GHG emissions as well as global mean surface temperature rises associated with U.S. light duty vehicle fleet.
- Demonstrated the effectiveness of combining critical climate mitigation strategies in line with the global target for the industry and governmental policy making.
- Highlighted the importance of growing manufacturing emissions at the transport-industry emissions nexus and led to a project with the Argonne National Laboratory to update their vehicle life cycle assessment model (GREET 2 model).
- The results are published on *Environmental Science & Technology.*

2017-2019 **Mapping the annual U.S. Steel flows (Funded by Michigan-Cambridge Research Initiative)**

- Conducted a detailed material flow model for U.S. steel industry from product of liquid steel, semi-finished products, intermediate products to five end-use product sectors.
- Developed a matrix cataloguing system for quickly updateable material flow network reconciliation and results presentation.
- The model has been used to help Yale researchers update the U.S. steel flow network for the REMADE institute and to produce the first alloy-shape-application material flow analysis for the aluminum extrusion industry.
- The results are published on *Environmental Science & Technology.*

Purdue University, West Lafayette, IN

2015 – 2017 **Automatic Life Cycle Assessment tool for machining product design**

- Developed an automated life-cycle assessment program based on Ecoinvent database for engineers to assess the environmental sustainability of machining product and manufacturing process design.
- The results are presented at ASME IDETC-CIE 2017 conference.

Publications

Peer Reviewed Journals:

- **Yongxian Zhu**, Jinlong Marshall Wang, Laurent B. Chappuis, George Luckey, Robert De Kleine, Hyung Chul Kim, Timothy J. Wallington, and Daniel R. Cooper, 2021. Forecasting U.S. aluminum flows and key alloying element streams for designing of recycling friendly alloys. Pending submission to *Resources, Conservation and Recycling.*

- **Yongxian Zhu**, Gregory A. Keoleian, Daniel R. Cooper, 2022. A Parametric Life Cycle Assessment Model for Ductile Cast Iron Components. *Resources, Conservation and Recycling.* Published.
- Gregory Oberhausen, **Yongxian Zhu**, Daniel R. Cooper, 2022. Reducing the environmental impacts of aluminum extrusion. *Resources, Conservation and Recycling*, 179, pp.106120.
- **Yongxian Zhu**, Steve Skerlos, Ming Xu, and Daniel R. Cooper, 2021. Reducing Greenhouse Gas Emissions from US Light-Duty Transport in Line with the 2° C Target. *Environmental Science & Technology, 55(13), pp.9326-9338.*
- **Yongxian Zhu**, Laurent B. Chappuis, Robert De Kleine, Hyung Chul Kim, Timothy J. Wallington, George Luckey, and Daniel R. Cooper, 2021. The coming wave of aluminum sheet scrap from vehicle recycling in the United States. *Resources, Conservation and Recycling* 164, pp. 105208.
- Daniel R. Cooper, Nicole A. Ryan, Kyle Syndergaard, and **Yongxian Zhu**, 2020. The potential for material circularity and independence in the US steel sector. *Journal of Industrial Ecology* 24 (4), pp.748-762.
- **Yongxian Zhu**, Kyle Syndergaard, and Daniel R. Cooper, 2019. Mapping the annual flow of steel in the United States." *Environmental science & technology,* 53(19), pp.11260-11268.

Conference proceedings:
- **Yongxian Zhu**, Steve Skerlos, Ming Xu, and Daniel R. Cooper, 2020. System level impediments to achieving absolute sustainability using LCA. *Procedia CIRP* 90, pp.399-404.
- **Yongxian Zhu**, and Daniel R. Cooper. 2019. An optimal reverse material supply chain for US aluminum scrap. *Procedia CIRP* 80, pp.677-682.
- Timothy R. Simon, Liang Cong, Yuxin Zhai, **Yongxian Zhu**, and Fu Zhao. A semi-automatic system for efficient recovery of rare earth permanent magnets from hard disk drives. *Procedia CIRP* 69, pp.916-920.
- **Yongxian Zhu**, and Fu Zhao, 2017. A rapid automatic life cycle assessment tool for eco-design. In *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* 58165, p.V004T05A036.

Selected talks:

Aug 2022	• Conference presentation at ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE 2022). 'Reducing Greenhouse Gas Emissions from US Light-Duty Transport in Line with the 2 °C Target.' St. Louis, Missouri.
Jun 2022	• Best student poster presentation at 2022 International Symposium on Sustainable Systems and Technology (ISSST). Reducing Greenhouse Gas 'Emissions from US Light-Duty Transport in Line with the 2 °C Target.' Pittsburgh, Pennsylvania.
	• Conference presentation at 2022 International Symposium on Sustainable Systems and Technology (ISSST). 'Forecasting US aluminum flows and key alloying element streams for designing of recycling friendly alloys.' Pittsburgh, Pennsylvania.
Oct 2020	• Invited talk at the Aluminum Association Annual Meeting. 'The Coming Wave of Aluminum Sheet Scrap from Vehicle Recycling in the United States'.
July 2019	• Honorable mention poster presentation at 10th International Society for Industrial Ecology (ISIE). 'A Fast, Flexible and Updateable Method for Mapping Data Reconciled Resource Flows'. Beijing, China.

- Conference presentation at 10th International Society for Industrial Ecology (ISIE). 'A least-cost 2050 recycling technology roadmap to increase end-of-life aluminum recycling rates'. Beijing, China.

Aug 2017
- Best student poster presentation at ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE 2017). 'A rapid automatic life cycle assessment tool for eco-design'. Cleveland, Ohio.

Teaching and Mentoring Experience (2012 – present)

- Mentoring five undergraduate and graduate students in our lab to give informational lectures on topics of dynamic material flow analysis, aluminum alloy designation and properties, etc.; providing one-on-one tutorials on power measurement, life cycle assessment software (Simapro), linear optimization model in MATLAB and Python, and various academic software; and overseeing model and manuscript revisions.
- Recipient of University of Michigan Postdoctoral Shrot Course on College Teaching in STEM Certificate (2022).
- Graduate student instructor at University of Michigan for laboratory class (Design and Manufacturing I) of 16-20 students for two semesters.
- Graduate student instructor at Purdue University for laboratory class (Introduction to Mechanical Engineering Design, Innovation, and Entrepreneurship) of 20-24 students for three semesters.
- Undergraduate teaching assistant at Purdue University for laboratory class (Modern Mechanics) for three semesters.

Professional Service
Conference Organization:
2021 – 2022
- Technical Session Chair at the 27th ASME Design for Manufacturing and the Life Cycle Conference (DFMLC) 2022.

2019 – 2020
- Organized the 2020 Michigan University-wide Sustainability & Environment (MUSE) Conference on Feb. 20 – 22, 2020 in Ann Arbor, Michigan with ten other organization board members.
- Lead the section planning, conference advertising, abstract collecting and reviewing.
- The three-day conference attracted 86 abstract submissions and 200 attendees from more than 20 departments and schools across the University of Michigan campus. Events of the conference include two keynote speeches, nine technical sessions, three workshops, one poster exhibits and public reception in person.

Reviewer:
- Resource Conservation and Recycling
- Journal of Cleaner Production
- International Journal of Metalcasting
- CIRP Life Cycle Engineering Conference (LCE)
- ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE)

- ASME International Manufacturing Science and Engineering Conference (MSEC)

Awards

2022	ISSST 2022 Best Student Poster Presentation
2019	ISIE 2019 Student Poster Competition Honorable Mention
2017	ASME 2017 IDETC DFMLC Student Poster Competition Award
2015	Mark and Stella Fitzsimmons Memorial Scholarship
2014	Williams Crabbs Memorial Scholarship
2011 – 2015	Dean's list and Semester Honors at Purdue University