



BINGHAMTON UNIVERSITY

STATE UNIVERSITY OF NEW YORK

Department of System Science and Industrial Engineering
Binghamton University
[Surface Design and Additive Manufacturing \(SDAM\) Lab](#)

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Ali Khoshkhoo

ACADEMIC APPOINTMENTS

[2018 - Present] SUNY Binghamton

- Assistant Professor
- Department of System Science and Industrial Engineering
- Research interests:
 - ❖ The cross-section of 3D printing or additive manufacturing (AM) and surface metrology for a variety of applications
 - ❖ Identify surface characteristics that affect physical surface properties for related applications
 - ❖ Design for Additive Manufacturing (DfAM)
 - ❖ Developing design guideline for additive manufacturing technologies
 - ❖ Additive manufacturing process optimization to improve mechanical, material, and surface properties
 - ❖ Distortion analysis for additive manufacturing technologies

EDUCATION

Ph.D. in Industrial and Systems Engineering (2018)

- *Auburn University*
- Thrust area: Advanced manufacturing and surface engineering
- Dissertation Advisors: Dr. Andres L. Carrano (Chair) and Dr. David Blersch (co-Chair)

M.Sc. in Industrial and Manufacturing Systems Engineering (2013)

- *University of Missouri-Columbia*
- Thrust area: Energy engineering and management
- Thesis Advisor: Dr. Bin Wu

B.S. in Industrial and Systems Engineering (2011)

- *University of Tehran, Tehran, Iran*

AWARDS AND HONORS

- **NSF Panel reviewer**, Washington DC, May 2019.
- **IISE New Faculty Colloquium**, IISE 2019, Orlando, Florida, summer 2019.
- **NSF fellowship**, MSEC 2018 / NAMRC 46 conference in College Station, Texas, summer 2018.
- **NSF fellowship**, Solid Free Form Symposium in Austin, Texas, summer 2017.
- **Curator's Grant-In-Aid (GIA) Scholarship**, University of Missouri.

FUNDING [Submitted]

1. **[Submitted, PI]** Transdisciplinary Areas of Excellence Seed Grant (TAE) Program, \$15,000, Binghamton University, Feb. 2019.
2. **[Submitted, PI]** Interdisciplinary Collaboration Grants (ICG) Program, \$10,000, Binghamton University, Feb. 2019.
3. **[Submitted, Co-PI]** Interdisciplinary Collaboration Grants (ICG) Program, \$10,000, Binghamton University, Feb. 2019.
4. **[Awarded, PI]** Analytical and Diagnostics Laboratory (ADL) Small Grant, \$2,500, Binghamton University, May 2019–May 2019.

PUBLICATIONS [Journal Articles – published, under review or near submission]

1. **Khoshkhoo A.**, Carrano, A.L., Blersch, D.M. (2018) "Effect of build orientation and part thickness on dimensional distortion in material jetting processes." *Rapid Prototyping Journal*. **Impact Factor: 3.683.**
2. Elliott, O., Gray, S., McClay, M., Nassief, B., Nunnelley, A., Vogt, E., Ekong, J., Kardel, K., **Khoshkhoo, A.**, Proano, G., Blersch, D.M., and Carrano, A.L. (2017). Design and manufacturing of high surface area 3D-printed media for moving bed bioreactors for wastewater treatment. *Journal of Contemporary Water Research and Education*. Issue 160. Pages: 144-156. **Impact Factor: 0.780.**
3. **Khoshkhoo A.**, Carrano, A.L., Blersch, D.M., Kardel, K, "Engineering of bio-mimetic substratum topographies for enhanced early colonization of filamentous algae" *Under review in PLOS One Journal*. **Impact Factor: 2.766.**
4. **Khoshkhoo A.**, Carrano, A.L., Kardel, K, "Design guideline for distortion in material jetting processes." *Under review in Rapid Prototyping Journal*. **Impact Factor: 3.683.**
5. **Khoshkhoo, A.**, Carrano, A.L., "Effects of 3D printed microtextured surfaces on contact angle." *Manuscript under preparation. To be submitted to 3D Printing and Additive Manufacturing Journal*. **Impact Factor: 2.304.**
6. **Khoshkhoo, A.**, Ning, F. Kardel, K. "Design guideline for mechanical properties in material jetting processes." *Manuscript under preparation. To be submitted to Rapid Prototyping Journal*. **Impact Factor: 3.683.**

PUBLICATIONS [Proceedings and Conference Presentations]

1. Alelaumi S., **Khoshkhoo A.**, Ning F., "Selective laser melting of curved surface metal parts: a fundamental study on surface quality and dimensional accuracy." Proceedings of the ASME 2019 14th International, Manufacturing Science and Engineering Conference (MSEC 2019), Erie, PA. June 10-14, 2019.
2. **Khoshkhoo A.**, Carrano, A.L., Blersch, D.M. "Effect of surface slope and build orientation on surface finish and dimensional accuracy in material jetting processes." 46th SME North American Manufacturing Research Conference (NAMRC 46) of SME, in College Station Texas. June 18-22, 2018.

3. Kardel K., **Khoshkhoo A.**, Carrano A.L., "Understanding Material Distortion in Flat Specimens in Material Jetting Processes" *Presented in the Institute of Industrial and Systems Engineers (IISE) Conference*, in Orlando Florida. May 19-22, 2018.
4. **Khoshkhoo A.**, Carrano, A.L., Blersch, D.M., Ghaednia H., Kardel K., "Understanding and engineering of natural surfaces with additive manufacturing." *Solid Free Form Fabrication Symposium (SFF)*, Austin Texas. August 7-9, 2017.
5. Carrano, A.L., Blersch, D.M., Kardel K., **Khoshkhoo A.** "Understanding attachment preferences of Benthic Algae through controlled surface topographies on 3D-printed substrata." *5th International Conference on Surface Metrology. (ICSM 2016)*, Poznan, Poland. April 4-7, 2016.
6. Wu, B., Sandina P., **Khoshkhoo A.**, "Computer-aided adaptation of superior energy performance program and iso50001." *International Academic Conference*. Paris, France. June 9-11, 2013.
7. Wu, B., Wibbenmeyer J., **Khoshkhoo A.**, "Setting achievable goals for industrial energy efficiency – a structured approach." *International Academic Conference*. Maui, Hawaii, January 3-5, 2013.

SCHOLARLY PRESENTATIONS

1. [Presentation] "Understanding Distortion in Material Jetting Process." *Solid Free Form Fabrication Symposium (SFF)*, Austin, Texas. August 13-15, 2018.
2. [Presentation] "Study of surface finish and dimensional accuracy in material jetting processes." *46th SME North American Manufacturing Research Conference (NAMRC 46) of SME*, College Station, Texas. June 18-22, 2018.
3. [Presentation] "Understanding Material Distortion in Flat Specimens in Material Jetting Processes." *Institute of Industrial and Systems Engineers (IISE) Conference*, in Orlando Florida. May 19-22, 2018.
4. [Presentation] "Surface engineering of rough surface contacts with additive manufacturing." *Proceedings of the STLE*, Minneapolis, Minnesota. May 20-24, 2018.
5. [Presentation] "Understanding and engineering of natural surfaces with additive manufacturing." *Solid Free Form Fabrication Symposium (SFF)*, Austin, Texas. August 7-9, 2017.
6. [Presentation] "Experimental study of the permanent deformation patterns after the low-speed collision of a rigid rod with, an elastic-plastic lubricated flat." *Proceedings of the STLE*. Atlanta, Georgia. May 21-25, 2017.
7. [Presentation] "Understanding attachment preferences of Benthic Algae through controlled surface topographies on 3D-printed substrata." *5th International Conference on Surface Metrology (ICSM 2016)*, Poznan, Poland. April 4-7, 2016.

TEACHING EXPERIENCE

Teaching, SUNY Binghamton

- *SSIE 670 (Developed Course-Grad): Advanced Additive Manufacturing (Fall 2019)*
- *ISE 312 (Undergrad): Manufacturing Systems (Spring 2019)*
- *ISE 311 (Undergrad): Enterprise Systems (Lean Manufacturing) (Fall 2018, 2019)*

Teaching Assistant, Auburn University

- *INSY 4970/7970: Additive Manufacturing (Fall 2015, 2016, 2017)*
- *INSY 3800: Manufacturing Systems I (Spring 2015, 2016, 2017)*
- *INSY 5800/6800/6806: Lean Manufacturing (Spring 2018)*
- *INSY 5840: Manufacturing Floor Control (Fall 2015)*
- *INSY 3400: Stochastic Operations Research (Fall 2014)*

- STAT 3600: *Quality Control and Probability and Statistics (Spring 2014)*

Teaching Assistant, University of Missouri

- IMSE 2110: *Probability and Statistics (Spring 2013)*
- IMSE 4001: *Project Management (Fall 2012)*
- IMSE 4001: *Lean Manufacturing (Spring 2011)*

Teaching Assistant, University of Tehran, Iran

- *Quality Control (Spring 2010, Fall 2010)*

RESEARCH EXPERIENCE

Surface Design and Additive Manufacturing (SDAM) Laboratory, Director, SUNY Binghamton, 2018-present.

- Conducted research in the various areas:
 - ❖ The application of additive manufacturing and surface characterization in support of surface wettability and surface free energy to figure out the impacts of surface topography on contact angle and surface free energy.
 - ❖ The fidelity of surface textures and dimensional distortion on material jetting process specimens by profilometry analysis. Several studies aimed at analyzing the (a) surface textures, (b) dimensional accuracy, and (c) material distortion of specimens fabricated with material jetting processes under controlled process parameters such as build orientation, surface angle, and specimen thickness.
 - ❖ The application of additive manufacturing and surface characterization in support of biosystems and environmental applications to figure out the impacts of surface topography on algal growth.
 - ❖ Contact force models for smooth 3D-printed surfaces. Also, the effect of roughness on the coefficient of friction, dynamic of collision and contact forces on rough 3D-printed materials. Analyze and compare effects of impact on different materials and methods of 3D printing.
 - ❖ The specific surface area and packing densities of biofilter media (bio-carriers) using commercially available biofilter media and 3D-printed biofilter media in 3D-PBS laboratory.

3D-Printed Bio-Surfaces (3D-PBS) Laboratory, Graduate Research Assistant, Auburn University, 2014-2018.

- Managed daily laboratory activities: additive manufacturing (fused deposition and polyjet binding) and surface metrology equipment installation, operation and maintenance, supply procurement and vendor relationships, training, research agenda management and job scheduling, fixture design and maintenance of bioreactors and cultures.

Lead Engineer of Industrial Assessment Center (IAC), Graduate Research Assistant, University of Missouri, 2011-2013

<https://iac.university/center/MZ>

- Completed more than 20 energy audits as IAC lead engineer.
- Saved companies an average annual profit of \$75,000 by minimizing energy utility bills.
- Led research and analysis for a variety of manufacturing companies searching for opportunities to reduce costs through more efficient and effective energy usage.
- Trained, motivated, and evaluated 30 culturally diverse graduate and undergraduate engineering students.

- Led technology projects to advance manufacturing process improvement recommendations, energy management-ISO50001, and student software and equipment training education.
- Presented summary of data analysis for energy cost reduction alternatives to client management and Department of Energy (DOE).
- Presented an Energy Management System (EMS) e-Guide to cover all the requirements for ISO 50001 standard. It is a thorough guide to help the companies learn how to organize their companies by EMS to reach more energy efficient, consuming levels.

OTHER APPOINTMENTS

Computer IT Assistant, Auburn University (2016-2018)

- Responsible for the instrumentation, controls, installation, operation, web design or internet security.

Association of Energy Engineers (AEE) (2013)

- Engaged in the field of energy and engineering through meetings for discussion of current issues in energy and engineering, presentations from guest speakers, facility tours with our Industrial Assessment Center, networking events with the Saint Louis and Kansas City AEE chapters, and national AEE webinars and conferences.

President of Iranian Student Association (ISA), University of Missouri (2012)

- Responsible for providing an opportunity as a leader for an interactive community for Iranian students and others with an interest in the Persian culture at the University of Missouri.

Quality Engineering Intern, Zarrin Ghazal, Shiraz, Iran (2010)

- Performed data analysis, and statistical process control.
- Performed lean manufacturing and six sigma essentials in processes.
- Assessed the active processes to identify deficiencies and root cause.
- Investigated the product quality problems, determine the cause(s) and implement corrective action to reduce or eliminate the cause(s).

CERTIFICATES

- SME's Certified Manufacturing Engineer credential, 2017 and 2018.
- Preparing Future Faculty Certificate of Achievement (PFF), 2017.
- Industrial Assessment Center (IAC): Completing 20 audits of mid-size manufacturing companies in Midwest area, 2013.
- Association of Energy Engineers (AEE), 2012.

PROFESSIONAL MEMBERSHIP

- Member of Society of Manufacturing Engineers (SME)
 - Member of Institute of Industrial and Systems Engineers (IISE)
 - Member of Institute for Operational Researches and Management Sciences (INFORMS)
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TECHNICAL SKILLS

Additive Manufacturing Technologies

- *Polymer:*
 - ❖ Material Jetting (polyjet, inkjet): objet30, J750
 - ❖ Fused Deposition Modeling (FDM): Makerbot Replicator+, IIP 3D Systems
 - ❖ Stereolithography (SLA): Form 2
- *Metal:*
 - ❖ Selective Laser Melting (SLM): EOS M290
 - ❖ Electron Beam Melting (EBM): Arcam
- *Post Processing:*
 - ❖ Chemical post-processing of AM parts
 - ❖ Abrasive post-processing of AM parts
 - ❖ Thermal post-processing of AM parts

Surface Metrology Techniques

- Structured white light Profilometry
- Surface Texture (Surface Roughness, Waviness, and Lay (ASME_B46.1))
- Surface texture-Areal (ISO 25178-2)

Programmable Logic Controller (PLC)

- OMRON PLC hardware
- Sysmac studio software and automation simulator
- Ladder Logic Programming
- Boolean-logic based automation

Computer Numerical Control (CNC)

- G-Code: CNC simulator
- CNC Milling

Wettability Characterizations

- Static, dynamic, and batch contact angle
- Surface free energy
- Surface and interfacial tension
- Roughness corrected contact angle

Software Skills

- Manufacturing Systems: CNC, PLC
- Manufacturing Design: Solidworks, CAD
- Programming Languages: Python, Matlab, C++
- Optimization and Operations Research Software: CPLEX, Aimms, Gurobi, AMPL
- Statistical Software: SAS, Minitab, SPSS, Excel
- Simulators: Simio, Arena, Ave Sim
- Database Software: R, Access, SQL, Delphi, Excel
- Business Process / Data Modeling Software: Power Designer
- Control Project Software: MSP, Primavera

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