

# Srikanthan Ramesh

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## EDUCATIONAL BACKGROUND

Ph.D. Industrial and Mechanical Engineering Rochester Institute of Technology, Rochester, NY <b>Dissertation Title:</b> Numerical and Experimental Investigation of Aerosol Jet Printing	May 2022
M.S. Industrial and Manufacturing Systems Engineering Iowa State University, Ames, IA <b>Thesis Title:</b> Biodegradable Polymer-Ceramic Composites for Guided Bone Regeneration	May 2017
B.Tech Mechanical Engineering Amrita University, India	May 2015

## PROFESSIONAL APPOINTMENTS

<b>Graduate Research Assistant</b> AMPrint Center, Rochester Institute of Technology, NY	May '21 – Present
<b>Course Instructor</b> Biomedical Engineering, Rochester Institute of Technology, NY	Jan '21 – May '21
<b>Graduate Teaching Assistant</b> Industrial and Systems Engineering, Rochester Institute of Technology, NY	Aug '20 – Dec '20
<b>Undergraduate Research Mentor</b> Industrial and Systems Engineering, Rochester Institute of Technology, NY	Aug '19 – May '20
<b>Visiting Graduate Researcher</b> Department of Biology, University of Rochester, NY	Jan '19 – Present
<b>Graduate Research Assistant</b> Industrial and Systems Engineering, Rochester Institute of Technology, NY	Jan '19 – May '21
<b>Bioink and Tissue Engineering Intern</b> Cellink LLC, Blacksburg, VA	June '18 – Dec '18
<b>Undergraduate Research Mentor</b> Industrial and Manufacturing Systems Engineering, Iowa State University, IA	Aug '17 – May '18
<b>Graduate Teaching Assistant</b> Industrial and Manufacturing Systems Engineering, Iowa State University, IA	Aug '16 – May '18

## AWARDS, HONORS, AND FELLOWSHIPS

Doctoral Dissertation Pitch Competition (Runner-up), Institute of Industrial and Systems Engineers	2021
Manufacturing and Design Student Sponsorship, Institute of Industrial and Systems Engineers	2021
Best Oral Presentation, Graduate Showcase, Rochester Institute of Technology	2019
Research and Creativity Grant, Office of Graduate Education, Rochester Institute of Technology	2019
Gilbreth Memorial Fellowship, Institute of Industrial and Systems Engineers	2018
Best Overall Graduate Research Poster Award, Annual Symposium, Iowa State University	2018
Wakonse College Teaching Fellowship, Graduate Professional & Student Senate, Iowa State University	2018
Graduate Research Excellence Award, Graduate College, Iowa State University	2018
Best Overall Oral Presentation, Nano@IAstate, Iowa State University	2017
NSF Student Award, Solid Freeform Fabrication Symposium	2017
Best Overall Graduate Research Poster Award, Annual Symposium, Iowa State University	2017
Professional Advancement Grant, Graduate Professional & Student Senate, Iowa State University	2017
Students-Undergraduate Research Graduate Excellence Internship, IIT-Kanpur, India	2014

## RESEARCH INTERESTS

Additive manufacturing, Bio-additive manufacturing (bio-AM), Biofabrication, Tissue Engineering, Biomaterials, Surface engineering of biomaterials, Drug delivery systems, Numerical modeling of bio-AM processes, Process monitoring and control in bio-AM

## SCHOLARLY PUBLICATIONS

Published in peer-reviewed journals

**Ramesh S**, Zhang Y, Cormier DR, Rivero IV, Harrysson OL, Rao PK, Tamayol A. Extrusion bioprinting: Recent progress, challenges, and future opportunities. *Bioprinting*. **2020** Nov 23:e00116.

**Ramesh S**, Kovelakuntla V, Meyer AS, Rivero IV. Three-dimensional printing of stimuli-responsive hydrogel with antibacterial activity. *Bioprinting*. **2020** Oct 9:e00106.

Hamilton JD, **Ramesh S**, Harrysson OL, Rock CD, Rivero IV. Cryogenic mechanical alloying of aluminum matrix composites for powder bed fusion additive manufacturing. *Journal of Composite Materials*. **2020** Sep 9:0021998320957698.

Gerdes S, Mostafavi A, **Ramesh S**, Memic A, Rivero IV, Rao P, Tamayol A. Process–Structure–Quality relationships of three-dimensional printed poly (caprolactone)-hydroxyapatite scaffolds. *Tissue Engineering Part A*. **2020** Mar 1;26(5-6):279-91.

Stromberg LR, Hondred JA, Sanborn D, Mendivelso-Perez D, **Ramesh S**, Rivero IV, Kogot J, Smith E, Gomes C, Claussen JC. Stamped multilayer graphene laminates for disposable in-field electrodes: application to electrochemical sensing of hydrogen peroxide and glucose. *Microchimica Acta*. **2019** Aug 1;186(8):533.

**Ramesh S**, Lungaro L, Tsikritsis D, Weflen E, Rivero IV, Elfick AP. Fabrication and evaluation of poly (lactic acid), chitosan, and tricalcium phosphate biocomposites for guided bone regeneration. *Journal of Applied Polymer Science*. **2018** Oct 15;135(39):46692.

Tran PL, Li J, Lungaro L, **Ramesh S**, Ivanov IN, Moon JW, Graham DE, Hamood A, Wang J, Elfick AP, Rivero IV. Cryomilled zinc sulfide: A prophylactic for *staphylococcus aureus*-infected wounds. *Journal of Biomaterials Applications*. **2018** Jul;33(1):82-93.

Spearman SS, Irin F, **Ramesh S**, Rivero IV, Green MJ, Harrysson OL. Effect of Pseudomonas lipase enzyme on the degradation of polycaprolactone/polycaprolactone-polyglycolide fiber blended nanocomposites. *International Journal of Polymeric Materials and Polymeric Biomaterials*. **2019** May 3;68(7):360-7.

#### Submitted to peer-reviewed journals

Gerdes S, **Ramesh S**, Mostafavi A, Tamayol A, Rivero IV, Rao P. Defect propagation, implication, and prevention in extrusion-based 3D (Bio) printed tissue engineering scaffolds. *ACS Biomaterials Science & Engineering*. (*under review*).

**Ramesh S**, Mahajan CG, Gerdes S, Gaikwad A, Tamayol A, Cormier DR, Rao PK, Rivero IV. Numerical and experimental investigation of aerosol jet printing for biomimetic patterning. *Additive Manufacturing*. (*under review*).

**Ramesh S**, Emily L, Sakaguchi D, and Rivero IV. 3D Printed polycaprolactone-hydroxyapatite scaffolds for trabecular bone regeneration. *Journal of Applied Polymer Science*. (*under preparation*).

**Ramesh S**, Mahajan CG, Cormier DR, Callanan A, Nelson LJ, Elfick PD. Patterning Metallic Nanoparticles on Low Melting Point Substrates via aerosol jet printing. *Applied Physics Letters*. (*under preparation*).

#### Published in peer-reviewed conferences

**Ramesh S**, Gerdes S, Lau S, Mostafavi A, Tamayol A, Rao P, Rivero IV, Rheological, *In-situ* printability and cell viability analysis of hydrogels for muscle tissue regeneration, 28th Annual Solid Freeform Symposium, Austin, TX, USA, **2018**.

**Ramesh S**, Yan J, Downey A, Rivero IV, Laflamme S, Zellner E, Solventless fabrication of biodegradable sensors for measuring soft tissue deformation, IISE Annual Conference and Expo, Orlando, FL, USA, **2018**.

Lau S, **Ramesh S**, Rivero IV, Korley L, A Solid-state processing approach to enhance the mechanical performance of polyolefins, IISE Annual Conference and Expo, IISE Annual Conference and Expo, Orlando, FL, USA, **2018**.

**Ramesh S**, Eldakrouy M, Rivero IV, Frank MC, Additive fabrication of polymer-ceramic composite for bone tissue engineering, 27th Annual Solid Freeform Symposium, Austin, TX, USA, **2017**.

### **SELECTED CONFERENCE PRESENTATIONS**

**Ramesh S**, Mahajan CG, Cormier DR, Rivero IV, Biomimetic patterning of metallic nanoparticles for antimicrobial applications, Materials Science and Technology, Virtual, **2020**.

**Ramesh S**, Mahajan CG, Cormier DR, Rivero IV, A hybrid printing approach for topographical patterning of bone tissue engineering scaffolds, IISE Annual Conference and Expo, Virtual, **2020**.

**Ramesh S**, Krishna V, Meyer AS, Rivero IV, Extrusion bioprinting of stimuli-responsive chitosan-based gel with antibacterial property, IISE Annual Conference and Expo, Orlando, FL, USA, **2019**.

**Ramesh S**, Weflen E, Rivero IV, Solid-State Fabrication and Characterization of Polycaprolactone/Chitosan Biocomposites for Additive Manufacturing, IISE Annual Conference and Expo, Orlando, FL, USA, **2018**.

**Ramesh S**, Yan J, Downey A, Rivero IV, Laflamme S, Zellner E, Solventless Fabrication of Biodegradable Sensors for Measuring Soft Tissue Deformation, IISE Annual Conference and Expo, Orlando, FL, USA, **2018**.

**Ramesh S**, Eldakrouy M, Rivero IV, Frank MC, Additive Fabrication of Polymer-Ceramic Composite for Bone Tissue Engineering, 27th Annual Solid Freeform Symposium, Austin, TX, USA, **2017**.

**Ramesh S**, Lungaro L, Tsikritsis D, Rivero IV, Elfick A, Solventless Preparation of Polylactic/Chitosan/Tricalcium Phosphate Biocomposite Powders for Guided Bone Regeneration, IISE Annual Conference and Expo, Pittsburgh, PA, USA, **2017**.

## RESEARCH EXPERIENCE

### Graduate Research Assistant

May '21 – Present

AMPrint Center, Rochester Institute of Technology, NY

Advisor: Dr. Denis R. Cormier

- Performed experimental and computational fluid dynamics modeling studies on aerosol jet printing.
- Investigated the influence of printhead geometry in dictating the morphology of aerosol printed lines.
- Developed silver nanoparticle inks for high-resolution aerosol jet printing.
- Established relationships to link ink rheology to the droplet size distribution of aerosolized ink.

### Bioink and Tissue Engineering Intern

June '18 – Dec '18

Cellink LLC, Blacksburg, VA

Advisors: Dr. Patrick Thayer, Dr. Hector Martinez

- Established operating procedures for assessing printability of bioinks for extrusion bioprinting.
- Collaborated with academic partners to develop thermoplastic scaffolds for macular degeneration.
- Established protocols for 3D print bioglass-containing biomaterials for bone tissue engineering.
- Designed and printed biodegradable gelatin methacrylate scaffolds for tissue engineering.
- Worked with industry partners to develop printing protocols for thermoplastic biomaterials.

### Graduate Research Assistant

Aug '15 – Present

iMED Laboratory, Rochester Institute of Technology, NY (Previously in ISU, IA)

Doctoral Advisor: Dr. Iris V. Rivero

- Investigated multi-material and non-planar capabilities for surface patterning tissue engineered scaffolds via aerosol jet printing.
- Implemented a two-step process for biomimetic patterning and sintering of low-melting point biocompatible substrates.
- Performed numerical analyses to explain principal aerodynamic interactions in aerosol jet printing.
- Fabricated interdigitated sensors on flexible substrates for nitric and nitrous oxide detection.
- Formulated and bioprinted novel pH-sensitive bioinks for inhibiting the formation of bacterial biofilms.
- Investigated mechano-chemical processing of zinc nanoparticles for treating burn wounds.
- Developed biodegradable nanofibers membranes guided tissue regeneration therapy.

### Summer Undergraduate Research Fellow

June '14 – Aug '14

Advanced Nanoengineering Laboratory, Indian Institute of Technology, India

Project Advisor: Dr. Kamal K. Kar

- Obtained and analyzed rheological data of polystyrene, low-density polyethylene, and polypropylene.
- Developed analytical models for predicting the die swell using a strain energy density function.
- Identified a linear relationship between die swell and maximum recoverable deformation.
- Established relationships between intrinsic material properties and the predicted die swell values.

## RESEARCH MENTORING EXPERIENCE

### Research Mentor

Aug '19 – May '21

Industrial and Systems Engineering, Rochester Institute of Technology, NY

#### Undergraduate Students Mentored

Ms. Julia Geigel, Ms. Abbey Pfentner

Project: Fabrication of biodegradable strain-sensors for measuring soft-tissue deformation

Ms. Emily Lazarus, Mr. Melvin Cruz

Project: Influence of pore geometry in 3D-printed bone scaffolds

(Outcome: 1 journal article currently under preparation, 1 poster presentation)

#### Graduate Students Mentored

Ms. Maria Ceballos Santa

Project: Formulation of aloe vera bioinks for skin tissue engineering

Mr. Elliott Gengo

Project: Analytical modeling for predicting printability in extrusion bioprinting

(Outcome: 1 conference presentation)

### Research Mentor

Aug '17 – May '18

Industrial and Manufacturing Systems Engineering, Iowa State University, IA

#### Undergraduate Students Mentored

Ms. Moira Henderson

Project: 3D-printing of thermoplastic bone tissue scaffolds

(Outcome: 1 poster presentation)

Ms. Jaclyn Stiller

Project: Mechanical and physico-chemical characterization of 3D-printed bone scaffolds

(Outcome: 1 poster presentation)

#### Graduate Students Mentored

Ms. Sharon Lau

Project 1: Solid-state grinding of polyolefins for improving mechanical performance

Project 2: Formulation and rheological analysis of hydrogels for musculoskeletal tissue engineering

(Outcome: 2 peer-reviewed conference proceedings)

## TEACHING EXPERIENCE

### BIME 391 Course Instructor

Jan '21 – May '21

- Prepared and delivered independent lectures covering topics in biomechanics and biomaterials.
- Held office hours and graded project presentations/reports.

## Graduate Teaching Assistant

Aug '16 – May '18, Aug '20 – Dec '20

- Assisted faculty members with classroom instructions and record keeping.
- Prepared and delivered numerous classroom and laboratory lectures.
- Mentored student teams for term projects.
- Prepared grading rubrics and graded exams, lab reports, and homework assignments.

### Courses and Laboratories Taught

### Semester

†BIME 391 Biomechanics and Biomaterials Lab (Eval. Not Available)	Spring '21
ISE 420 Production Planning and Scheduling (Eval. 4.19/5.00; N=48)	Fall '20
IE 448 Manufacturing Systems Engineering (Eval. 4.41/5.00; N=141)	Spring '18
‡IE 248 Engineering System Design, Mfg. Processes and Specs. (Eval. 4.73/5.00; N=80)	Fall '17
*IE 348 Solidification Processes (Eval. 4.81/5.00; N=36)	Spring '17
*IE 248 Engineering System Design, Mfg. Processes and Specs. (Eval. 4.34/5.00; N=54)	Fall '16

\*Laboratory instructor, ‡Head teaching assistant, †Course instructor

## SERVICE AND OUTREACH

### Toyota Production Systems Laboratory Instructor

May '19 – June '19

College and Careers, Industrial and Systems Engineering, RIT

- Conducted hands-on workshops and demonstrations for high-school students making career decisions.

### Student Committee Member

Aug '17 – May '19

Manufacturing and Design Division, IISE, USA

- Organized a student-oriented webinar (Graduate School: Common Questions and Opportunities in Manufacturing and Design) and engaged in a conversation with faculty members from ISU and NCSU
- Contributed to a student-targeted newsletter for a year (2017-2018).