Rahul Sharan Renu

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EDUCATION	**Clemson University**, Clemson, South Carolina, USA

- Ph.D. in Mechanical Engineering — May 2016
  - Dissertation: Product-Process Coupling to Enable Continuous Improvement of Assembly Processes
  - Advisor: Prof. Gregory Mocko
  - Focus: Digital Manufacturing, Artificial Intelligence, Natural Language Processing.

- M.S. in Mechanical Engineering — Aug 2013
  - Thesis: Decision Support Systems for Assembly Line Planning
  - Advisor: Prof. Gregory Mocko

Visvesvaraya Technological University, Bangalore, Karnataka, India

- B.S. in Mechanical Engineering — May 2011

PROFESSIONAL AFFILIATIONS

American Society of Mechanical Engineers, Member
American Society of Engineering Education, Member

WORK EXPERIENCE

Francis Marion University, Florence, South Carolina, USA
- Associate Professor, Department of Physics and Engineering — May 2021 – Present
- Coordinator of Mechanical Engineering — Aug 2019 – Present
- Assistant Professor, Department of Physics and Engineering — Aug 2016 – May 2021

Clemson University, Clemson, South Carolina, USA
- Instructor of Record, Mechanical Engineering — May 2014 – May 2016
- Research Assistant, Mechanical Engineering — Jan 2012 – Apr 2014

Faurecia Interior Systems, Fountain Inn, South Carolina, USA
- Process Engineering Intern — Jun 2014 – Jan 2015

TEACHING EXPERIENCE

Francis Marion University, Florence, South Carolina, USA
• Introduction to Engineering • Engineering Graphics • Engineering Mechanics • Engineering Economics • Materials Engineering • Mechanics of Materials • Manufacturing Processes • Manufacturing Processes Laboratory • Senior Design • Physical Science Laboratory • Technical Physics I Laboratory • University Life

Clemson University, Clemson, South Carolina, USA
• Manufacturing Processes (Online) • Engineering Graphics

ADVISING EXPERIENCE

Academic Advisor, Francis Marion University
- Developed graduation plans and assisted with course registration for several undergraduate students every semester.

Research Advisor, Francis Marion University
- Advisor for **fourteen** undergraduate students on faculty-led research projects.

- Honors Thesis Committee Member
  Student: Dante Ahquin

Research Advisor, Clemson University
- Advisor for two undergraduate students.

EXTRAMURAL GRANTS & FUNDING

South Carolina Research Authority — Awarded in June 2021

- Project Title: Improving Workforce Readiness and Capabilities in South Carolina (I-WoRC in SC)
- Principal Investigator
- In collaboration with The Citadel, Bicycle Corporation of America, and GE Healthcare
- Amount: $303,425

SC Fraunhofer USA Alliance   Awarded in Feb 2020

- Grant Title: Architecture and Platform for Manufacturing Knowledge Capture for SMEs
- Co-Principal Investigator
- In collaboration with Clemson University, and Fraunhofer USA.
- Amount: $128,126

South Carolina Research Authority   Awarded in Jun 2019

- Grant Title: The Doctor Is In: Monitoring and Visualizing Supply Chain Health through Machine Learning
- Principal Investigator
- In collaboration with Drs. Lorna Cintron-Gonzalez (FMU), Brett Shields (FMU), Scott Mason (Clemson University), and six SC industries (BMW, GE, Michelin, Milliken, Seminar Brewing, Bicycle Corporation of America).
- Amount: $100,000

South Carolina Department of Commerce   Awarded in Aug 2018

- Grant Title: Automation and Process Improvement
- Co-Principal Investigator
- In collaboration with Bicycle Corporation of America, Clemson University, University of South Carolina, Fraunhofer USA.
- Amount: $145,000

Horizon Mud Company   Awarded in Aug 2018

- Project Title: Engineering Data Management
- Principal Investigator
- Consulting project (contracted through FMU) focused on engineering data management
- Amount: $30,000

South Carolina Research Authority   Submitted for Review

- Project Title: Improving Supply Chain Resilience using Industry and Logistics 4.0
- Co-Principal Investigator
- In collaboration with University of South Carolina, Clemson University, McCall Farms, SC Dept. of Transportation, Port of Charleston, and several others.
- Amount: $949,227

INTRAMURAL GRANTS & FUNDING

Francis Marion University

- International Collaboration Grant   Awarded in Spring 2020
  - Total Amount: $2,500
  - Funds to support travel to FMU's International Exchange partners to setup teaching and student exchanges for the FMU Mechanical Engineering program.

- Inter-Disciplinary Collaboration Grant   Awarded in Oct 2019
  - Total Amount: $15,000
  - Towards the design and execution of a STEAM Day event.
  - In collaboration with Drs. Jodi Zeis, Nathan Harness, Howard Frye, and Ivan Dungan

- Information Technology Committee Grants   2 in Sp. 2020, 3 in Sp. 2017; 1 Fall 2017
  - Total Amount: $28,145
  - Towards purchase of additive manufacturing machines, web server, laser cutter machine, PASCO Statics System, and others.

- Professional Experience and Knowledge (PEAK)   Awarded in Spring 2018, Spring 2020
  - Total Amount: $4,000

- Towards a panel session and networking event to connect alumni with current students.

- Professional Development Funds　　　　　　　　　　One award every semester since Fall 2016
  - Total Amount: $10,005
  - Towards travel and attendance for several international and regional conferences.

- Summer Research Funding　　　　　　　　　　　　　Awarded for Summer 2017
  - Total Amount: $4,000
  - Awarded on a competitive basis.

- Ready to Experience Applied Learning (REAL)　　　Awarded in Fall '16, '17, '18, and Spring '18, '19
  - Total Amount: $10,850
  - Towards research stipend and conference travel costs for two undergraduate students, and towards travel to graduate schools and local industries.

STATE & NATIONAL SERVICE	

- National Science Foundation Graduate Research Fellowship Program, Grants Proposal Reviewer
- South Carolina Research Authority　　　　　　　　　Spring 2019
  - Industry 4.0 Feasibility Assessment Collaboration Team, Member
- Belle Baruch Institute for South Carolina Studies
  - Assisted Dr. Lynn Hanson with analysis of the data gathered.
  - Used solid modeling and additive manufacturing to make replicas of buttons found on Belle Baruch's clothing.
    This was in collaboration with Dr. Lynn Hanson and Prof. Allison Steadman

UNIVERSITY SERVICE

- Universities Studying Slavery - FMU Chapter, Executive Committee Member　　Spring 2021 – Present
- FMU Professional Experience and Knowledge (PEAK) Committee, Member　　Fall 2020 – Present
- FMU Admissions, Advising, and Retention Committee, Member　　Fall 2020 – Present
- FMU Honors Committee, Member　　Spring 2019 – Present
- FMU Faculty Senator　　Spring 2019 – Present
- FMU First Year Seminar Advisory Committee, Member　　Spring 2019 – Present
- FMU Information Technology Committee, Member　　Fall 2017 – Fall 2020
- FMU Multicultural Advisory Board, Co-Chair　　2017 – 2018
- FMU Open House, Speaker
- FMU Scholarship Interviews, Interviewer

DEPARTMENTAL SERVICE

- Faculty Advisor, FMU Mechanical Engineering Student Body
- FMU Mechanical Engineering Program Development
  - Feasibility Committee Member
  - Curriculum Committee Member
  - Authored syllabi for new ME courses and developed a four-year plan
  - Co-authored ABET accreditation documents
- Facilitated student internships/full-time employment at:
  - A.O. Smith
  - Beneteau
  - GE Healthcare
  - Georgia Pacific – Dixie Operations
  - M. Padgett Engineering & Construction
  - Nucor Steel
  - Stanley Black and Decker
  - Schaeffler Group
  - QVC
  - Wyman Gordon

- Developed collaborative relationships with:
  - Companies listed above
  - Bicycle Corporation of America
  - Fastenal
  - Fiber Industries
  - Franco Manufacturing
  - Honda of South Carolina
  - Otis Elevators
  - South Carolina Society of Professional Engineers
  - South Carolina Fraunhofer USA Alliance

- Procured Senior Design projects from Otis Elevators, Beneteau, Sonoco, GE Healthcare, and South East Express

- Industrial Engineering Program ABET Accreditation
  - Gathering and organizing data for ABET accreditation visit
  - Co-authoring, reviewing, and editing the ABET self-study report
  - Developed a database management system for ABET student outcome measurement

- Founder and Lead of the FMU Physics and Engineering Social Hour
  - Students, faculty and staff gather in an informal environment (typically, a weekday lunch). This enhances the rapport among members of the department.

- Formal mentor for multiple new faculty

- Assisted with multiple faculty searches

- FMU Materials and Manufacturing Lab Setup
  - Involved with procurement of laboratory equipment
  - Assembled, setup and calibrated the following laboratory equipment
    CNC router, Rockwell hardness testing machine, sheet forming machine, injection molding machine, universal materials testing machine, rotating fatigue tester and various metrology equipment

- FMU Engineering Makerspace
  - Involved with redesign of rooms for Makerspaces
  - Sourced and setup equipment
    Additive manufacturing machines (3D printers), Laser etcher, Waterjet, CNC Lathe.

OUTREACH & OTHER ACTIVITIES

- Toastmasters, Member   December, 2019 - Present

- Faculty International Orientation Program   Spring 2018
  - Selected to be part of a delegation from FMU to Germany
  - One objective was to gain new perspective by engaging in an international experience
  - Another objective was to enhance collaboration with existing partner universities

- FMU Honors Trips
  - Washington DC   Fall 2018
  - New York City, NY   Fall 2019

- ASME Design Education Committee Mentorship Program - Mentor
  - 2020
  - 2021

- High School Outreach
  - Speaker at Darlington County Institute of Technology
  - Conducted interactive programs for high school students through the SC GEAR UP initiative

- Faculty Intramural Volleyball Team Member, and Intramural Singles Billiards Champion   Spring 2017

CONFERENCE ORGANIZATION

- Conference Session Chair
  - American Society for Engineering Education – Southeast Section Annual Conference 2018, Daytona Beach, FL
  - Simulation-Based Design Under Uncertainty, ASME International Design Engineering Technical Conference (IDETC) 2016, Charlotte NC

- Symposium Co-Chair
  - Design of Complex Systems, ASME International Design Engineering Technical Conference (IDETC) 2016, 2017, 2018, 2019, and 2020

- Student Competition Judge/Grader
  - Poster Competition: American Society for Engineering Education – Southeast Section Annual Conference 2018, Daytona Beach, FL
  - Research Paper Grader: South Carolina Junior Academy of Science 2018 Annual Meeting

- Industrial Engineering Division, American Society for Engineering Education – Southeast Section
  - Chair (2019); Vice-chair (2018)

- NSF Engineering and Systems Design Grantees Conference 2015, Lead Student Coordinator

SERVICE AS A GRADUATE STUDENT
- Association for India's Development – Clemson Chapter, Vice-President
- Activities Committee, Graduate Student Government, Member
- Clemson Graduate Student Academic Integrity Committee, Member
- Clemson Graduate Student Academic Grievance Committee, Member
- Clemson Indian Students Association, Treasurer
- Graduate Student Government, Finance Committee Chair
- Graduate Student Government, Senator
- Mechanical Engineering Graduate Student Council, Member

PUBLICATIONS REVIEWER
- National Science Foundation ASME IDETC/CIE Design Essays
- Artificial Intelligence for Engineering Design, Analysis and Manufacturing
- ASME Journal of Mechanical Design
- ASME Journal of Computing and Information Science in Engineering
- Computer Aided Design Journal
- CAD and Applications Journal
- International Journal of Information Technology & Decision Making
- International Journal of Production Research
- International Journal of Vehicle Design
- ASEE Southeastern Conference
- ASME DETC/CIE Conference
- Complex Adaptive Systems Conference

BOOK REVIEWER
- Manufacturing Processes for Engineering Materials by Serope Kalpakjian and Steven Schmid, Sixth Edition
- Materials and Manufacturing: An Introduction to How They Work and Why it Matters… by Mark Atwater

AWARDS & HONORS
- Francis Marion University Faculty Award for Excellence in Research and Scholarship   2020 - 2021
- FMU Phi Kappa Phi Honor Society, Member
- Recognized as a faculty member who has made a lasting impact on Student Atheletes' lives
  - Ivan Henderson   Spring 2020
  - Lauryn Jones   Spring 2019
  - Lars Sandvoll   Spring 2019
  - Javier Bustos Jaimes   Spring 2018
- National Science Foundation – Travel Award   2014
- National Science Foundation – Design Essay Award   2013 & 2014
- Clemson University Professional Enrichment Grants Award   December 2014 & May 2015
- Eastman Chemical Award for Excellence
  Department of Mechanical Engineering, Clemson University   2013

INVITED TALKS
- "Using Artificial Intelligence for Technical Writing"
  Francis Marion University Science Symposium   August 2019
- "Manufacturing: The Past, The Present, and The Future"
  Plenary Address at the Pee Dee Regional High School Mathematics Tournament   December 2017

<table>
<tr><td></td><td>■ "Manufacturing: The Past, The Present, and The Future"
Francis Marion University Science Symposium</td><td>November 2017</td></tr>
<tr><td></td><td>■ "Francis Marion University – Industrial Engineering"
South Carolina Society of Professional Engineers: Coastal/Pee Dee Chapter</td><td>May 2017</td></tr>
<tr><td></td><td>■ "Pattern Recognition: Understanding How We Learn"
Vox Novo, Clemson University</td><td>October 2013</td></tr>
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GRADUATE RESEARCH EXPERIENCE

BMW Manufacturing, Graduate Research Assistant
- Project: Failure Modes Effects and Analysis (FMEA) for Flexible Parts   Jan 2015 – May 2016
- Project: Assembly Process Knowledge Management   Jan 2012 – May 2014

ZF Transmissions, Graduate Research Assistant
- Project: Scrap and Downtime Data Analysis   Jan 2015 – Feb 2016

Industrial Fabrics Association International, Graduate Research Assistant
- Project: Friction Testing of Tent Ballasts   Jan 2012 – May 2012

PUBLICATIONS

JOURNAL ARTICLES

[1] Sousa, C.*, Renu R., (2020) "Computing Solid Model Similarity for Engineering Applications using Congruence of Triangles", *Computer Aided Design and Applications Journal*, 18(5), pp. 66–70.

[2] Renu R., Visotsky, D., Knackstedt, S., Mocko, G., Summers, J., Schulte, J., (2016) "A Knowledge Based FMEA to Support Identification and Management of Vehicle Flexible Component Issues", *Procedia CIRP, 44*, 157-162

[3] Renu R., Mocko, G., (2016) "Retrieval of Solid Models based on Assembly Similarity", *Computer-Aided Design and Applications, 13(5)*, 628-636

[4] Renu R., Mocko, G., (2016) "Computing Similarity of Text-based Assembly Processes for Knowledge Retrieval and Reuse", *Journal of Manufacturing Systems, 39*, 101-110

PEER REVIEWED CONFERENCE ARTICLES

[1] Renu R., Mocko, G. (2021, Accepted for Publication). Computationally Assisted Retrieval and Reuse of 3d Solid Models and Assembly Work Instructions. *ASME 2021 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. 41st Computers and Information in Engineering Conference (CIE). Virtual, Online.*.

[2] Stoll, F., Warren, D.*, Vasseur, E.*, Chodha, S.*, Mason, S.J., Renu R., Shields, B. Cintron-Gonzalez, L., Lee, S. (2020, Under Review). The Doctor Is In: Monitoring and Visualizing Supply Chain Health through Machine Learning. *Institute of Industrial and Systems Engineers (IISE) Conference*.

[3] Schweisinger, T., Renu R., Wagner, J. (2021, accepted for publication). Student and Faculty Perceptions of COVID-19's Impact on Engineering Preparedness. *American Society for Engineering Education Southeastern Section Conference*.

[4] Renu R., (2020, accepted for publication) "Unsupervised Method of Determining Cycle Times of Manual Assembly Processes", *Proceedings of the ASME 2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference. Volume 9: 40th Computers and Information in Engineering Conference (CIE). Virtual, Online. V009T09A057*,

[5] Sousa, C.*, Renu R., (2020) "Computing Solid Model Similarity for Engineering Applications using Congruence of Triangles", *Computer-Aided Design and Applications Conference*, Catalonia, Spain; doi: 10.14733/cadconfP.2020.66-70

[6] Renu R., (2019) "Decision Support System for Maynard Operating Sequence Technique Analyses", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Anaheim, CA

[7] Renu R., Shields, B., (2019) "Developing a Method to Quantify Difficulty of Engineering Graphics Assignments", *American Society for Engineering Education Southeastern Section Conference*, Raleigh, NC

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* FMU Undergraduate Student

[8]   Renu R., (2019) "Observations from a Two-Semester Design and Build Project", *American Society for Engineering Education Southeastern Section Conference,* Raleigh, NC

[9]   Renu R., Sousa, C.* (2018) "Similarity of Tessellated Solid Models for Engineering Applications", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* Quebec, Canada

[10] Jaimes, J. B.*, Powell, T.* Renu R., Hanson, L. (2018) "Use of Artificial Intelligence to Evaluate Authoring of Technical Instructions", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* Quebec, Canada

[11] Renu R., Cintron-Gonzalez, L. (2018) "Towards Standardization of ABET Student Outcome Assessment", *American Society for Engineering Education Southeastern Section Conference,* Daytona Beach, FL

[12] Renu R., Hanson, L. (2017) "Rule-Based Decision Support System for Authoring Technical Instructions", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* Cleveland, OH

[13] Renu R., Anthony, G., Grigg, S., Minor, J., Yasmin, N., (2016) "Improving Engineering Graphics Grading Using a Shape Similarity Algorithm – An Initial Investigation", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* Charlotte, NC

[14] Renu R., Visotsky, D., Knackstedt, S., Mocko, G., Summers, J., Schulte, J., (2016) "A Knowledge Based FMEA to Support Identification and Management of Vehicle Flexible Component Issues", *6th CIRP Conference on Assembly Technologies and Systems*, Gothenberg, Sweden

[15] Renu R., Mocko, G., (2015) "Text Analysis of Assembly Work Instructions", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* Boston, MA

[16] Renu R., Mocko, G., (2015) "Retrieval of Solid Models based on Assembly Similarity", *Proceedings of Computer-Aided Design and Applications Conference,* London, UK

[17] Renu R., Mocko, G., (2015) "Design and Implementation of a Line Balance Visualization and Editing Tool", *5th International Conference of Research into Design,* Bangalore, India

[18] Renu R., Mocko, G., (2014) "Ontological Knowledge Representation and Inference Rules for MTM Decision Support System", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* Buffalo, NY

[19] Antani, K., Pearce, B., Mears, L., Renu, R., Kurz, M. E., Schulte, J. (2014) "Application of System Learning to Precedence Graph Generation for Assembly Line Balancing", *Manufacturing Science and Engineering Conference*, Detroit, MI.

[20] Renu R., Mocko, G., Summers, J., Peterson, M. , (2013) "Automated Navigation of Method Time Measurement (MTM) tables for Automotive Assembly Line Planning", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference,* Portland, OR

[21] Renu R., Mocko, G., Koneru, A., (2013) "Use of Big Data and Knowledge Discovery to Create Data Backbones for Decision Support Systems", *Complex Adaptive Systems,* Baltimore, MD

[22] George, D., Mocko, G., Renu R. (2013) "Concept Generation through Morphological and Options Matrices", *4th International Conference of Research into Design,* Chennai, India

DOCTORAL DISSERTATION

Renu, R.S., (2016) "Product-Process Coupling to Enable Continuous Improvement of Assembly Processes", *Department of Mechanical Engineering, Clemson University*, Clemson, South Carolina.

MASTERS THESIS

Renu, R.S., (2013) "Decision Support Systems for Assembly Line Planning – Modular Subsytems for a Large Scale Production Management System", *Department of Mechanical Engineering, Clemson University*, Clemson, South Carolina.

AWARD PAPERS, POSTERS AND PRESENTATIONS

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* FMU Undergraduate Student

[1] Sousa, C.*, <u>Renu, R.,</u> (2019) "Tessellated Solid Model Similarity Using Congruent Triangles", *Presentation at the South Carolina Academy of Sciences Annual Meeting*, Florence, SC

[2] Chodha, S.*, <u>Renu, R.,</u> (2019) "Data-Driven Conceptual Design using Historical Knowledge", *Poster at the South Carolina Academy of Sciences Annual Meeting*, Florence, SC

[3] <u>Renu, R.,</u> Sarthy, V., Mocko, G. (2014) "Brain Mapping and Adaptive Manufacturing" *ASME International Design Engineering Technical Conference*, Buffalo, NY.

[4] Antani, K., Pearce, B., Mears, L., <u>Renu, R.,</u> Kurz, M. E., Schulte, J. (2014) "Application of System Learning to Precedence Graph Generation for Assembly Line Balancing", *Manufacturing Science and Engineering Conference*, Detroit, MI.

[5] Linnerud, B., <u>Renu, R.,</u> Mocko, G. (2013) "Design as a First Person Cooperative Game", *ASME International Design Engineering Technical Conference*, Portland, OR.

[6] <u>Renu, R.,,</u> Mocko, G., (2013) "Decision Support System for Assembly Line Planning", *Mechanical Engineering Graduate Student Poster Competition, Clemson University*, Clemson, SC

NON-REFEREED PRESENTATIONS AND POSTER SESSIONS

[1] Ellison, J.*, <u>Renu, R.,</u> (2021) "Assessing Human Motion Using Wireless Sensors", *Poster at FMU Research Exhibition Day*, Florence, SC

[2] Fulmer, C.*, <u>Renu, R.,</u> (2019) "Database Retrieval Of Three-Dimensional Models Using KDE", *Poster at the South Carolina Academy of Sciences Annual Meeting*, Florence, SC

[3] Fulmer, C.*, <u>Renu, R.,</u> (2019) "Database Retrieval Of Three-Dimensional Models Using KDE", *Poster at FMU Research Exhibition Day*, Florence, SC

[4] Sousa, C.*, <u>Renu, R.,</u> (2019) "Tessellated Solid Model Similarity Using Congruent Triangles", *Poster at FMU Research Exhibition Day*, Florence, SC

[5] Chodha, S.*, <u>Renu, R.,</u> (2019) "Data-Driven Conceptual Design using Historical Knowledge", *Poster at FMU Research Exhibition Day*, Florence, SC

[6] Sousa, C.*, <u>Renu, R.,</u> (2018) "Assessing 3D Model Similarity Based on Mathematical Similarity", *Poster at FMU Research Exhibition Day*, Florence, SC

[7] Jaimes, J. B.*, <u>Renu, R.,</u> (2018) "Use of Machine Learning to Understand Technical Writing", *Poster at FMU Research Exhibition Day*, Florence, SC

[8] <u>Renu, R.,,</u> Mocko, G., (2014) "Reducing Defects in Original Equipment Manufacturers", *Graduate Research and Discovery Symposium*, Clemson, SC

[9] <u>Renu, R.,,</u> Mocko, G., (2013) "Utilizing Knowledge Extraction Techniques to Process Big Data", *Computers In Engineering, ASME International Design Engineering Technical Conference*, Portland, OR

[CV compiled on 2021-08-20]

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