Curriculum Vitae

Prahalada Rao

Assistant Professor

Mechanical and Materials Engineering

University of Nebraska-Lincoln

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I. Academic Appointments

- **Assistant Professor** 2016-present

  Mechanical and Materials Engineering
  University of Nebraska-Lincoln
  2017 SME, Yoram Koren Outstanding Young Manufacturing Engineer Award
  2018 NSF CAREER Award

- **Assistant Professor** 2014-2016

  System Science and Industrial Engineering
  Binghamton University (State University of New York)
  Finalist: IIE Manufacturing and Design Division Young Investigator Award

- **Post-Doctoral Research Associate** 2013-2014

  Grado Department of Industrial and Systems Engineering
  Virginia Polytechnic Institute and State University (Virginia Tech)
  Supervisor: Dr. Zhenyu (James) Kong

II. Academic Qualifications

- Ph.D. Industrial Engineering and Management, Oklahoma State University 2013

Adviser: Dr. Satish T.S. Bukkapatnam, Dr. Zhenyu (James) Kong (co-adviser).
Dissertation Title: Sensor-based monitoring and inspection of surface morphology in ultraprecision manufacturing processes.

- M.S. Industrial Engineering and Management, Oklahoma State University 2006

Adviser: Dr. Satish T.S. Bukkapatnam, (Late) Dr. Ranga Komanduri (co-adviser)
Thesis Title: Statistical characterization, sensor-based modeling and monitoring of fine abrasive, chemical mechanical planarization (CMP).

- B.Engg Production Engineering 2003

  In First Class, (top 10% of graduating class)

  Victoria Jubilee Technical Institute (VJTI), Bombay University

III. Research and Scholarly Contributions

A. Research Focus

- **Monitoring and Modeling of Advanced Manufacturing Processes**.

  Additive Manufacturing (AM/3D Printing):

  Laser Powder Bed Fusion (LPBF), Directed Energy Deposition (DED), Aerosol Jet Printing (AJP), Fused Freeform Fabrication (FFF), and Binder Jetting (BJ).

  Machining and Abrasive Finishing

  Ultraprecision machining (UPM), semiconductor chemical mechanical planarization (CMP), lapping, and magneto-rheological free-form finishing (MR3F)

- **Big Data Analytics and Artificial Intelligence.**

  Sensor fusion, Neural networks, and Bayesian learning in Advanced Manufacturing

  Decision theory and spectral graph theoretic sensor fusion for in-process quality assurance in additive manufacturing. Recurrent neural networks for surface finish monitoring in ultraprecision machining. Bayesian decision theoretic models for process monitoring of defects in semiconductor polishing

  Deep learning and statistical models for healthcare application

  Detection of epileptic seizures, cardiac anomalies, and neuropsychological degradation.

B. External Funding as Principal Investigator ($917,971)

- **National Science Foundation** – CMMI, Service, Manufacturing and Operations Research Program, Grant Number: CMMI 1719388, *Biosensor Data Fusion for Real-time Monitoring of Global Neurophysiological Function.* Project Duration: September 2015 - 2018, Amount $217,971.
- **National Science Foundation** – CMMI, Cyber Physical Systems Program, Grant Number: CMMI 1739696, *CPS: Medium: Collaborative Research: Cyber-Enabled Online Quality Assurance for Scalable Additive Bio-Manufacturing.* Project Duration: September 2017 - 2021, Amount $200,000.
- **National Science Foundation –** CMMI, Manufacturing, Machines, and Equipment, Grant Number: CMMI 1752069, *CAREER: Smart Additive Manufacturing - Fundamental Research in Sensing, Data Science, and Modeling Toward Zero Part Defects*. Project Duration: April 2018 – 2023, Amount $500,000.

C. Internal Funding as Principal Investigator ($81,000)

At University of Nebraska-Lincoln

1) Layman Seed Funding for Magnetic Abrasive Finishing Apparatus ($10,000, 2017).
2) Undergraduate Research Experience for Process Control in BioAdditive Manufacturing awarded to Mr. Sam Gerdes ($5000, Summer 2018).
3) Undergraduate Research Experience for Quality Assurance in Hybrid Additive Manufacturing awarded to Mr. Grant King ($5000, Summer 2018).
4) Undergraduate Research Experience for Freeform Polishing awarded to Mr. Joe Broadway ($5000, Summer 2018).
5) Undergraduate Research Experience for Computational Modeling in Metal Additive Manufacturing awarded to Mr. August McLenehan ($5000, Summer 2018).

At Binghamton University

6) Strategic Partnership for Industrial Resurgence (SPIR), *Quality Assurance in Direct Metal Sintering Process*. With Incodema3D, Ithaca, NY. September 2015 – January 2016.
7) SUNY Binghamton Transdisciplinary Area of Excellence (TAE) *Real-Time Monitoring of Global Neurophysiological Function Using Customized 3D Printed BioSensors and Sensor Data Fusion Algorithms* ($15,000, granted March 2015, Position PI). Co-PIs: V. Miskovic (Psychology); C-A Chou (Industrial Engineering).
8) Instructional Labs and Software Grant for Additive Manufacturing Instructional Lab ($36,000, granted January 2015).

D. Scholarly Publications

D1. Peer Reviewed Archival Journal Articles Published or Currently Accepted (26)

* corresponding author; # student under my sole supervision; ^ student supported by NSF REU under my supervision; @ joint supervision with another faculty.

1. F. Imani, A. Gaikwad, M. Montazeri, P. Rao, H. Yang, E. Reutzel, Modeling and In-process Monitoring of Porosity in Laser Powder Bed Fusion Process. A*SME Transactions*, *Journal of Manufacturing Science and Engineering,* Accepted, Pending Revisions, 2018.

2. X. Wang, M. Sealy, R. Williams, **P. Rao**, Y. Guo Stochastic Modeling and Analysis of Spindle Energy Consumption During Hard Milling, A*SME Transactions*, *Journal of Manufacturing Science and Engineering,* Accepted, Pending Revisions, 2018.

3. M. Montazeri[#], **P. Rao***, Heterogeneous Sensor-based Build Condition Monitoring in Laser Powder Bed Fusion Additive Manufacturing Process using a Spectral Graph Theoretic Approach, A*SME Transactions*, *Journal of Manufacturing Science and Engineering*, Accepted, In-Press, 2018.

4. M. Montazeri, R. Yavari, **P. Rao***, P. Boulware, In-process Monitoring of Material Cross-Contamination Defects in Laser Powder Bed Fusion, A*SME Transactions, Journal of Manufacturing Science and Engineering,* Accepted, Pending Revisions, 2018.

5. M. Sealy*, G. Madireddy, R. Williams, **P. Rao**, M. Toursangsaraki, Review Article - Hybrid Processes in Additive Manufacturing. A*SME Transactions, Journal of Manufacturing Science and Engineering,* Accepted, In-press, 2017. doi:10.1115/1.4038644.

6. H. Sun, **P. Rao**, Z. Kong, X. Deng and R. Jin*, Functional Quantitative and Qualitative Models for Quality Modeling in a Fused Deposition Modeling Process, *IEEE Transactions, Automation Science and Engineering*, Accepted, In-press. doi: 10.1109/TASE.2017.2763609.

7. M. Khanzadeh, **P. Rao**, R. Jafari-Marandi, B. K. Smith, M. Tschopp, L. Bian*, Characterizing the Geometric Accuracy of Additively Manufactured Components Using Self-Organizing Maps, *ASME Transactions, Journal of Manufacturing Science and Engineering*, Vol 140(3), pp. 031011- 031023, 2017. doi: 10.1115/1.4038598

8. M. Aboutaleb, M. Tschopp, **P. Rao**, L. Bian*, Accelerated Multiobjective of Part Geometric Accuracy in Additive Manufacturing (AM), *ASME Transactions, Journal of Manufacturing Science and Engineering*, Vol. 139(10), pp. 101001 – 101014, 2017. doi: 10.1115/1.4037319

9. R. Salary[@], J. Lombardi, **P. Rao***, M. Poliks, Aerosol Jet Printing (AJP) of Flexible Electronic Devices: Online Monitoring of Functional Electrical Properties Using Shape-from-Shading (SfS) Image Analysis, *ASME Transactions, Journal of Manufacturing Science and Engineering,* Vol. 139(10), pp. 101010 – 101023, 2017. doi:10.1115/1.4036660

10. M.S. Tootooni[#], A. Dsouza[#], R. Donovan[#^], **P. Rao*,** Z. Kong, P. Borgesen, Classifying the Dimensional Variation in Additive Manufactured Parts from Laser-Scanned 3D Point Cloud Data using Machine Learning Approaches, *ASME Transactions, Journal of Manufacturing Science and Engineering*, Vol. 139(9), pp. 091005 – 091019, 2017. doi: 10.1115/1.4036641

11. M.S. Tootooni[#], C. Liu, D. Roberson, R. Donovan[#^], **P. Rao***, Z. Kong, S.T.S. Bukkapatnam, Online Non-contact Surface Finish Machining using Graph-based Image Analysis. *SME Journal of Manufacturing Systems*, Vol. 41, pp. 266-276, October 2016, doi: 10.1016/j.jmsy.2016.09.007.

12. R. Salary[@], J. Lombardi, M.S. Tootooni[#], R. Donovan[#^], **P. Rao***, M. Poliks, P. Borgesen, Modeling and Monitoring of Aerosol Jet Printing (AJP) Process. *ASME Transactions, Journal of Manufacturing Science and Engineering*, 139(2), pp. 021015-021036, October 2016, doi:10.1115/1.4034591

13. M. S. Tootooni[#], **P. Rao*,** C-A. Chou, Z. Kong, A Spectral Graph Theoretic Approach for Monitoring Multivariate Time Series Data from Complex Dynamical Processes. *IEEE*

Transactions, *Automation Science and Engineering* (Accepted, In-Press), July 2016. doi: 10.1109/TASE.2016.2598094

14. J. Liu, Omer F. Beyca, **P. Rao**, Z. Kong*, and S. Bukkapatnam, Dirichlet Process Gaussian Mixture (DPGM) Models for Real-Time Monitoring and its Application to Chemical Mechanical Planarization (CMP). *IEEE Transactions*, *Automation Science and Engineering*, Vol. 14(1), pp. 208-221. doi: 10.1109/TASE.2016.2599436.

15. K. Bastani, **P. Rao,** and Z. Kong*, An Online Sparse Estimation-based Classification (OSEC) Approach for Real-time Monitoring in Advanced Manufacturing Process from Heterogeneous Sensor Data. *IIE Transactions*, *Quality and Reliability Engineering*, 48(7), pp. 579-598, 2016. doi: 10.1080/0740817X.2015.1122254

Best Paper Award, Invited talk at IISE Conference, 2018. Article highlighted in the June 2016 (Volume 48, Number 9) Issue of the Industrial and Systems Engineer (ISE) Magazine.

16. **P. Rao**, Z. Kong*, C. Duty, R. Smith, V. Kunc, and L. Love, Assessment of Dimensional Integrity and Spatial Defect Localization in Additive Manufacturing (AM) using Spectral Graph Theory. *ASME Transactions, Journal of Manufacturing Science and Engineering*, 138(5), pp. 051007, 2015. doi: 10.1115/1.4031574

17. O. Beyca, **P. Rao**, Z. Kong*, S. Bukkapatnam, and R. Komanduri, Heterogeneous Sensor Data Fusion Approach for Real-time Monitoring in Ultraprecision Machining (UPM) process using non-parametric Bayesian clustering and evidence theory. *IEEE Transactions*, *Automation Science and Engineering*, 13(2), pp.1033-1044, 2016 doi: 10.1109/TASE.2015.2447454

18. **P. Rao**, J. Liu, D. Roberson, and Z. Kong*, and C. Williams, Online Real-time Quality Monitoring in Additive Manufacturing Processes using Heterogeneous Sensors, *ASME Transactions*, *Journal of Manufacturing Science and Engineering*. 137(6), pp. 061007, 2015 doi: 10.1115/1.4029823

19. **P. Rao**, S. Bukkapatnam*, O. Beyca, Z. Kong, K. Case, and R. Komanduri, A Graph-Theoretic Approach for Quantification Of Surface Morphology and Its Application To Chemical Mechanical Planarization (CMP) Process. *IIE Transactions*, *Quality and Reliability Engineering*, 47(10), pp. 1-24, 2015. doi: 10.1080/0740817X.2014.1001927

Best Paper Award (Honorable Mention), Invited talk at IISE Conference, 2017. Article highlighted in the September 2015, (Volume 47, Number 6) issue of the Industrial Engineer Magazine (now called Industrial and Systems Engineer).

20. **P. Rao**, S. Bukkapatnam*, O. Beyca, Z. Kong, and R. Komanduri, Real-time Identification of Incipient Surface Morphology Variations in Ultraprecision Machining Process. *ASME*

Transactions, *Journal of Manufacturing Science and Engineering*, 136(2), pp. 021008, 2014. doi: 10.1115/1.4026210

21. **P. Rao**, M. Bhushan, S. Bukkapatnam*, Z. Kong, S. Byalal O. Beyca, A. Fields, and R. Komanduri, Process-Machine Interaction (PMI) Modeling and Monitoring of Chemical Mechanical Planarization (CMP) Process Using Wireless Vibration Sensors. *IEEE Transactions*, *Semiconductor Manufacturing*, 27(1), pp. 1-15, 2014. doi: 10.1109/TSM.2013.2293095

22. S. Bukkapatnam*, **P. Rao**, W-C. Lih, N. Chandrashekeran, and R. Komanduri, Process Characterization and Statistical Analysis of oxide CMP on a Silicon Wafer, *Applied Physics (A)*, 88(4) pp. 785-792, 2007. doi: 10.1007/s00339-007-4082-x

23. S. Bukkapatnam*, **P.Rao**, and R. Komanduri, Experimental Dynamics Characterization and Monitoring of MRR in Oxide Chemical Mechanical Planarization (CMP) Process. *International Journal of Machine Tools and Manufacture*, 2008, 48(12-13), pp.1375-1386. doi: doi:10.1016/j.ijmachtools.2008.05.006.

24. Wen-Chen Lih, S. Bukkapatnam*, **P. Rao,** N. Chandrasekharan, R. Komanduri, Adaptive Neuro-Fuzzy Inference System Modeling of MRR and WIWNU in CMP Process with Sparse Experimental Data. *IEEE Transactions*, *Automation Science and Engineering*, 5(1), pp. 71 -83, 2008. doi: 10.1109/TASE.2007.911683

25. S. Bukapatnam*, R. Komanduri, H. Yang, **P. Rao,** W.C. Lih, M. Malshe, L.M. Raff, B. Benjamin, and M. Rockley, Classification of Atrial Fibrillation Episodes from Sparse Electro-Cardiogram Data, *Journal of Electrocardiology*, 41(4), pp. 292-299, 2008. doi:10.1016/j.jelectrocard.2008.01.004

26. J.M, Govardhan, S. Bukkapatnam*, Y. Bhamare, **P. Rao,** and V. Rajamani. Statistical analysis and design of RFID systems for monitoring vehicle ingress/egress in warehouse environments, *International Journal of Radio Frequency Identification Technology and Applications*, 2007, 1(2), pp. 123-146. doi: 10.1504/IJRFITA.2007.013140

D2. Refereed and Peer Reviewed Conference Articles (14)

1. J. Lombardi, R. Salary, D. Weerawarne, **P. Rao**, M. Poliks, *In-situ Image-Based Monitoring and Closed-Loop Control of Aerosol Jet Printing* (Accepted). Paper # MSEC2018-6487, 46th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2018 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 18th-June 22nd, Texas A&M University, College Station, TX, 2018.

2. F. Imani, B. Yao, R. Chen, **P. Rao**, H. Yang, *Fractal pattern recognition of image profiles for manufacturing process monitoring and control control*(Accepted). Paper # MSEC2018-6523, 46th Proceedings of the North American Manufacturing Research Institution (NAMRI)

of SME/2018 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 18th-June 22nd, Texas A&M University, College Station, TX, 2018.

3. P. Mehta, **P. Rao**, Z. Wu, V. Jovanovic, O. Wodo, M. Kuttolamadom, *Smart manufacturing: a state-of-the-art review in context of conventional and modern manufacturing process modeling, monitoring and control* (Accepted). Paper # MSEC2018-6658, 46th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2018 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 18th-June 22nd, Texas A&M University, College Station, TX, 2018.

4. M. Montazeri, R. Yavari, **P. Rao***, P. Boulware, *In-Process Monitoring of Material Cross-Contamination in Laser Powder Bed Fusion* (Accepted) Paper # MSEC2018-6470, 46th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2018 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 18th-June 22nd, Texas A&M University, College Station, TX, 2018.

5. F. Imani, A. Gaikwad, M. Montazeri, H. Yang, **P. Rao***, *Layerwise In-process Quality Monitoring in Laser Powder Bed Fusion* (Accepted). Paper # MSEC2018-6477, 46th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2018 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 18th-June 22nd, Texas A&M University, College Station, TX, 2018.

6. M.S. Tootooni[#], A. Dsouza[#], R. Donovan[#^], **P. Rao*,** Z. Kong, P. Borgesen, *Assessing The Geometric Integrity Of Additive Manufactured Parts From Point Cloud Data Using Spectral Graph Theoretic Sparse Representation-Based Classification* Paper # MSEC2017-2794, 45th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2017 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 4th-June 8th, University of Southern California, Los Angeles, CA, 2017. doi:10.1115/MSEC2017-2794

7. R. Salary[@], J. Lombardi, **P. Rao***, M. Poliks, *Additive Manufacturing (AM) of Flexible Electronic Devices: Online Monitoring Of 3d Line Topology In Aerosol Jet Printing Process Using Shape-From-Shading (SfS) Image Analysis,* Paper # MSEC2017-2947, 45th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2017 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 4th-June 8th, University of Southern California, Los Angeles, CA, 2017. doi:10.1115/MSEC2017-2947

8. M. S. Tootooni[#], M. Fan, R. Sivasubramony[#], C.-A. Chou, V. Miskovic, and **P. Rao***, *Graph Theoretic Compressive Sensing Approach for Classification of Global Neurophysiological States from Electroencephalography (EEG) Signals*, in Lecture Notes in Computer Science, Vol 9919, 2016, pp. 42-51. doi: 10.1007/978-3-319-47103-7_25. *Brain Informatics and Health: International Conference, BIH 2016*, Omaha, NE, USA, October 13-16, 2016 Proceedings. Online ISBN: 978-3-319-47103-7. doi: 10.1007/978-3-319-47103-7_5

9. M. Fan, M.Tootooni[#], R. Sivasubramony[#], V. Miskovic, **P. Rao**, C-A. Chou*. *Acute Stress Detection Using Recurrence Quantification Analysis of Electroencephalogram (EEG) Signals*. in Lecture Notes in Computer Science, Vol 9919, 2016, pp. 252-261. doi: 10.1007/978-3-319-47103-7_25. *Brain Informatics and Health: International Conference, BIH 2016,* Omaha, NE, USA, October 13-16, 2016 Proceedings. Online ISBN: 978-3-319-47103-7. doi: 10.1007/978-3-319-47103-7_25

10. R. Salary[@], J. Lombardi, M. Tootooni, R. Donovan, **P. Rao***, M. Poliks, *In-situ Sensor-based Monitoring and Computational Fluid Dynamics Modeling of Aerosol Jet Printing Process.* Paper # MSEC2016-8535, 44th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2016 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 27th-July 1st, Blacksburg, VA, 2016. doi:10.1115/MSEC2016-8535.

11. **P. Rao**, Z. Kong*, C. Duty, R. Smith, *Three Dimensional Point Cloud-based Dimensional Integrity Assessment for Additive Manufactured Parts using Spectral Graph Theory.* Paper # MSEC2016-8516, 44th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2016 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 27th-July 1st, Blacksburg, VA, 2016. doi:10.1115/MSEC2016-8516

12. **P. Rao,** M. Tootooni[#], C-A Liu, D. Roberson, R. Donovan^[#], R. Sivasubramony[#], S. Bukkapatnam, Z. Kong, *Online Non-contact Surface Finish Measurement in Machining using Graph-based Image Analysis* Paper # NAMRC 44-5, *Komanduri Symposium*, 44th Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME/2016 Manufacturing Science and Engineering Conference (MSEC) of the ASME, June 27th-July 1st, Blacksburg, VA, 2016. Note: This Paper was accepted for publication as a peer-reviewed journal paper in the SME Journal of Manufacturing Systems, and was hence withdrawn from the conference proceedings.

13. **P. Rao**, Z. Kong, S. Bukkapatnam*, O. Beyca, K. Case, R. Komanduri, *Quantification of Ultraprecision Surface Morphology using an Algebraic Graph Theoretic Approach*. *Hoken Symposium*, 43rd Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME, Paper # NAMRC 43-65, *Proceedia Manufacturing*, June 8th – June 12th, Charlotte, NC, 2015. doi.org/10.1016/j.promfg.2015.09.025

14. **P. Rao**, J. Liu, D. Roberson, Z. Kong,* Sensor-based Online Fault Detection in Additive Manufacturing, Paper # MSEC 2015-9389, 43rd Proceedings of the North American Manufacturing Research Institution (NAMRI) of SME, June 8th – June 12th, Charlotte, NC, 2015. doi:10.1115/MSEC2015-9389.

D3. Journal Articles Currently Under Review or Preparation (5)

1. J. Liu, Y. Bai, P.Rao, C. Williams, Z. Kong, *IIE Transactions,* (Under Review).
2. P. Dryburgh, J. Williams, M. Montazeri, A. Clare, P. Rao, (Under Preparation).

3. A. Gaikwad, P. Rao, F. Imani, H. Yang, E. Reutzel, *ASME Transactions* (Under Preparation).
4. M. Montazeri, A. Nassar, A. Dunbar, P.Rao, *ASME Transactions* (Under Preparation).

D4. Books and Book Chapters (3)

1. In-Process Monitoring of Material Cross-Contamination in Laser Powder Bed Fusion
2. **P. Rao**, **Chapter 6**: Monitoring and Control, in *Laser-based Additive Manufacturing Processes*, Eds. John Usher and Linkan Bian, Springer. Expected Publication Date: 2017.
3. B. Khoda, T. Benny[#], **P. Rao**, M. Sealy, C. Zhou, **Chapter 8:** Applications of Laser-based Additive Manufacturing, in *Laser-based Additive Manufacturing Processes*, Eds. John Usher and Linkan Bian, Springer. Expected Publication Date: 2017.
4. **P. Rao**, R. Komanduri, and S. Bukkapatnam, *Sensor-based Modeling and Monitoring of Chemical Mechanical Polishing*, VDM Verlag, ISBN 978-3-639-03564-3.

E. Invited Presentations and Posters

E1. Invited departmental seminar talks at other institutions

- Kansas State (Spring 2018)
- Virginia Tech (Spring 2018)
- Iowa State University (Spring 2018)
- National Institute of Standards and Technology (Fall 2017)
- Pennsylvania State University (Fall 2017)
- North Dakota State University (Spring 2017)
- University of Kentucky (Spring 2016)
- University at Buffalo (Fall 2015, Spring 2016)
- Texas Tech University (Spring 2016)
- Kansas State University (Spring 2016)
- University of Iowa (Spring 2016)
- University of South Florida (Spring 2016)

E2. Conference Talks and Presentations.

1. Emerging Researcher Showcase, 2017 International Forum on Sustainable Manufacturing, Institute of Sustainable Manufacturing, University of Kentucky, funded through a NSF Travel Grant (December, 2017)
2. **Invited Poster and NSF Student Fellow:** Real-time monitoring of surface morphology variations in ultra-precision manufacturing processes, NSF Civil Mechanical and Manufacturing Innovation Conference, Boston, MA, 2012.
3. **Invited Poster and Future Academician Colloquium Invitee:** Real-time monitoring of surface morphology variations in ultra-precision manufacturing processes, IIE Industrial Engineering Research Conference, Orlando, FL, 2012.
4. **Invited paper and CIRP student grant:** S.T.S Bukkapatnam, P.K. Rao, O.F. Beyca, Z. Kong, and R. Komanduri, Towards Real-time Detection of Incipient Surface Variations in Ultra-Precision Machining Process, 44th CIRP Conference, University of Wisconsin-Madison, Madison, WI, 2011.
5. **Invited paper:** R. Komanduri, S. Bukkapatnam, P.K. Rao and U. Phatak , Experimental Dynamics Characterization and Monitoring of Chemical Mechanical Planarization Process, Invited Paper, CMP-MIC 2007, Freemont, CA.
6. **Invited Poster and NSF Student Fellow:** Monitoring of Surface Generation in Ultra-Precision Machining using Multi sensor Fusion, NSF Civil Mechanical and Manufacturing Innovation Conference, Atlanta, GA , 2010.
7. **Invited Poster and NSF Student Fellow:** Heterogeneous Wireless Sensing and Modeling of Chemical-Mechanical Interactions in Chemical Mechanical Planarization Process for Microelectronic Applications, NSF Nanomanufacturing Workshop, Boston, MA, 2009.
8. **Multiple invited talks at INFORMS conference,** 2005, 2010-2016.
9. **Multiple invited talks at IERC conference,** 2012, 2015, 2016.
10. **Multiple talks at NAMRC/MSEC,** 2015, 2016, 2017.
11. **Invited Webinars for Institute of Industrial and Systems Engineers**
    - Additive Manufacturing – Challenges and Opportunities, March 2016 for Quality Control and Reliability Engineering Division (QCRE).
    - In-process Quality Assurance in Additive Manufacturing, March 2017 for the Computer and Information Systems Division (CIS)

IV. Teaching and Pedagogy, and Graduate Students Mentored

A. Teaching Interests

- **Conventional and advanced manufacturing processes**

  Dynamic modeling and process diagnosis of ultraprecision machining, semiconductor planarization, non-traditional metal cutting, and additive manufacturing processes.

- **Data Analytics and quality control**

  Sensor-based modeling, time series analysis, networks, image processing, inferential statistics, design of experiments, statistical process control, and six sigma methods.

- **Signal processing, robotics, and automation**

  Digital data acquisition, wireless sensor networks, microcontroller programming, Arduino-based robotics, and autonomous systems.

B. Courses Taught

At University of Nebraska-Lincoln

- MECH 498/498: Additive Manufacturing (Spring 2017)
- MECH 321: Statistics and Data Analytics (Fall 2017)
- MECH 422/822: Industrial Quality Control (Spring 2018)

At Binghamton University

- SSIE 505: Applied Statistics and Probability (Fall 2014, 15)
- SSIE 561: Quality Assurance for Engineers (Spring 2015)
- Sensor Design Mentor, Fall and Spring 2015, Spring 2016.

At Virginia Tech

- Senior Design Mentor, Team won second place in regional IIE conference (2013-14).

At Oklahoma State University

- IEM 3503: Engineering Economic Analysis (Fall 2012, Spring 2013)
- Integrated Manufacturing Control Systems and Robotics (Summer 2008, 10, 11, 12, 13)

V. Students Mentored

B1. Doctoral Advisees (4 ongoing, 1 graduated)

- M. Samie Tootooni, Ph.D. (Dissertation Defended, June 2016)
- Roozbeh Salary (co-advised with Dr. M. Poliks at Binghamton Univ., expected 2018)
- Mohammad Montazeri (Expected, 2019)
- Jacob Williams (with Dr. Ashok Samal, Computer Science, Nebraska, Expected, 2020)
- R. Yavari (Expected, 2021)

B2. MS Advisees (2 graduated)

- Ashley D'Souza (Binghamton, Thesis Defended, May 2016)
- Rajesh Sharma Sivasubramony (Binghamton, Thesis Defended, May 2016)
- Taniya Benny (Binghamton, MS Project, transferred to Dr. Borgesen, May, 2017)
- Rahul Morye (Binghamton, MS Project, transferred to Dr. Borgesen, May 2017)
- Aniruddha Gaikwad (University of Nebraska, Thesis Expected, May 2018)

B3. Undergraduate Student Research Involvement (3)

- Ryan Donovan, Mechanical Engineering, Binghamton, Funded through NSF REU.
- Emily Curtis, Mechanical Engineering, University of Nebraska.
- Ben Bevans, Mechanical Engineering, University of Nebraska.
- Grant King, Mechanical Engineering, University of Nebraska.
- Sam Gerdes, Biosystems Engineering, University of Nebraska.
- Joseph Broadway, Mechanical Engineering, University of Nebraska.
- August McLenehan, Mechanical Engineering, University of Nebraska.

VI. Other Academic and Industrial Experience

A. Graduate Research Assistant

Advanced Technology Research Center (ATRC), Oklahoma State University

With Drs. Bukkapatnam, Kong, and Komanduri 2004-06, 2008-13

B. Teaching Assistant

- **School of Industrial Engineering and Management, Oklahoma State University**
  - Design of Experiments (IEM 4113) 2009-2010
  - Manufacturing Processes (IEM 3303) 2009
  - RFID applications in Industrial Engineering (IEM 5990) 2009
  - Reliability and Maintainability Engineering (IEM 5143) 2008
- **Industrial and Manufacturing Engineering, The Pennsylvania State University**
  - Manufacturing System Design and Analysis (IE 470) 2006 -2008

C. Visiting Research Scholar

- Indian Institute of Technology, Bombay

  Suman A. Mashruwala Advanced Microprocessor Laboratory 2007

  Investigated and presented evidence of existence for various dynamical regimes in fluid slosh using nonlinear, chaos theory state-space analysis.

D. Industrial Experience

- Engineering Trainee Process Engineer
  Mahindra and Mahindra Automotive Ltd., Bombay, India 2003
  - CAD/CAM design of jigs and fixtures for Single Minute Exchange of Dies (SMED).
  - Applied lean manufacturing concepts to enhance process outcomes, particularly jidoka, 5S, and poka-yoke.

VII. Professional Service and Recognition

A. Awards, Honors, and Certifications

- Finalist, IISE Manufacturing and Design Division's Young Investigator Award 2016
- Department nominee for IIE Pritsker Dissertation Award 2014
- Finalist, IIE, John L. Imhoff graduate fellowship 2010
- Outstanding Research Assistant, Alpha Pi Mu, Oklahoma State University chapter 2009
- Finalist, IIE Graduate thesis (Master's) award 2007
- ASQ Certified Quality Process Analyst (CQPA). 2005
- APICS Certified in Supply Chain Management (CSM) - Module 1 2004
- Listed in Academic Keys Who's Who in Engineering Academia 2015
- Invited to attend the Junior Faculty Colloquium: ISERC, Nashville, TN 2015
- Invited to attend the Future Academician Colloquium: INFORMS, Phoenix, AZ 2012

B. Professional Service

B1. Institute for Operations Research and Management Science (INFORMS)

- Referee, Best Paper Competition, IIE 2015,-16, -17
- Co-Chair, Best Paper Competition, INFORMS, QSR Section 2017
- Referee, INFORMS QSR Refereed Paper Competition 2015, -16, -17
- Referee, INFORMS Student Poster Competition 2015
- Session Chair (several sessions), INFORMS, IIE, MSEC, ASME since 2013
- NAMRC/ASME -43 Young Reviewers' Panel, Charlotte, NC 2015
- Track Chair, Process Industries, ISERC 2015
- Symposium Chair, Additive Manufacturing Cluster MSEC since 2016
- Symposium Chair, Cyber-Manufacturing Systems Cluster MSEC since 2016
- Track Chair, Production Planning and Scheduling, ISERC 2016
- Editorial Board: Journal of Manufacturing Systems. since 2017

- Editorial Board: International Journal of Rapid Manufacturing since 2014
- Associate Editor, Special Issue on Cyber Manufacturing 2017
- Reviewer of flagship journals
  - IIE Transactions, Design and Manufacturing/Quality and Reliability
  - ASME Transactions, Journal of Manufacturing Science and Engineering
  - IEEE Transactions, Automation Science and Engineering, Semiconductor Manufacturing.
  - SME, Journal of Manufacturing Systems
- Invited member, ASQ CQPA examination committee.
- President, ASQ Oklahoma State University Student Chapter.

C. Graduate Dissertation and Thesis Committees

- S. Yoon (Ph.D. Dissertation, Spring 2018)
- X. Wang (Ph.D. Dissertation, Under Progress)
- David Roberson (MS Thesis, Dr. Z. Kong, Virginia Tech, Summer 2016)
- Saurabh Kulkarni (MS Thesis, Dr. Nagarur, Binghamton University, Fall 2015)
- Frezer Feyissa (MS Thesis, Dr. Borgesen, Binghamton University, Fall 2015)
- Maan Z. Kokash (MS Thesis, Dr. Borgesen, Binghamton University, Fall 2015)
- Akshay Sharma (MS Thesis, Dr. Borgesen, Binghamton University, Summer 2015)
- Saif Khasawneh (MS Thesis, Dr. Borgesen, Binghamton University, Fall 2014)

VIII. References

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2) Dr. Zhenyu (James) Kong, Associate Professor, Virginia Tech
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3) Dr. Kenneth E. Case, Regents Professor (emeritus), Oklahoma State University
   Member of National Academy of Engineering
   email: ken.case@okstate.edu; cell: 405-377-7586
4) Dr. Chad E. Duty, Associate Professor, University of Tennessee (Knoxville)
   email: cduty@utk.edu; office phone: 865-974-8107