Akash Tiwari Jag Prasad

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EDUCATION

Texas A&M University, College Station, Texas, USA *2019 - 2023*
Ph.D., Industrial and Systems Engineering (GPA: 3.70/4.00)
- Advisor: Professor Satish Bukkapatnam
- Area of Study: Advanced Manufacturing

Indian Institute of Technology, Kharagpur, West Bengal, India *2015 - 2019*
B.Tech in Industrial and Systems Engineering (GPA: 8.80/10.00)

Maharishi Vidya Mandir, Tamil Nadu, India
CBSE Senior Secondary School *2013 - 2015*
  All India Senior School Certificate Examination (Score: 96.2%)
CBSE Secondary School *2011 - 2013*
  All India Secondary School Examination (CGPA: 10.00/10.00)

INTEREST AREAS
Data analytics and Machine Learning applications in manufacturing cybersecurity and process monitoring.

EXPERIENCE

Oak Ridge National Laboratory, Knoxville, TN **Researcher**
2024 - Present
- Supporting CRADA projects on machine tool monitoring and in-situ part distortion estimation.

Texas A & M Engineering Experimentation Station **Graduate Research Assistant**
Cybersecurity Assurance for Machine Tool Controllers *2020 - 2023*
- Developed MTC emulator for modeling real MTCs and optimized using Genetic Algorithm.
- Implemented Dynamic Watermarking on emulator to secure control loops of manufacturing controllers.
- Developed packetized G-code streaming approach for preventing reverse engineering attacks in MaaS.

Anomaly Detection in Polishing Process for Spherical Fusion Targets *2020 - 2023*
- Developed unsupervised approach for identifying discriminative spectral bands during shell polishing.
- Implemented sensor fusion for vibration and image sensors to detect anomalies using machine learning.
- Detecting sliding and slipping motion of shell using deep learning to infer mode of material removal.

Additive Manufacturing Supply Chain Cybersecurity using Embedded Codes *2019 - 2021*
- Developed anti-counterfeit code embedding platform for 3D printed parts in Manufacturing-as-a-Service.
- Developed ultrasound imaging approach for quick scanning (99.7% faster) of embedded codes.

Investigation of Colors on Polished Stainless Steel Surfaces *2019 - 2020*
- Discovered oxide growth on magnetically polished stainless steel surface which explain surface colors.
- Explained oxide formation from flash temperatures through physical structure inspection (3D profilometry), surface chemical composition (SEM-EDS) and color distribution (optical micrograph).

Durham University Business School, Durham, UK **Research Intern**
Economic Impact Assessment and Supply Chain Modelling *2018*
- Developed 8 questionnaires for gauging the economic impact of 186 UNESCO offices in the UK.
- Developed supply chain model to evaluate actions when self-publishing disrupts traditional publishing.

Department of Industrial & Systems Engineering, IIT Kharagpur **Student Researcher**
Blockchains for Machine-to-Machine Communication in Manufacturing *2017 - 2018*
- Modeled Industrial conveyer system with sensors and actuators as finite state machines using Petrinets.
- Demonstrated blockchains to reliably store and retrieve information for entities within system.

Royal Enfield, Tiruvottiyur, Chennai, Tamil Nadu, India **Summer Intern**
Quality Control for Motorcycle Engine Machining *2017*
- Conducted process flow analysis in machining cells of cylinder head, barrel and crank case.
- Achieved 36.82% increase in acceptance rate from operation re-sequencing and pre-inspection.

TEACHING
EXPERIENCE
Graduate Teaching Assistant *2021*
- ISEN 310 (Uncertainty Modeling in Industrial Engineering)
Teaching Assistant, NSF Research Experiences for Teachers (RET) *2022*

- Surface Engineering: Taught and trained twelve high school teachers on fundamental principles and operation of state-of-art metrology instruments for surface quality inspection.

SKILLS

Instruments: 3D profilometer, SEM, Nanoindentation testing, optical microscope, SIEMENS controller
Software: Python, MATLAB, SIMULINK R, LaTeX, Excel VBA, Mathematica

PUBLICATIONS

[1] Nikhil Gupta, *Akash Tiwari*, Satish Bukkapatnam, Ramesh Karri. "Additive manufacturing cyber-physical system: Supply chain cybersecurity and risks." IEEE Access 8 (2020)

[2] Priyanka Mahesh, *Akash Tiwari*, Chenglu Jin, Panganamala R. Kumar, AL Narasimha Reddy, Satish Bukkapatanam, Nikhil Gupta, Ramesh Karri. "A survey of cybersecurity of digital manufacturing." Proceedings of the IEEE 109, no. 4 (2020)

[3] *Akash Tiwari*, AL Narasimha Reddy, Satish Bukkapatnam. "Cybersecurity assurance in the emerging manufacturing-as-a-service (MaaS) paradigm: A lesson from the video streaming industry." Smart and Sustainable Manufacturing Systems 4, no. 3 (2020): 324–329. (2020)

[4] *Akash Tiwari*, Fang Xu, Akhlesh Lakhtakia, Hitomi Yamaguchi, Satish Bukkapatnam. "On colors of stainless-steel surfaces polished with magnetic abrasives." Applied Optics 60, no. 9 (2021)

[5] *Akash Tiwari*, Eduardo Jose Villasenor, Nikhil Gupta, Narasimha Reddy, Ramesh Karri, Satish Bukkapatnam. "Protection against counterfeiting attacks in 3D printing by streaming signature-embedded manufacturing process instructions." In Proceedings of the 2021 Workshop on Additive Manufacturing (3D Printing) Security, pp. 11-21. 2021

[6] Shilan Jin, Rui Tuo, *Akash Tiwari*, Satish Bukkapatnam, Chantel Aracne-Ruddle, Ariel Lighty, Haley Hamza, Yu Ding. "Hypothesis Tests with Functional Data for Surface Quality Change Detection in Surface Finishing Processes." IISE Transactions (2022)

[7] Adithyaa Karthikeyan, *Akash Tiwari*, Yuhao Zhong, Satish Bukkapatnam. "Explainable AI-infused ultrasonic inspection for internal defect detection." CIRP Annals (2022)

[8] Zhong, Yuhao, *Akash Tiwari*, Hitomi Yamaguchi, Akhlesh Lakhtakia, Satish Bukkapatnam. "Identifying the influence of surface texture waveforms on colors of polished surfaces using an explainable AI approach." IISE Transactions (2022)

[9] *Akash Tiwari*, McLaren Wang, Kyle Saleeby, AL Narasimha Reddy, Satish Bukkapatnam. "Learning Digital Emulators for Closed Architecture Machine Tool Controllers." *SME NAMRC 51 (Accepted), reccomended to JMS/JMP Fast track.*

[10] *Akash Tiwari*, Satish Bukkapatnam. "Unsupervised spectral-band identification for optimal process discrimination." *arXiv preprint arXiv:2212.03800* (2022)

[11] *Akash Tiwari*, Satish Bukkapatnam. "Dynamic Watermarking for Digital Twin-based Machine Tool Controller Cybersecurity." *Under preparation.*

PATENTS

[12] *Akash Tiwari*, Eduardo Jose Villasenor, Narasimha Reddy, Satish Bukkapatnam. "Manufacturing-As-A-Service Platform with G-Code Streaming of Designs with Embedded Signatures for 3D Printing". (Pending)

[13] *Akash Tiwari*, Yuhao Zhong, Adithyaa Karthikeyan, Yuandong Wang, Satish Bukkapatnam. "Convolutional neural network model to detect internal markers using ultrasound imaging". (Pending)

CONFERENCE PRESENTATIONS

[14] "Cybersecurity Assurance Techniques for Machine Tool Controllers", Institute for Operations Research and Management Science (INFORMS), Annual Meeting, Indianapolis, IN, Oct 2022.

[15] "Unsupervised Spectral Band Identification in Process Change Detection", Institute for Operations Research and Management Science (INFORMS), Annual Meeting, Anaheim, CA, Oct 2021. (Virtual Presentation)

[16] "Protection against Counterfeiting Attacks in 3D Printing by Streaming Signature-embedded Manufacturing Process Instructions", AM'Sec 21: Proceedings of the 2021 Workshop on Additive Manufacturing (3D Printing) Security, Virtual Event (held in conjunction with ACM CCS 2021).

CONFERENCE POSTER	[17] *Akash Tiwari*, Satish Bukkapatnam. "Unsupervised spectral-band identification for optimal process discrimination."

AWARDS

Wm Michael Barnes '64 Department of Industrial and Systems Engineering
- Outstanding Service to the Department, Industrial and Systems Engineering Spring Awards 2023.

NSF I-Corps TAMU site Fall 2021
- Secured $4000 grant for entrepreneurial venture of Manufacturing-as-a-Service for Additive Manufacturing of custom parts.

CSAW 2019, New York University, Nov 2019
- **Third Position** - Testing cybersecurity defenses in additive manufacturing and computer aided design

MENTORING EXPERIENCE

Graduate Student Research Credits
- Eashwar Venkitesan Iyer — *Spring 2021*
- Madhusudhan Gopalaraju — *Summer 2022*
- Shashank Galla — *Spring 2022*
- Sai Kiran Chary — *Fall 2022*

NSF Research Experiences for Undergraduates (REU)
- Sayed Ahmed — *Summer 2021*

Undergraduate Student Research Credits
- Eduardo Jose Villasenor — *Summer 2021*
- McLaren Wang — *Fall 2022 - Fall 2023*

PROFESSIONAL SERVICE

Conference Service
- Chair for session: "Data Science for Cybersecurity in Industry 4.0", 2022 INFORMS Annual Meeting, Indianapolis, IN, October 15-19, 2022 (Co-chair: Professor Dan Li, Professor Satish Bukkapatnam)
- Chair for session:"Data-science for Securing Industrial Cyber-Physical Systems", 2022 INFORMS Annual Meeting, Indianapolis, IN, October 15-19, 2022 (Co-chair: Professor Dan Li)

Referee Service
- *ASME Journal of Computing and Information Science in Engineering (JCISE), 2023*
- *ASME Manufacturing Science and Engineering Conference (MSEC), 2023*
- *QSR Best Paper Competition, INFORMS 2021*
- *Expert Systems with Applications*
- *SME Journal of Manufacturing Processes*
- *SME North American Manufacturing Research Conference (NAMRC) 49, 2021*
- *ASME Journal of Manufacturing Science and Engineering*
- *IEEE Embedded Systems Letters*

LEADERSHIP

INFORMS Student Chapter, Texas A&M University
Vice President of Academic Activities — *2022 - 2023*
- Organized Poster competition including 13 faculty judges and 20 participants with total $425 in award.
- Secured $850 from Student Engineering Council for chapter activities during Spring/Summer 2023.
- Organized student technical talks and coffee chats with distinguished faculties.
- Organized mini-conference for INFORMS annual meeting 2022 involving student talks to faculty.

Aggie Toastmasters, Texas A&M University
Sergeant at Arms — *2022*

RELEVANT COURSES

• Sensing and Prognostics in Manufacturing • Principles of Manufacturing Processes • Quality Engineering • Inventory Systems • Operations Research • Optimization and Heuristic Methods • Pattern Recognition • Methodology in Statistics • Bayes theory and Algorithm • Analysis and Prediction

PROFESSIONAL MEMBERSHIPS

Institute for Operations Research and the Management Sciences (INFORMS) — *2021 - Present*
- Quality, Statistics and Reliability (2021 - Present)

Institute of Industrial and System Engineers (IISE) — *2023 - Present*