Utsav Awasthi

Cell: 412-960-0414 ♦ utsav.awasthi@uconn.edu ♦www.linkedin.com/in/utsavavasthi/

Education

University of Connecticut Storrs, CT
Ph.D., Chemical Engineering August-2018 to preset
GPA: 3.9/4.0
Advisor: George M. Bollas
Research focus: Fault detection, surrogate modeling, digital twin, physics-based models, optimization, modeling, data analytics, genetic programming.
Graduate Certificate in Advanced Systems Engineering May 2022
GPA: 4.0/4.0
Coursework: System engineering fundamentals, Model-based systems engineering, Uncertainty-Analysis, Robust design and optimization, Machine learning in physical science, Transport phenomenon.

Carnegie Mellon University Pittsburgh, PA
Master of Science, Chemical Engineering December 2017
Advisor: Ignacio E. Grossmann
Coursework: Advanced process systems engineering, Computational methods for process engineering, Mathematical modeling, Process systems modeling, Linear programming.

Indian Institute of Technology (BHU) Varanasi, India
Bachelor of Technology, Chemical Engineering May 2012

Skills

Application Software**:** PRO II, ASPEN, COMSOL, gPROMS, HTRI, ROMeo, Dymola, ALAMO.
Programming Languages: MATLAB, Python, GAMS, FORTRAN.
Optimization: Linear programming, Mixed Integer Programming, Nonlinear programming, Mixed Integer Nonlinear programming, Supply chain optimization.

Academic Experience

University of Connecticut Storrs, CT
Graduate Research Assistant November 2018- Present

Topic**: Energy management system for subtractive and additive precision manufacturing.**

- Developing a surrogate model for inferential sensor in machining for fault detection.
- Working on the development of a physics-inspired surrogate model for tool wear prediction using symbolic regression.
- Developed a digital twin model for face milling to calculate force, power consumption and validated the model using real data from Connecticut Center for Advanced Technology.
- Build an MINLP model to perform optimal sensor selection and test setting selection to detect fault in the milling operation.

Topic**: Developed a methodology using integer programming for active fault detection and diagnosis**.

- Formulated a model-based methodology to determine optimal input test setting and sensors to isolate faults.
- Devised an algorithm to implement the input test setting and sensor selection as a mixed-integer nonlinear programming problem.

Teaching Assistantship

- CHEG 4147, Process Dynamics and Controls January 2019-May 2019
- CHEG 3145, Chemical Engineering Numerical Analysis August 2018-December 2018

Carnegie Mellon University Pittsburgh, PA
Research Assistant /Master's research project December 2016 – June 2018

Topic: **Integration of oilfield planning and infrastructure optimization, in collaboration with TOTAL, France**.

- Developed a multi-period nonlinear programming (NLP) model for maximizing the net present value (NPV) for oil production for reduced oil wells model for a time horizon of 20 years

- Developed a Bicriterion optimization model to find an ideal compromise solution between maximizing the NPV and maximizing the total oil production for the reduced model.
- Developed a multiperiod mixed integer programming model with integer variable for piecewise linear approximation to optimize of gas lift injection in the oil wells.
- Formulated an integrated oil well model with collocation to handle pressure drop in the oil wells.

Work Experience

Reliance Industries Limited (RIL) Mumbai, India
Technologist September 2013 –July 2016
Process optimization and control

- Configured models for petrochemical plants and refinery for their proficient and optimal functioning.
- Developed a reactor model for LLDPE plant based on the molecular weight distribution of the polymer. The reaction kinetics model was built in Milano (programming language by Invensys).
- Modelled Kalman filter for a LLDPE reactor. The filter was built for controlling reactor parameters in case of grade changeover and normal operation.
- Developed a model of Gasifier for Coke gasification plant. The model optimized the production of the coke gasification plant and selected the grade of coke for the gasifier to meet the required business demand.
- Developed Real-Time Optimization Model of Gas Cracker, Dahej, Reliance Industries Limited. The model provides set points to the controllers run the plant to optimum conditions based on the current pricing of products, utilities, and sources.

Shift Engineer/ Graduate engineer Trainee Hazira, India
Plant operations and Training July 2012-September 2013

- Completed one year of field training in Mono Ethylene Glycol production plant at RIL, Hazira, which involved successful completion of assigned projects at the plant.
- During training in Mono ethylene glycol production plant, I worked with a team of plant members on a project to perform root cause analysis for a non-functioning of a vapor absorption machine.
- Received commendation from the management for successfully completing the analysis and making it machine operational. The successful working of machine helped to make process more efficient and prevented the capital investment for a new machine.

Axis Techsoft Solutions Chandigarh, India
Team Lead & Content Developer May 2009 – March 2010

- Worked as Team leader and content developer for a start-up venture -Axis Techsoft Solutions, an e-learning content, and tools development company.

Industrial/ Research Internship

Reliance Industries Limited Dahej, India
Industrial Internship May 2011 - July 2011

- **Study of vapor compression refrigeration and polyvinyl chloride manufacturing and improvement of efficiency of vapor compression refrigeration system.**
  Performed root cause analysis for performance improvement of refrigeration cycle used for cooling of demineralized water used to maintain the temperature of PVC (polyvinyl chloride) reactor temperature.

National Chemical Laboratories Pune, India
Research Internship May 2010 - June 2010

- **Development of nonlinear model predictive control using artificial neural network and partial least square method in Fortran 90.**
  Developed a FORTRAN model to compare the control characteristics of the nonlinear partial least square method over integral proportional control.

Publication/ Presentations/ Conferences

Publication

- **Awasthi, U.**, Wang, Z., Mannan, N., Pattipati, K. R., & Bollas, G. M. (2022). Physics-based modeling and information-theoretic sensor and settings selection for tool wear detection in precision machining. Journal of Manufacturing Processes, 81(December 2021), 127–140. https://doi.org/10.1016/j.jmapro.2022.06.027
- Yang, Q., Pattipati, K. R., **Awasthi, U.**, & Bollas, G. M. (2022). Hybrid data-driven and model-informed online tool wear detection in milling machines. Journal of Manufacturing Systems, 63(December 2021), 329–343. https://doi.org/10.1016/j.jmsy.2022.04.001
- Wilson, P. J., Shen Z., **Awasthi, U.**, Bollas, G. M., Gupta, S. (2021). Multi-Objective Supervisory Framework for Minimizing Expected Costs and Increasing Reliability in Precision Machining. Journal of Advanced Manufacturing and Processing: Special Edition on CESMII.
- **Awasthi, U.**, & Bollas, G. M. (2020). Sensor network design for smart manufacturing – Application on precision machining. *IFAC PapersOnLine*, *53*(2), 11440–11445. https://doi.org/10.1016/j.ifacol.2020.12.581
- **Awasthi, U.**, Palmer, K. A., & Bollas, G. M. (2020). Optimal test and sensor selection for active fault diagnosis using integer programming. *Journal of Process Control*, *92*, 202–211. https://doi.org/https://doi.org/10.1016/j.jprocont.2020.06.007
- **Awasthi, U.**, Marmier, R., & Grossmann, I. E. (2019). Multiperiod optimization model for oilfield production planning: bicriterion optimization and two-stage stochastic programming model. *Optimization and Engineering*. https://doi.org/10.1007/s11081-019-09455-0

Manuscripts under review/ Working papers

- **U. Awasthi**, K.R. Pattipati, G.M. Bollas. (2022). Hybrid Physics-Informed tool wear model for milling.
- **U. Awasthi,** G.M. Bollas. (2022). Recursive tool wear model for milling operations.
- M. Mina, **U. Awasthi**, M. Albayati, A. Thompson, G.M. Bollas. Meta-Model for an IoT System for a CNC Manufacturing Process Using Model-Based Systems Engineering.

Poster presentations

- Student Association of Graduate Engineers, University of Connecticut, March 2022, Title: Digital twin and surrogate model for tool wear prediction.
- Student Association of Graduate Engineers, University of Connecticut, March 2021, Title: Fault detection in CNC machines.
- INCOSE conference, University of Connecticut, October 2019, Title: Optimal test design and sensor selection for active FDI.
- CAPD conference, Carnegie Mellon University, March 2018, Title: Oilfield planning optimization, October 2018.
- Enterprise-wide optimization conference, Carnegie Mellon University, Title: Oilfield planning optimization, October 2017.

Conference presentations/Invited talks

- **Utsav Awasthi**[1], Krishna Pattipati[1] and George M. Bollas[1], " Physics-Inspired inferential sensor for tool wear classification in milling", Advanced Manufacturing and Processing Conference, 2022, Bethesda, MD, USA. [1] University of Connecticut. (*Invited talk*)
- **Utsav Awasthi**[1], Tom Maloney[2] and George M. Bollas[1], " Maintenance Testing in Precision Machining", AICHE, 2020, Virtual meeting, USA. [1] University of Connecticut, [2] Connecticut Centre for Advanced Technology.
- **Utsav Awasthi**[1] and George M. Bollas[1], " Sensor Network Design for Smart Manufacturing - Application on Precision Machining", IFAC, 2020, Berlin, Germany. [1] University of Connecticut.
- **Utsav Awasthi**[1] and George M. Bollas[1], " Physics-based models for precision machining", AICHE, 2019, Orlando, USA. [1] University of Connecticut.
- **Utsav Awasthi**[1], Kyle A. Palmer[1] and George M. Bollas[1], " Sensor and test selection for Passive & Active fault diagnosis", AICHE, 2019, Orlando, USA. [1] University of Connecticut.
- **Utsav Awasthi**[1], Remy Marmier[2] and Ignacio Grossmann[1], "Optimization of production and gas lift for oil wells", Mathais, October 25-27, 2017, Paris, France. [1] Carnegie Mellon university, [2]Total France.

Awards

- GE Fellowship of Excellence 2022-2023.
- UTC-IASE Graduate Fellow, 2019-2023
- John Lof Leadership Academy Conference travel award, 2022.
- Conference Participation Award, Graduate School University of Connecticut, 2022.

Workshops/ Certification

- Introduction to Quantum computing, Qubit x Qubit, sponsored by IBM Quantum, 2020-2021.
- Attended workshop and training program on Business Skills Development Program organized by MSME Development Institute, Government of India.

Professional affiliations

- American Institute of Chemical Engineers (AIChE)
- Society of Industrial and Applied Mathematics (siam)
- INFORMS
- INCOSE

Leadership Experience

University of Connecticut Storrs, CT

- John Lof Leadership Academy
  - General member — September 2020 – July 2022
  - Treasurer — September 2021 – July 2022
- Graduate Student Senate
  - Department Senator — August 2020 – July 2021
  - Senator At-Large — August 2019 – July 2020
- TARANG, South Asian Graduate Student Organization
  - Treasurer — August 2019 – July 2020