UTEP
INDUSTRIAL, MANUFACTURING AND SYSTEMS ENGINEERING

DIGITAL TRANSFORMATION IN ENGINEERING SYSTEMS

PREPAREDNESS FOR THE FUTURE

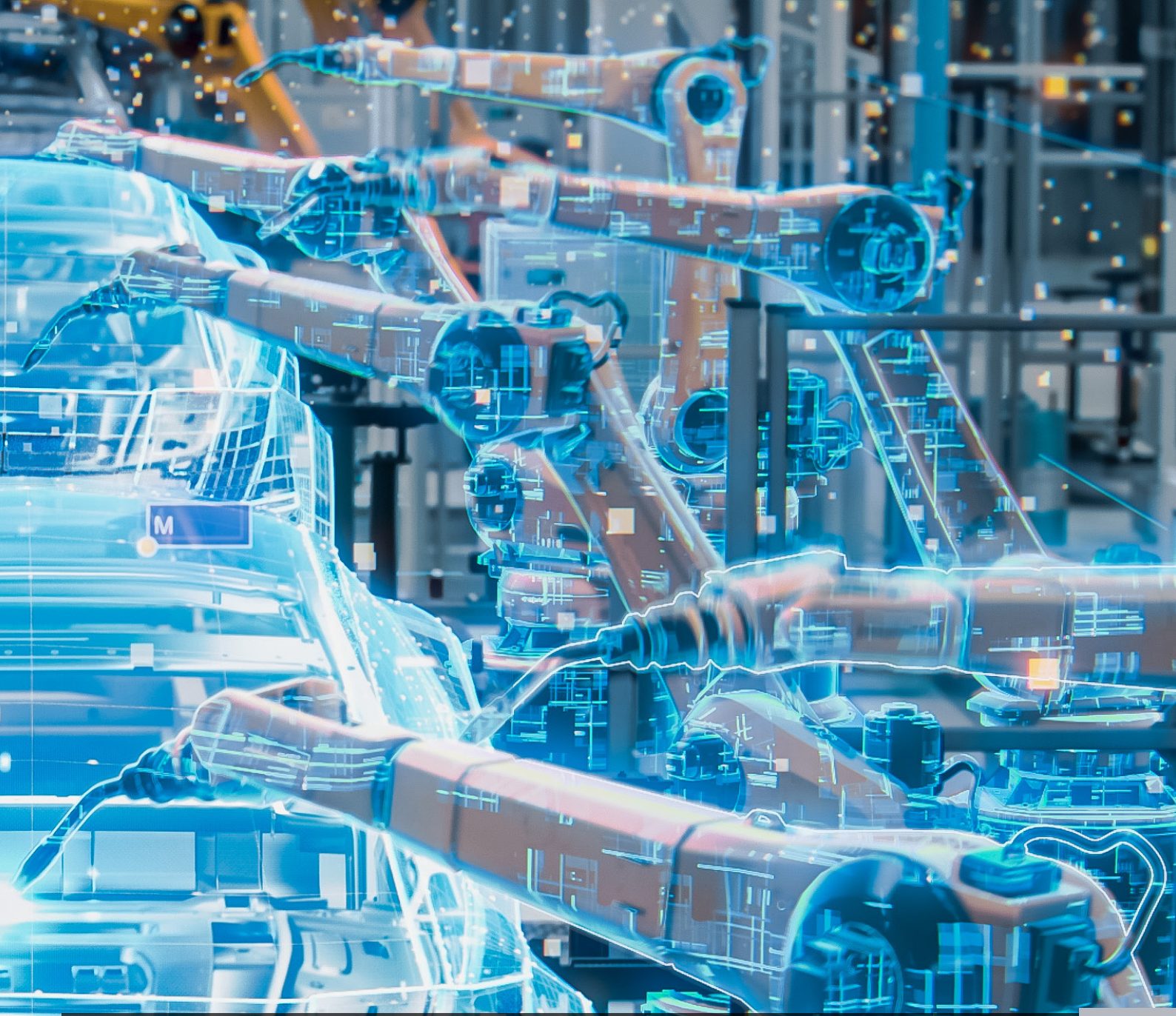
IMSE DAY 2024

EL PASO NATURAL GAS CONFERENCE CENTER

APRIL 17, 2024

8:30 AM TO 5:00 PM

Open to all students and faculty



WELCOME TO THE IMSE DAY, 2024 CELEBRATED AT UTEP

The Industrial, Manufacturing, and System Engineering Department at The University of Texas at El Paso extends a warm welcome to all participants of IMSE Day 2024!

We are delighted to host this year's event under the theme "Digital Transformation in Engineering Systems: Preparedness for the Future," highlighting the profound impact of digitalization on industrial, manufacturing, and system engineering. This occasion serves as a platform to delve into the practical applications of Digital Transformation and explore its vast potential across diverse industries.

IMSE Day 2024 strongly emphasizes interdisciplinary research, aiming to bring together students, researchers, practitioners, and industry leaders. Our goal is to create a collaborative environment where ideas can flourish, and innovative solutions can be developed with real-world impact. We are excited about the prospect of uniting the IMSE community to foster collaboration, share insights, and collectively contribute to the advancement of the field of Engineering, including manufacturing, complex systems, simulation, healthcare, and transportation. Through a series of engaging sessions, workshops, and discussions, we aim to showcase the transformative power of digital technologies in shaping the future of engineering systems.

We encourage all attendees to seize this unique opportunity for networking, exchanging ideas, and actively participating in the discourse surrounding Digital Transformation. Your attendance and contributions are integral to the success of IMSE Day 2024, and we look forward to the impactful collaborations that may arise from this collective endeavor.

Thank you for being a part of this exciting event. Let's join hands to explore, innovate, and collectively shape the future of Digital Transformation within IMSE.

Md Fashiar Rahman, Ph.D.
Assistant Professor, IMSE

CONTENT

MESSAGE FROM
IMSE DEPARTMENT CHAIR

Welcome to the Industrial, Manufacturing, and Systems Engineering [IMSE] Day in Digital Transformation in Engineering Systems

It is my pleasure to welcome you all to our annual IMSE Day event. The event brings together industry leaders and subject-matter expert panelists to share their valuable insights on Digital Engineering (DE) technologies, Digital Transformation, Smart Manufacturing, Logistics, Robotic Systems, and active collaborations needed among industry leaders, researchers from academia, and workforce development institutes, for broader Digital Engineering adoption.

As we witness the continuous growth and advancement in DE technologies, we can see that many applications are being enabled in various fields such as aerospace, healthcare, transportation, automotive, and military. The manufacturing industry has seen a lot of advancement over the years, and this calls for even more innovation and development in DE technologies. At UTEP, our academic work emphasizes experiential learning for students from the El Paso-Cd. Juarez region. Events like IMSE Day provide students with an opportunity to develop leadership and networking abilities, which will be critical in their future careers.

I would like to thank all the speakers, presenters and most importantly, all the students and staff who have participated in making this annual event a success. I encourage all the student community and those attending this event to see this as a networking opportunity and build professional relationships which will enhance your personal, networking, and professional growth. I invite you to also send us your valuable suggestions and feedback on the event to help us organize a better event in the future.

Dr. Tzu-Liang (Bill) Tseng

CHAIR- DEPARTMENT OF INDUSTRIAL, MANUFACTURING & SYSTEMS ENGINEERING (IMSE)
DIRECTOR- RESEARCH INSTITUTE OF MANUFACTURING AND ENGINEERING SYSTEMS (RIMES)

OUR DEPARTMENT
GENERAL OVERVIEW

Industrial, Manufacturing, and Systems Engineering

The Industrial, Manufacturing and Systems Engineering Department at The University of Texas at El Paso plays a vital role in providing innovative solutions to complex problems across various industries such as manufacturing, transportation, technology, healthcare, agriculture, aerospace, and supply chai management. With a mission to advance the field of engineering and address pressing societal issues, the department offers innovative research and education opportunities to its students.

The IMSE Department offers a bachelor's degree in industrial & Systems Engineering (ISE) and three Master of Science (MS) programs in Industrial Engineering, Manufacturing Engineering, and Systems Engineering. The curriculum of these programs is designed to equip students with a deep understanding of the fundamentals of engineering, including mathematics, science, and technology, as well as practical skills in problem-solving, analysis, and design. The department also offers an online MS program in Systems Engineering to provide greater flexibility to students pursuing higher education.

In addition to its academic and research programs, the ISE Department is committed to providing students with opportunities for experiential learning, including internships, co-op programs, and research projects. The department also hosts seminars, workshops, and conferences that provide students with access to leading experts in the field of engineering.

Overall, IMSE is an essential contributor to the advancement of engineering and the advancement of society. Its commitment to interdisciplinary collaboration, innovative research, and experiential learning prepares students for successful careers in a range of industries and positions them to make a positive impact in the world.

CENTERS AND ACTIVE RESEARCH LABS ASSOCIATED WITH THE DEPARTMENT

RESEARCH INSTITUTE FOR MANUFACTURING & ENGINEERING SYSTEMS (RIMES)
RIMES, formerly IM3 since 1995, focuses on research in systems for Manufacturing and Engineering while fostering collaboration with private industry and promoting education at The University of Texas at El Paso.

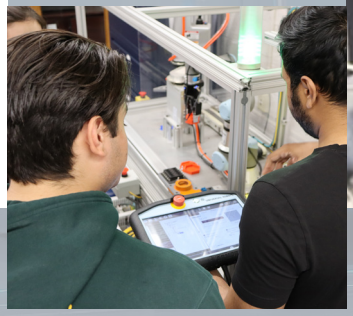
TEXAS MANUFACTURING ASSISTANCE CENTER (TMAC)
TMAC's mission is to enhance Texas's global manufacturing competitiveness by providing customized solutions to improve efficiency and foster business growth.

PHYSICAL, INFORMATION AND COGNITIVE HUMAN FACTORS ENGINEERING RESEARCH LAB (PIC-HFE)
PIC-HFE primary research focuses on supporting workers in high-stress occupations, such as construction or health care, that not only cause physical injuries in the workplace, but also have high cognitive impacts such as workload, stress and burnout.

SMART MANUFACTURING LAB
The Smart Manufacturing Lab serves as a research hub pioneering innovative technologies and methodologies to optimize manufacturing processes, enhance productivity, and integrate advanced automation and data analytics for agile and efficient production systems.

SYSTEMS INNOVATION WITH MODELING AND SIMULATION (SIMS) LAB
The SIMS laboratory at UTEP's IMSE Department develops and simulates models of real-world systems to provide research exposure and foster innovative solutions for complex processes.

SOFT ROBOTICS DESIGN LAB
At the Soft Robotics Design Lab, we are focused on designing, simulation modelling and manufacturing of soft robots. These are robots made with flexible materials, which are ideal for interaction with humans and other organic tissues. Our goal is to apply creativity to create devices and control algorithms to improve people's lives, from healthcare applications to enhancing industrial processes.



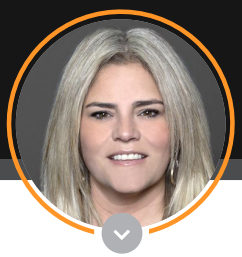
PROGRAM COMMITTEE

BILL TSENG, PH.D.
IMSE CHAIR | RIMES DIRECTOR

MD FASHIAR RAHMAN, PH.D.
ASSISTANT PROFESSOR

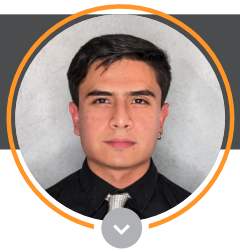
HONGLUN XU H, PH.D.
RESEARCH ASSISTANT PROFESSOR

ANAIS ACOSTA
BRANDING MANAGER, COLLEGE OF ENGINEERING



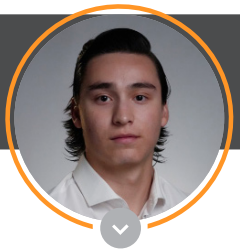
RENE DOMINGUEZ
IMSE PROGRAM MANAGER/ COORDINATOR

JUAN ORTIZ
UTEP STUDENT CHAPER APM CHAPTER, PRESIDENT



ENOC FERNIZA
UTEP STUDENT IISE CHAPTER, PRESIDENT

IRVYN HERNANDEZ
UTEP STUDENT APM CHAPTER, VICEPRESIDENT



ANEL GOMEZ
UTEP STUDENT IISE CHAPTER, OFFICER

JESUS A. GUTIERREZ
UTEP STUDENT IISE CHAPTER, OFFICER

COLLEGE OF ENGINEERING

INDUSTRIAL, MANUFACTURING & SYSTEMS ENGINEERING

FALL 2023

296 STUDENT ENROLLMENT

118 TOTAL DEGREES CONFERRED

10 FACULTY

DEGREES CONFERRED AY 2022-23

(FALL 22, SP23 & SU 23)

Bachelor of Science (B.S.)	**31**
Industrial & Systems Engineering	31
Master of Science (M.S.)	**86**
Industrial Engineering	16
Manufacturing Engineering	10
Systems Engineering	59
Systems Engineering - AT&T	1
Interdisciplinary Ph.D.	
Computational Science	3
Environmental Science and Engineering	1
i. Students with a Thesis Advisor from the College of Engineeering	2

FALL 2023 ENROLLMENT

Undergraduate	**181**
Industrial & Systems Engineering	147
Industrial Engineering	5
Lower Division Industrial Engineering	29
Master's	***115**
Industrial Engineering	15
Manufacturing Engineering	9
Systems Engineering	82
Systems Engineering – AT&T	9

*These numbers do not include certificates, only actual degrees.

FACULTY AS OF FALL 2023

Total	**10**
Tenured	5
Tenure-track	4
Non-Tenure-Track	1
Faculty Rank (T/TT)	
Assistant	4
Associate	4
Professor	1
Faculty Rank (Non-Tenure Track Faculty)	
Assistant Research Professor	1
Gender (T/TT Faculty)	
Female	2
Male	7
Gender (Non-Tenure Track Faculty)	
Female	0
Male	1

STUDENTBODYPROFILE- DEGREES CONFERRED AY 2022-23

Ethnicity (UG)	**31**
Black Non-Hispanic	3.23%
Hispanic	74.19%
Mexican International	12.90%
Other International	6.45%
White Non-Hispanic	3.23%
Gender (UG)	
Female = 52 % Male = 48 %	
Ethnicity (MS)	**86**
Black Non-Hispanic	2.33%
Asian American	2.33%
Hispanic	59.30%
Mexican International	20.93%
Other International	5.81%
White Non-Hispanic	9.30%
Gender (MS)	
Female = 24 % Male = 76 %	
Ethnicity(Ph.D. Interdisciplinary)	**1**
Hispanic	100%
Gender (Ph.D. Interdisciplinary)	
Female = 0 % Male = 100 %	

STUDENT BODY PROFILE - FALL 2023 ENROLLMENT

Ethnicity (UG)	**181**
Black Non-Hispanic	1.10%
Hispanic	78.45%
Mexican International	13.82%
Native American	1.10%
Other International	2.76%
Unknown	1.10%
White Non-Hispanic	1.67%
Gender (UG)	
Female = 32 % Male = 68 %	
Ethnicity (MS)	**115**
Asian American	1.74%
Black Non-Hispanic	8.70%
Hispanic	55.65%
Mexican International	14.78%
Other International	4.35%
Unknown	3.48%
White Non-Hispanic	11.30%
Gender (MS)	
Female = 30% Male = 70%	

PROGRAM AGENDA

DIGITAL TRANSFORMATION IN ENGINEERING SYSTEMS

IMSE DAY, 2024

8:30AM - 9:00AM | COFFEE AND REGISTRATION

9:00AM - 9:15AM | OPENING REMARKS: ERIC MACDONALD, PH.D.

Associate Dean for Graduate Studies and Research | Aerospace and Mechanical Engineering Professor, ***The University of Texas at El Paso***

09:15AM - 10:05AM | RAGU ATHINARAYANAN, PH.D.

Professor | ***Purdue University***

DISCUSSION TOPIC: Navigating the Manufacturing Digital Transformation in Higher Education – The Purdue University Journey

10:10AM - 11:00AM | ROBERT NATHAN

Government Relations Professional | **Schneider Electric**

DISCUSSION TOPIC: Digitization: Unleashing Organized DERS for Renewable Flexibility and Decarbonization.

11:10AM - 12:00PM | THORSTEN WUEST, PH.D.

Associate Professor at Industrial and Management Systems Engineering Department | ***West Virginia University***

DISSCUSION TOPIC: How Smart Manufacturing Technologies Enable Servitization

12:00PM - 12:50PM | LUNCH | POSTER EXHIBITION | APPLIED RESERACH

1:00PM - 1:50PM | OSCAR MACHADO ALDAVA

HALO Staff Systems Engineer | ***Northrop Grumman Corporation***

DISCUSSION TOPIC: Habitation and Logistics Outpost (HALO) Overview

02:00PM - 2:50PM | DANIEL DAVIS

R&D Mechanical Engineer | ***Sandia National Laboratories***

DISCUSSION TOPIC: All Aboard the Struggle Bus: MBD at Sandia National Labs

3:00PM - 3:50PM | IMSE ALUMNI EXPERIENCES: HOW DID I GET HERE?

BHRI HERNANDEZ, Project Engineering Tech Lead
Lockheed Martin Aeronautics

ABISAI RAMIREZ, Product Engineer
Cardinal Health

MIGUEL SAMA, Operations Area Manager
Amazon

DANIEL BERNAL, Research Engineer
National Renewable Energy Laboratory

SANTIAGO SEGOVIA, Customer Satisfaction & Quality Manager
Schneider Electric

4:00PM - 4:50PM | ANGEL FLORES-ABAD, PH.D.

Assistant Professor at Aerospace and Mechanical Engineering Department | ***The University of Texas at El Paso***

DISCUSSION TOPIC: Digitally Assisted Development of Robotic Systems for ISAM Applications

4:50PM - 5:00PM | CLOSING REMARKS: BILL TSENG, PH.D., CMFGE

IMSE Chair & Professor, ***The University of Texas at El Paso***

SEMINARS & PRESENTERS

RAGU ATHINARAYANAN, PH.D.
Professor of Smart Manufacturing
Industrial Informatics
Purdue University

NAVIGATING THE MANUFACTURING DIGITAL TRANSFORMATION IN HIGHER EDUCATION – THE PURDUE UNIVERSITY JOURNEY

Acknowledging the disparity in the pace of digital transformation in manufacturing and higher education institutions, in 2019 Purdue University embarked on a journey to fundamentally transform manufacturing on the West Lafayette campus. One of the primary goals of this initiative was aimed at bridging the growing disparity between emerging job roles and the skills needed in the future manufacturing workforce. Through a strategic alliance with key stakeholders such Microsoft Corp, Caterpillar, PTC, and Rockwell Automation, alongside partners such as the US Department of Energy (USDOE) and the US Smart Manufacturing Institute (CESMII), Purdue is today driving efforts in advancing education, research, and workforce development programs in smart manufacturing, impacting industries both at regional and national levels.

Dr. Ragu Athinarayanan, a professor at Purdue University's School of Engineering Technology, brings three decades of experience in higher education to his role. During his 17 years of service as a Department Head and Associate Dean, he championed the development of a multitude of research and academic programs in alignment with state and national priorities.

His leadership also extends to directing the Smart Manufacturing Innovation Center at Purdue University, aimed at fostering the adoption of smart technologies to enhance energy productivity in U.S. manufacturing industries.

PURDUE UNIVERSITY

ROBERT NATHAN
Government Relations Professional
Schneider Electric

DIGITIZATION: UNLEASHING ORGANIZED DERS FOR RENEWABLE FLEXIBILITY AND DECARBONIZATION.

State and local officials will have an important responsibility over the next six years. They will direct significant investments that will affect their communities' ability to modernize, thrive and compete for generations to come. The Infrastructure and Investment Jobs Act (IIJA) will provide historic funding towards water and wastewater facilities, airports, ports, buildings, and the energy grid. The focus will be on achieving resiliency and sustainability objectives. The IIJA funding can work in tandem with the digital transformation of the economy to further reduce energy usage, greenhouse gases, and identify threats to the overall grid. However, the benefits of digitalization are not well understood, and deploying available digital solutions will require critical policy changes to fully realize the vision of a modern digital economy.

Mr. Robert Nathan is a Government Relations professional based in Austin, Texas with 17+ years in state legislative and regulatory policy covering energy, utilities, and advanced manufacturing. He leads Government Relations in Texas for Schneider Electric, a global Fortune 500 company recognized as the world's most sustainable company. Robert proactively engages with Texas-based stakeholders to advance policy objectives in the company's largest footprint in the USA. Prior to joining Schneider Electric, Robert spent 14 years in Government Relations for CPS Energy in San Antonio, the largest combined municipal electric and natural gas utility in the nation. Robert Nathan is a 2005 graduate of the University of Texas at Austin with a bachelor's degree in journalism.

Schneider Electric

SEMINAR 3

HOW SMART MANUFACTURING TECHNOLOGIES ENABLE SERVITIZATION

Servitization and associated innovative non-ownership business models are disrupting the manufacturing industry. None of that is possible without digital transformation and smart manufacturing technologies, including but not limited to cloud computing, smart sensor systems, digital twins, and augmented reality. In this talk, we will discuss smart manufacturing technologies and barriers of their adoption, the current state of servitization, and explore opportunities for machine tool providers and manufacturers using these assets from a technology perspective.

THORSTEN WUEST, PH.D.

Associate Professor at Industrial and Management Systems Engineering Department
West Virginia University

Dr. Thorsten Wuest is an associate professor at West Virginia University and is globally recognized as one of SME's 20 most influential professors in smart manufacturing. Dr. Wuest has co-authored 3 books and more than 170 refereed journal and conference articles gathering over 9,600 citations to date. In addition to publishing his work in the premier academic outlets of his field, he was featured by Forbes, Futurism, IndustryWeek, WEF, CBC Radio, and WMF. He received several awards for his work incl. Outstanding Teacher of the Year, research of the year/senior, SME Journal Award, and multiple best paper awards. His research is funded by NSF, NIST, DoD, DoE, EPA, TJF, and others. He serves as Vice-Chair Americas for IFIP WG 5.7, Associate Editor for Robotics & Computer Integrated Manufacturing (RCIM), Smart and Sustainable Manufacturing Systems (SSMS), and the International Journal of Manufacturing Research (IJMR), on the Editorial Board for the Journal of Manufacturing Systems (JMSY) and Production & Manufacturing Research (PMR), as well as the advisory boards of the Knudsen Institute, Maven Machines, Sustainment, SavePlanetEarth, and the WVU Industrial Extension. Learn more at www.SmartMfg.info

SEMINAR 4

HABITATION AND LOGISTICS OUTPOST (HALO) OVERVIEW

The Habitation and Logistics Outpost (HALO) will serve as the living quarters and research facility for astronauts while visiting the Gateway. The pressurized living quarters will provide command and control systems for the lunar outpost, and docking ports for visiting spacecraft, such as NASA's Orion spacecraft, lunar landers, and logistics resupply craft. The HALO module will serve as the backbone for command, control and power distribution across Gateway and will perform other core functions, including hosting science investigations via internal and external payload accommodations and communicating with lunar surface expeditions. HALO also will enable the aggregation of additional habitable elements to expand Gateway capabilities in its near-rectilinear halo orbit (NRHO), around the Moon.for over 10 years.

OSCAR MACHADO ALDAVA

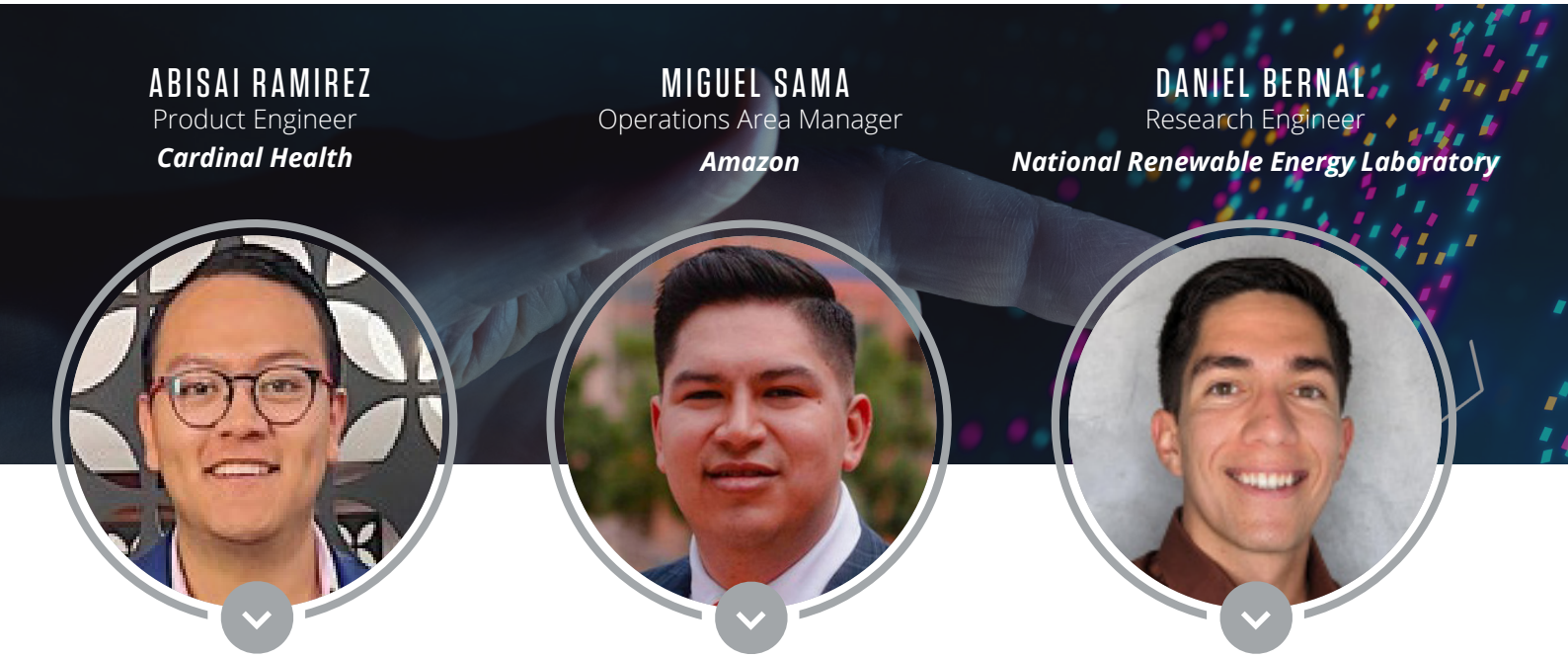
HALO Staff Systems Engineer
Northrop Grumman Corporation

Mr. Oscar Machado Aldava, Staff System Engineer at Northrop Grumman Corporation, a graduate of UTEP class of 2011 with a BSEE has worked for the top aerospace companies in the world, including Lockheed Martin, Boeing, Honeywell, General Dynamics, and currently Northrop Grumman.

He has worked in roles from software, electrical, field engineering, integration and test (I&T), Fault Management and System Autonomy (FMSA) and is currently a Systems Engineer with the Human Space Systems Engineering group, leading the mechanical, thermal and environmental tests for the Habitation and Logistics Outpost (HALO) Program.

NORTHROP GRUMMAN

IMSE ALUMNI EXPERIENCES: HOW DID I GET HERE?
PANELIST



ABISAI RAMIREZ
Product Engineer
Cardinal Health

Abisai Ramirez works as Product Engineer/ Project Leader at Cardinal Health, one of the largest healthcare companies who focus on distribution and is a global manufacturer of pharmaceuticals and medical products.

he currently develops different projects that build on saving cost, continuous and product improvement. collaborating globally with locations such as, Mexico, Dominican Republic and Singapore.

Prior this role, Abisai collaborated with Engine Logistics at DAU5 Amazon, Designing and installing quality control processes to improve operational efficiency and package delivery. Additionally, analyzing production limitations and standard parameters for each driver to improve customer service and experience. Analyzing data to perform root cause analysis on issues that impact inventory performance and implement appropriate corrective actions. Abisai was part of MAES/SHEP serving as Social and Leadership Board.

MIGUEL SAMA
Operations Area Manager
Amazon

Miguel Sama is an Operations Area Manager at Amazon and overview different departments on the southwest Region focused in the El Paso Fulfillment Center (ELP1). He has led outbound and count, amnesty and pick (CAP) areas which include Amazon Fulfillment Engine, Pick and Pick to Rebin process paths. Completed an Amazon University Recruiting Program in 2023 which helped thousands of students from Texas, Oklahoma and New Mexico to find an opportunity to become part of Amazon Operations team. President of Latinos at Amazon during 2023 cycle year and current Vice President.

Prior to this role, Miguel was part of The Toro Company as a logistics analyst supporting El Paso and Juarez operations and inventory management. During the time as a student, worked at UTEP Food Services as a Catering Supervisor.

Born in Chihuahua, Chihuahua and received a Bachelor's of Science in Mechanical Engineering on 2020, followed by a Master of Science in Systems Engineering in 2021, both from UTEP.

DANIEL BERNAL
Research Engineer
National Renewable Energy Laboratory

Daniel Bernal's passion for inclusion and environment justice grew during the years that he and his mother would cross the "Bridge of the Americas" (BOTA) almost every day so that Daniel could attend school and his mother could go to work. BOTA passes over the polluted and murky Rio Grande. This experience drove him to focus his career on sustainability issues.

Daniel is a research engineer with the Modeling & Analysis Group in the Accelerated Deployment and Decision Support Center. He works in decarbonizing industrial processes by providing technical assistance for onsite renewable energy integration through DOE's Onsite Energy Program for a variety of industrial facilities across many subsectors, such as glass, aluminum, cement, food & beverage.

Additionally, working on incorporating diversity, equity, inclusion, and accessibility into education and workforce development at industrial sites through DOE's 7th Manufacturing Institute - EPIXC. Apart from the industrial space, he's working on providing technical assistance to Honduras to electrify schools in remote, rural areas.

SANTIAGO SEGOVIA

Customer Satisfaction & Quality Manager

Schneider Electric

Santiago Segovia is a Customer Satisfaction & Quality Manager at Schneider Electric El Paso Texas Campus.

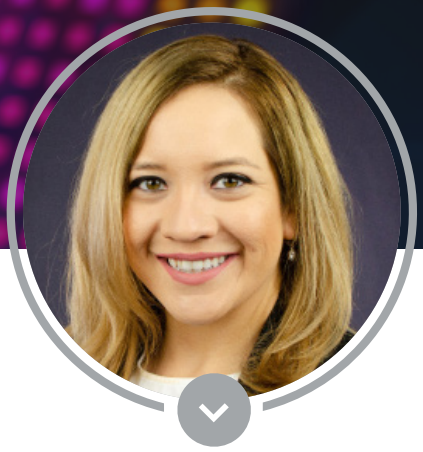
He overlooks the quality and customer experience of the Engineered to Order and Configured to Order Equipment manufactured in the campus. Prior this role he supported the eOEM business partners cluster in North America (Canada/Mexico/US) as Program Manager & Quality Liaison. He was born and raised in Parral, Chihuahua Mexico and received his Bachelor of Science in Industrial Engineering from the Tecnologico Nacional de Mexico and the Master of Science in Industrial Engineering from UTEP.

Coach and mentor of ten direct reports and 130 indirect reports across two manufacturing facilities and six product lines with a yearly revenue of US$850 million.

BHRI HERNANDEZ

Systems Engineering Lead

Lockheed Martin Company



Bhriannon (Bhri) Hernandez is a Project Engineering Technical Lead at Lockheed Martin Aeronautics over the F-35 Sustainment and Operations team. She leads a team that supports Aircraft on Ground, Canopy, Crew Systems and the Engineering Investigation Board.

Prior to this role she has supported multiple F-35 Sustainment projects, F-35 Training Systems, Orion Spacecraft and the 747 Boeing Airplane.

She was born and raised in El Paso, TX and received her Bachelor of Science in Mechanical Engineering and Master of Science in Systems Engineering from UTEP. During her time in Cape Canaveral, FL she founded the Space Coast HOLA (Hispanic Organization of Leadership and Awareness) Business Resource Group. She is currently the NMA (National Management Association) Associate Director over the Lockheed Martin Leadership Association – Fort Worth Chapter.

SEMINARS & PRESENTERS

DANIEL DAVIS

R&D Mechanical Engineer
Sandia National Laboratories

ALL ABOARD THE STRUGGLE BUS: MBD AT SANDIA NATIONAL LABS

This presentation will lay out the steps taken, data collected, as well as difficulties and successes of a project implementing a Model-Based Definition to procure a production part, within the rigors of Sandia National Laboratories' structure.

He has worked in providing autonomous capabilities to different systems of NASA, AFRL, And DLR (German Space Agency). His research has been sponsored by DOE, NSF and NASA. He is a member of the AIAA (Space Automation and Robotics Technical Committee).

Mr. Daniel Davis, Mechanical Engineer at Sandia National Laboratories, is part of the R&D and Production Tooling Team. The Tooling Team is responsible for designing, manufacturing, procuring, and implementing tooling, gauges, fixtures, and molds used in production at Sandia National Labs. An alumnus from Purdue University, Daniel has been working at Sandia for 5 years.

Sandia National Laboratories

ANGEL FLORES ABAD, PH.D.

Assistant Professor of Aerospace and Mechanical Engineering
The University of Texas at El Paso

DIGITALLY ASSISTED DEVELOPMENT OF ROBOTIC SYSTEMS FOR ISAM APPLICATIONS

The Digital Engineering paradigm is rising as an approach to conduct design, development, testing and evaluation in a more integrated fashion. The DE framework allows all the stakeholders to be actively informed during the project and product life cycle via a digital thread. It is expected that DE will reduce expenses in expensive muck-ups, physical testing and qualifications, for instance.

This talk will present the application of the DE principles in the design, development and testing of space robotic systems for ISAM (In-space Servicing Assembly and Manufacturing) tasks. The introduced scheme creates the digital thread using IoT and Cloud services to maintain the interconnectivity and omnipresence of the digital entities.

Dr. Angel Flores Abad is an assistant professor in the Aerospace and Mechanical Engineering Department at the University of Texas at El Paso, and an affiliated researcher at its Aerospace Center. Dr. Flores Abad's area of interest lies in Robotics and Autonomous systems for space, aerial, and industrial applications.

He has worked in providing autonomous capabilities to different systems of NASA, AFRL, And DLR (German Space Agency). His research has been sponsored by DOE, NSF and NASA. He is a member of the AIAA (Space Automation and Robotics Technical Committee).

UTEP

NORTHROP GRUMMAN

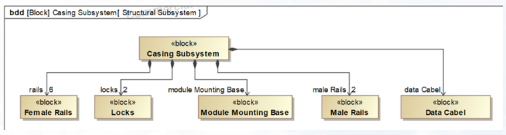
APPLIED RESEARCH

1994 marked the massive consolidation of a heritage over 90 years old which became known as Northrop Grumman Corporation (NGC). Its acquisitions diversity allowed NGC to explore and refine their work at 4 main sectors: Aeronautics, Defense, Mission, and Space Systems amounting to $36.6 Billions in sales in 2022, employing over 95k.

In recent conversations with IMSE, Aerospace and Mechanical Engineering leaders, Dr. Bill Tseng, and Dr. Yirong Lin respectively, NGC decided to formalize a relationship with UTEP – College of Engineering (COE) under the direction of Dr. Andrew Kwas. This marked the first time NGC Collaborated with IMSE, offering a new set of opportunities for the students in the Industrial and Systems Engineering BS Program. The agreement materialized into a set of four projects all involving the creation of innovative solutions to real life problems in the aerospace industry.

These projects objective can be summarized in the following descriptions:

Project 1. Assessing MEV, MEP, and MRV Platforms capabilities. Exploring potential missions for these life extension vehicles by examining current missions (Class A Satellites) in orbit and future missions which could potentially benefit from these services.



Project 2. Exploring the potential of On-Orbit Attachable Components (OAC) and focus on designing an OAC capable of modifying satellite operations, primary researching about modularity.

Project 3. Analyzing the capabilities of robotics in space and their operation in the unique space environment, which differs significantly from Earth. Leveraging these capabilities to establish a baseline for constructing large structures in space.

Project 4. The fourth project would assess the Mylar repair in space environments.

These four will set the sediment to a fruitful and long-lasting relation in which both COE students and NGC will benefit, overall providing NGC fresh ideas and results in research and practical techniques. Strengthening problem solving and critical thinking skills in systems that currently populate space.

HEALTHCARE SYSTEMS PROCESS IMPROVEMENT USING MODELING AND SIMULATION – AN INTERACTIVE WAY TO EXPLORE YOUR SYSTEMS

In the bustling landscape of healthcare management, the 2024 Society for Health Systems/FlexSim Student Simulation Competition stands out for its innovative challenge: optimizing existing clinical spaces (shown in Figure 1) to enhance operational efficiency and patient care. Led by Team MINERS from the University of Texas at El Paso, their approach to this challenge offers a profound insight into the strategic optimization of healthcare facilities, using FlexSim's simulation software. This article delves into the methodologies, results, and conclusions of their study, showcasing the potential for simulation technologies in transforming healthcare operations.

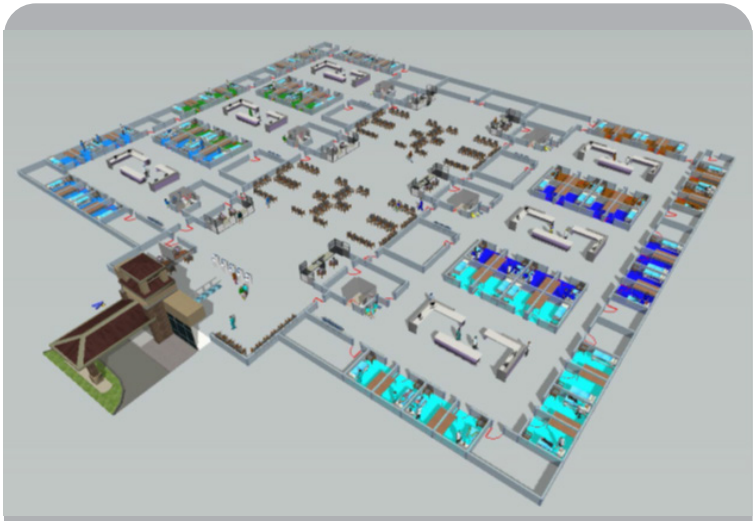


Figure 1. The clinical space used in this case study.

At the heart of the competition was a call to reimagine the use of clinical spaces amidst growing demands for healthcare services and the complexities of shared facilities. The team tackled this challenge head-on by aiming to streamline operations, optimize resource utilization, and ultimately improve patient experiences. Through the FlexSim simulation platform, they embarked on a data-driven journey, evaluating key metrics like throughput, room utilization, patient length of stay, and profitability.

The methodology adopted by Team MINERS was meticulous and multi-faceted. It began with establishing a baseline scenario to serve as a benchmark for future experiments. Key to their strategy was the use of a weighted decision matrix analysis, allowing them to prioritize departments based on a variety of performance metrics, such as room utilization, patients' length of stay, overall system. throughput, and total earnings. This analytical foundation supported a series of "what-if" scenarios, enabling the team to explore different configurations and operational adjustments without the need for real-world alterations.

The results of their experiments were remarkable. The team demonstrated significant improvements across all evaluated metrics through strategic department activation and configuration with different registration types, section assignments, and varying the daily volume of departmental operations (refer to Figure 2).

Notably, the optimized scenario yielded substantial increases in profit and patient throughput, alongside reductions in patients' length of stay and enhancements in room utilization, as demonstrated in Figure 3. These outcomes underscore the efficacy of the team's approach, highlighting the power of simulation technologies in healthcare optimization.

Department Parameters

		Registration Type	Section Assignment	Minimum Daily Volume	Maximum Daily Volume
Behavioral Health	☑ Active	Central Registration	Section 4	80.00	80.00
Cardiology	☑ Active	Central Registration	Section 2	60.00	60.00
Dermatology	☑ Active	Department Registration	Section 5	90.00	150.00
ENT	☐ Active	Department Registration	None	75.00	75.00
Endocrinology	☑ Active	Department Registration	Section 5	80.00	80.00
Family Medicine	☑ Active	Central Registration	Section 3	100.00	140.00
Gastroenterology	☑ Active	Central Registration	Section 1	78.00	100.00
Gynecology and Obstetrics	☑ Active	Central Registration	Section 4	100.00	105.00
Neurology	☑ Active	Department Registration	Section 1	75.00	75.00
Oncology	☐ Active	Central Registration	Section 4	64.00	64.00
Orthopedics	☑ Active	Department Registration	Section 2	70.00	100.00
Podiatry	☐ Active	Central Registration	Section 4	84.00	84.00
Pulmonary and Allergy	☑ Active	Department Registration	Section 6	80.00	100.00
Urology	☐ Active	Central Registration	Section 4	80.00	80.00

Figure 2. Experimental setup through strategic department activation and configuration

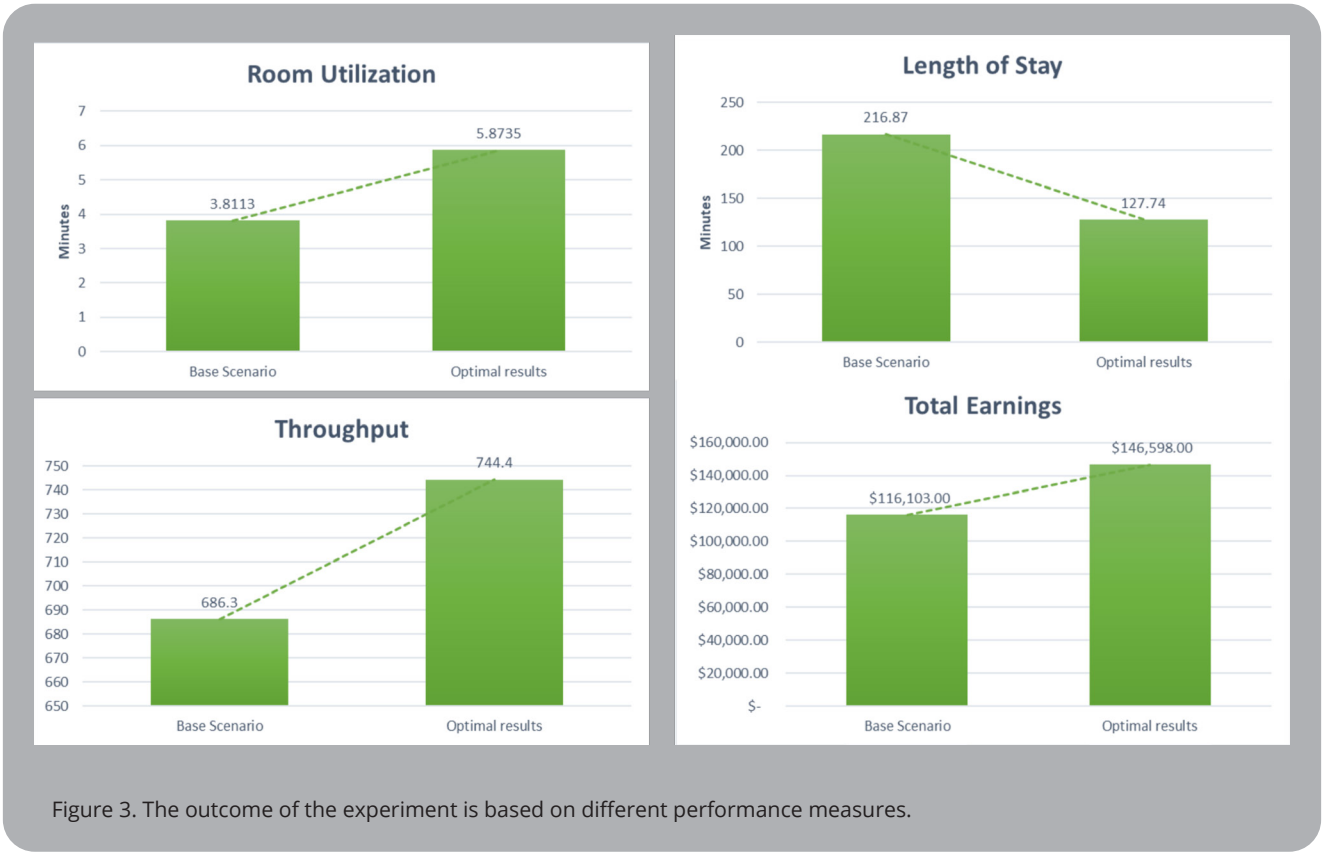
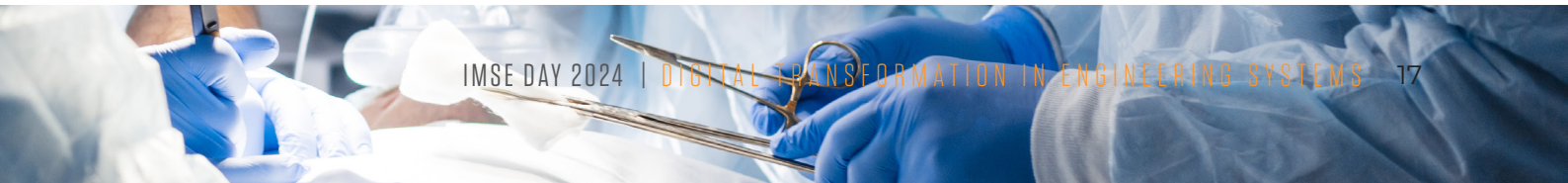


Figure 3. The outcome of the experiment is based on different performance measures.

Despite their successes, the team encountered several constraints, particularly in optimizing staff levels and bed assignments, due to limitations within the simulation tool. These challenges indicate the complexities of real-world healthcare operations and the need for continued innovation and refinement in simulation methodologies.

The work of Team MINERS in the 2024 Society for Health Systems/FlexSim Student Simulation Competition is a testament to the potential of simulation technologies in addressing the multifaceted challenges of healthcare facility management. Their study not only demonstrated the practical applications of FlexSim in optimizing clinical spaces but also highlighted the importance of strategic, data-driven decision-making in improving healthcare outcomes.

In essence, their research serves as a beacon for future explorations in healthcare optimization, emphasizing the need for adaptable, efficient, and patient-centric healthcare environments. As the healthcare industry continues to evolve, the insights garnered from this competition will undoubtedly play a pivotal role in shaping the future of healthcare facility planning and management.



Poster Title: "COVID-19 Conversations from Twitter Insights And Trends"

Student Name: S M Atikur Rahman

UTEP COLLEGE OF ENGINEERING

COMPILATION OF POSTERS | BRIEFINGS WITH RESEARCH

Introduction

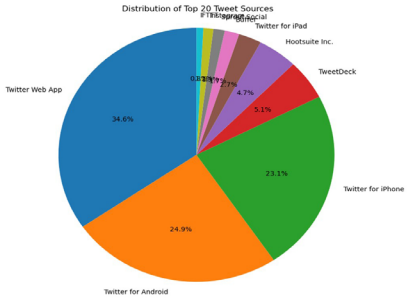
In this project, we delve into the public discourse surrounding COVID-19 on Twitter to unearth the collective sentiments, concerns, and spread of information during the pandemic. By leveraging a dataset of relevant tweets and corresponding ISO country codes, our analysis will map out the geographical and digital landscape of these conversations. The significance of this work lies in its potential to inform public health strategies, shape policymaking, and contribute to social research on crisis communication. Stakeholders ranging from health officials to the public have a vested interest in understanding the contours of this dialogue. Our objective is to craft a data-driven narrative through visualizations that reveal how the world engages with the pandemic on the digital front, providing actionable insights into global and local responses to COVID-19.

Methods / Data Understanding

Data Collected

- Twitter, capturing a wide array of tweets specifically related to COVID-19, alongside a dataset of Wikipedia ISO country codes.
- **Data Description**
- Data provides a description of individual tweets, user information, and country codes, which together offer a broad view of the global discourse on the pandemic.
- **Data Manipulation**

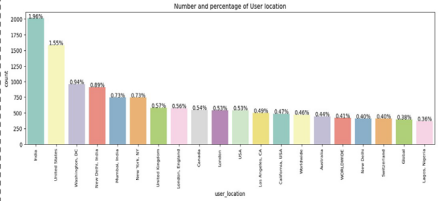
1. Cleaning (handling missing values, correcting data types), merging (associating tweets with standardized country codes), and transforming (extracting hashtags, processing dates and times for temporal analysis).
2. Data to conduct the study: This data answer the research questions about public sentiment and information dissemination during the COVID-19 pandemic.



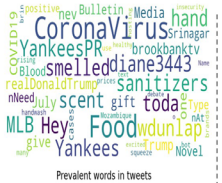
Distribution of the top 10 sources in pie chart

Visualizations

User location based on country is addressed by below graph



Top User from India: 1.96% and the second Top is USA

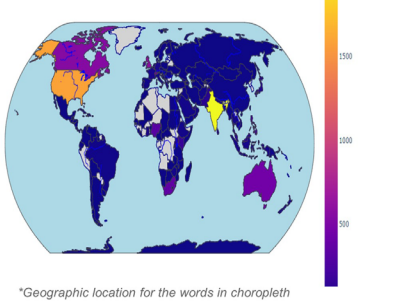


Prevalent words in tweets

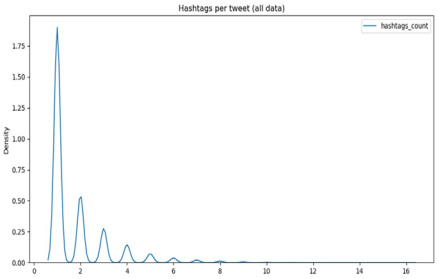
Prevalent words in tweets from India

Here the prevalent words from tweets and from India

Here the prevalent words Tweets per country in choropleth map's



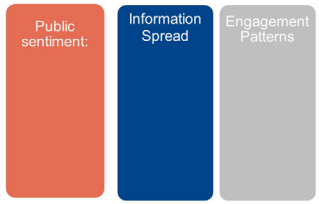
**Geographic location for the words in choropleth*



total hashtags 38694 from tweets

Evaluation (so-what)

Reveal the public's mood towards COVID-19, the spread of information, the demographics most engaged in the discourse, regional sentiment variations, and how public opinion shifts over time.



Summary of extracted insights from visualizations

For stakeholders such as public health officials and policymakers, the results might indicate areas where public concern is highest, misinformation is spreading, or where more communication is needed. For researchers, these insights could signal trends worthy of deeper study, such as the relationship between public sentiment and compliance with health guidelines.

- **Public Health Communications**: Tailor messaging to address prevalent concerns and misinformation identified in tweets.
- **Policy Formulation**: Consider the sentiment and topics of discussion when creating or adjusting COVID-19 related policies.
- **Engagement Strategies**: Engage with key influencers and leverage popular hashtags to improve public health message dissemination.
- **Further Research**: Conduct longitudinal studies to see how sentiments and topics change over time, which could inform future crisis communication strategies.

The visualizations would have served as a foundation for these insights and recommendations, providing stakeholders with actionable data to inform their decisions and strategies.

Conclusions

This study analyzes Twitter data to grasp public sentiment on COVID-19, identifying key topics and dissemination patterns. Public health bodies, policymakers, and academics benefit from insights into global conversations and regional sentiment variances, aiding informed decision-making. By assessing tweets and ISO country codes, we've mapped sentiments and information spread, revealing prevalent concerns and influential communication channels. These findings are pivotal for crafting effective health messaging and policies, ensuring they resonate with the public's voice and address pressing issues highlighted through social media discourse during the pandemic. A limitation of our research is that due to the large volume of data, we were not able to analyze all the tweets

Future Work

To expand the COVID-19 Twitter analysis project, incorporating diverse data like news articles and health reports, alongside advanced analytics like sentiment and network analysis, could yield deeper insights. This would enable tracking sentiment trends, topic shifts, and misinformation spread, and could measure influencer impact and the effectiveness of health responses. Access to broader data and advanced tools for processing natural language would be necessary for this enhanced analysis.

References

1. COVID-19 on Social Media: Analyzing Misinformation in Twitter Conversations, K sharma, S seo, C meng, Y Liu
2. A comprehensive guide to sentiment analysis techniques. Bing Liu
3. "Natural Language Processing with Python" by Steven Bird, Ewan Klein, and Edward Loper.
4. "Network Analysis in Python" by Maksim Tsvetovat and Alexander Kouznetsov.
5. "Communicating public health information on social media: A framework for building online health literacy" by Chou
6. Global Database of Events, Language, and Tone (GDELT)
7. Uncovering temporal differences in COVID-19 tweets.H Zheng, D HL, Y L zheng

Satellite modularity design and Implementation

AUTHORS: Naomi Gutierrez, Robert Ruiz, Enoc Ferniza, Juan del Real
Industrial and Systems Engineering Department, The University of Texas at El Paso
*salunafong@utep.edu

Project Objective

Our project centers around the concept of modularity to revolutionize assembly, disassembly, replacement, and maintenance procedures in space, specifically tailored to satellite platform.

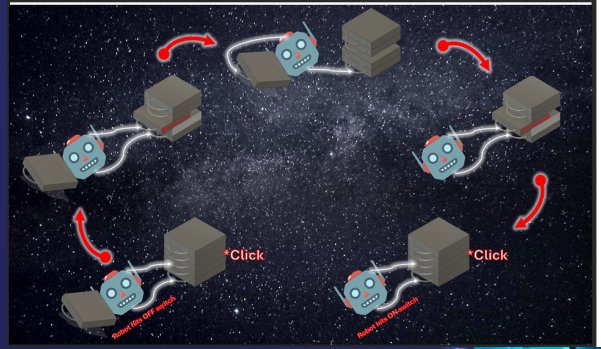
Introduction

- Future satellites will incorporate On-Orbit Attachable Components (OACs) for versatile mission adjustments.
- OACs enable seamless docking and provide access to software, guidance, navigation, and power via an exterior USB-type plug-in.
- This project explores the potential of OACs and aims to design one for satellite operation modification, with specific details pending.

Background

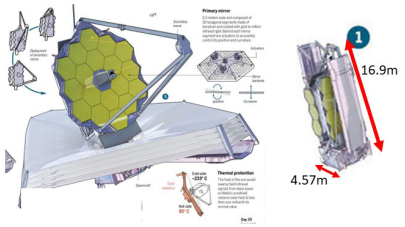
- Designing a satellite to align with launch logistics and implement necessary technology defines mission complexity and incurs significant cost
- CubeSat satellites have revolutionized space exploration by offering innovative and cost-effective technology solutions.
- Using robotic arm for in orbit satellite repair enhances mission resilience and sustainability

Project Concept



Setup

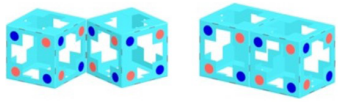
Why is modularity a desirable capability?
165M to Launch – 9.8B Develop



100K-150K to launch - develop 10K

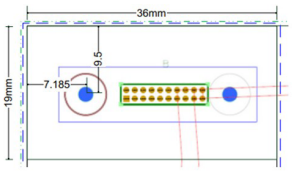
Cube-Like structures

- Cube like structures have demonstrated to be effective in the management of structures in manipulating and coupling the structures



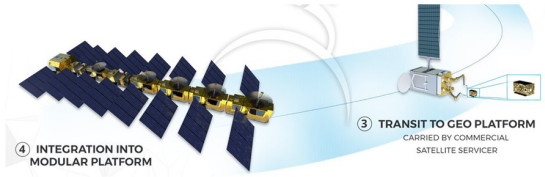
Quick Release Interfaces

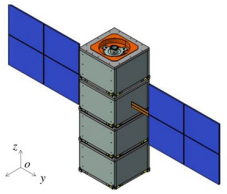
- Development of quick release mechanisms reduce the efforts of managing structures in space.



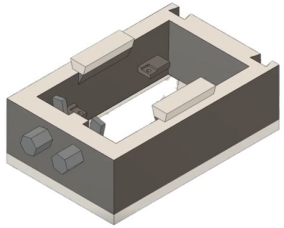
Modularity

Organizations dedicated to space industry, have developed concepts. However there is not a developed or dedicated standard.

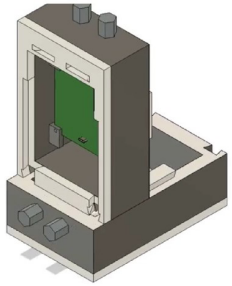




Results



- Casing Lock handles and Pins



- Type C USB connection between modules

Conclusion

In conclusion, the utilization of Cameo and Fusion 360 proved instrumental in the successful design of our quick release mechanism and the creation of a comprehensive 3D model showcasing the efficacy of our project. Through meticulous planning and implementation, we devised a quick release plug system facilitating effortless removal of modules by the robotic arm. Additionally, we integrated a USB connection to enable seamless communication between modules, enhancing the overall functionality and adaptability of our project. This collaborative effort and innovative approach exemplify the integration of modularity into existing Cube Satellites.

Acknowledgments

This research was funded through the US Department of Education Award # P031S120131.

TMAC-PASO DEL NORTE

RESOURCES FOR LOCAL SMALL & MEDIUM MANUFACTURERS

TMAC Paso del Norte is a public-private partnership located at UTEP to serve a wide range of businesses including manufacturing, healthcare, and government. TMAC's mission is to increase the global competitiveness of the Texas economy by working to grow and sustain the extended manufacturing enterprise. TMAC works with companies to help them advance and make operations more agile by using Lean, Quality, Supply Chain, and Workforce Development practices. TMAC PdN provides lean and efficient customized solutions that deliver a competitive edge, identify growth opportunities, and foster regional economic development.

TMAC delivers hands-on business management, technology and operations solutions to a wide range of businesses, including manufacturing, distribution, logistics, construction, health care and government. We have a wide array of services that accelerate profitable growth by developing and improving products, processes and people. Focus areas include Strategic Management, Technology and Operations.

PUBLIC PRIVATE PARTNERSHIP

TMAC is an affiliate of the Manufacturing Extension Partnership (MEP) program of National Institute of Standards and Technology (NIST).

The National Institute of Standards and Technology's Hollings Manufacturing Extension Partnership (MEP) works with small and mid-sized U.S. manufacturers to help them create and retain jobs, increase profits, and save time and money. The nationwide network provides a variety of services, from innovation strategies to process improvements to green manufacturing. MEP also works with partners at the state and federal levels on programs that put manufacturers in position to develop new customers, expand into new markets and create new products.

MEP field staff has over 1,300 technical experts – located in all 50 states and Puerto Rico – serving as trusted business advisors, focused on solving manufacturers' challenges and identifying opportunities for growth. As a program of the U.S. Department of Commerce, MEP offers its clients a wealth of unique and effective resources centered on five critical areas: technology acceleration, supplier development, sustainability, workforce and continuous improvement.

TMAC offices are strategically located across Texas.

OUR APPROACH MAKES US DIFFERENT

Our TMAC advisors have several decades of combined industry experience. Their knowledge and expertise encompasses vast technical, innovative, operational and support areas within an organization. Because of TMAC's hands-on approach, our advisors understand the issues customers face on a daily basis.

TMAC doesn't leave a to-do list for you to navigate alone. We work with you to achieve dramatic results. Our objective is not to implement these methodologies to you or for you, but rather with you to develop your in-house expertise so that improvements are sustainable.

WORK SMART, GROW SMART

TMAC's mission is to increase the global competitiveness of the Texas economy by working to grow the extended manufacturing enterprise.

TMAC works with you to make your company more efficient, whether it is energy efficiency, quality issues, or supply chain, we will give you the customized solutions to have the competitive edge, discover financial opportunities and grow your business.

In today's super competitive environment, growing a business requires planning, efficient processes, customer focused innovation, new customers and markets and smart financial decisions. Whether you desire assistance in one area or a comprehensive approach, TMAC provides actionable steps to get you to the next level and beyond.

TMAC SOLUTIONS

- Executive Leadership
- Supply Chain & Logistics
- Product Development
- Operations
- Maintenance & Facilities
- HR
- Finance & Accounting
- Administration

ECONOMIC IMPACT

MEP Center impacts are based on clients surveyed in FY2020

$528.6 Million
Total Increased/Retained Sales

5,259
Total Increased/Retained Jobs

$207.3 Million
New Client Investments

$170.6 Million
Cost Savings

THE **5** PILLARS OF TMAC

PROFIT
PRODUCT
PROCESSES
TECHNOLOGIES
PEOPLE

Candidate Selection for Mission Extension Vehicles

Carlos Ortega, Alexis Escandon, Luis Ponce, Justine Adebayo

Industrial, Manufacturing & Systems Engineering

COMPILATION OF POSTERS | BRIEFINGS WITH RESEARCH

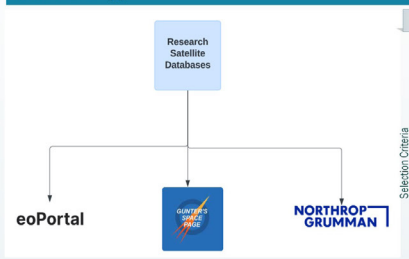
Abstract

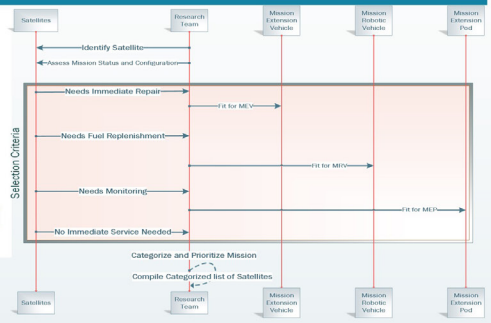
This study embarks on a comprehensive evaluation of Northrop Grumman Corporation's (NGC) innovative Space Logistics platforms, encompassing the Mission Extension Vehicle (MEV), Mission Extension Pod (MEP), and the Mission Robotic Vehicle (MRV). The primary focus is to assess their fundamental capabilities and to identify potential candidate missions by reviewing both current satellites in orbit and prospective future missions that could benefit from these services. Situated within the rapidly evolving sector of space servicing, this project is guided by the ambition to extend the operational lifespan of satellites through in-orbit repairs, refueling, and technological upgrades, thereby advancing the sustainability and efficiency of space activities. These objectives are underscored by the drive to mitigate space debris and enhance the cost-effectiveness of maintaining space assets. The exploration of these platforms is further contextualized by the technological advancements that have made such services feasible, including robotics, miniaturization, and advanced propulsion systems. Despite facing regulatory and technical hurdles, the space servicing industry presents a promising avenue for revolutionizing space operations, making them more resilient and efficient. The project outlines objectives aimed at optimizing the research process through software implementation and identifying optimal candidate missions for Space Logistics services. Future work will expand the scope of research, refine service date estimations for candidate missions, and enhance the precision of the Selenium software for improved search capabilities, marking a significant step towards realizing the full potential of space logistics in the contemporary era of space exploration.

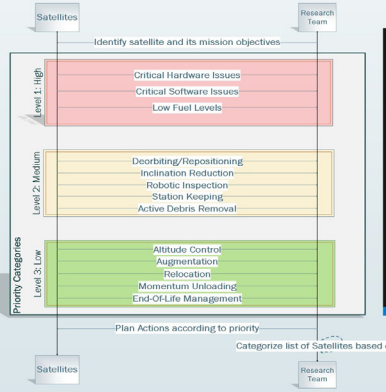
Introduction

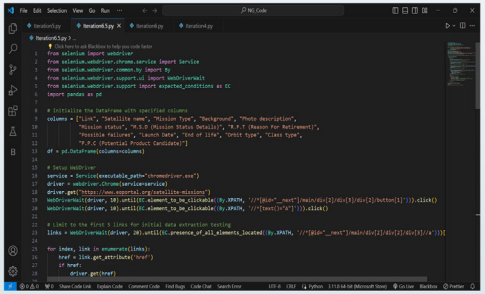
NGC's Space Logistics platforms are leading the way for space servicing right now. This project would assess the basic capabilities of the platforms (MEV, MEP, and MRV) and work to develop candidate missions based on a review of satellites currently in orbit, or future missions that could use those services..

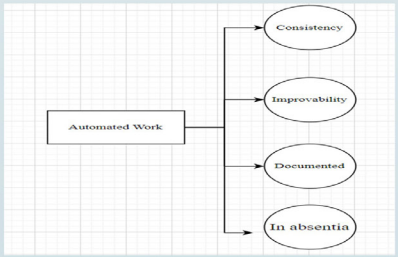
Methodology

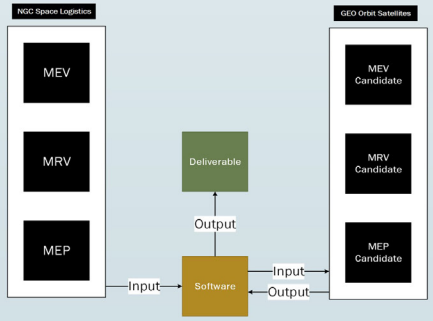












Results

Priority	Satellite Mission	Nation	Background	Mission Status	Mission Status Details	Possible Failures	Launch Date	End of Life Date	Orbit	Recommended Service
High	AMC 16	USA	AMC-16 was a Broadcasting Satellite System (BSS) satellite constructed by Lockheed Martin, equipped with 32 Ku-band transponders and high levels of redundancy in core components. Its purpose was to provide Direct-to-Home services in the United States, marking the first BSS satellite in SES AMERICOM's domestic fleet. Originally planned for launch in 2008, modifications were requested by EchoStar, the lessee of its capacity, to increase flexibility, including the ability to temporarily operate from Mexico's 77 degrees west longitude orbital slot. Launched in March 2008, AMC-16 encountered a launch vehicle failure, leaving it stranded in a low transfer orbit. Despite efforts to maneuver it to geostationary orbit, it was deemed a complete loss by SES American. The satellite was subsequently sold to the US Department of Defense and eventually reached geosynchronous orbit in late January 2009, now positioned at around 35 degrees East with a notable inclination of more than 15 degrees.	Inactive	Partial failure, declared a complete loss	Launch vehicle failure	2008	2023	GEO	MRV and MEP

Satellite Class	Satellite Name	Mission Type	Background	Priority	Mission Status	Mission Status Details	Recommendations	Possible failures	Launch Date	End of Life Date	Orbit
A	Intelsat 14	Communication	Intelsat 14 is a communications satellite providing broadband and television services to customers in the Americas and Europe.	Low	Operational	Delivering telecommunications services to a wide user base.	MEP: MEP's propulsion and attitude control capabilities align well with Intelsat 14's needs, offering a reliable solution to extend its operational lifespan without significant disruptions to ongoing operations.	Propulsion failure, Power system failure	25-Nov-2009	Nov-2029	GEO

Conclusion

In conclusion, our project provides NGC with a categorized list of qualified satellite missions for their SpaceLogistics services. The automated software offers an efficient way to identify these missions, enhancing NGC's operations and positioning them for success in the evolving space industry.

Acknowledgements

We would like to thank Rene Dominguez, William Newcomb, Dr. Smith, Dr. Luna, Dr. Kwas, and Oscar Machado from NGC..

"Elevating Efficiency: Implementing Industry 4.0 at Eaton's LVA Manufacturing Center"

The University of Texas at El Paso

Industrial, Manufacturing & Systems Engineering (IMSE)

TEAM MEMBERS: Jose Graells, Roberto Torres, Ivan Delgado, Eduardo Jaquez

Abstract

At Eaton's manufacturing center in El Paso, a strategic initiative is underway to implement a new assembly line dedicated to producing Low Voltage Assembly units. Utilizing Industry 4.0 solutions and simulations, including but not limited to AI, Augmented reality, Flex Sim, Jack and Cameo. This endeavor aims to revolutionize production processes by integrating advanced technologies for enhanced efficiency, precision, and adaptability. Eaton seeks to achieve optimal performance and responsiveness in meeting evolving market demands.

Introduction

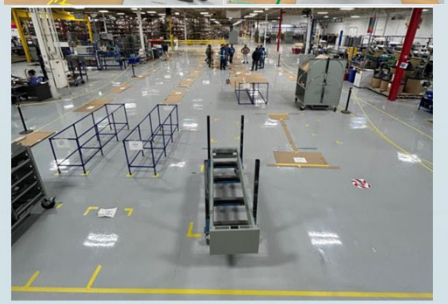
EATON, among the top global players in the low- and medium-voltage electrical industry, provides comprehensive electrical solutions and engineering services to meet the world's growing power demands. Our Low-Voltage Assemblies (LVA) serve critical power applications, such as data centers. Recently, EATON will supply a multimillion-dollar data center for a leading computer development company.

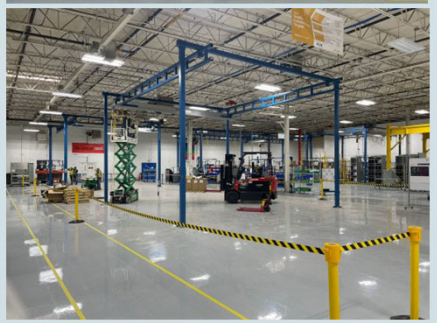
Methodology

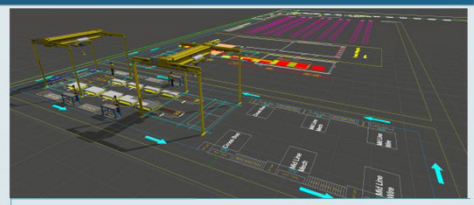
The CAD Drawings and Layouts for the new LVA assembly line has been defined and its ready to be implemented using Industrial, Manufacturing, and Systems concepts. The objective is to validate what has been defined electronically (CAD Drawings) in order to be safe, efficient and functional. Many methodologies were implemented throughout the whole collaboration process between UTEP Senior Design students and EATON Employees

Results

The UTEP Senior Design Team achieved outstanding results through collaboration with EATON's Plant Manager, Operations Manager, and Employees, leading to rapid improvement workshops, layout revisions, and internal meetings. As a result, the new LVA assembly line was verified and validated, earning acceptance from EATON and proceeding to the construction phase.

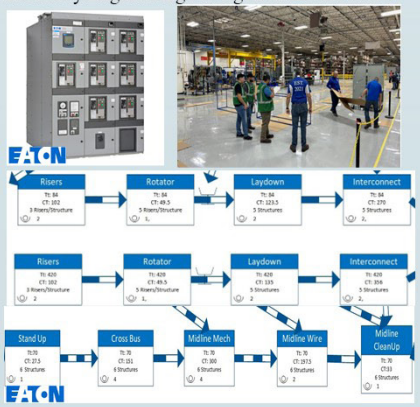






Conclusion

Eaton embraces Industry 4.0 principles and simulation-driven strategies for its commitment to innovation and excellence in manufacturing. The implementation of a new assembly line for Low Voltage Assemblies at the city of El Paso facility, represents a significant step towards achieving heightened efficiency and agility in meeting market demands by using advanced technologies as simulations and augmented reality, as well as Lean manufacturing techniques such as 5's and 8 waste, and Safety Engineering for ergonomics and risks.



Acknowledgements

"This research was developed for EATON, who sponsored this Senior Design Project."

THE UNIVERSITY OF TEXAS AT EL PASO

NEW RESEARCH CAPABILITIES

INFORMATION AND COGNITIVE HUMAN FACTORS ENGINEERING (PIC-HFE)

With STAR funding from the State of Texas, The University of Texas at El Paso has launched a new industrial engineering research laboratory called PIC-HFE – Physical, Information and Cognitive Human Factors Engineering. PIC-HFE Lab investigates interdisciplinary research problems in human factors engineering with a focus on human performance and behavior with a view to designing and engineering real world systems that impact our society across diverse fields such as healthcare, future work systems and construction.

The work from this research lab aims to further our understanding of how people interact with technologies and work systems, and how design can make systems safe, accessible, healthy and productive.undergraduate, master's, and doctoral students engage in multidisciplinary projects aimed at addressing these complex challenges.

TEAM

Faculty

Arunkumar Pennathur, Ph.D.
Priyadarshini Pennathur, Ph.D.

Student Team

Prajina Edayath
Karen Gonzalez
Valeria Velarde
Laura Tovar
Alejandra Martinez
Carla Irigoyen
Gloria Chavez

EQUIPMENT AND CAPABILITIES

- Exoskeletons
- Virtual Reality System
- Physiological assessment
- Strength, force and anthropometry measurements
- Emotional and behavioral assessment

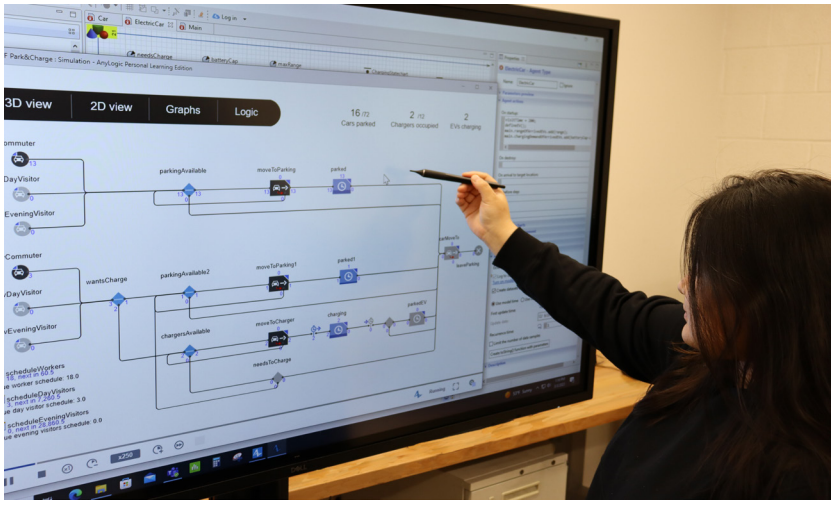
SYSTEMS INNOVATION WITH MODELING AND SIMULATION (SIMS) LABORATORY

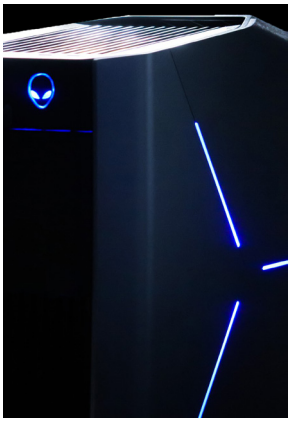
The Systems Innovation with Modeling and Simulation (SIMS) laboratory is a specialized facility at UTEP's IMSE Department to develop models of real-world systems and processes and simulate their behavior under various conditions. The primary goal of the SIMS laboratory is to provide state-of-the-art research exposure to students and professionals in developing innovative solutions for complex systems and processes. This can be particularly useful for designing complex systems, optimizing processes, predicting the effects of changes to existing systems, developing new products/services, etc.

The SIMS laboratory is committed to training the next-generation workforce and extending collaboration with local and national industries to overcome their challenges involving the application of mathematical modeling, simulation, optimization, control, and prediction. The laboratory includes high computing performance resources, as well as specialized software tools for creating, analyzing, and visualizing complex systems and processes.

RESOURSES & SOFTWARE

- AnyLogic, University Researcher Version
  - DES, AB, SD and Event-Based Simulation with 2D & 3D Animation
- CAD Software
  - 3D design & modeling
- Alienware
- Stratasys F370 3D Printer
- Interactive, moving Screen
  - 65' Inches
  - Display 3D Rendering





SYSTEMS MODELING & SIMULATION (SMS)

CONCENTRATION

Modeling and Simulation (M&S) is an important tool as it helps engineers to design and optimize complex systems and processes. A system can be simple as a single machine or complex as an entire production line. Here, M&S can be used to explore how the systems work and to identify areas where improvements can be made. For example, engineers can use simulation to identify potential bottlenecks in a production line and to test different strategies for increasing throughput and reducing downtime.
Most importantly, it allows engineers to test different "if-then" scenarios without having to make expensive or time-consuming physical modifications to the systems. It is a risk-free way, where engineers can create a virtual model of a system and simulate under different process variants to evaluate the impact of changes. Due to pervasive usefulness, M&S is widely used across many sectors, including manufacturing, healthcare, transportation, supply chain and logistics, warehouse operations, etc. The engineering workforce must gain expertise in M&S to meet critical skill shifts for the industries of today and future.
To make the future leaders, the Department of Industrial, Manufacturing and Systems Engineering (IMSE) at The University of Texas at El Paso (UTEP) is establishing a new concentration in Systems Modeling and Simulation (SMS) in support of the U.S. Department of Education.
This new concentration will allow graduate engineering students to enhance their knowledge in data analytics, computer simulation, machine learning for systems emulation, and augmented and virtual reality (AR/VR) technology. In addition, the newly established laboratory on Systems Innovation with Modeling and Simulation (SIMS) will provide hands-on training on developing simulation models, big data analytics, and AR/VR applications.
In this rapidly evolving environment, Industries face lots of challenges in terms of market growth, efficiency, productivity, and profitability. These challenges cannot be fully addressed using only analytical knowledge. Students who graduate from this concentration will gain the necessary expertise to make significant contribution in searching innovative solutions. This project is cultivating next-generation leaders, especially the minority and female engineering students from the west Texas region.
The concentration is offered the IMSE graduate students. Students who want to pursue the SMS certificate need to complete any of the three courses from the following list:

1

INDUSTRIAL DATA ANALYTICS

Industries, nowadays, are mostly data-driven in taking many strategic decisions. Data analytics can help industries in improving efficiency and productivity, predictive maintenance, quality control, cost savings, taking competitive advantages, and many more. The industrial data analytic course introduces the concepts, algorithms, and techniques to handle big data for data-driven solutions. In this course, students will learn- 1) data preprocessing, 2) descriptive data analytics, 3) mining frequent patterns and correlation, 4) data classification clustering, and (5) data visualization and interpretation. Students will learn and apply all these data analytics techniques using Python programming.

2 COMPUTER SIMULATION APPLICATIONS

In this course, students will be introduced to the different concepts and methods of computer including discrete-event simulation (DES), process-centric modeling, and agent-based simulation to solve mathematically intractable problems in stochastic modeling. The course includes topics such as 1) Queuing theory, 2) Introductory Java programming, 3) Several case studies for DES, 4) Pedestrian modeling, 5) Agent-based modeling, 6) Statistical distribution, 7) Statistical result analysis of simulation output, 8) Presenting simulation using a dashboard, and 9) Model verification and validation. Students will learn these simulation techniques using AnyLogic simulation software.

3 AUGMENTED AND VIRTUAL REALITY (AR/VR) BASED SIMULATION

This course module covers the field of Augmented Reality (AR) and Virtual Reality (VR). AR allows merging of real world with virtual objects superimposed to enable Marker-based tracking and/or Marker-less tracking. VR is a simulation generated with the help of interactive software and hardware, which utilizes the controller and the Head Mounted Devices (HMDs) to replicate real-world scenarios for workforce training and design verification purposes. In this course students will learn to simulate an environment using software like Maya 3D Design and Unity game engine.

4 MACHINE LEARNING FOR SYSTEM EMULATION

This course emphasizes machine learning (ML) and artificial intelligence in system emulation. Students will closely work with different types of ML and AI models. They will further be introduced foundations of simulation and computer experiments in Python, R, Matlab, and/or Julia paired with extensive training in high-performance computing (HPC) such as OpenMP, OpenACC and OpenMPD. Students will have access to these computational resources and receive hands-on experience with statistical emulation based on real-world problems in industrial manufacturing and systems engineering.

ALPHA PI MU

INDUSTRIAL & SYSTEMS ENGINEERING HONOR SOCIETY

The best opportunities to develop skills in effective communication, collaborative leadership, & presentation

Only Top 30% Seniors, Top 20% Juniors, & Grad Students qualify

Mentorships & connections to better prepare for pre-professional opportunities & jobs upon graduation

Socials, certification, sponsorships, leadership retreats, technical and career workshops, & more!

Our members have obtained opportunities with:

- Lockheed Martin
- The Boeing Co.
- Toyota
- Cummins
- Microsoft
- Amazon

Research Areas:

- Renewable Energy
- Model-Based Systems Engineering
- Data Analytics
- Optimization Systems

Studied Abroad:

- Czech Republic
- Spain
- Mexico
- Peru
- Costa Rica

For more info e-mail: alphapimu@utep.edu

Institute of Industrial & Systems Engineers

Vision

We aspire to be recognized as the reference point for Industrial, Manufacturing and Systems Engineering students to request support and as the main way to obtain leadership skills for success beyond college.

Mission

We are devoted to supplement and enhance the ISE curriculum through activities, services, or tools to improve the milestones of engineering students on their college path on their academic and professional areas.

IISE
Operational Excellence Division

Thank you

TO THIS YEAR SUPPORTING PARTNERS AND PRESENTERS

Follow Us!

THE UNIVERSITY OF TEXAS AT EL PASO
College of Engineering
Industrial, Manufacturing & Systems Engineering
500 West University Avenue
El Paso, Texas 79968 - 0742
(915) 747-5752
imse.utep.edu