

2022 Intermountain Conference on Engineering, Technology, and Computing (IETC)

Welcome

Welcome to the second annual Intermountain Conference on Engineering, Technology, and Computing. After an inaugural conference interrupted by the COVID pandemic, we are excited to meet in person for the first time. We have 58 papers in Engineering, 21 in Computing, and 10 papers in Technology. We also welcome a new track, engineering, and technology education. It has 8 papers.

The theme of this year's conference, "Innovations and Solutions for Today's Challenges" expresses one of the two visions of this conference. While engineering, technology, and computing are different disciplines, they work together to create practical solutions. This conference embodies the synergy.

The second vision is to tap into the vibrancy of students, especially undergraduate students. This conference especially supports undergraduate students and gives them opportunities to share their innovative ideas. To this end, we also have over forty posters, mainly of undergraduate research and capstone projects.

We look forward to a stimulating conference, and hope you find it educational and enjoyable.

- Neil Harrison, General Chair



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Larry Zeng

Utah Valley University, USA

IETC Schedule

Friday, May 13

9:00 – 10:00 Opening Session, Room CS 404

9:00 - 9:15 Opening remarks, Chairs

9:40 – 10:00 Keynote: Jake Barker, Rocky Mountain Power

Continual Reliability Improvement



PacifiCorp has continually and steadily improved its service reliability to customers as measured by SAIDI and SAIFI. This presentation will detail the programs and practices put in place to achieve continual improvement, as well as discuss ideas for future improvement.

Jake Barker serves as director of distribution engineering and area transmission planning for PacifiCorp. He also has responsibility for customer generation engineering and power quality engineering. His responsibilities include ensuring PacifiCorp's distribution and sub-transmission grid provides adequate capacity to serve customers reliably, customers' power quality is within standards and customer generation installations comply with company interconnection policy. Previous to his current role, Barker worked in asset management developing the 10 year capital plan for major projects as well as managing customer engineering services and smart grid. Barker's background at PacifiCorp includes service as a transmission planner, manager of distribution engineering and distribution engineer for downtown Salt Lake City, Utah. Prior to PacifiCorp, Barker worked for the Salt Lake Organizing Committee for the Olympic Winter Games of 2002 as a project engineer in timing and scoring. He received a master of business administration degree from the University of Utah, and an electrical engineering degree from Utah State University.

10:00 – 10:20 Break

Poster Session: Location: CS Building-Losee Center Breezeway

10:20 – 11:40 Session 1

Engineering 1 (Controls\Electrical Engineering 1) – Room CS 410

Session Chair: Afsaneh Minaie

Nonlinear Control Algorithm for Systems with Convex Polytope Bounded Nonlinearities

Olli Jansson and Matt Harris

Nonlinear, Low-Energy-Actuator-Prioritizing Control Allocation for Winged eVTOL UAVs

Mason B. Peterson, Randal W. Beard, and Jacob B. Willis

Temperature Uniformity Control in a Gas Heated Box Furnace

Arthur Peck and Dakota Roberson

Engineering 2 (Machine Learning/Artificial Intelligence 1) - Room CS 411

Session Chair: Mohammad Shekaramiz

Sparse Bayesian Learning via Variational Bayes Fused with Orthogonal Matching Pursuit

Mohammad Shekaramiz and Todd K. Moon

Offline Signature Verification: A Study on Total Variation versus CNN

Kateryna Anatska and Mohammad Shekaramiz

System Identification and Machine Learning Model Construction for Reinforcement Learning Control Strategies Applied to LENS System

Golam Gause Jaman, Asa Monson, Kaman Roy Chowdhury, Marco Schoen, and Thomas Walters

Computing 1 (Systems) - Room CS 402

Session Chair: Paul Bodily

Exploring AV1 Encoder Potentials for Priority-Driven Wireless Multimedia Services

Evan Ballesteros, Krishna Murthy Kattiyan Ramamoorthy, and Wei Wang

Human Cognition Aware QoE for NOMA Pricing: A Prospect-Theoretic Augmentation To Non-Orthogonal Wireless Multiple Access

Wei Wang

Communication without Connection

Jeffrey Johnson, Robert Foster Houghton, and Alex Jensen

A Reference Architecture for Healthcare Systems with Coded Terminology Support

Renato F. Bulcao-Neto, Valdemar V. Graciano Neto, and Alessandra Alaniz Macedo

Education 1 (Education and Technology) – Room CS 403

Session Chair: Larry Zeng

Curriculum Development for Teaching Cybersecurity of Industrial Control Systems & Critical-Infrastructure

Basil Hamdan and Rawan Al Nsour

Online Engineering Education: Laboratories Factors and Barriers During the Pandemic - A Case Study

Rawan Al-Nsour, Ruba Alkhasawneh, and Sura Alqudah

Syntax Exercises and Their Effect on Computational Thinking

Marina Johnson, Hillary Swanson, and John Edwards

Examples of Machine Learning Models from Classic to Modern

Gengsheng L. Zeng

Technology 1 (Mixed Reality/ Technology Design) – Room CS 401

Session Chair: Kodey Crandall

Teaching & Learning in Virtual Reality: Metaverse Classroom Exploration

Emily Hedrick, Michael Harper, Eric Oliver, and Dan Hatch

Theatrical and Spatial Modes of Presenting the Endowment Ritual in Latter-day Saint Temples

Brandon R. Ro

Using Biometric Data to Assess the Interior Design of Transitional Housing

Derek Stevens

Poster Judging Session 1: CS Building-Losee Center Breezeway

11:40 – 1:00 Lunch

Poster Session: Location: CS Building-Losee Center Breezeway

1:00 – 2:20 Session 2

Engineering 3 (Transportation Engineering 2) – Room CS 410

Session Chair: Khaled Shaaban

Challenges and Lessons Learned from Building a New Road Drainage System in a Developing Country

Khaled Shaaban

COVID-19 Impact on Traffic Fatalities in Utah

Khaled Shaaban and Mitch Mortimer

Effect of Through Movement Flow Rate on Left-Turn Lane Utilization at Signalized Intersections

Mohammad Shareef Ghanim and Khaled Shaaban

Driver Compliance at All-Way Stop-Controlled Intersections

Khaled Shaaban, Steven Taylor, Ryan Jackson, and Dustin Wall

Engineering 4 (Machine Learning/Artificial Intelligence 2) - Room CS 411

Session Chair: Mohammad Shekaramiz

Automated Hearing Impairment Diagnosis Using Machine Learning

Kyra Taylor, Waseem Sheikh

Identifying Patterns in Fault Recovery Techniques and Hardware Status of Radiation Tolerant Computers Using Principal Components Analysis

Fereshteh Ramezani, Christopher Major, Colter Barney, Justin Williams, Brock J. LaMeres, and Bradley M. Whitaker

Facial Password Data Augmentation

Shad Torrie, Andrew Sumsion, Zheng Sun, and Dah-Jye Lee

Feature Analysis in Satellite Image Classification Using LC-KSVD and Frozen Dictionary Learning

Kaveen Liyanage and Bradley M. Whitaker

Computing 2 (Machine Learning 1) – Room CS 402

Session Chair: JP Tang

Composition of Short Stories Using Book Recommendations

Delaney Moor, Aleksandar Petrovic, Caitlyn Bailey, and Paul Bodily

Stock Market Feature Selection Using Orthogonal Array

Jingpeng Tang, Qianwen Bi, Ian Beal, Eric Stauffer, Yashwanth Kotha, and Smita Gupta

Adaptive Encrypted Traffic Characterization via Deep Representation Learning

Jonathan Wintrode and David DeTienne

Education 2 (COVID-19 and Online Teaching) – Room CS 403

Session Chair: Ghimire, Aashish

Quantifying Student Struggles using Heatmaps and Keystroke Data

Gordon Fjeldsted and John Edwards

Introspection with Data: Recommendation of Academic Majors Based on Personality Traits

Aashish Ghimire, Travis Dorsch, and John Edwards

Remote Microelectronics Laboratory Education in the COVID-19 Pandemic

Chris J. Winstead

Impact of the COVID-19 on Undergraduate Research for Engineering Students and Possible Strategies to Promote Research

Khaled Shaaban and Alaa Alsarhan

Technology 2 (Technology Management)– Room CS 401

Session Chair: Rawan Al-Nsour

Developing & Implementing a System of Rubrics for Assessing Interaction Design

Dan Hatch and Eric Oliver

What Twitter is Saying About Women in Technology

Kelsey Stephens and Kodey Stephen Crandall

Examining the Role of Art in Healthcare Architecture through Pre-Attentive Visual Processing Software and Surveys

Ian Hargrave

Digital Twins in Control Cabinet Construction

Dusko Lukac, Sergio Montiel, Jeffrey Kilburn, Sean Mulherrin, Todd Telles, and Ahmad Omari

Poster Judging Session 2: CS Building-Losee Center Breezeway

2:20 – 2:40 Break

Poster Session: Location: CS Building-Losee Center Breezeway

2:40 – 3:40 Session 3

Engineering 5 (Transportation Engineering 3) – Room CS 410

Session Chair: Khaled Shaaban

Operational Performance of Signalized Intersections: HCM and Microsimulation Comparison

Mohammad Shareef Ghanim, Khaled Shaaban, and Suhaib Allawi

Analysis of Pedestrian Crashes in Utah

Khaled Shaaban and Austin Pinter

Engineering 6 (Wind Turbine Inspection: Machine Learning/Drone Path Planning) – Room CS 411

Session Chair: Mohammad Shekaramiz

Drone Path Planning and Object Detection via QR Codes; A Surrogate Case Study for Wind Turbine Inspection

Branden Pinney, Shayne Duncan, Mohammad Shekaramiz, and Mohammad A.S. Masoum

Locating and Extracting Wind Turbine Blade Cracks Using Haar-like Features and Clustering

Cherif Seibi, Zachary Ward, Mohammad A.S. Masoum, and Mohammad Shekaramiz

Residual and Wavelet based Neural Network for the Fault Detection of Wind Turbine Blades

Lalle M. N'diaye, Austin Phillips, Mohammad A.S. Masoum, and Mohammad Shekaramiz

Wind Turbine Fault Classification Using Support Vector Machines with Fuzzy Logic

Colton Seegmiller, Blake Chamberlain, Jordan Miller, Mohammed A.S. Masoum, Mohammad Shekaramiz

Computing 3 (Image processing) - Room CS 402

Session Chair: Bob Houghton

Handwritten Multi-Digit Recognition with Machine Learning

Soha Boroojerdi and George Rudolph

Learn Dynamic Facial Motion Representations Using Transformer Encoder

Zheng Sun, Andrew Sumsion, Shad Torrie, and Dah-Jye Lee

Engineering 7 (Communications Engineering 1) – Room CS 403

Session Chair: Todd Moon

Soft Linear Algebra over Noisy GF(2) matrices

Todd K. Moon and Jacob H. Gunther

Scheme of Secure Satellite Intercommunications Based at Solar Photons

Huber Nieto -Chaupis

~~**Outdoor Surveillance and Mitigation of Infected Zones Through Engineered Electrical Fields**~~

~~Huber Nieto -Chaupis~~

Using Dual Approximation for Best Linear Unbiased Estimators in Continuous Time, with Application to Continuous-Time Phase Estimation

Todd K. Moon, Randy Christensen, and Jacob H. Gunther

Technology 3 (Automotive/ Industrial Automation) – Room CS 401

Session Chair: David Frame

Using Gasoline Engines to Power Electric Cars

Edward Durney and Brian Durney

Lightweight Foldable Robotic Arm for Drones

Wesley Thomas, Parker Wegrowski, Jacob Lemirick, and Taher Deemyad

Make Cars Modular Again

Edward Durney and Brian Durney

Poster Judging Session 3: CS Building-Losee Center Breezeway

3:45 – 4:45 Session 4

Engineering 8 (Mechanical and Civil Engineering 1) – Room CS 410

Session Chair: Masood Amin

Design and Development of a Single-Stage Axial Compressor Testbench

Shishir Khanal, Cooper Dastrup, Andrew Anderson, Anish Sebastian, and Marco P. Schoen

Sarrus Linkage Aerial Drone Arm

Jacob Lemirick, Wesley Thomas, Parker Wegrowski, and Taher Deemyad

Jet Engine Modeling Using T-MATS with Experimental Verification

Kellie Wilson, Marco P. Schoen, and Ji-Chao Li

Engineering 9 (Communications Engineering 2) – Room CS 411

Session Chair: Todd Moon

Soft Solution of Noisy Linear GF(2) Equations

Todd K. Moon, Jared O. Jensen, and Jacob H. Gunther

Doppler Shift and Envelope Distribution of V2V Channels at 5.9 GHz in Suburban Environments

Carlos A. Gutierrez, Willie Harrison, Michael Rice, Bryan Redd, and Autumn Twitchell

Fabrication of Metallic Far-Infrared Filters

Jared E. Payne, Joseph Eddy, Hunter R.J. Stevenson, Brad Ferguson, Ryan T. Beazer, Gregory N. Nielson, and Stephen M. Schultz

Computing 4 (Machine Learning 2) - Room CS 402

Session Chair: Larry Zeng

Sketch-a-Map (SAM): Creative Route Art Generation

Marcus Goeckner, Kirill Brainard, Austin Lyman, and Paul Bodily

Authorship Verification via Linear Correlation Methods of n-gram and Syntax Metrics

Jared Ray Nelson and Mohammad Shekaramiz

Using Neural Networks to Model the Spread of COVID-19

Isaac Boyd, David Hedges, Benjamin T. Carter, and Bradley M. Whitaker

Technology 4 (Technical Sessions) – Room CS 403

Session Chair: Tyler Bird

IT/OT Cyber Security

Rockwell Automation / Codale - MATTSON Jacob

Siemens Motor Management and Data Usages

Siemens Industry / Mark Berger

Post-Pandemic IoT Electronics/ Accelerated Change

Engineering Technology / David W. Frame

Saturday, May 14

9:00 – 9:30 Plenary, CS 404

Keynote: Tulinda Larsen, Utah Advanced Materials Manufacturing

Initiative: New Technologies in Manufacturing



Dr. Tulinda Larsen is Executive Director, Utah Advanced Materials and Manufacturing Initiative (UAMMI), a public-private partnership to elevate the advanced materials and advanced manufacturing industry in Utah. She serves as the key spokesperson for UAMMI at industry events and before government agencies.

She began her career in Washington, D.C. as an economist at the US Department of Transportation, where she gained experience in the air transport industry. For more than 40 years, she has been a practicing economist studying various aspects of the aerospace industry.

Dr. Larsen is also an Adjunct Professor in the School of Business, Embry Riddle Aeronautical University, Worldwide Campus. She holds a Doctorate of Management from University of Maryland Global Campus, BA and MA in economics from The George Washington University.

9:40 – 10:40 Session 5

Engineering 10 (Communications Engineering 3) – Room CS 410

Session Chair: Todd K. Moon

Audio Event Recognition in Noisy Environments using Power Spectral Density and Dimensionality Reduction

Siddat Bin Nesar and Bradley M. Whitaker

Open-Source Antenna Pattern Measurement System: Development and Applications

Christian Hearn

Engineering 11 (Transportation Engineering 1) - Room CS 411

Session Chair: Khaled Shaaban

A Time-Series Analysis of Traffic Crashes in New York City

Khaled Shaaban and Mohamed Ibrahim

Review of Factors Affecting Public Transportation Ridership

Khaled Shaaban and Abdalla Siam

COVID-19 and Public Transportation Usage in Utah

Khaled Shaaban and Luke Maeser

Design Challenges for Hyperloop Transport Systems

Khaled Shaaban and Essam Radwan

Computing 5 (Applications) - Room CS 402

Session Chair: Sayeed Sajal

The Quality Attributes and Architectural Tactics of Amazon Web Services (AWS)

Neil Harrison and Hind Milhem

KAMI: Leveraging the power of crowd-sourcing to solve complex, real-world problems

Kaden Marchetti and Paul Bodily

Engineering 12 (Civil/Environmental Engineering 1) - Room CS 403

Session Chair: Ben Willardson

Evaluation of Cleaning Methods for Restoring Water Drainage Through Pervious Concrete Pavement

Leah C. Guthrie and W. Spencer Guthrie

Investigation of High-Frequency Ground-Penetrating Radar for Detecting Debonding of Asphalt Overlays on City Streets

Ammon K. Hymas, Maia A. Nelsen, Adam Z. Guthrie, Robert J. Stevens, and W. Spencer Guthrie

Incorporating Waste Plastic in Cement-Lime Mortar Mixtures

Alex P. Guthrie, Nathan J. Weaver, W. Spencer Guthrie, and Aaron N. Weaver

Technology 5 (Technology Design) - Room CS 401

Session Chair: Dan Hatch

Using Modular Model Cars to Drive Innovation and Learning

Brian Durney and Edward Durney

Mobile Remote Assistance with Augmented Reality Applied in a Power Distribution Utility: A Qualitative Study

Paula Zenni Lodetti, Aguinaldo B. dos Santos, Leandro Takeshi Hattori, Edgar Gerevini Carvalho, and Marcos A. Izumida Marins

10:40 – 11:00 Break

11:00 – 12:00 Session 6

Engineering 13 (Controls\Electrical Engineering 2) – Room CS 410

Session Chair: Afsaneh Minaie

Design and Implementation of a Quadcopter Drone Control System for Photography Applications

Blake Chamberlain and Waseem Sheikh

Design, Analysis, and Manufacturing of a Novel Electrically-Assisted Human Powered Vehicle

Tyler Orr, Nathan Robertson, Jonathan Hill, Kevin McAllister, Chandler Hoopes, and Israd Jaafar

Design of a Multi-Effects Guitar Pedal Controlled via Bluetooth App

Nick Robillard, Charles Farrell, Miles Pearson, and Hua Tang

Engineering 14 (Power Systems\Electronics 1) - Room CS 411

Session Chair: Ehsan Rohani

Business Models for Charter Electric Bus Fleets

Lucas Silveira dos Santos, Cesare Quinteiro Pica, Rodolfo Sabino de Moura, Pamela Rugoni Belin,

Marcos Aurelio Izumida Martins, Jessica Ceolin de Bona, and Luiz Henrique Cruz

Evolution of Electric Mobility in Brazil and Study of Charging Infrastructure to Meet the Expected Demand

Flavio de Faveri, Daniel Gomes Makohin, Pamela Rugoni Belin, Cesare Quinteiro Pica, Leonardo Gasparini Duarte, Marcos Aurelio Izumida Martins, Marco Aurelio Giancesini, and Thiago Jeremias
Long Range Sensor Network for Disaster Relief
Elliot Elison, Ehsan Rohani

Computing 6 (Education and Communication) – Room CS 402

Session Chair: Abraham Teng

Temporal Abstract Syntax Trees for Understanding Student Coding Thought Process

Delaney Moore, John Edwards, Hamid Karimi, Rajiv Khadka, and Paul Bodily

Automated Unit Testing and Test-Driven Development Approach to Teaching C++

Kyra Taylor and Waseem Sheikh

BabelFish: A Seamless Solution to Communicate with Multi-Lingual Individuals

Clay Keisel and Sayeed Sajal

Engineering 15 (Civil/Environmental Engineering 2) – Room CS 403

Session Chair: Ben Willardson

Factors that Influence a Student's Decision to Pursue a Bachelor's Degree in Civil Engineering

Gina Young, Alexis Post, and W. Spencer Guthrie

Utah Lake Nutrient Cycling Studies: Limnocorral Usage and Experiments

Rachel Ann Valek, Emily Sara Walmer, Cristian Alun Dorrett, Kaylee Brook Tanner, Anna Catherine Cardall, Gustavious Williams, and Woodruff Miller

Mineral Precipitation in Utah Lake and its Effluent Mixing Zones

Jacob Taggart, Theron Miller, Alexis Navarre-Sitchler, and Gregory Carling

12:00 – 1:00 Lunch

1:00 – 2:20 Session 7

Engineering 16 (Power Systems\Electronics 2) - Room CS 410

Session Chair: Ehsan Rohani

Laser Assisted Cleaving for Waveguide Facets on Silicon

McKay Formica, Noah Boehme, Tyler Adams, Gracie Richens, Aaron Hawkins

Charge Detection Mass Spectrometry of Micron-Sized Particles Using a Differential Amplifier

Parker Allred, JuHang Kim, Yixin Song, Shih-hua Wood Chiang, and Aaron R. Hawkins

Particle Concentration using Electroactuated Nanopumps

Hollis Belnap, Samuel Lahti, and Aaron Hawkins

Accelerated Protection Methodology for Broken Conductor Protection - An Implementation Case

Diogo Vinicius Joao, Hamilton G. B. Souza, Marcos A. Izumida Martins, and Kennedy A. Martins

Engineering 17 (Mechanical and Civil Engineering 2) – Room CS 411

Session Chair: Masood Amin

Advanced Folding Robotic Arm for Quadcopters

Parker Wegrowski, Wesley Thomas, Jacob Lemrick, and Taher Deemyad

Object Detection and Navigation Strategy for Obstacle Avoidance Applied to Autonomous Wheelchair Driving

Nusrat Farheen, Golam Gause Jaman, and Marco P. Schoen

Development of a Transparent Cryogenic Probe Card Based on Silicon Carbide

Ryan Beazer, Jared Payne, Gregory N. Nielson, Rebecca Anderson, Madeline Thompson, Topher Johnson, Brad Ferguson, and Stephen Schultz

Machining of Silicon Carbide Wafers

Madeline Thompson, Bradley Ferguson, Gregory N. Neilson, and Stephen Schultz

Computing 7 (Security and Theory) - Room CS 402

Session Chair: John Edwards

A Comprehensive Survey: Cybersecurity Challenges and Futures of Autonomous Drones

Nyles Durfey and Sayeed Sajal

Utilizing a Blockchain for Managing Sensor Metadata in Exposure Health Studies

Aaruchi Sarbhai, Ramkiran Gouripeddi, Philip Lundrigan, Pavithra Chidamdaram, Aakanksha Saha, Randy Madsen, Julio Facelli, Katherine Sward, and Sneha Kumar Kasera

Visualizing the 3SAT to CLIQUE Reduction Process

Kaden Marchetti and Paul Bodily

John the Ripper: An Examination and Analysis of the Popular Hash Cracking Algorithm

Paul Bodily

Engineering 18 (Mechanical and Civil Engineering 3) - Room CS 403

Session Chair: Ben Willardson

Unbalanced Civil Engineering Education on Sustainability

Irma Wang

Analysis of Long-Term Chlorophyll Trends in Utah Lake using Landsat Data and Lake Regions

Kaylee Brook Tanner, Anna Catherine Cardall, and Gustavious Paul Williams

A Thermoacoustically-Driven Vocal Tract Model

Veronica Gunyan, Benjamin Miera, Abolfazl Amin, Bonnie Andersen

Rebalancing Civil Engineering Education to Address Social Aspects of Sustainability

Xiaomei Wang, Andrew J. South, W. Spencer Guthrie, Clifton Farnsworth

2:30 – 3:00 Closing session, Room CS 404

Closing remarks, student awards