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 96 papers in engineering, 21 in computing, and ten papers in technology. We also welcome a new track, engineering, and technology education. It has eight 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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Intermountain Engineering, Technology and Computing Conference

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
Offline Signature Verification: A Study on Total Variation versus CNN
Kateryna Anatska and Mohammad Shekaramiz
Wafer Pattern Counting, Detection and Classification Based on Encoder-Decoder CNN Structure
Yu Lin
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
Automated Hearing Impairment Diagnosis Using Machine Learning
Waseem Sheikh

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
Bringing Virtual Reality to the Classroom
Jenna Smith
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
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
Sparse Bayesian Learning via Variational Bayes Fused with Orthogonal Matching Pursuit
Mohammad Shekaramiz and Todd K. Moon
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

Domain Adaptive Scene Text Localization in Night View Images

Mohammed Alshehri

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
Faculty Department Scheduler
Christopher Nagel

Engineering 12 Session (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 Gianesini, and Thiago Jeremias

Microgrids and Virtual Power Plants: integration possibilities
> Sophia Boing Righetto

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, Shiuh-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 Wheel Chair 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, (Civil/Environmental 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

2:20 – 2:40   Closing session, Room CS 404

Closing remarks, student awards