Intermountain Engineering, Technology and Computing Conference

Innovations & Solutions for Today's Challenges

Welcome

Welcome to the annual Intermountain Conference on Engineering, Technology, and Computing.

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 this 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.

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

- Stephen Schultz, General Chair

i-ETC Committee Members

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i-ETC
Intermountain Engineering, Technology and Computing Conference

Friday, May 12

9:00 – 10:00 Opening Session, EB Event Space

9:00 - 9:15 Opening remarks

9:30 – 10:00 Keynote: Rob Sowby, Brigham Young University

Great Salt Lake: From Afterthought to Asset

Great Salt Lake has been at its lowest level in decades, imperiling regional ecosystems, air quality, and economies. Reversing the decline may be the grand challenge of the decade for the Intermountain West, taking a coordinated effort of policy, planning, and especially engineering. From pipes to sensors to databases, engineering solutions are playing a major role in its immediate recovery and its long-term health. Once an afterthought of water priorities, Great Salt Lake is now being elevated to the status of a precious asset.

Dedicated to advancing sustainable water resources, Dr. Rob Sowby is a licensed professional engineer with expertise in the planning, design, construction, and operation of water systems.

At BYU he is an assistant professor in the Department of Civil and Construction Engineering, where he teaches environmental engineering, urban water infrastructure, and water treatment. He mentors students in the Sustainability Lab, which launched in 2021 to address interdisciplinary research needs in sustainable infrastructure. Dr. Sowby studied civil engineering at Brigham Young University, the Massachusetts Institute of Technology, and the University of Utah and practiced for 10 years in industry before coming to BYU. His other interests include business, German literature, and classical music.

10:20 – 12:20 Session 1

Track 1: Engineering (Civil – Concrete) 126 MARB

Indirect Tensile Strength of Clayey Soils Treated With Cement or Lime

Melissa Adams Cowley and W. Spencer Guthrie (Brigham Young University, USA)

Qualitative Comparison of Sampling Methods for Determining Chloride Concentrations of Concrete

Jared Murri and W. Spencer Guthrie (Brigham Young University, USA)

Long-Term Modulus of Microcracked Cement-Treated Base

Patrick McDivitt, W. Spencer Guthrie and Melissa Adams Cowley (Brigham Young University, USA)

On the Optimization of Two-Level Thermoelectric System for Pavement Energy Harvesting

Ehsan Rohani (Utah Valley University, USA)

Passive Thermal Performance of Earth-Sheltered Thin-Shell Concrete Dome Structures

Daira Sofia Velasco Vega, Kendrick M Shepherd, W. Spencer Guthrie and Andrew South (Brigham Young University, USA)

Compressive Strength and Rapid Chloride Permeability Testing of Concrete Comprising Silica Fume

Nicholas Day, Madelyne Bleazard, W. Spencer Guthrie and Taylor J. Sorensen (Brigham Young University, USA); Amanda C Bordelon (Utah Valley University, USA)

Track 2: Engineering (Electrical -- Machine Learning) 128 MARB

Inverse Design of a 2x2 Coupler

Elise Bangerter and Ryan Camacho (Brigham Young University, USA)

Neural Network Self Driving Car: A Platform for Learning and Research on a Reduced Scale

Andrew W Sumsion, Shad Torrie, Joshua Broekhuijsen and Dah-Jye Lee (Brigham Young University, USA)

Deep and Machine Learning-Based Methods for Defect Classification in Jet Engines

Marco P Schoen (Idaho State University, USA); Marcel Oettinger (MTU Aero Engines AG, Germany); Dajan Mimic (Leibniz Universität Hannover, Germany)

Exploration and Object Detection via Low-Cost Autonomous Drone

Branden Pinney and Ben Stockett (UVU, USA); Mohammad Shekaramiz (Utah Valley University, USA); Masoum Mohammad A. S. (Utah Valley Univ, China); Abdennour Seibi and Angel Rodriguez (UVU, USA)

Hyperparameter Tuning of Support Vector Machines for Wind Turbine Detection and Inspection Using Drones

Jordan Miller and Colton Seegmiller (UVU, USA); Masoum Mohammad A. S. (Utah Valley Univ, China); Mohammad Shekaramiz (Utah Valley University, USA); Abdennour Seibi (UVU, USA)

Track 3: Technology, 108 MARB

Enhanced image captioning using deep learning model

Fatima Yousif Rustamani (Mehran University of Engineering and Technology MUET Jamshoro, Pakistan); Samiullah Kalhoro (Mehran University of Engineering and Technology, Jamshoro, Pakistan); Mariam alias Alwaz Kazi (Mehran University of Engineering and Technology MUET Jamshoro, Pakistan); Qasim Arain (Faculty at Mehran University of Engineering and Technolgy, Pakistan)

Exploring the design of virtual space in the metaverse

Mohamad Izani (Higher Colleges of Technology, United Arab Emirates); Aishah Razak (Multimedia University, Malaysia); Abdulsamad Alkhalidi (University of Sharjah, United Arab Emirates); Fauzan Bin Mustaffa (Multimedia University, Malaysia)

Evaluating the effectiveness of obfuscated instruction

Lucas L Ritzdorf, Colter Barney, Christopher M Major, Tristan Running Crane, Hezekiah Austin, Benjamin Macht, Clemente Izurieta and Brock LaMeres (Montana State University, USA)

Co-design of transimpedance amplifiers and photonic

Benjamin J Fisher (Brigham Young University, USA)

On the Crucial Role of Information Theory in the Metaverse

Morteza Shoushtari (Brigham Young University, USA)

Track 4: Computing (Remote sensing and VR) 109 MARB

Immersion, Presence and Transference: Bringing Story Thinking to Simulation Design

Nicole Kosoris (Georgia Tech Research Institute, USA); Maribeth Gandy-Coleman (Georgia Institute of Technology, USA)

Using Sparse Coding as a Preprocessing Technique for Insect Detection in Pulsed Lidar Data

Connor R Zsidisin, Trevor C Vannoy, Joseph A Shaw and Bradley M Whitaker (Montana State University, USA)

Insect Identification in Pulsed Lidar Images Using Changepoint Detection Algorithms

Nathaniel Sweeney (Montana State University, USA); Caroline Xu (University of Michigan, USA); Joseph A Shaw (Montana State University, USA); Toby D. Hocking

(Northern Arizona University, USA); Bradley M Whitaker (Montana State University, USA)

12:20 – 1:40 LUNCH Engineering Building Event Space

1:40 – 3:00 Session 2

Track 1: Engineering (Civil -- Machine Learning) 126 MARB

Freezing Optically Clear Microdroplets in a Laboratory Setting

Kimi S Wright, Parker A Awerkamp, David Hill, Brandt Bashaw and Dean Van Woerkom (College of Engineering, USA); Davin T Fish, Greg Nordin and Ryan Camacho (Brigham Young University, USA)

Long-Range Bluetooth Smart Stake System for Soil Sensing

Samuel J Craven and James M Subieta (Brigham Young University, USA); Coby B Sandholtz (Brigham Young, USA); Daniel K Nelson (University of Utah, USA); Alison Langford and Brian A Mazzeo (Brigham Young University, USA)

Modeling Axial Compressor Systems Using Deep Learning Methods

Kellie N Wilson and Marco P Schoen (Idaho State University, USA)

Measuring Pavement Smoothness From the Perspective of E-Scooters

Dylan Apelu, Gregory S Macfarlane, W. Spencer Guthrie, Nicole Adams and Brian A Mazzeo (Brigham Young University, USA)

Track 2: Engineering (Electrical -- Communications) 128 MARB

Simulating a Time-Varying Communications Channel

Todd Moon and Brandon Lemon (Utah State University, USA)

On Polarization Diversity in 5G and Beyond Internet-Of-Things Networks

Michael Rice, Riley Kirkwood, Laura Landon, Preston Walker and Willie K Harrison (Brigham Young University, USA)

System Identification of a Mobile Robot With Motion Capture Data

Douglas Isenberg (Embry-Riddle Aeronautical University, USA)

Two Stage Soft-Detector Integer Forcing Receiver Using Slowest-Descent Method for IEEE 802.16e

Ehsan Rohani (Utah Valley University, USA)

Track 3: Education in Engineering, Computing, and Technology, 108 MARB

Redesigning the Introduction to Electrical & Computer Engineering for COVID-19

Ehsan Rohani (Utah Valley University, USA); Mona Milani (UVU, USA)

Impact of Undergraduate Research Activities on Engineering Students' Persistence

Khaled Shaaban (UVU, USA); Alaa Alsarhan (Utah Valley University, USA)

Entrepreneurial Mindset Project Amenable to Introducing Undergraduate Students to Machine Learning Classification

Bradley M Whitaker (Montana State University, USA)

Track 4: Computing (AI and ML) 109 MARB

Improving COVID-19 Predictions With Multimodal Neural Networks

Isaac P Boyd (Montana State University, USA); David Hedges (SelectHealth, USA); Benjamin Carter (Billings Clinic, USA); Bradley M Whitaker (Montana State University, USA)

Too Legal; Didn't Read (TLDR): Summarization of Court Opinions

Aashish Ghimire, John M Edwards and Raj Shrestha (Utah State University, USA)

Metadata in Tweets: Broadcasting a Lot More Than What You Tweet

Aashish Ghimire, John M Edwards and Rita Ghimire (Utah State University, USA)

3:00 – 4:00 Poster/Industry Demonstration

Poster Session

Location: Clyde Building Step Down Lounge

Industry Demonstration

Location: Engineering Building Event Space

Schweitzer Engineering Laboratories / Codale Electric

(See Appendix for abstract)

4:00 – 5:40 Session 3

Track 1: Engineering (Civil -- Transportation) 126 MARB

Comparison of Saturated Headways in Mixed Traffic Conditions at Signalized Intersection

Mohammad Shareef Ghanim (Ministry of Transport, Qatar); Khaled Shaaban (UVU, USA); Ghassan Abu-Lebdeh (American University of Sharjah, United Arab Emirates)

Modeling of Severity in Red-Light-Running Crashes Using Deep Learning Recognition

Khaled Shaaban (UVU, USA); Mohammad Shareef Ghanim (Ministry of Transport, Qatar)

Measuring Seat Belt Compliance Among University Students

Khaled Shaaban (UVU, USA); Steven Taylor (Utah Valley University, USA)

Measuring Traffic Noise for Different Types of Vehicles

Khaled Shaaban (UVU, USA); Abdelrahman Abouzaid (Qatar University, USA)

An Artificial Intelligence Approach to Estimate Peak Hour Travel Time

Mohammad Shareef Ghanim (Ministry of Transport, Qatar); Khaled Shaaban (UVU, USA); Abdulla Siam (Qatar University, Qatar)

Track 2: Engineering (Biomedical) 128 MARB

Pulsatile Impedance Monitoring Circuit

Sharisse Poff, Daniel Tebbs, Robert C Davis and Shiuh-hua Wood Chiang (Brigham Young University, USA)

Evaluation of Decision Tree for Predicting Patients' Length of Stay After Arthroplasty Surgical Procedures in the Rural Healthcare

Nejc Sitar, Faraz Dadgostari and Bradley M Whitaker (Montana State University, USA); Bernadette McCrory (Montan State University, USA)

Supine and Lateral Recumbent Posture Recognition for Improving Automatic Respiratory Measurements

Siddat Nesar (Montana State University, USA); Bryce Hill (Montana Tech University, USA); Ryan Stapley (Montana Technological University, USA); Bradley M Whitaker (Montana State University, USA)

Classification System of Breast Cancer Using Machine Learning on Hu Moment Invariants and GLCM Features

Yessi Jusman, Rika Nursanthika and Anna Nur Nazilah Chamim (Universitas Muhammadiyah Yogyakarta, Indonesia)

Study on the Sanitization Efficacy for Safe Use of 3D-Printed Parts for Food, Engineering, and Medical Applications

Matt A Thomas (UVU, USA), Israd Jaafar (UVU, USA), Abdennour Seibi (UVU, USA), Abolfazl Amin (UVU, USA)

Track 3: Education in Engineering, Computing, and Technology, 108 MARB

Teachers' Perception and Experiences of Computer Science Education in K-8 Schools

Vaibhav Anu and Sumi Hagiwara (Montclair State University, USA); Katherine Herbert (1 Normal Ave & Montclair State University, USA); Kazi Zakia Sultana, Minsun Shin, Rebecca Goldstein and Patricia Virella (Montclair State University, USA)

Digital Storyboards: Making CS Elementary

Scott Bartholomew, Jessica M Yauney, Veronica Wuthrich, Katie Wolfley, Emerson Elya, Peter Rich, Steven Shumway and Geoff Wright (Brigham Young University, USA)

Track 4: Computing (Software engineering and security) 109 MARB

Vulnerability of Prime Based Cryptosystem

Jingpeng Tang (Utah Valley University, USA); Wenguang Xu (Southwest Jiaotong University, China)

Programmer Cognition Failures as the Root Cause of Software Vulnerabilities: A Preliminary Review

Darsh Patel, Hetkumar Patel, Kazi Zakia Sultana and Vaibhav Anu (Montclair State University, USA)

Membership and Participation in Object Oriented and Procedural Paradigms

Grant J Nelson (Gianforte School of Computing, Montana State University & Workiva, USA); Clemente Izurieta (Montana State University, USA); Derek Reimanis (Gianforte School of Computing, Montana State University, USA)

i-ETC
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Saturday, May 13

9:00 – 11:00 Session 4

Track 1: Engineering (Civil -- Structural) 126 MARB

Reducing the Carbon Footprint of Concrete by Expanding the Use of Supplementary Cementitious Materials

Matthew W Evans; W. Spencer Guthrie (Brigham Young University, USA)

Embankment Stabilization Using Injection of Cementitious Slurry

Lance Guthrie and Eliza Jenkins (Timpview High School, USA); W. Spencer Guthrie and Robert Stevens (Brigham Young University, USA); Amy McElwee (Infrastructure Research, LLC, USA)

Smartfoam Based Pressure Mapping

Jake D Sundet (Brigham Young University & Nano Composite Products, USA); Stephen Schultz (Brigham Young University, USA); Jake Merrell (Employer, USA); Trevor Christensen and Maxwell Tree (Co-worker, USA)

Fire-Induced Charring of Common Residential Siding Types

Makenzie Wilson, Thomas H. Fletcher and Taylor J. Sorensen (Brigham Young University, USA)

Establishing Connectivity for Isogeometric and Hybrid FEA/Isogeometric Analyses With Multiple Parts Through Beam Element Projection

Brian Shawcroft and Kendrick M Shepherd (Brigham Young University, USA)

An Analysis of the Structural Performance of Cross and Chevron Diagrid Structural Frame Configurations and Cost-Effectiveness of Buoyant Foundation System Incorporated Into an Amphibious House Design

Angelo R. Sayson and Rose O. Cabrera (Mapua University, Philippines); Dante Silva (Mapúa University, Philippines)

Track 2: Engineering (Electrical -- Optical / Microfab) 128 MARB

Conformal Open-Air Electroplating of Through-Wafer Vias

Dillon R Jensen, Madeline Thompson and Topher Johnson (Brigham Young University, USA); Gregory Nielson (Nielson Scientific, USA); Stephen Schultz (Brigham Young University, USA)

Speeding Up Direct-Write Laser Ablation Process for Microstructures

Bradley E Ferguson (Brigham Young University & Nielson Scientific, USA); Ryan S Lee (Nielson Scientific, USA); Joseph Eddy and Jared E Payne (Brigham Young University, USA); Gregory Nielson (Nielson Scientific, USA); Stephen Schultz (Brigham Young University, USA)

Verification of Metal-Mesh Filter Response via ANSYS HFSS Simulation

Hunter Stevenson, Jared E Payne and Joseph Eddy (Brigham Young University, USA); Bradley E Ferguson (Brigham Young University & Nielson Scientific, USA); Ryan T Beazer (Brigham Young University, USA); Gregory Nielson (Nielson Scientific, USA); Stephen Schultz (Brigham Young University, USA)

Optimized Free Space Emission From Layered Diamond Microdisk Resonators

Helaman R Flores and Benjamin Szamosfalvi (Brigham Young University, USA); Yuqin Duan and Ian Hammond (Massachussetts Institute of Technology, USA); Ryan Camacho (Brigham Young University, USA); Dirk Englund (MIT, USA)

Using Reflected Light as a Measure of Best Focus and Control Variable in an Ablation-Focused Optical System

Joseph Eddy (Brigham Young University, USA); Bradley E Ferguson (Brigham Young University & Nielson Scientific, USA); Gregory Nielson (Nielson Scientific, USA); Jared E Payne, Stephen Schultz and Hunter Stevenson (Brigham Young University, USA)

Low-Cost, Open, Citizen Science With IoT and TinyML

Srihari Yamanoor, Narasimha Sai Yamanoor and Satyakanth Thyagaraja (Self, USA)

Track 3: Education in Engineering, Computing, and Technology, 108 MARB

Early Submission of Project Analysis Milestones Correlates Positively With Student Project Performance; Incentives for This Early Project Analysis Positively Changes Student Behaviors

Jaxton Winder, John M Edwards and Erik Falor (Utah State University, USA)

Implementing a Competency-Based Education Curriculum in a Semester Format Across Individual and Group Courses

Paul Cheney (Utah Valley University, USA); Daniel Hatch (800 West University Parkway & Utah Valley University, USA); Eric Oliver (Utah Valley University, USA)

Activity During High-Repetition Practice of Syntax

Stephanie Gonzales, Hillary Swanson and John M Edwards (Utah State University, USA)

Diagnose Digital Skills Gap Between Professional and Academic Sectors in Architecture Discipline - Jordan Case Study

Anwaar Mohammed Banisalman and Ibrahim Maarouf (Alexandria University, Egypt); Ali Abu Ghanimeh (University of Jordan, Jordan); Amira Fathi (Alexandria University, Egypt)

Track 4: Computing (Networks and systems) 109 MARB

A Comparative Analysis on Load Balancing and gRPC Microservices in Kubernetes

Katherine Nieman and Sayeed Sajal (Utah Valley University, USA)

The Art of RFID Hacking

Kolin Nielson and Sayeed Sajal (Utah Valley University, USA)

AI in Cybersecurity

Mary Corbett and Sayeed Sajal (Utah Valley University, USA)

The Offshore Power Portal: A Web-Based Repository to Improve Offshore Wind Knowledge Dissemination

Alexandra Reyes and Vaibhav Anu (Montclair State University, USA)

11:15 – 12:20 Closing Session and Awards Presentation

12:20 – 1:40 LUNCH Engineering Building Event Space

Appendix

Industrial Demonstrations

Schweitzer Engineering Laboratory

Power Quality Basics: What happens when we switch to switching?

Power systems in the classroom have some significant differences from the power systems of real life. Clean, perfectly sinusoidal waveforms quickly become distorted. What does this mean for the power system and the devices connected to it?

We'll take a look at the common power quality measures, where some of these issues come from, and their effects on loads. We'll also take a live look at the wave shapes created by some common load types using an SEL power quality meter.

SEL is a leading manufacturer and supplier of power system protection, control, monitoring, communication products, and so much more. Making electric power safer, more reliable, and more economical has been SEL's mission since its founding over 40 years ago.

Codale

Industrial Cybersecurity: CIP Security Demonstration

As industrial automation systems become increasingly connected, cybersecurity is becoming a critical concern for organizations that rely on these systems to operate their businesses. In this presentation, we will explore the Purdue model, a widely-used framework for organizing industrial control systems (ICS) into logical levels that can be secured individually. We will also demonstrate Common Industrial Protocol (CIP) Security, a standard for securing industrial control systems and industrial Ethernet networks. Finally, a review the cybersecurity solutions recommended by Rockwell Automation, a leading provider of industrial automation technology.