Steven C Hespeler, Ph.D.

Postdoctoral Research Associate
Computer Science and Mathematics
Oak Ridge National Laboratory
1 Bethel Valley Road,
Oak Ridge, TN 37830

+1 (860) 961-6306
hespelersc@ornl.gov
schesp.research@gmail.com
github.com/Tov-Nephesh/
website: tov-nephesh.github.io/
linkedin.com/in/stevenhespeler

SUMMARY

Ambitious data science professional at Oak Ridge National Laboratory and key member of the consortium "Enabling In- and Ex-situ Quality Control of Additive Manufacturing" (QCAM). Experienced mathematical programmer with a specialty in Machine Learning (ML) and a passion for learning new skills.

EDUCATION

Ph.D., Industrial Engineering, (Minor: Applied Statistics) New Mexico State University , Dec 2020

M.S., Industrial Engineering, New Mexico State University, May 2012

B.S., Engineering (Minor: Mathematics), Roger Williams University, May 2008

PUBLICATIONS

Papers Accepted:

E. Dehghan-Niri, **S. C. Hespeler**, M. Juhasz, H. S. Halliday, and M. Lang, "Anomaly Detection for In-situ Quality Control of Directed Energy Deposition (DED) Additive Manufacturing", Accepted pending publication, 2022 Annual International Solid Freeform Fabrication Symposium, July 25-27, 2022, Austin, Texas

Hespeler, S. and Niri, ED. (2022). Deep Learning for In-situ Layer Quality Monitoring during Laser-based Directed Energy Deposition (LB-DED) Additive Manufacturing Process. Applied Sciences, 12(18), 8974.

Fuqua, D., & **Hespeler, S**. (2022). Commodity demand forecasting using modulated rank reduction for humanitarian logistics planning. Expert Systems with Applications, 117753.

Hespeler, S., Nemati, H., & Dehghan-Niri, E. (2021). Non-destructive thermal imaging for object detection via advanced deep learning for robotic inspection and harvesting of chili peppers. Artificial Intelligence in Agriculture, 5, 102-117.

Hespeler, S., & Fuqua, D. (2021). Online State of Charge Prediction in Next Generation Vehicle Batteries Using Deep Recurrent Neural Networks and Continuous Model Size Control. Journal of Energy and Power Technology, 3(1), 1-1.

Hespeler, S., & Fuqua, D. (2020). Online RNN Model for SOC Prediction in Next Generation Hybrid Car Batteries. In IIE Annual Conference. Proceedings (pp. 97-102). Institute of Industrial and Systems Engineers (IISE).

Papers Submitted or In Preparation:

Verma, M.E., Iannacone, M.D., Bridges, R.A., Hollifield, S.C., Moriano, P., **Hespeler, S.C.**, Kay, B., and Combs, F.L. (2023). Addressing the Lack of Comparability & Testing in CAN Intrusion Detection Research: A Comprehensive Guide to CAN IDS Data & Introduction of the ROAD Dataset. Submitted to PLOS One.

Hespeler, S., Nemati, H., Masurkar, N., Alvidrez, F., Marvi, H., & Dehghan-Niri, E. (2023). "Deep Learning Based Time-Series Classification for Robotic Inspection of Pipe Condition using Non-Contact Ultrasonic Testing", Journal of Nondesturctive Evaluation, Diagnostics and Prognostics of Engineering Systems. Accepted pending minor revisions.

Sina Zamen, **Hespeler, S**., Dehghan-Niri, E., and David Jauregui "Gradient boosting for bridge rating classification using combined national bridge inventory and Oversized/Overweight vehicles traffic datasets", Currently in Development.

TEACHING AND RESEARCH EXPERIENCE

Research Interests:
- Algorithms: Machine Learning, Deep Learning, Recurrent Neural Networks, Convolutional Neural Networks, Long-short Term Memory
- Data: Sensing data, Time-Series/sequential, Big Data
- Non-Destructive Evaluation, Signal Processing, Energy Storage, Nonlinear Programming, Operations Research, Automation in Manufacturing

Postdoctoral Research Associate: May 2023-present
    Oak Ridge National Laboratory
    Computer Science and Mathematics
    Systems and Decision Science Group

- Data Scientist and machine learning expert in the Mathematics in Computation Section and Systems and Decision Sciences Group

- Research Focus: Currently conducting pioneering research in the Scalable Architecture-Aware Algorithms domain, specializing in the development of adaptive algorithms for anomaly detection tasks (i.e. intrusion detection of controller area networks), with a primary emphasis on cybersecurity applications in complex cyberphysical systems

- Project Goals: Tasked with advancing the state of the art in adaptive anomaly detection algorithms, requiring the design and implementation of innovative data-driven pipelines for real-time analysis of streaming data from cyberphysical systems. This research is aimed at enabling deployment in cloud computing platforms like CADES

- Professional Development: Actively engaged in postdoctoral professional development, fostering collaborations with scientists from various disciplines within the laboratory, and participating in activities facilitated by the Oak Ridge Postdoctoral Association (ORPA)

- Initial Research Phase: Currently in the initial phase of the appointment, which involves an extensive literature review to gain a comprehensive understanding of adaptive unsupervised anomaly detection and cognitive cyber, particularly in the context of cyberphysical systems

- Collaborative Engagement: Actively participating in seminars and presentations, both internally at ORNL and externally at conferences, to disseminate research findings and engage with the scientific community

- Software Development: Engaged in the development of software solutions as a result of pioneering research, contributing to the expansion of methods and tools in the field

Postdoctoral Scholar: Winter 2021- May 2023
    College of Engineering
    New Mexico State University
    Intelligent Structures and Nondestructive Evaluation (ISNDE) Laboratory

- Key member of a consortium supported by DOE National Nuclear Security Administration (NNSA). QCAM is a first-of-a-kind 3-year consortium that was awarded $3M under the MSI Partnership Program

- QCAM integrates several minority serving universities- New Mexico State University, Navajo Technical University, and Prairie View A&M University- with three DOE-NNSA laboratories- Los Alamos National Laboratory (LANL), Oak Ridge National Laboratory (ONRL), and Kansas City National Security Campus (KCNSC)

- Utilize big sensory input data (ultrasound, thermal, acoustic emission, and metal Additive Manufacturing (AM) parameters/features) for creating advanced data-driven DL prediction/classification models

- Developed a method for inter-layer in-situ quality control during the AM process with acoustic and AM parameter data

- Currently developing a technique to utilize acoustic emission data for real-time quality control of AM parts

Graduate Assistant: Fall 2020- Winter 2020
     College of Engineering
     New Mexico State University

- Conducted independent and group research focused in advanced Deep Learning applied to civil engineering applications

Instructor:

IE 217L - Manufacturing Processes Lab	Spring 2018
IE 375/575 - Manufacturing Processes II/ Advanced	Fall 2017
IE 590-M70 - Selected Topics	Summer 2017

Lab Monitor   Aug 2017 to May 2018
     Department of Industrial Engineering 3D Printing Lab

- Conduct experiments that abide by the NMSU lab safety rules, ensure all employees are up to date on safety training and monitor the safety of peers

- Complete requested printing jobs, maintain equipment, grow and monitor the 3D printing club

- As the master key keeper, monitor digit key codes for all students and faculty associated with labs

- Most recently led a group of graduate engineering students with a project consisting of 3D printing and control of a prosthetic hand

Teaching Assistant:

IE 567 - Discrete Event Simulation	Spring 2013
IE 478 - Facilities Planning	Spring 2012
IE 152 - Introduction to Industrial Engineering	Fall 2011

Graduate Assistant   Jan 2013 to Aug 2013
     Physical Science Laboratory
     New Mexico State University

- Prepare literature review and technical report based on military and commercial drone technology

- Assist team with drone testing and governmental certification for private drone companies

Research Assistant   Jan 2011 to Aug 2011
    Department of Industrial Engineering
    New Mexico State University

- Worked on a semester long project creating a DOE, manufacturing an innovative combination of wood fiber composite samples, tensile testing of samples, and ANOVA

Research and Student Awards:

USDA Wheels of Change Engineering Research Award, Las Cruces, NM	Fall 2017
Aggie I-Corps Feasibility of Business Idea Award, Arrowhead Center, Las Cruces, NM	Apr 2016
New Mexico State University Honors Graduate	May 2012
Alpha Pi Mu, Industrial Engineering Honor Society Award	Jan 2011
E.I.T. Certification	Jan 2009
IEE/WERC Environmental Design Contest 1st Place Award	Apr 2008

SOFTWARE EXPERIENCE

Programming/Statistical:
    Python:

- Environments- Spyder, Jupyter, Conda
- Packages and Libraries- TensorFlow, NumPy, Pandas, SciKit Learn, Keras, matplotlib, Seaborn, Django, IPython

    Matlab, R, Minitab

Typesetting and Other:
    LaTeX, Microsoft office, Markdown, Cura (and a variety of slicing and CNC software), Unigraphics NX, SoildWorks, AutoCad

PRESENTATIONS

Niri, E.D., **Hespeler, S.C.**, Juhasz M., Halliday, H.S., and Lang, M.
"*Simplified Unsupervised Statistical Anomaly Detection for In-situ quality Control of Directed Energy Deposition (DED) Additive Manufacturing*"   Aug 2022
SFF Conference, Austin, TX

Hespeler, S.C., Juhasz M., Niri, E.D., and Riemann J. "*Deep Learning*   Mar 2022
for Real-time Non-destructive Inter-layer Quality Control during Additive Manufacturing Process " TMS Conference, Anaheim, CA

Hespeler, S.C. "*Deep Learning for Inter-layer Classification*   Feb 2022
During In-situ Quality of Additive Manufacturing " IMAC-XL
Conference, Orlando, FL

Hespeler, S.C. "*Implementation of Machine Learning Techniques*   Dec 2016
to Predict the Prominent Factors Effecting the Life Cycle of a Flow Battery " 1st Colloquium of Engineering and Technology,
Universidad Autonoma de Ciudad Juarez, Ciudad Juarez, MX

Hespeler, S.C. "*An Intelligent Predictive Algorithm Utilized to Assess Influential Factors Effecting the Recharge Process of a Zinc Polyiodide Flow Battery* " 1st International Workshop on Quality and Productivity, Universidad Autonoma de Baja California, Ensendada, Baja California, MX

Oct 2016

Hespeler, S.C., J. Soltero, and D.J. Valles-Rosales "*New Eco-friendly Wood Plastic Composite Material Based on Chile Fibers Plastic* "83rd National Technical Association Conference, Washington, D.C.

Sep 2011

Poster Presentations:

Hespeler, S.C. "*Novel RNN Model for SOC Prediction in Next Generation Batteries and Continuous Model Size Control* " Poster Presentation, IISE, New Orleans, LA

Nov 2020

D. Alodan, H. **Hespeler, S.C.** "*A Study of An Innovative Sustainable Blend of Materials between Red Chile Pepper Stems and Polymers* " ISERC Conference, Orlando, FL

May 2012

D. Alodan, H. **Hespeler, S.C.**, J. Soltero, B. Garcia, D.J. Valles-Rosales "*Sustainable Commodity Wood Plastic Composite Materials from Chile Fibers and Plastic* " 2nd Annual Southwest Energy Science and Engineering Symposium, El Paso, TX

Mar 2012

Hespeler, S.C. "*Biodegradation Analysis of a New Blend of Poly (lactic acid) and a Zinc Coordination Biopolymer subjected to Environmental Stresses* " GRAS Conference, New Mexico State University, Las Cruces, NM

Mar 2011