Pengdi Zhang Ph.D. (08/01 exp.)

412-692-1687 | Pengdizhang0123@gmail.com | LinkedIn | Personal website

EXECUTIVE SUMMARY

Internationally recognized researcher and R&D 100 Award recipient (2024) for pioneering works in ultrasonic photonics and distributed fiber-optic sensing. Completing Ph.D. at University of Pittsburgh with 2 patents, 10 conference papers, and 4 presentations including an invited talk. Developed innovative guided wave-based NDT systems with fiber sensors for structural health monitoring. Implemented tensor-based signal processing algorithms enhancing sensing system sensitivity. Seeking challenging multidisciplinary projects to advance next generation sensing and monitoring technologies. Available September 2025.

PROFESSIONAL SKILL

Optic Fiber Sensor System: Fiber Bragg Grating (FBG)， Single-Mode-Multimode-Single-Mode (SMS)，Distributed Acoustic Sensing (DAS).

FEA Skills: CAE, CFD, FEA, COMSOL, ANSYS, and Firedrake, Nektar

Programming Skills: MATLAB, Python, Embedded C++, SQL, ANSYS APDL, Fortran and HPC Operation

Numerical Method: Reduced order and multi-fidelity modeling, Gaussian Process Regression (GPR), Bayesian Optimization (BO)

Machine Learning: Deep Learning Architectures (AE, CAE, FFNN), Transfer Learning, Anomaly Detection, Time series Analysis

EDUCATION

University of Pittsburgh, *Ph.D. in Mechanical Engineering & Materials Science* - Pittsburgh, PA 08/2025 (exp)

- Advisor*: Prof. Paul R. Ohodnicki (The Ohodnicki Lab)*

University of Pittsburgh, *M.Sc. in Mechanical Engineering & Materials Science* - Pittsburgh, PA 04/2021

- Certificate: *Stanford Certificate on Machine Learning*

University of Shanghai for Science & Technology, *B.Sc. in Energy & Power Engineering* - Shanghai, China 07/2018

WORK & RESEARCH EXPERIENCE

Leidos Research Support Team, National Energy Technology Laboratory - Pittsburgh, PA

Assigned Researcher: Fusion of Fiber Optics Sensing, Acoustic NDE, and Physics-Based AI for Structure Monitoring 06/2022 - Present

- **Field Validation:** Partnered with fiber optic sensor team to field test, validate and optimize the fiber sensor's sensitivity to pipe distributed strain, including Fiber Bragg Grating (FBG), Single-Mode-Multimode-Single-Mode (SMS), Distributed Acoustic Sensing (DAS).
- **Fluid-structure Interaction:** Incorporated fluid-structure interaction (FSI) analysis to evaluate pipeline responses under operational and stress-induced conditions, enhancing prediction reliability.
- **Deep Learning Model:** Developed a convolutional neural network (CNNs) and integrated AI-driven analytics into a predictive maintenance framework to detect early signs of wear, corrosion, and leaks.
- **VR Platform:** Developed a cloud-based VR platform with Docker for real-time collaboration & scalability. (Mentored 2 interns to enhance immersive visualization of failures and defect propagation using Unity.)
- **High Efficiency:** Reduced simulation time by 80% by using reduced-order modeling (ROM).
- **Int'l Recognition:** R&D 100 Award in 2024, invited talk at the SPIE DCS 2024 conference, and filed 2 patents.

Ultrasonic Wave Propagation Simulation Tool Development 06/2022 - Present

- **FEA:** Established guided wave propagation (GWP) model using high-order spectral/hp discretization method.
- **Programming Tools:** Embedded C++, CAD, Unity Engine, Python, AWS IoT.
- **Achievement:** Reduced runtime by 83% and increased processing capability compared to commercial FEA software.

Reduced Order Modeling for Guided Wave Propagation 04/2022 - Present

- **Decomposition:** Applied Tucker tensor decomposition to guided wave propagation data, creating compact representations of wave-defect interactions in pipeline structures.
- **Model:** Integrated tensor-based feature extraction with deep neural networks using strategic regularization techniques to predict defect parameters from compressed representations.

Pengdi Zhang Ph.D. (08/01 exp.)
412-692-1687 | Pengdizhang0123@gmail.com | LinkedIn | Personal website

- **Achievement**: Achieved 1000× computational acceleration compared to FEM while maintaining exceptional prediction accuracy (R^2>0.989) for defect parameters.

Domain adapted AI for Structural Health Monitoring based on Guided Wave Propagation 01/2021 - Present

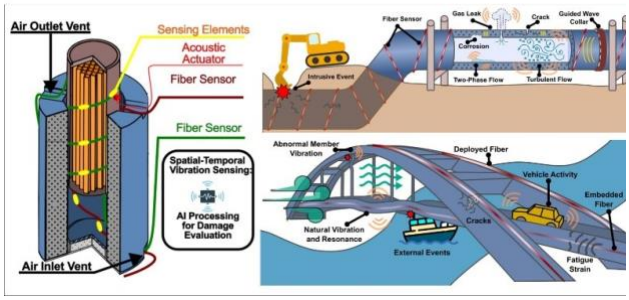
- **Specialization:** led acoustic signal processing to improve SHM and NDT for pipeline corrosion management.
- **Collaboration:** collaborated with scientists from National Energy Technology Laboratory (NETL) on GWP modeling and DAS sensor simulations, focusing on acoustic signal processing for high-quality training data.
- **Machine-Learning:** utilized machine learning, including Maximum Mean Discrepancy-Domain Adaptation Neural Networks (MMD-DANN), to align simulation and experimental data, improving acoustic signal analysis and corrosion detection accuracy.
- **ANSYS Modeling:** developed ANSYS Twin Builder for SHM using Distributed Fiber Optics, Acoustic NDE, and Physics-Based AI for real-time monitoring and predictive maintenance.

Multi-Fidelity Modeling for Transient Heat Transfer Using ROM 08/2019 - 04/2021

- **Reduced-order Modeling:** developed a transient ROM heat transfer model with SVD and Gaussian process regression.
- **Improve Compute Efficiency:** utilized Nektar (spectral/hp discretization) to obtain high-fidelity data, improve compute performance and provide effective solutions for designing and optimizing transient forced convection systems.
- **Achievement:** achieved enhanced efficiency of the design and optimization of heat transfer models.

APPENDIX

Feature 1: R&D 100 Award of 2024:



Feature 2: Filed Patent WO2024206395 and Patent WO2024206298:

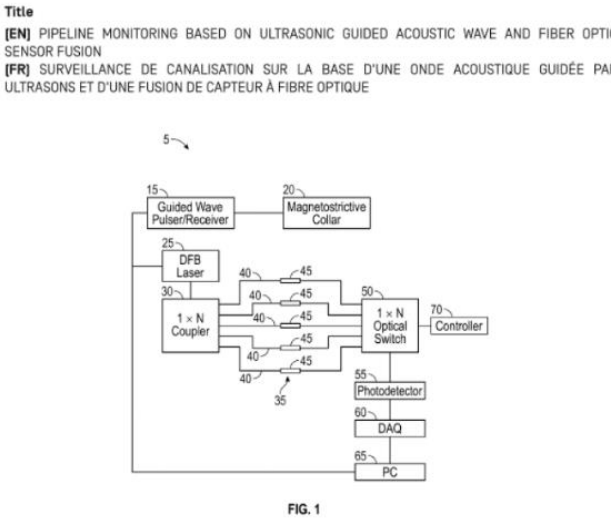


FIG. 1

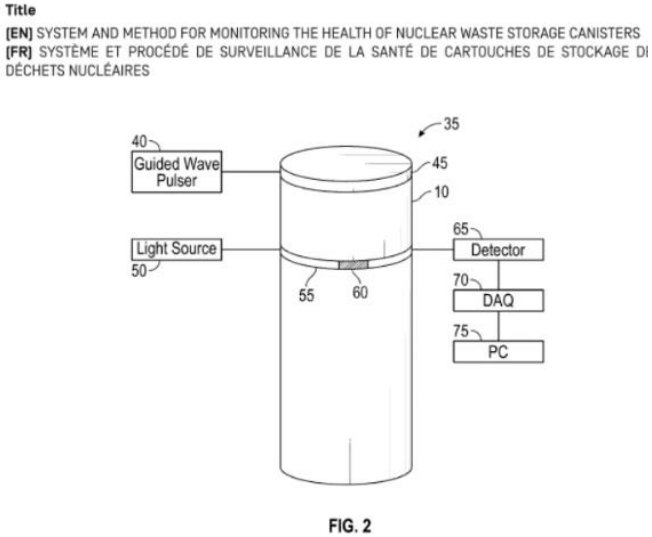


FIG. 2