Qi Pang

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Education

Xi'an Jiaotong University, China | *Sep. 2023 – Jul. 2026 (Expected)*

- *Master in Information and Communication Engineering*
- **Current GPA:** 90.05/100 **| Supervisor:** Jinghuai Gao
- Relevant Courses: Modern Inverse Problem Theory and Its Application, Linear Space and Matrix Analysis

Shenyang Aerospace University, China | *Sep. 2019 – Jul. 2023*

- *Bachelor of Information and Communication Engineering*
- **GPA:** 87.05/100
- Relevant Courses: Signals and Systems, Digital Signal Processing

Research Interests

Inverse Problems, Physics-informed Machine Learning, Generative Models, Geological modeling

Publication

[1] **Pang Q**, Chen H, Gao J, et al. Iterative Gradient Corrected Semi-Supervised Seismic Impedance Inversion via Swin Transformer. IEEE Transactions on Geoscience and Remote Sensing, 2025.

[2] **Pang Q**, Gao J, Chen H. A Semi-supervised Seismic Impedance Inversion Method Based on U-shaped Transformer. In Annual Meeting of China Geoscience Union, Xiamen, China, 2024.

Research Experience (listed in reverse chronological order)

Petrophysical Inversion with Multi-source Information-guided Diffusion Model

Jan. 2025 – Present

Objective: Developing a unified framework for seismic inversion incorporating diffusion models and multi-source information.

Key Contributions:

- Compared explicit rock physics relations and neural-network-based implicit forward models to understand their representational differences in seismic inversion.
- Currently exploring integration of implicit forward modeling and multiple priors into diffusion-based inversion frameworks, enabling simultaneous updating of forward relations during inference.

Generating 3D Structural Geological Models

Jan.2025 – Present

Objective: High-quality training data are critical for machine learning in seismic applications, yet open-source datasets remain scarce and inconsistent—highlighting the need for meaningful, well-curated datasets.

Key Contributions:

- Constructed initial geological models using geostatistical methods to ensure consistency with the structural characteristics of the target subsurface region.
- Introduced multi-scalar fields to simulate stratigraphic deformation and fault displacement, enabling user-defined control over structural complexity
- Currently developing a generative model for multimodal source-conditioned sample generation

Iterative Gradient Corrected SemiSupervised Seismic Impedance Inversion via Swin Transformer

May. 2024 – Jan. 2025

Objective: Developed a learned iterative framework incorporating Transformers and structural consistency constraints to reduce inversion nonuniqueness and improve precision in seismic impedance inversion.

Key Contributions:

- Developed an iterative gradient-updating seismic inversion framework based on the Swin Transformer, which performs optimization directly in the model space instead of the observation space. This approach employs a more flexible training strategy and simultaneously improves global feature modeling.
- Integrated anisotropic structural regularization informed by seismic dip into the loss function, thereby improving inversion accuracy and ensuring geological consistency.
- **Publication:** Results published in IEEE Transactions on Geoscience and Remote Sensing

Deep Learning-Based Time-Shift Estimation for Seismic-Well Tie

Jan. 2024 – May. 2024

Objective: Simulated time-shifted seismic data and trained a neural network to correct misalignment, improving label quality for seismic inversion.

Key Contributions:

- Applied a piecewise block time shift to the time-depth relationship to align with physical conditions, generating training datasets with time-shifted seismic data and corresponding time-depth relationships.
- Utilized soft-DTW as loss function and integrated Kolmogorov-Arnold Networks (KAN) as mapping layer to construct a time-shift estimation network, achieving improved prediction accuracy.

Model-driven Seismic Inversion with Structural Constraints

Oct. 2023 – Jan. 2024

Objective: Investigated seismic inversion workflows combining model-driven approaches with regularization-based constraints.

Key Contributions:

- Estimated dip angles using structural tensors and validated results against estimates from plane-wave destruction estimates.
- Developed a structural constraint operator based on seismic dip and incorporated into regularization terms enhancing inversion continuity and resolution.
- Implemented FISTA and conjugate gradient algorithms for regularized least-squares inversion.

Awards and Awards

Second Prize in the 2021 National College Student Electronic Design Competition 2021

Second Prize in the 13th National College Student Mathematics Competition 2021

First Prize in the 12th National College Student Mathematics Competition 2020

Technical Skills

Programming Languages: Python, MATLAB, C

Machine Learning Frameworks: PyTorch