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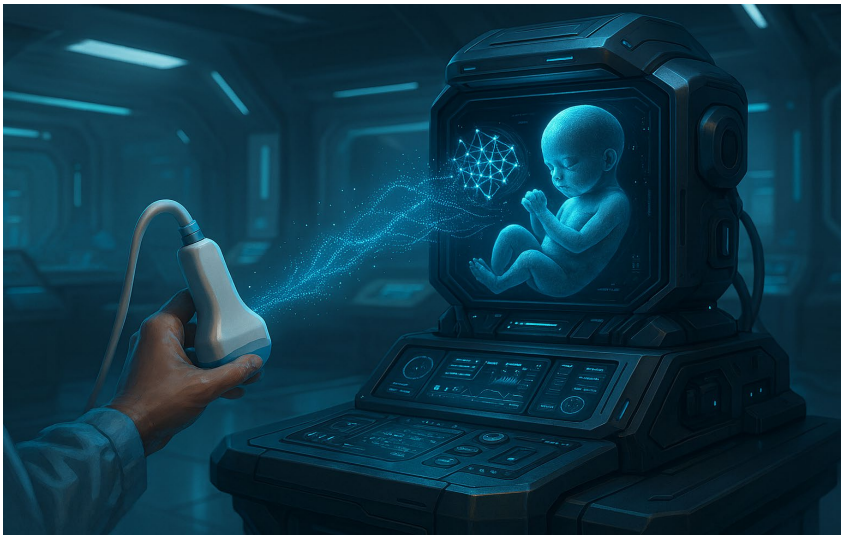
Licensing Opportunity

TTO – Technology Transfer Office

AI-Enhanced Ultrasound Imaging for Real-Time Diagnostics



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Keywords

Ultrasound imaging, beamforming, neural networks, sparse data reconstruction, real-time medical imaging, wireless probes, deep learning, portable diagnostics

Intellectual Property

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Description

Traditional ultrasound imaging relies on beamforming techniques such as Delay-and-Sum (DAS) to reconstruct images from raw sensor data. However, these systems face significant limitations, such as bandwidth constraints in wireless probes, degraded image quality, hardware and communication limitations.

This technology introduces a computer-implemented method that combines neural network-based signal enhancement with beamforming to overcome the limitations of conventional ultrasound imaging.

Sensor arrays transmit a subset of raw ultrasound data (due to bandwidth or hardware constraints), and a pre-trained neural network enhances this sparse data in the signal domain, reconstructing it to approximate full-array data.

The enhanced data undergoes beamforming to generate high-quality ultrasound images or other acoustic data structures (e.g., Doppler or speed-of-sound maps). Training combines signal-domain and image-domain loss functions, ensuring accurate reconstruction even under severe data sparsity.

This solution enables real-time, high-resolution imaging using wireless, portable ultrasound probes, without requiring expensive hardware upgrades.

Advantages

- Real-time imaging with wireless probes.
- High-quality images from sparse or down-sampled data.
- Cost-effective: reduces need for high-density sensor arrays.
- Portable and ultra-portable for point-of-care and remote diagnostics.
- Supports multiple imaging modes: ultrasound, Doppler, speed-of-sound.
- Deep learning enhancement ensures robustness across probe types.

Applications

- Medical diagnostics: bedside and remote imaging.
- Telemedicine: wireless ultrasound for remote monitoring.
- Veterinary medicine: portable imaging for animals.
- Industrial non-destructive testing: structural integrity checks.
- Wearable/mobile ultrasound devices for continuous monitoring.