Docket #: S22-198

Advanced Software for Enhanced Multi-Dimensional Image Processing in AI

This software is a transformative technology in the fields of AI and digital image processing, offering a breakthrough approach to convolution, particularly for large-scale images. Developed by researchers at Stanford, the convolution scheme showcased the capability to handle higher-dimensional convolution cases, accommodating input and output data with multiple channels found in videos and LIDAR scans. This compact and configurable solution provides an efficient means of performing multi-dimensional convolution. The limitations faced by traditional digital electronic hardware in processing multi-dimensional convolution, such as energy consumption and data movement bottleneck, are overcome by leveraging optical neural networks (ONNs) through this software. Unlike previous ONNs struggling with scalability and compactness, this approach overcomes these challenges, ensuring compatibility with compact implementations and energy-limited edge devices.

The effectiveness of the software has been successfully demonstrated in 2D convolution, extracting spatial features from individual two-dimensional images, effectively enhancing digital image processing. Furthermore, the application scope extends to broader settings involving higher-dimensional input datasets. For instance, the identification of 3D objects in LIDAR scans and the recognition and prediction of motion in videos require higher-dimensional convolution. This transformative technology offers a competitive advantage in the evolving landscape of AI and digital image processing. The software's efficient convolution approach empowers improved performance, scalability, and energy efficiency, enabling companies to advance the boundaries of machine learning hardware. The commercial viability of this technology presents opportunities for innovation and progress across diverse industries.

Applications

- Digital Image Processing
- Video Analysis and Processing
- LIDAR Data Processing
- Machine Learning Hardware Optimization
- Edge Computing and IoT Applications
- Medical Imaging
- Autonomous Vehicles

Advantages

- Enhanced Efficiency: faster processing of multi-dimensional image data compared to traditional electronic circuits.
- Improved Performance: higher accuracy in feature extraction
- Scalability: The software's approach to convolution is scalable, allowing it to handle large-scale images and higher-dimensional convolution cases
- Energy Savings: reduced power consumption and minimized the energy requirements for multi-dimensional convolution operations, making it a more sustainable solution.

Patents

- Published Application: WO2023239735
- Published Application: 20260044030

Innovators

- Shanhui Fan
- Lingling Fan
- Zhexin Zhao
- Kai Wang

Licensing Contact

Jon Gortat

Licensing & Strategic Alliances Director for Physical Science

Email