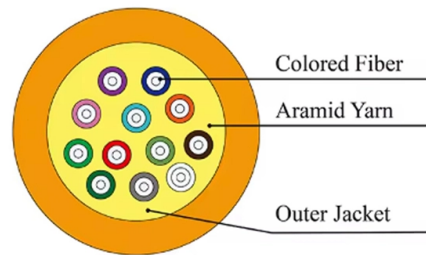


Super-resolution photoelectric fusion imaging



AI Overview

Super-resolution photoelectric fusion imaging combines multiple imaging modalities to produce high-resolution, all-in-focus images, often using deep learning and advanced fusion algorithms. Overview Super-resolution photoelectric fusion imaging integrates multi-modal or multi-focus images to generate a single high-resolution image that contains more information than any individual source. This approach addresses limitations of imaging sensors, such as low resolution, narrow spectral range, or focus constraints, by combining data from optical, infrared, or other photoelectric sensors. The goal is to achieve all-in-focus, high-resolution 2D or 3D representations for applications in remote sensing, medical imaging, and microscopy.

Key Techniques

- Multi-Focus Image Super-Resolution Fusion (MFISRF)** MFISRF unifies multi-focus image fusion (MFIF) and super-resolution (SR) into a single framework. Methods like Deep Fusion Prior (DFP) leverage deep image priors to perform unsupervised, dataset-free fusion and super-resolution simultaneously, producing sharper, all-in-focus images.
- Multimodal Image Fusion with Deep Learning** Frameworks such as FS-Diff use semantic guidance and clarity-aware strategies to fuse visible and infrared images while enhancing resolution. These methods employ convolutional neural networks (CNNs) to extract features and integrate them into a high-resolution fused image.
- Wavelet and Transform-Based Fusion** Traditional approaches decompose source images into wavelet or contourlet coefficients, enhance resolution using CNNs, and then reconstruct the fused image. This method preserves multi-resolution characteristics and improves the quality of the final image.
- Particle-Level Super-Resolution Fusion** In microscopy, DeepSRFusion enables 3D super-resolution reconstruction by fusing multiple single-molecule localization imag...

Article Content

Super-Resolution Time-Resolved Imaging using Computational Sensor Fusion

Imaging across both the full transverse spatial and temporal dimensions of a scene with high precision in all three coordinates is key to applications ranging from LIDAR to fluorescence

Multimodal super-resolution: discovering hidden physics and its ...

Here, authors develop a multimodal AI method to generate super-resolution of a sensor using other available sensors in the system, revealing hidden dynamics in fusion plasmas and

A Fusion-Guided Inception Network for Hyperspectral Image Super-Resolution

However, this fusion process relies on the availability of precise alignment between image pairs, which is often challenging in real-world scenarios. To mitigate this limitation, we propose a single-image super

Full article: DBFF-SRNet: an image super-resolution method based on ...

This fusion provides a novel approach for image super-resolution, combining the strengths of traditional spatial domain methods and frequency domain techniques, thereby demonstrating

Recent advances in super-resolution optical imaging based on ...

Apart from technical requirements in optical systems and algorithms, super-resolution imaging relies on fluorescent dyes with special photophysical or photochemical properties. The

Spectral Correlation-Based Fusion Network for Hyperspectral Image

To address the limitations of hyperspectral imaging systems, super-resolution (SR) techniques that fuse low-resolution hyperspectral image (HSI) with high-resolution multispectral

4D-MISR: a unified model for low-dose super-resolution

Drawing inspiration from multi-image super-resolution (MISR), which is a cornerstone technique in remote sensing and satellite imaging that

Multi-modal medical image super-resolution fusion based on detail ...

To overcome these problems, a multi-modal medical image super-resolution (SR) fusion (MMISRF) method is proposed based on detail enhancement and weighted local energy deviation

4D-MISR: a unified model for low-dose super-resolution

Compared to conventional ptychography, our method not only achieves resolution enhancement but also delivers a 3× improvement in contrast

Remote sensing image Super-resolution reconstruction by fusing multi ...

In the field of remote sensing, super-resolution (SR) is a severely ill-posed problem, and image quality is influenced by numerous factors such as atmospheric disturbance, ultra-long-range...

Remote Sensing Imagery Super Resolution Based on Adaptive Multi

Due to increasingly complex factors of image degradation, inferring high-frequency details of remote sensing imagery is more difficult compared to ordinary digital photos. This paper

Image fusion under Multiframe Super-resolution framework

In this work, we have demonstrated that the multiframe super-resolution framework can be used in medical image fusion applications. The proposed method aggregates information from input

Quantum super-resolution imaging: a review and perspective

Quantum super-resolution imaging provides a nonlabeling method to surpass the diffraction limit of imaging systems. This technique relies on measurement of the second-order

Teledyne FLIR Launches Prism Ground ISR Platform

Key Points 1 Teledyne FLIR OEM launched Prism Ground ISR, fusing visible and thermal imaging with AI to classify and track up to 15 ground-target classes. 2 Computational imaging

Semantic-Driven Global-Local Fusion Transformer for Image Super

Image Super-Resolution (SR) has seen remarkable progress with the emergence of transformer-based architectures. However, due to the high computational cost, many existing

CN103308496B

The invention discloses a photoelectric fusion microscopic imaging system combining a high-resolution fluorescence microscope and a scanning electron microscope, including a

AI-empowered super-resolution microscopy: a revolution in ...

This Review provides a comprehensive discussion of how methods in machine learning and computer vision have been used to improve super-resolution microscopy to gain insights into

Exploring the frontiers of image super-resolution: a review ...

Super-resolution (SR) aims to reconstruct high-resolution images from low-resolution inputs, with deep learning advancements driving substantial improvements in SR performance.

Dynamic live-cell super-resolution imaging with parallelized ...

The super-resolution images are obtained by aligning and subtracting two images, that are acquired simultaneously using parallelized scanning solid- and donut-shaped excitation beams with a

Multi-Resolution Data Fusion for Super-Resolution Electron Microscopy

We introduce a novel multi-resolution data fusion (MDF) method for super-resolution computational EM. Our method combines innovative data acquisition with novel algorithmic techniques to dramatically

Hybrid photoacoustic and fast super-resolution ultrasound imaging

Dual photoacoustic and fast super-resolution ultrasound imaging technique bridges the physiological and structural details in vivo. The authors demonstrated that this interleaved technology

Multi-Resolution Data Fusion for Super Resolution Imaging

Applications in materials and biological imaging are limited by the ability to collect high-resolution data over large areas in practical amounts of time. One solution to this problem is to

Improved Image Fusion in PET/CT Using Hybrid Image

Purpose. To provide PET/CT image fusion with an improved PET resolution and better contrast ratios than standard reconstructions. Method. Using a super-resolution algorithm, several PET acquisitions

DNA-PAINT Super-Resolution Imaging for Nucleic Acid Nanostructures

Far-field super-resolution fluorescence microscopy has allowed observation of biomolecular and synthetic nanoscale systems with features on the nanometre scale, with chemical

Super-resolution reconstruction of terahertz images via a deep

This study proposed a SR reconstruction method, DL-MFIF, for THz-TDS point-scan imaging, aiming to address key challenges in existing THz imaging systems, including insufficient

ESR-LEFuse: Hybrid Infrared and Visible Image Fusion and Super ...

This paper proposes ESR-LEFuse, an end-to-end framework that couples a dual-branch fusion module with an ESR-U-Net upsampling head to realize fourfold super-resolution while preserving thermal

Image Fusion for Super-Resolution Mass Spectrometry Imaging of

A loss controlled residual network (LCRN) workflow is developed for super-resolution fusion of plant mass spectrometry imaging data. LCRN uses a novel edge perceptual loss metric to

Super-resolution reconstruction of terahertz images via a deep

Although existing super-resolution (SR) reconstruction methods can partially improve imaging efficiency, a certain gap still remains between the reconstruction performance and practical

Infrared Thermal Imaging Super-Resolution via Multiscale Spatio ...

Infrared thermal imaging is widely used in military and civil fields like security and protecting monitoring, military reconnaissance, road traffic monitoring. However, most current infrared sensors have limited

A self-supervised remote sensing image fusion framework with dual

In this study, we proposed a self-supervised pan-sharpening method with the aid of spectral super-resolution named sSRPNet. Coarsening-scale self-learning exploits the internal

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