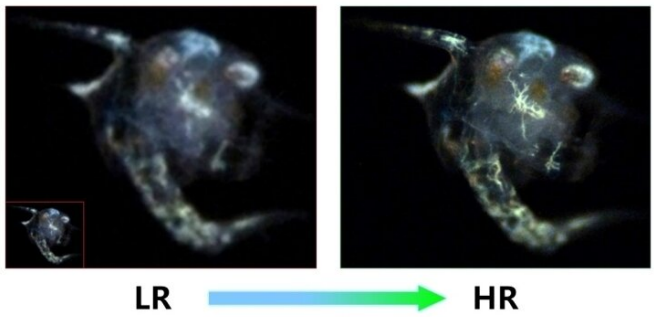
Researchers develop AI-based technology for clearer plankton observation in deep ocean

28 October 2021



Aligned real low-resolution (LR) and high-resolution (HR) underwater plankton image pair after image registration. Credit: Li Jianping's team

Due to the limitation of the wave properties of light, underwater microscopes and cameras compromise between their imaging resolution and field of view for in situ observations.

In order to enlarge their sampling volume, they usually adopt lower imaging magnifications. However, this sacrifices their imaging resolution and brings challenges for subsequent plankton species identification.

To alleviate this magnification-resolution dilemma, Dr. Li Jianping's group from the Shenzhen Institute of Advanced Technology (SIAT) of the Chinese Academy of Sciences has developed a novel image super-resolution method for digitally restoring resolutions of in situ plankton images from low to high.

Their study entitled "Super-Resolution for In Situ Plankton Images" was published at the International Conference on Computer Vision 2021.

The researchers trained a deep learning model called Enhanced Deep Residual Network (EDSR) with a large-scale, real-world dataset called IsPlanktonSR. During the training, they tried different loss functions and compared the model performance by using traditional downsampled and IsPlanktonSR data sets.

Through extensive experiments, the team has demonstrated that the model trained on real data through the contextual loss has delivered the best visual and quantitative SR performance.

"The model has been proved to generalize well to images of various plankton species or captured by different instruments," said Dr. Li.

In the future, the developed technology is anticipated to enhance existing plankton images and strengthen next-generation plankton imagers for better observation capabilities, and hence, deeper our understanding of the mysteries deep ocean.

More information: Wenqi Ma et al, Super-Resolution for In Situ Plankton Images, Proceedings of the IEEE/CVF International Conference on Computer Vision (ICCV) Workshops (2021).

Provided by Chinese Academy of Sciences