Origin-Direct determination of aberration functions in microscopy by an artificial neural network

该文章利用人工神经网络，可以从获得的两张离焦PSF图像中直接分辨出Zernike多项式，经过多轮训练可以显著提高Strehl ratio，同时该网络也具有一定的鲁棒性。

This article uses an artificial neural network to directly distinguish the Zernike polynomial from the obtained two defocus PSF images. After multiple epochs of training, the Strehl ratio can be significantly improved. Besides, the network is robust.

18-Use of a neural network to control an adaptive optics system for an astronomical telescope

利用一对对焦和离焦的天文望远镜图片进行神经网络训练，可测定有天文涡流造成的低倍相差

With the neural network training of pairs of in- and out-of-focus images from atmospheric telescope，we can measure low-order distortion created by atmospheric turbulence.

19-Artificial neural network for the determination of Hubble Space Telescope aberration from stellar images

本文使用多层感知器网络来预测Zernike系数，该网络在望远镜最佳焦点的相对两侧具有两个PSF图像。 在只有一个PSF图像的情况下，也可以使用默认的CCD相机对单个PSF图像进行训练，但不会预测出像散焦之类的轴对称像差。

This article uses a multi-layer perceptron network, which has two PSF images on opposite sides of the best focus of the telescope, to predict Zernike coefficients. Where there is only one PSF image, training on single PSF images using the default CCD camera is certainly possible but will not lean the sign of axially symmetric aberrations such as defocus.

20- Adaptive optics for array telescopes using neural-network techniques

本文优化出适用于红外波长成像的神经网络，该网络利用一对聚焦和离焦的图像，可以导出和预测阵列元件之间的光程和wavefront tilt的变化。

This article optimized a neural network appropriate for infrared wavelengths imaging with a pair of simultaneous in-focus and out-of-focus images, which can derive and predict variations in pathlength and wavefront tilt between array elements.

21-Neural networks for image-based wavefront sensing for astronomy

该文章对比了多种神经网络形式，在其中分析聚焦图像和离焦图像，发现尽管无法矫正衍射极限，但是对2-4m的小型望远镜残余相位误差的改善是很有希望的。

This article compares various neural network forms, analyzes the focused image and the defocused image, and finds that although the diffraction limit cannot be corrected, the improvement of the residual phase error of the 2-4m small telescope is promising.

22-Comparative Study of Neural Network Frameworks for the Next Generation of Adaptive Optics Systems

本文分析了基于大小不同的人工神经网络的断层摄影波前重建器的训练和对比执行了不同框架，从而避免了无用的计算并提高了计算效率。C/CUDA code深受推崇

This article analyses different frameworks for training and executing of a tomographic wave-front reconstructor based on small or huge artificial neural networks to avoid useless calculation and improve the calculating efficiency. C / CUDA code is highly respected.

23-Deep-STORM: super-resolution single-molecule microscopy by deep learning

这篇文章利用deep-storm卷积神经网络，在高密度发射器下仍然能够得到超分辨图像，省去了传统的不断调整参数的烦恼。

This article uses the deep-storm convolutional neural network to obtain super-resolution images under high-density emitters, eliminating the traditional troubles of continuously adjusting parameters.

24-Deep learning massively accelerates super-resolution localization microscopy

因为PALM及STROM类显微镜有大量图像冗余，因此由提升空间。这篇文章利用神经网络识别此类显微镜宽视场图像，可以大大减少显微镜采样时间，同时保证一定的图谱质量，并且可以预测最有可能出现重建错误的地方。而且，该神经网络仅凭广角图像可以直接进行判断，定位数据为辅助作用

As PALM and STROM microscopes have a lot of image redundancy, there is space for improvement. This article uses neural networks to identify such microscope wide-field images, which can greatly reduce the microscope sampling time, at the same time ensure a certain quality of the map, and can predict the most likely places for reconstruction errors. Moreover, the neural network can directly judge based on widefield images alone, though adding localization data improves image quality.

25-Object-independent image-based wavefront sensing approach using phase diversity images and deep learning

本文介绍的LSTM神经网络（a variant of recurrent neural network）由于将图片利用傅里叶变换后拆成多个序列，因此训练的特征图像与相位差有关，与原图片无关。这赋予了该神经网络很大的扩展性，无需大量扩展数据进行训练，而且对硬件要求低

In this article, the LSTM neural network (a variant of recurrent neural network) uses Fourier transform to split the picture into multiple sequences, so the training feature image is related to the phase aberrations, not the original picture. This feature gives the neural network a great scalability, does not require a large amount of extended data for training, and has low hardware requirements

26-Optical phase retrieval with the image of intensity in the focal plane based on the convolutional neural networks

这篇文章与Ben的很像，使用卷积神经网络技术根据测得的点色散函数补偿波前像差，着重提到了神经网络会遇到过度拟合问题，用dropout算法可以解决该问题。

This article is very similar to Ben's. It uses convolutional neural network technology to compensate wavefront aberrations based on the measured point dispersion function. It emphasizes that neural network can avoid overfitting problems and its solutions-dropout.

27-Numerical study of adaptive optics compensation based on convolutional neural networks

这篇文章也与Ben的文章很像，不过关注的天文学。它利用卷积神经网络提取了in-focal and out-of-focus图像，用于识别大气涡流导致的Zernike像差叠加。

我关注的是这句话，解释了为什么用一个在焦点图片一个偏离焦点图片的原因：Phase diversity method [9,10] is an improved method based on Gerchberg–Saxton, which key idea is to construct an optimal iterative model to estimate the wavefront phase by using an intensity image in the focal plane and a defocus plane through maximum likelihood estimation.

This article is also similar to Ben's article, but focuses on astronomy. It uses convolutional neural networks to extract in-focal and out-of-focus images, which are used to identify superposition of Zernike aberrations caused by atmospheric vortices.

28-Accurate phase retrieval of complex 3d point spread functions with deep residual neural networks

该文章利用深度残差神经网络，取了n组五个in-focal和out-of-focus PSF图像作为训练集还原Zernike多项式信息并与目前的相位检索方法较为匹配。不过值得注意的是，需要使用的训练数据集量非常大（看一位PSF图片较多），100000左右。这也许就是Ben只用了两张PSF没有用五张PSF的原因。

This article uses a deep residual neural network to take several sets of five in-focal and out-of-focus PSF images as training sets to restore Zernike polynomial information and the result matches the current phase retrieval method. However, we should notice that the amount of training data set that needs to be used is very large (may be there are lots of PSF images), about 100,000.