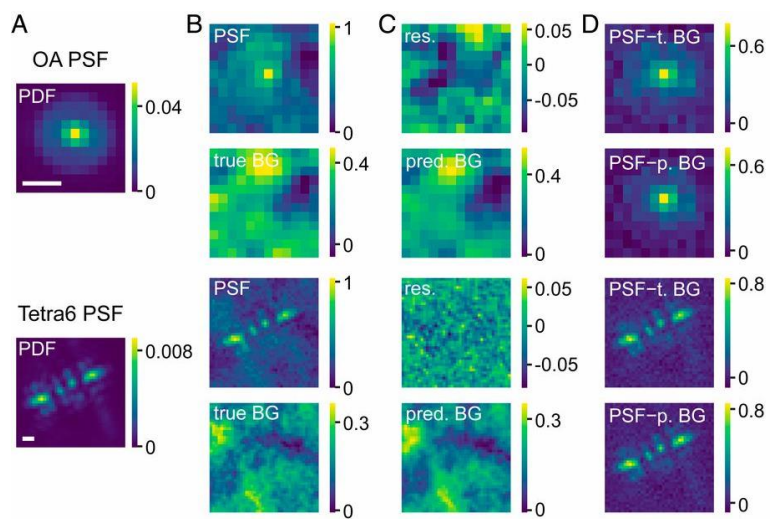
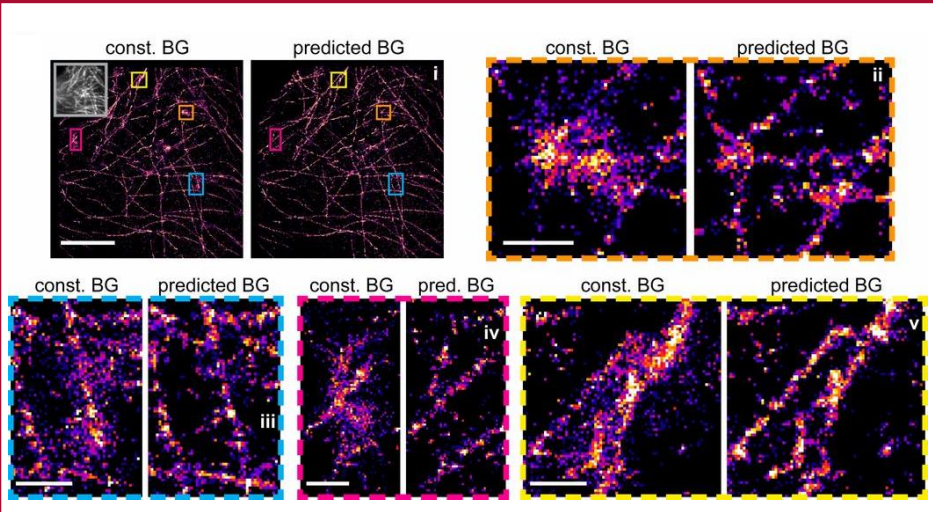


Accurate and rapid background estimation in single-molecule localization microscopy using the deep neural network BGnet

Structured background (sBG) severely deteriorates image quality in localization microscopy. Correction for sBG has been challenging. Here, we introduce **BGnet**, a deep neural network that accurately and rapidly estimates sBG from arbitrary point spread function (PSF) images, **significantly improving localization precision**.



sBG estimation with BGnet on simulated open aperture (OA) and Tetra6 PSFs. A: Ideal, noise-free PSFs. B: sBG-corrupted PSFs and true sBGs. C: Predicted sBGs and residuals. D: PSFs after correction with true or predicted sBGs. **Note the excellent quality of the predictions of the network.** Scale bars: 500 nm.



Strong improvement of localization precision when analyzing experimental OA PSFs in STORM, resulting in **significantly higher image quality** compared to constant background estimation (note unstructured regions used for constant background estimation). Imaged sample: Fluorescently labeled microtubules in BSC-01 cells. Scale bars: 5 μ m (i), 500 nm (ii-v).