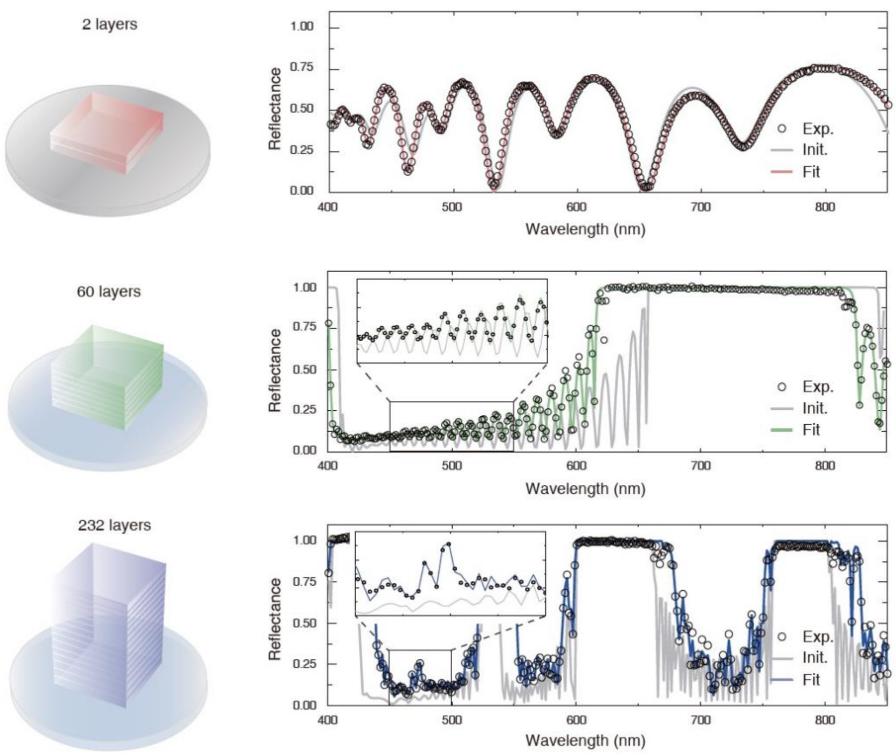
Release Date: December 10, 2021

LAM | Latest publications from prestigious teams Light: Advanced Manufacturing published two articles

1. LAM article | Light vs. data: Backpropagation advancing optical metrology and inverse design process

The research team proposed optical coatings with backpropagation in it used as neural networks (TFNNs) to try and solve the inverse problems. That problem exists where a set of observations is used to calculate the causal factors that produced those observations. They found a refreshing solution to avoid previous shortcomings in the current optical inverse problem, such as the need for a vast dataset and low accuracy.



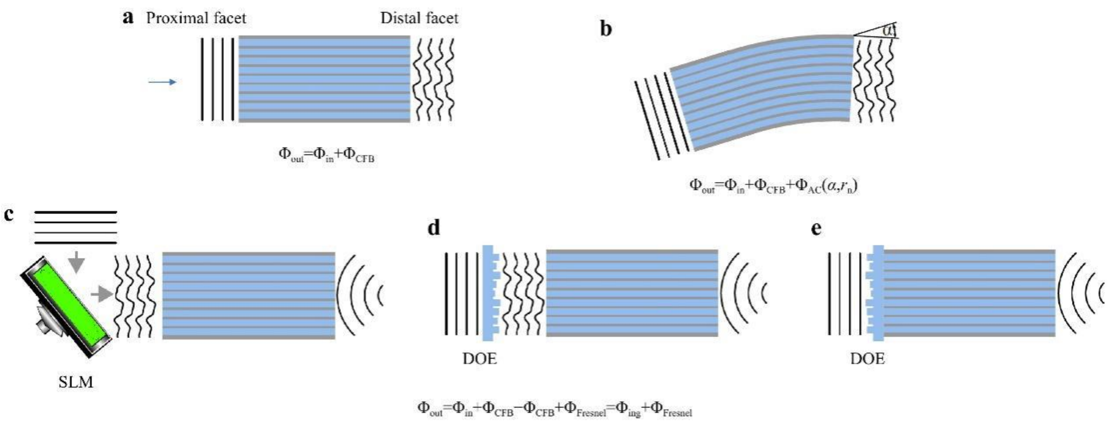
Caption | Experimental value, initial value, and optimization result of TFNNs for multilayer films

See the article:

Lingjie Fan, Ang Chen, Tongyu Li, Jiao Chu, Yang Tang, Jiajun Wang, Maoxiong Zhao, Tangyao Shen, Minjia Zheng, Fang Guan, Haiwei Yin, Lei Shi, Jian Zi. Thin-film neural networks for optical inverse problem[J]. Light: Advanced Manufacturing. https://doi.org/10.37188/lam.2021.027

2. LAM article | Ultra-thin 3D lensless fiber endoscopy using diffractive optical elements and deep neural networks

Dr. Kuschmierz, Prof. Czarske and colleagues from TU-Dresden, Germany report on DOEs produced by 2-photon polymerization lithography to compensate these distortions to enable 3D imaging without any lenses on the CFB. Furthermore, a DOE with random patterns can be used in conjunction with neural networks to circumvent the distortions altogether for single shot 3D imaging. Both methods enable compact, low cost 3D systems with resolution of around 1 µm and diameters below 0.5 mm for biomedical applications.



Caption | a Each fiber core exhibits a random phase delay, which adds to the in-coupled wavefront and results in a high spatial frequency disturbance at the fiber output. **b** Additionally, bending the fiber adds a global tilt to the transmitted wavefront, according to the optical memory effect. **c** Conventionally, phase distortions are compensated using spatial light modulators for dynamic digital optical phase conjugation (DOPC). Focusing at the distal fiber side is performed by adding the phase structure of a Fresnel lens on the SLM at the proximal fiber side. **d** The DOE provides focusing and phase conjugation assuming static aberration of the CFB and is placed in front of the proximal fiber facet. **e**: Printed DOE on the proximal fiber facet for aberration correction and focusing.

See the article:

Robert Kuschmierz, Elias Scharf, David F. Ortegón-González, Tom Glosemeyer, Jürgen W. Czarske. Ultra-thin 3D lensless fiber endoscopy using diffractive optical elements and deep neural networks[J]. Light: Advanced Manufacturing. https://doi.org/10.37188/lam.2021.030

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