

Principles of Fiber Bragg Gratings in Artificial Intelligence

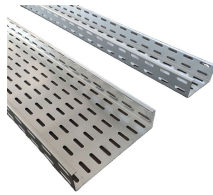


Overview

This perspective provides an overview of the sensing systems that combine FBG and AI technologies in medicine, focusing on their working principle, potentials, and challenges. It also explores the open research directions for encouraging further investigations in this field. Fully automatic fabrication of fibre Bragg gratings using an AI-powered femtosecond laser inscription system Wenbo Liu, Guiyuan Cao, Zian Liu, Hongyang Chen, Hao Zhang, Renjie Li, Keng-Te Lin, Han Lin, Baohua Jia Fully automatic fabrication of fibre Bragg gratings using an AI-powered femtosecond laser inscription system Wenbo Liu#. Among many solutions, fiber Bragg grating (FBG) sensors have gained significant acceptance in the medical field, due to their good static and dynamic performance, small dimensions, biocompatibility and immunity to electromagnetic interferences. The integration of artificial intelligence (AI) with. This paper presents a comprehensive review of AI-enhanced OFS technologies, encompassing both localized sensors such as fiber Bragg gratings (FBG), Fabry-Perot (FP) interferometers, and Mach-Zehnder interferometers (MZI), and distributed sensing systems based on Rayleigh, Brillouin, and Raman. The ML models in the legend are polynomial regression (PR), support vector regression (SVR),

decision tree regression (DTR), k-nearest neighbors (KNN) and extreme gradient boosting (XGB). This is achieved by creating a periodic variation in the refractive index of the fiber core, which generates a. In the vast realm of optical fiber sensing, where precision and innovation converge, Fiber Bragg Gratings (FBGs) stand as luminaries, casting their influence across myriad applications. These microscopic structures within optical fibers have become the bedrock of cutting-edge sensor.

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In this study, we present an AI- powered FLI system that enables automated, stable, and efficient FBG fabrication. By integrating a Multi-Layer Perceptron (MLP) model for real-time fabrication position ...



Section II provides an overview of the theoretical framework and measuring principle of FBGs, underlining also their strengths and weaknesses. Section III summarizes the current state of ...

Rear of the optical fiber distribution box



Fiber Bragg gratings (FBGs) are the most popular component used for efficient sensing purposes due to their unique inherent properties. Here, we have analyzed v



We predict the characteristics of Bragg gratings by means of AI algorithms trained on their OR. By refining simulation accuracy, optimizing AI algorithms to predict the OR, and constructing ...



This included an overview of the operating mechanisms of fiber Bragg grating sensors, interferometric sensors, and distributed sensing methods based on Rayleigh, Brillouin, and Raman ...

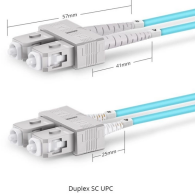


In this work, the development of a large-area sensitive soft skin with a curved geometry is presented, allowing for robot total-body coverage through modular patches.



Section II provides an overview of the theoretical framework and measuring principle of FBGs, underlining also their strengths and weaknesses.

...



Here, we present a novel artificial intelligence-based approach that effectively addresses these challenges. We introduce a methodology centered on applying deep learning (DL) to estimate ...



In this paper, we conducted a more thorough investigation to find a suitable architectural design of the deep learning model to further increase shape prediction accuracy. We used the ...



In conclusion, this comprehensive review paper provides a panoramic view of the recent advancements in Fiber Bragg Gratings (FBGs) and their diverse applications in optical fiber sensors.



We systematically explored the effects of pulse energy and scanning speed on the quality and spectral characteristics of the gratings, achieving reflectivities as high as 99.81%.

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