Rare earth (RE) doped active fiber laser or amplifier offers important application in space laser communication, space laser radar, space trash disposal and military, owing to their reduced weight, size, and high electronic-optic conversion efficiency. However, the radiation-induced attenuation of RE-doped fiber is approximately 1000 times larger than that of a RE-free fiber under the same radiation condition, which poses a severe challenge to the long-term stability of fiber laser or amplifier in space. Firstly, this paper briefly introduced the space radiation environment, the application requirements and challenges of silica-based optical fibers in space. Secondly, the latest research progress in the field of radiation-resistant active optical fiber at home and abroad were systematically introduced from three aspects: (1) the mechanism of radiation-induced darkening of active fiber; (2) the primary factors influencing the radiation resistance of active fiber; (3) the methods to improve the radiation resistance of active fiber. Finally, the potential issue which needs further investigation is prospected.

题目：基于深度学习和条件随机森林的人脸表情识别方法。

摘要：

人脸表情识别是人工智能和计算机领域的重要研究方向，目前，多种人脸识别方法已经获得了很大成功，而深度学习需要大量训练样本支持的缺点仍然存在，非可控环境和小样本下的人脸识别也仍是具有挑战的问题。本文提出了基于深度学习和条件随机森林的鲁棒性人脸表情识别方法（G\_DRF），缓解了深度学习需要大量训练样本支持和非可控环境下的表情识别准确性和有效性问题。

G\_DRF人脸表情识别技术采用深度多示例学习提取鲁棒性人脸特征以降低人脸图像遮挡、光照和低分辨率的问题，并利用随机森林分类方法进行人脸性别估计和人脸表情识别，提高了特征提取与分类识别的效率。本文使用公开的CK+，BU-3DFE，LFW数据集对本文方法进行验证，在人脸性别估计实验和人脸表情识别实验中均有较好的识别率。另外，本文方法对小量级训练样本的鲁棒性较好，准确度为95.65%。

关键字：人脸表情识别 人脸性别估计 条件随机森林 鲁棒性