Winter 2025

# Optics & Photonics Group Lunchtime Seminar Series

University of Nottingham

## Miniature three-wavelength SFDI Endoscope for Early Pancreatic Cancer Detection


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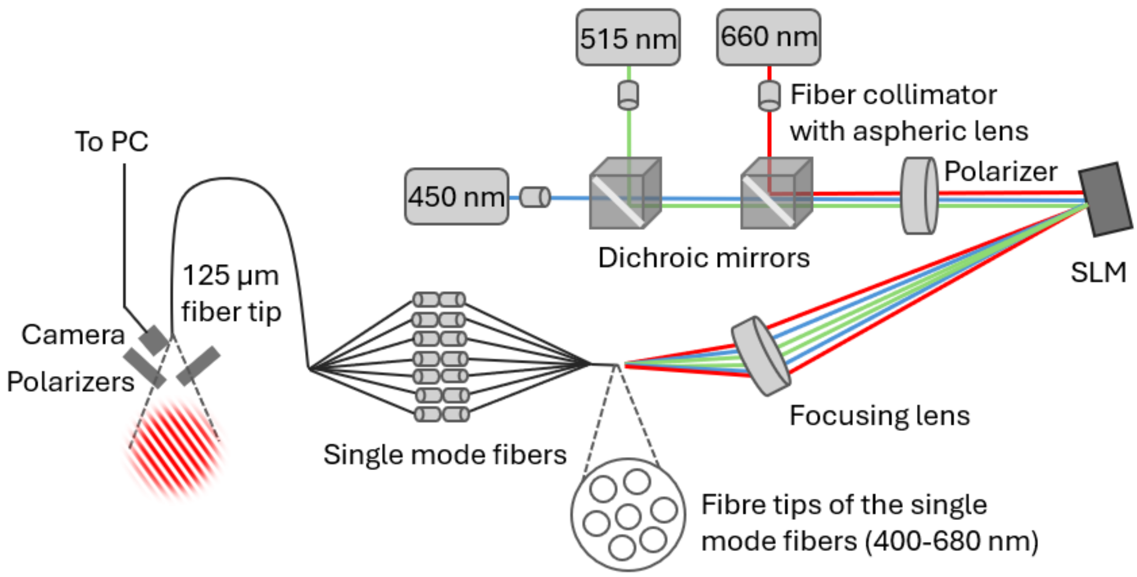
*OPG UoN*


12:00 Wed 12 March 2025

Coates – Room C25

OPTICS & PHOTONICS
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Cristina Cortes

# Miniature three-wavelength SFDI Endoscope

There is a clinical need for a cost-effective imaging device capable of detecting pancreatic cancer at early stages [1]. The aim of our research is to develop an ultra-thin endoscope ( <0.8 mm) that uses Spatial Frequency Domain Imaging (SFDI) to provide enhanced image contrast of pancreatic cysts, with the goal of guiding clinicians to the most promising areas from which to collect tissue during biopsy procedures. SFDI is a low-cost optical imaging technique that works by projecting fringes over a sample and measuring the diffuse reflectance, from which optical properties that serve as cancer indicators can be calculated: the absorption and reduced scattering coefficients [2]. This technique is non-invasive and has the potential of producing near real-time results, making it ideal for clinical use, but existing commercialised systems are bulky and cannot be used inside the body.

Previous work has miniaturised these devices to a level suitable for endoscopic deployment with two wavelengths (515 nm and 660 nm) [3]. However, the fringe patterns can only be modulated manually which creates relatively slow and unreliable performance, making it unfit for a real-time clinical usage. Here, we will discuss how the fringe pattern selection has been automated by introducing a Spatial Light Modulator device (60 Hz frame rate). We will also discuss future work including validating the system's performance, introducing a third wavelength, and using AI algorithms to obtain more accurate optical property maps. This work represents a first step towards a miniature SFDI prototype that can produce near real-time measurements of pancreatic cancer indicators.

1. G. Gheorghe et al. Diagnostics, vol. 10, p. 869, (2020).

2. S. Gioux, A. Mazhar and D. J. Cuccia. Journal of Biomedical Optics, vol. 24, pp. 071613, (2019).

3. J. Crowley and G. S. D. Gordon. Journal of Biomedical Optics, vol. 29, pp. 026002, (2024)

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All are welcome

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