

# The Resurgence of the Linear Optics Interferometer — Recent Advances & Applications

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## I. INTRODUCTION

Si-Hui can colour code things she adds like this  
And Peter can do it like this  
Let's add comments and questions like this

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## II. MATHEMATICAL BACKGROUND

[Mathematical representation for LO networks, and very basic background on quantum optics](#)

## III. OPTICAL ENCODING OF QUANTUM INFORMATION

### A. Single-photons

1. Polarisation
2. Dual-rail
3. Time-bins

### B. Continuous-variables

1. Coherent states
2. Squeezed states

## IV. EFFICIENT CIRCUIT DECOMPOSITIONS OF LINEAR OPTICS NETWORKS

[Discuss the Reck et al. decomposition](#)

## V. EXPERIMENTAL IMPLEMENTATION

### A. State preparation

1. Single-photons
2. Bell pairs
3. Coherent states
4. Squeezed states

### B. Linear optics networks

1. Bulk-optics
2. Waveguides
3. Time-bins

Discuss fibre-loop architecture

Discuss NOON states - Heisenberg limited

Discuss MORDOR scheme

### **C. Measurement**

#### **1. Photodetection**

Discuss number-resolved and bucket detectors, multiplexed detection, APDs, current micropillar detectors

#### **2. Homodyning**

## **VI. APPLICATIONS FOR LINEAR OPTICS INTERFEROMETRY**

### **A. Linear optics quantum computation**

### **B. Boson-sampling**

### **C. Quantum metrology**

### **D. Encrypted quantum computation**

## **VII. STATE OF THE ART**

Discuss where experiments are at at the moment

## **VIII. CONCLUSION**

### **Acknowledgments**