**Dispersion-assisted Optical Phase Recovery**

**Coding Skills Required: Intermediate**

## Goals

The goal of this project is to investigate an advanced receiver technique in optical communication. The project explores the Gerchberg-Saxton algorithm in time domain for optical phase recovery for application to a *carrier-less coherent receiver*.

## Introduction

Phase information plays a crucial role in fiber optical communication. Traditionally, coherent detection techniques have been employed, involving the mixing of the output signal with a local oscillator for coherent detection. Recently, there are growing interest in the field of "carrier-less" communication, where the goal is to recover phase from intensity measurements alone, without relying on a local oscillator and coherent detection to measure the phase. In this project, the focus lies on investigating the time-domain equivalent of the Gerchberg-Saxton algorithm for phase retrieval in fiber optical systems. The ultimate goal is to assess the feasibility of applying this algorithm for carrier-less optical communication.

## Tasks

## Make yourself familiar with the Gerchberg-Saxton algorithm[1]

1. Investigate the time-domain equivalent of the Gerchberg-Saxton algorithm and time stretch phase retrieval [2]
2. Create a Colab notebook simulator for the system in Reference [2]
3. Simulate phase recovery from with optical communication data that will be provided to you.

A diagram of a phase recovery

Description automatically generated

## Deliverables

PowerPoint slides, final presentation, Colab notebook, and GitHub repository.

## Resources

1. Gerchberg-Saxton Paper: <https://www.scinapse.io/papers/1484412996>

# Optical phase recovery in the dispersive Fourier transform: <https://pubs.aip.org/aip/apl/article/95/23/231108/120920/Optical-phase-recovery-in-the-dispersive-Fourier>

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