

## Project Overview

### Title: Remote Scan & Recognition of Human's Signature

**Background:** The COVID-19 pandemic has brought significant changes to the way we live and work, forcing many individuals and organizations to adapt to a new way of doing things. So, most of traditional methods for signature recording that involve physical contact are now discouraged to minimize the spread of the virus. To address this challenge, this project aims to develop an application that uses computer vision techniques to record and identify finger-based signatures, providing a contactless and secure way to sign documents.

### Objective 1: Remote tracking of finger movement by Web Camera

**Goal:** Visualize ability to track the trajectory of the finger movement in 3D space.

#### General tasks:

1. **Background Learning:** Build a foundational understanding of computer vision techniques to identify a user's finger, to capture its position from video stream for easy signature creation and storage.
2. **Initial Solution Analysis:** Analyse the provided solution and application based on Artificial Neural Networks (ANN) approach for finger movement tracking.
3. **Finger tracking measurements:** Conduct research on the finger tracking for digital signature in 3D and 2D spaces creation, testing and fixing the failures in application accuracy (interruptions).
4. **Depth Correction Implementation:** Develop a program that classifies the finger's trajectory points according to the distance between the finger and camera (depth). This requires:
  - Algorithm to calculate the distance between the finger and camera.
  - Visualization techniques to represent this data effectively and storage for future processing & recognition.

### Objective 2: Algorithm Enhancement for Interruptions Avoidance

**Goal:** Improve the algorithm to avoid the interruptions for smooth, singularity-free trajectories

1. **Advanced Research:** Survey methods in literature for singularity avoidance strategies.
2. **Algorithm Development:** Propose and develop modifications to the existing ANN algorithm to avoid the interruptions due to slope of virtual plane of finger movement. This could involve:
  - Adjusting the depth estimation algorithm with finger movement plane's slope measurement.
  - Refining the finger's trajectory detection with a focus on interruptions avoidance.
3. **Testing and Validation:** Compare the performance with the original algorithm.

### Documentation and Reporting:

The project must be documented in the project's portfolio. An abstract must be submitted to the presented in the RatSif conference. The presentation in the RatSif conference should include research findings, methodology, code, tests, and comparisons.