## 1. INTRODUCTION

In this problem, we are going to analyze the motion of a tower of blocks after the bottom block is removed abruptly. To do so, we will track a video of the tower using OpenCV.

2. PROBLEM STATEMENT

[Adapted from IYPT 2020 Problem 14 – *Falling Tower*]

Identical blocks are stacked one on top of another to form a freestanding tower. The bottom block is removed by applying a sudden horizontal force such that the rest of the tower will drop down onto the surface. Under certain conditions, the tower may remain standing.
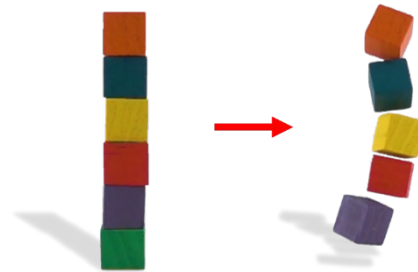
Track both the x-position of the bottom block and the y-position of the block above it for either the unstable or stable case. On separate axes, plot both positions against time.

Use either of the videos provided here in GitHub or take your own! (Note that the provided videos are in slow motion and are thus taken at a higher framerate then they are played back.)

3. CHECKING YOUR RESULTS

To check your results, compare your solution with the provided solution files in the GitHub repository.

4. TABLE OF CONSTANTS (For Provided Videos)

Unstable Video	
Pixel to Meter Ratio	$1 : 5 \times 10^{-4}$
Slow Motion Factor	1/32
Stable Video	
Pixel to Meter Ratio	$1 : 2 \times 10^{-4}$
Slow Motion Factor	1/32