**MOTIVATION**

1. Built own database of spectral images with RGB and IR over 200 tomatoes

2. Average ripeness, collected with penetrometer, was around 17.1 Newtons (N) with a min. of 4 N and a max of 32 N.
   - < 8 N as overripe (red line)
   - > 8 N and < 22 N as ripe
   - > 22 N as uneripe (green line)

3. Selected 2 of 16 machine learning (ML) models developed to predict ripeness factor.
   - Average pixel intensities for Near IR and RGB wavelengths as features
   - A second model built using Pix2Pix architecture to spectrally reconstruct IR images from the RGB images.

**EXPERIMENTAL PROCEDURE**

1. collected with penetrometer, was around 17.1 Newtons (N) with a min. of 4 N and a max of 32 N.
   - < 8 N as overripe (red line)
   - > 8 N and < 22 N as ripe
   - > 22 N as uneripe (green line)

2. Selected 2 of 16 machine learning (ML) models developed to predict ripeness factor.
   - Average pixel intensities for Near IR and RGB wavelengths as features
   - A second model built using Pix2Pix architecture to spectrally reconstruct IR images from the RGB images. Pix2Pix is a deep learning model that can learn a mapping function from an input image to an output image. The input and output images can be related in some way, such as an image of a hand-drawn sketch and the corresponding realistic image. The architecture uses a conditional generative adversarial network (cGAN). Pix2Pix architecture is a powerful tool for image-to-image translation tasks

3. ML models achieve root mean squared errors (RMSE) between the predicted and actual ripeness metric ranging from 2.8N to 3.1N.