Good afternoon. Welcome and thank you for coming to my internship defense on topic of Crop Analysis on UAV Images. I am Pham Gia Phuc. This internship was conducted at ICTLab under the supervision of Dr. Tran Giang Son. Before starting, I would like to express my sincerely thanks to Dr. Tran Giang Son for his support and help during the implementation of this internship.

My presentation today contains 5 parts: Introduction, Background, Materials and Methods, Results and Discussion and Conclusion.

So, to begin with, crop and weed are the terms that related to the agriculture. Agriculture is the practice of cultivation plants and livestock, and is the key development in the rise of human civilization. By growing plants, herding and breeding animals, agriculture created food surpluses that enabled people to live in cities and ensure the quality of life and condition of development. And after years of developing, nowadays, technology, especially information technology has been applied to every aspect of life, including agriculture. The term precision agriculture was born from this point.

Precision agriculture is an approach to farm management, which uses information technology to ensure the crop and soil receive exactly what they need for optimum health and productivity, thereby ensure the profitability, sustainability and the protection of environment. But in order to be effective, precision agriculture requires a steady amount of data, which UAV is really fit the position.

UAV or Unmanned Aerial Vehicle is an aircraft without any human pilot, crew or passenger onboard. In precision agriculture, UAV with the ability to fly above the field can collect huge amount of data from a large area. Compare to other data-collecting tools, UAV usually has high spectral resolution, not sensitive to clouds or easily accessing difficult areas. Thus, it is really effective for the data requirement of precision agriculture.

However, raw data from UAV is not enough effective but needs to be processed. And one of the best ways is using deep learning model, where potential approach is semantic segmentation with ability of clearly indicate the target audience.

So, to handle the problem, in this internship, I aimed to research about precision agriculture and semantic segmentation in order to create a deep learning model that uses multispectral images for crop and weed mapping, which might help scientists and farmers in deciding which algorithms to employ for accurately analyzing different crop and weed locations.

Before implementing, there are some important backgrounds that is needed to know. The first is sematic segmentation. Semantic segmentation is a computer vision task in which specific regions of an image will be labelled. It aims to assign a class to each pixel that correspond to the concept being represented. Segmentation models are useful for several tasks, including precision agriculture.

The second thing is convolution operation. It is the process of transforming an image, which applying a kernel over each pixel and its local neighbors to create a feature map. So close, Max Pooling operation make the feature map smaller by elimination unnecessary details for reducing the dimension as well as the amount of parameter. Together with convolution, they are called down sampling.

In the opposite site. Transposed convolution is a technique for performing up sampling, which in essence, is the exact revert of a conventional convolution, where input is low quality while output is high one images.

So, when implementing, I have also researched about 2018 Weed Map dataset, which being public in ASL datasets, and being divided into 129 directories and 18746 png picture files. But due to the limitation of this internship, I only built the segmentation model for the weed part, and filtered for RGB images, mask and groundtruth images which red color indicate weed. The filtered dataset is stored into 3 directories with 1668 png pictures.

For the segmentation issue, I have researched about UNet. UNet is first introduced for biological image segmentation. With a tweaked and extended architecture, It allows operating with less training photo and provide more accurate segmentation, it is based on fully convolution neural networks.