



# **Sugarcane grading from photos** using machine learning

Group: 39

Student: Phuong Pham - 56070503447 - [phuongmaipham@icloud.com](mailto:phuongmaipham@icloud.com)

Advisor: Dr. Sally E. Goldin

Bangkok  
Sep 13 2016

# Content

- >> Problem insight
- >> Proposed method
- >> Expected results
- >> Deliverables

**Problem insight**



# Problem insight

## Sugarcane statistics

A close-up photograph of several sugarcane stalks that have been sliced into thick, circular pieces. The slices are arranged on a brown, woven bamboo or rattan surface. The sugarcane has a white, fibrous interior and a thin, yellowish-brown outer layer. Some stalks still have their green leaves attached. The background is slightly blurred, showing more of the same setup.

**Value** ~ \$600 million/  
year

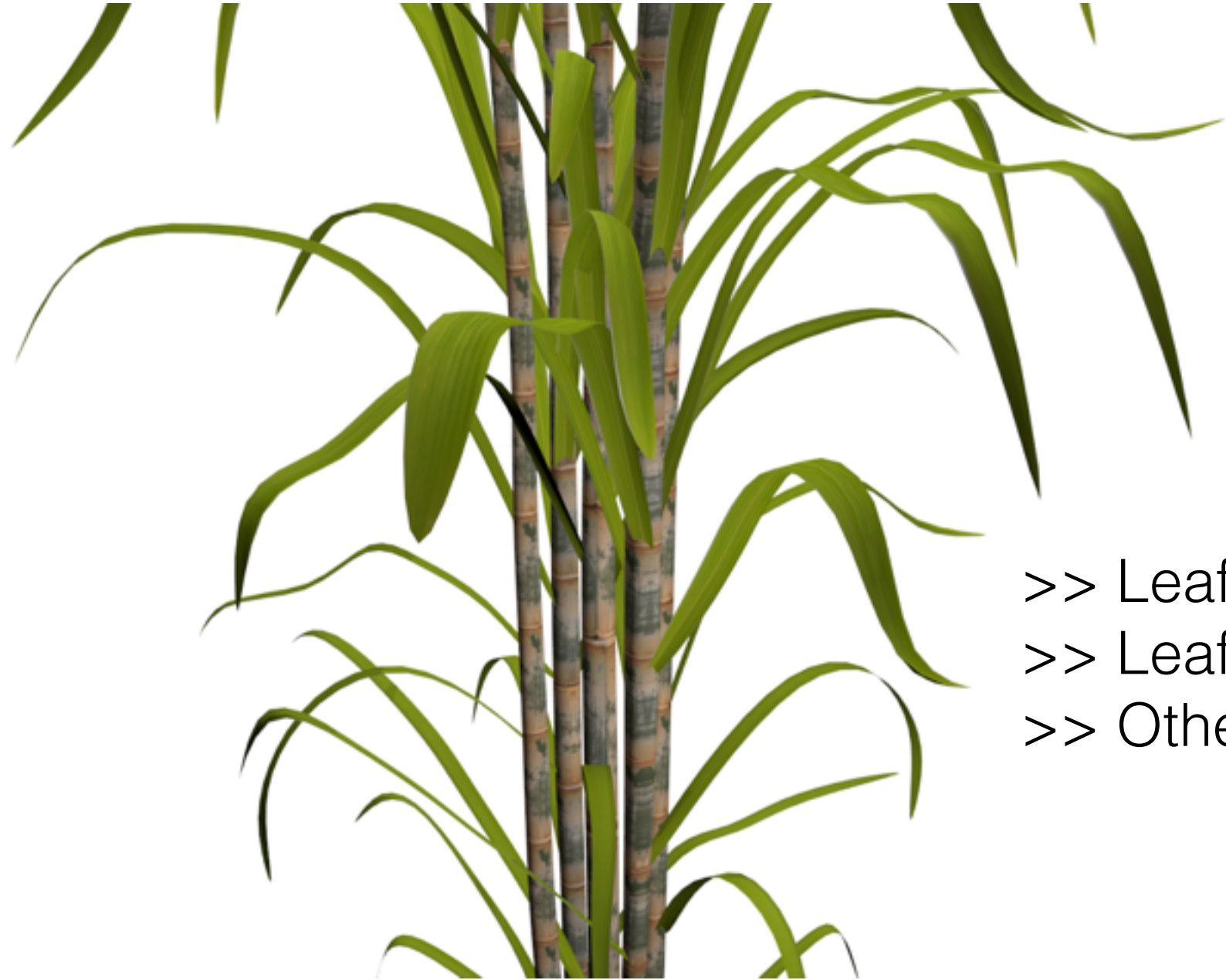
**Production** ~ 47  
million ha/year

**Area** ~ 1 million ha



# Problem insight

Sugarcane health - important to predict the yield



- >> Leaf size
- >> Leaf colour
- >> Others

Close up of a sugarcane bunch



# Problem insight

Why do we do this project?



**Cane companies typically survey only 10% of their fields**



# Problem insight

Why do we do this project?

A satellite image showing a tropical region, likely the Amazon basin, with dense cloud cover over the ocean and surrounding land. The clouds are thick and white, obscuring much of the underlying terrain. The land is visible in shades of green and brown, indicating dense vegetation and some cleared areas. The ocean is a deep blue, with white foam from waves visible along the coastlines.

**Satellite Image: Too many clouds during main growing season**

# Problem insight

Why do we do this project?

>> We need a **convenient** way  
to **classify** cane quality over a  
**large area**



# Problem insight

Mobile phone photos



- >> Fields are owned by individual farmers
- >> Every farmer has a phone
- >> Images could be easily obtained



# Problem insight

Example data



Good



# Problem insight

Example data



Medium



# Problem insight

Example data



Poor



# Problem insight

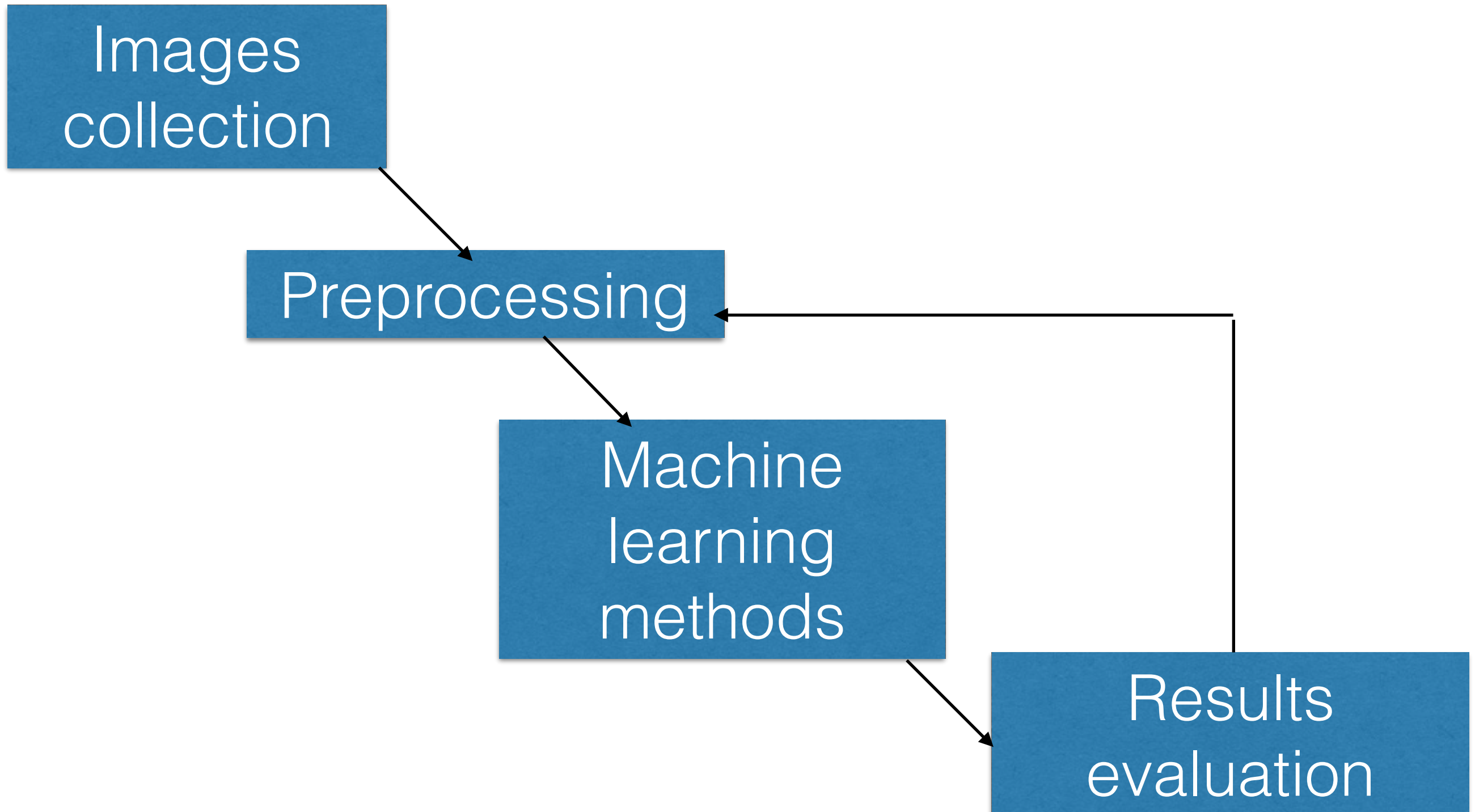
Why do we do this project?

**>> A machine learning method  
to classify cane quality using  
mobile phone photos**

# Proposed Method



# Proposed method



# Proposed method

What we attempt to do

- >> Implement several ML models
- >> Try them with different parameters
- >> Results & method evaluations



# Proposed method

Machine learning method

>> Many possibilities  
(K-means, design  
tree, SVM)

>>> Which features to extract?

>>> Pictures from different perspectives of the  
same view

# Proposed method

Machine learning method

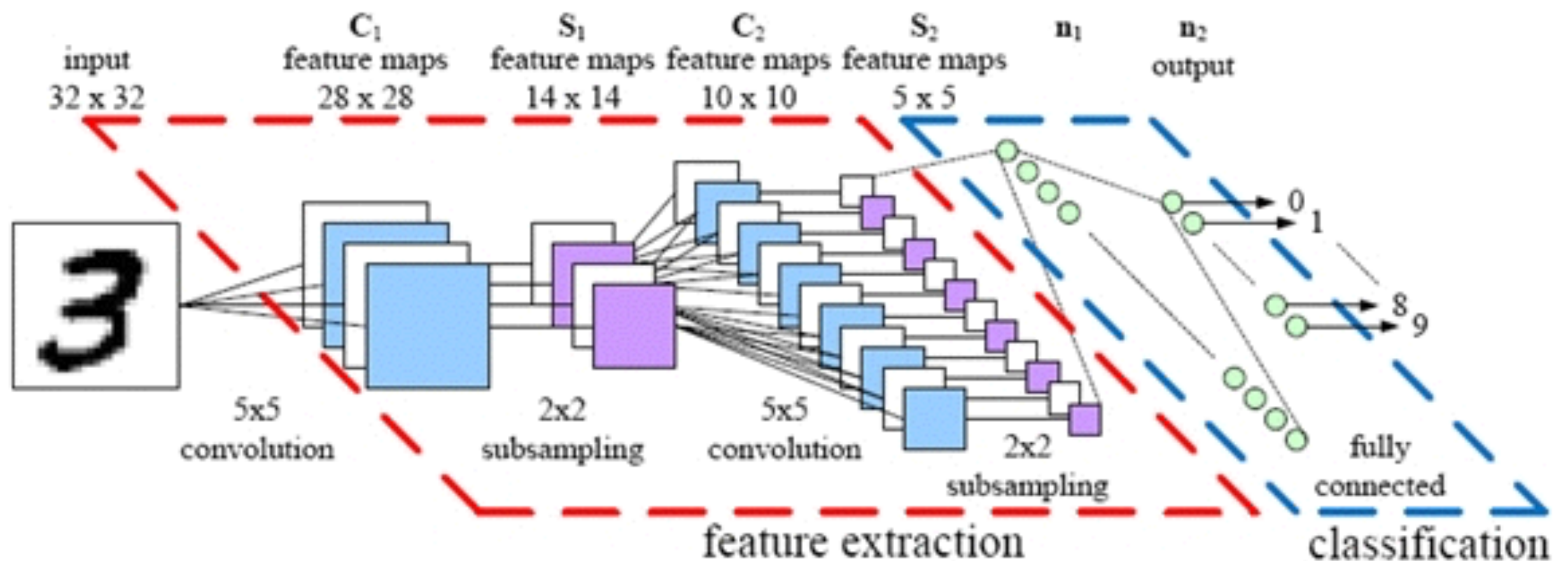
## >> Convolutional neural networks!

- >>> automatically learn the important features for decision making
- >>> Good approach to tell different between objects in the same basic category



# Proposed method

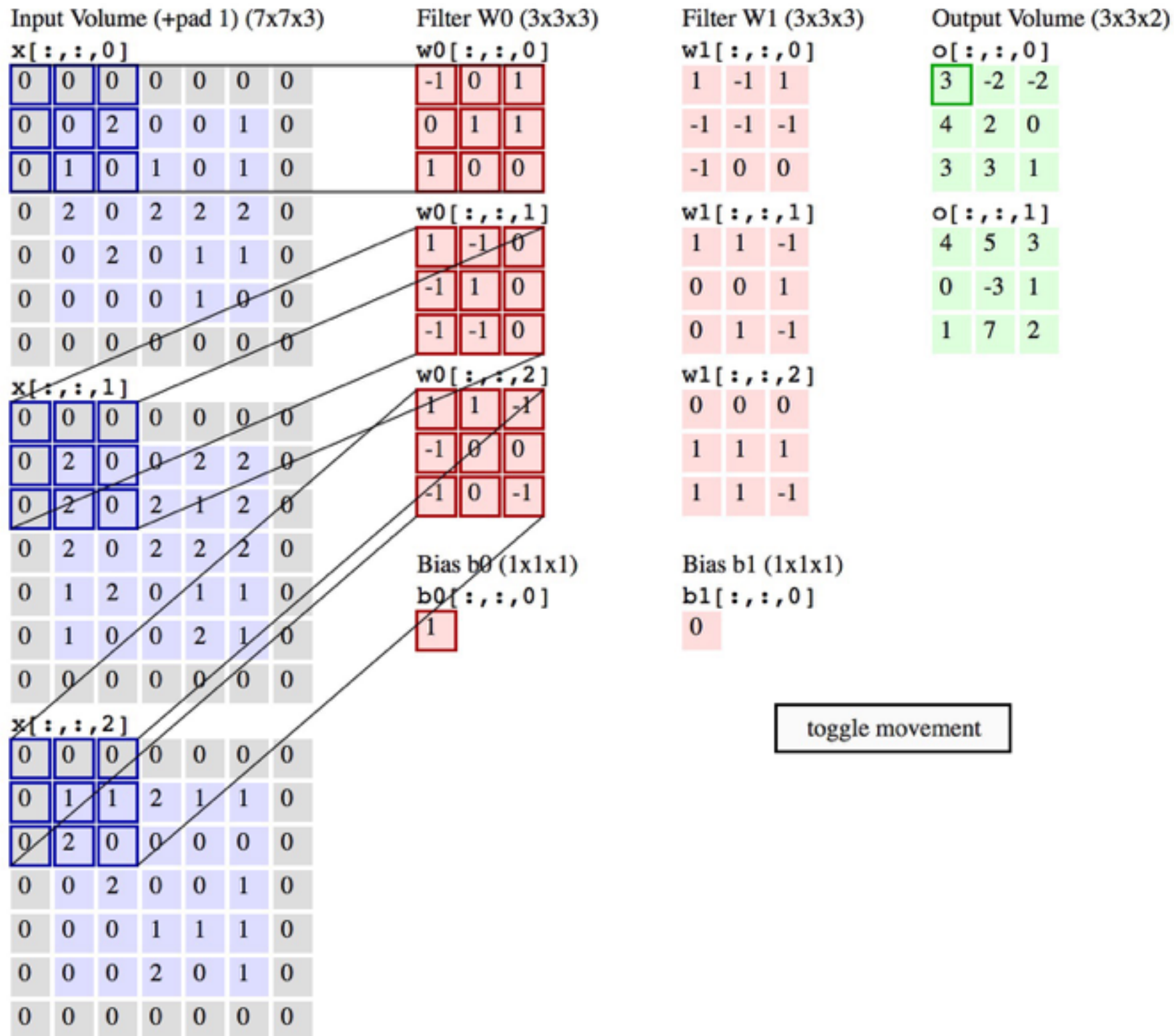
## Convolutional neural network





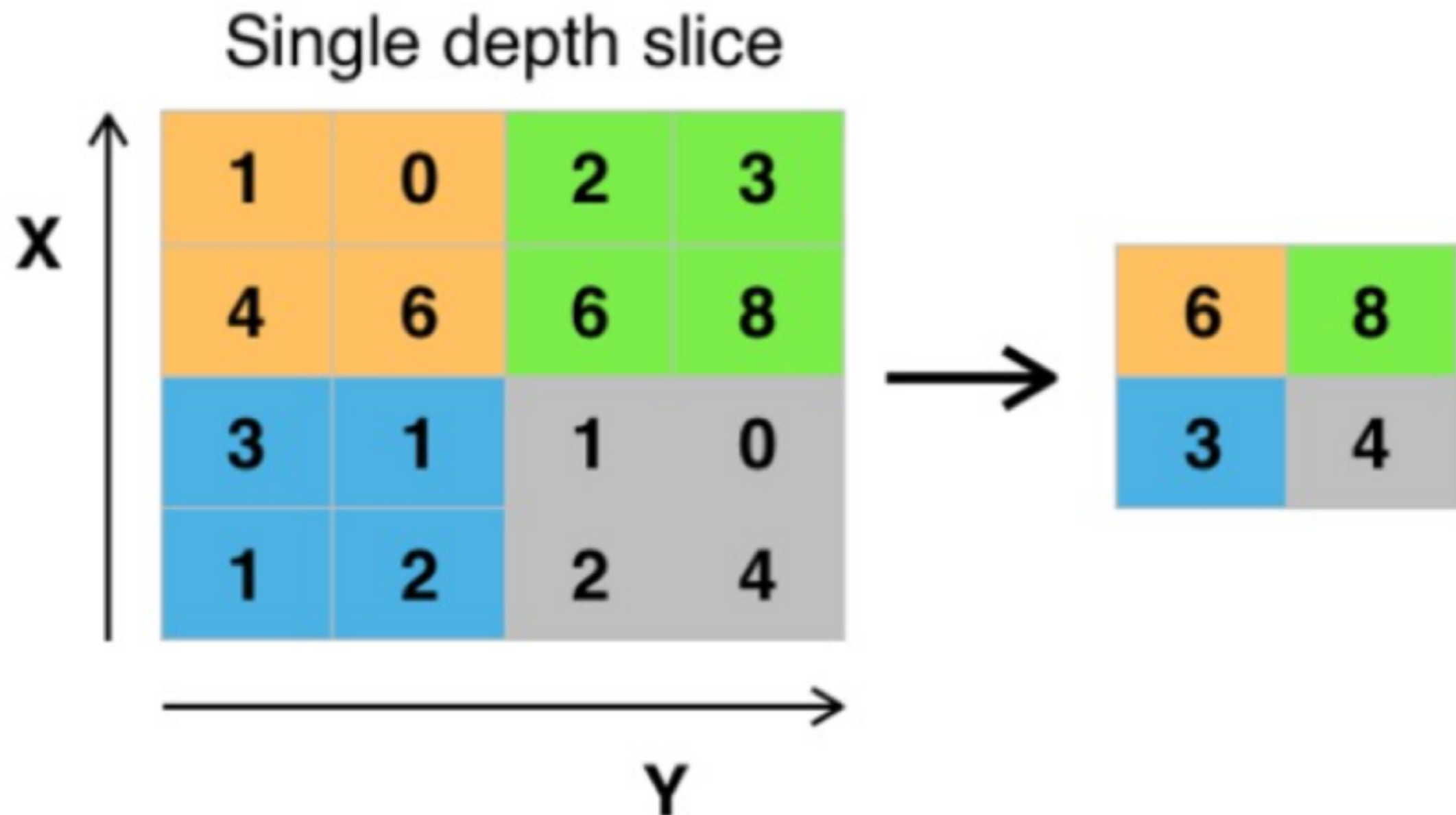
# Proposed method

## Convolutional neural network -convolutional layer



# Proposed method

Convolutional neural network -pooling layer





# Proposed method

## Cons

>> Requires very **LARGE** dataset

>> Processing speed: **SLOW!!!**

# Proposed method

## Data Augmentation

>> Scaling

>> Brightness adjust

>> Contrast adjust

>> Flipping

>> Size normalisation



# Proposed method

Hardware - NVIDIA GeForce Titan X



>> Computing  
capacity  $\geq 3.0$

>> NVIDIA card -  
CUDA tool kit - GPU

**Expected results**



# Expected results

- >> Comparison of classification accuracy between different learning models
- >> Conclusion regarding the feasibility of using ML for sugarcane health classification

# Deliverables



# Deliverables

## Term 1

- >> Experimental data set
- >> Experimental design
- >> Some prototypes including preprocessing code
- >> Decision about frameworks & learning methods

# Deliverables

## Term 2

- >> Complete experimental design
- >> Software test bed
- >> Results & data analysis



# Questions