# High thoroughput Plant phenotyping : Light interception measurement

Anjana K N , Dr. Stephen Nuske | Field Robotics Centre, Robotics Institute, Carnegie Mellon University

## OBJECTIVES

- To collect high-precision, high-resolution measurements of plants in field settings using distributed sensor networks
- Calculation of Leaf Area Index and proportionate leaf area estimation in various heights and radii

## INTRODUCTION

- High-throughput image-based phenotyping is a technology that can image hundreds of plants per day with minimal time and effort
- Plant traits are captured non-destructively

Fig.1: Image of the sorghum field with the phenotyping system

## METHODS

- Tools used
  - Ueye camera ( IDS-UI1246LE-C-HQ )
  - Pointgrey Camera (Flea3 GigE)
  - Fish eye lenses
  - ROS, MATLAB, OpenCV
- Experiment:
  - Fish eye lens attached to the upward facing monocular camera, positioned 6 inches above the ground

- Collected images subjected to binary thresholding for image segmentation

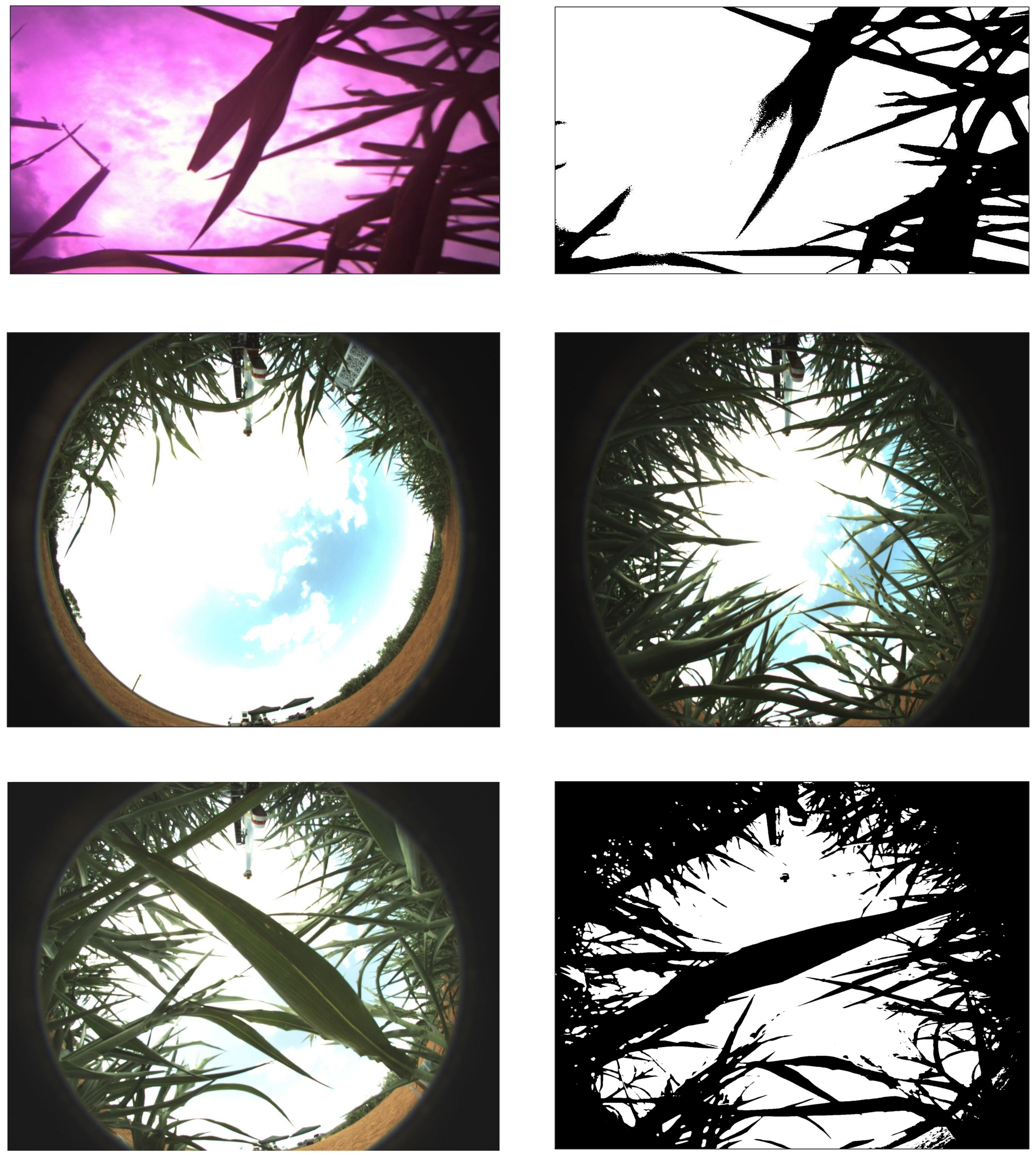

Fig.2: Captured images and segmented images

- Leaf area and Leaf Area Index (LAI) calculated using camera calibration parameters

LAI= Total one-sided area of leaf tissue per unit ground surface area

## RESULTS

- Leaf area is found at various radii with respect to the camera center for light interception calculation

Fig.3: Proportional leaf area in various radii

- Map of the field generated from the data using GPS coordinates

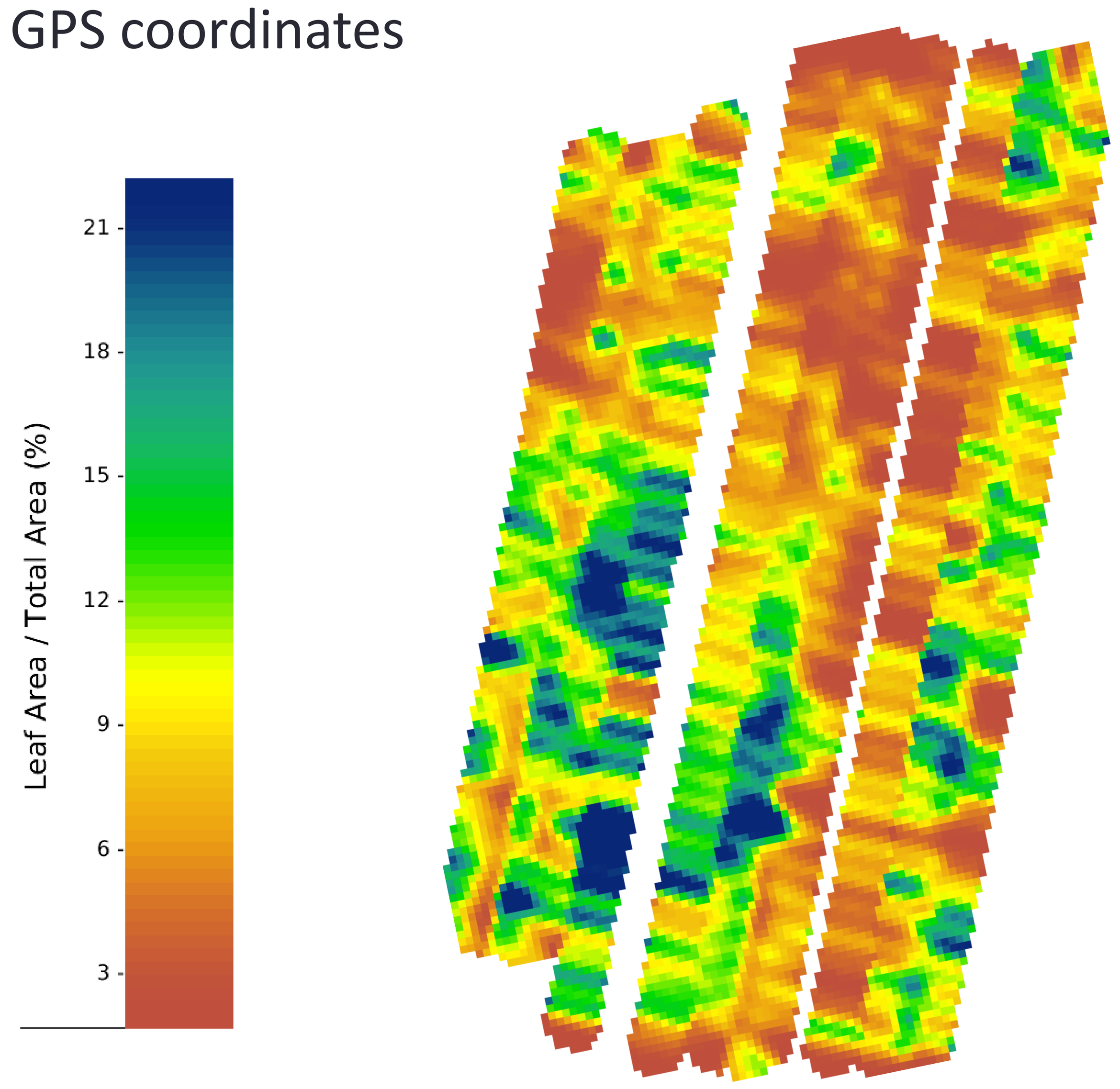


Fig.4: Field map with color bar

- The processed data can then be used to quantify genotype by phenotype and by environment interaction

## FUTURE WORK

- Validating the results with data from light measurement meters and other techniques
- Capturing more plant traits
- Extending the technique to other crop varieties

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