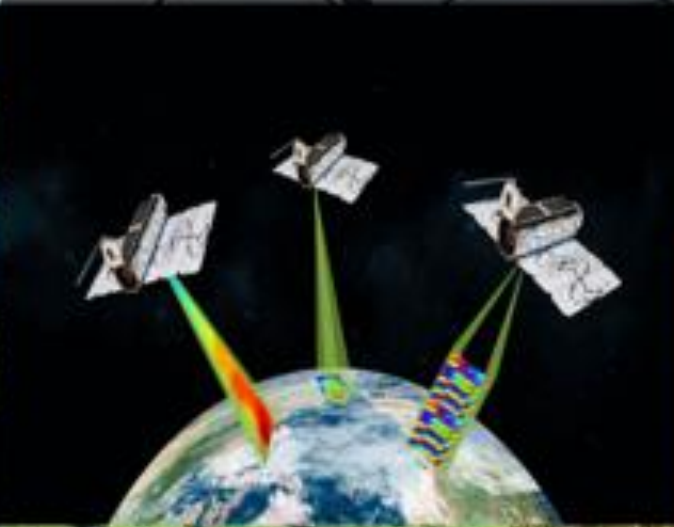


Harmonizing Seed Testing Assays

Using Computer Vision to Ensure Consistency Across Labs



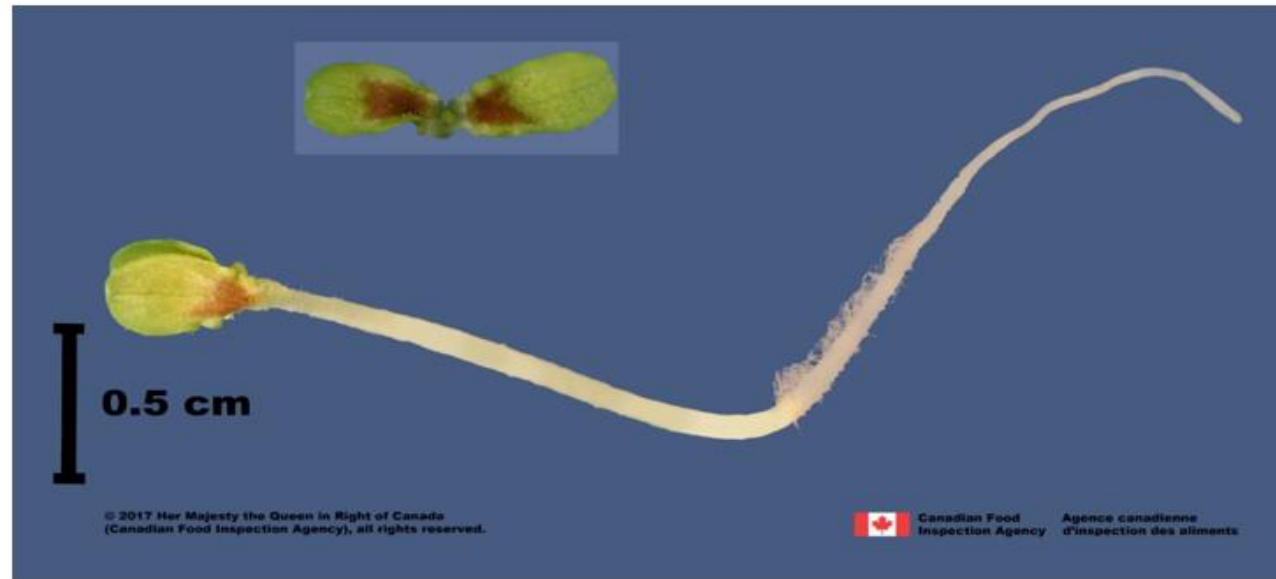
FULL STACK IMAGE ANALYTICS



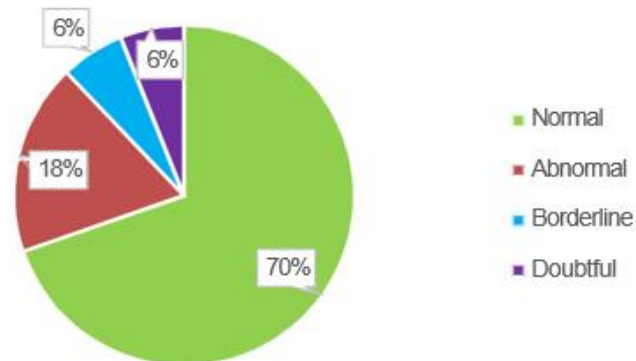
hiphen

Agricultural imaging solutions

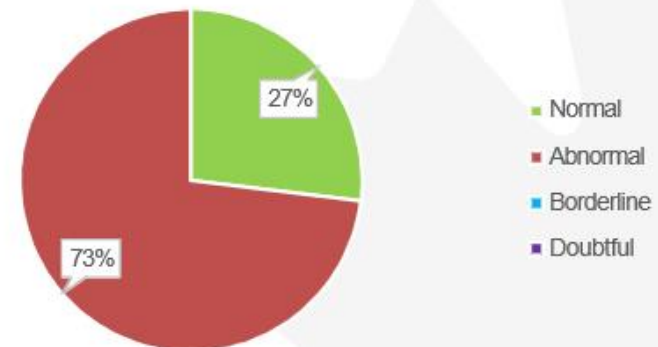
Different Results From Different Rules (Con.)



Results using AOSA rule (33 participants)

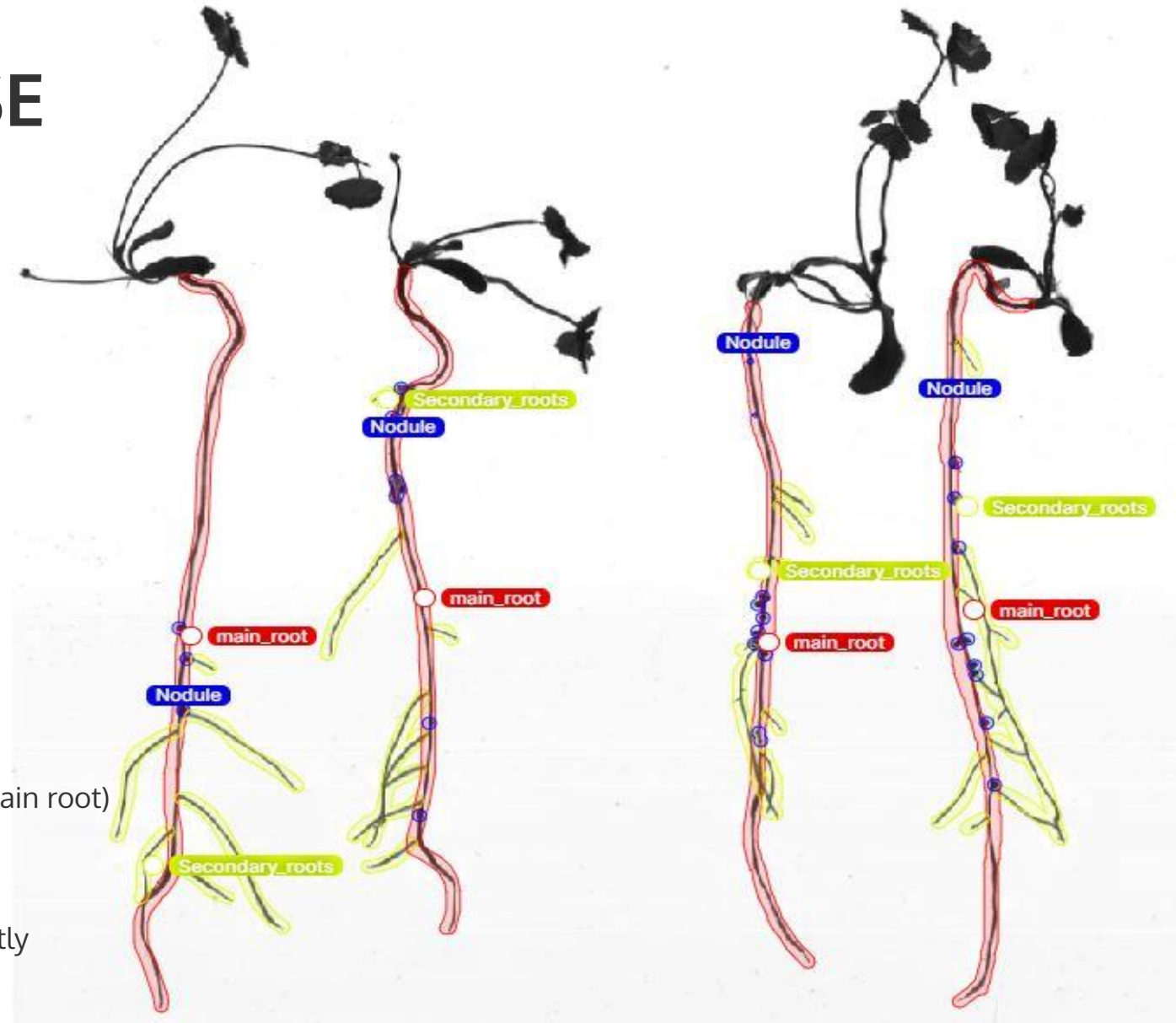
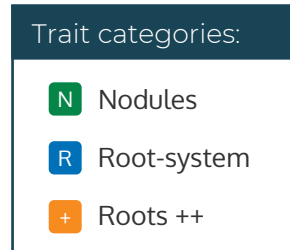


Results using M&P rule (26 participants)



ENCODING SME EXPERTISE

- N** Number of nodules
 - R** Main root length
 - R** Number of secondary roots
 - R** Root-system area
 - R** Root-system shape
 - R** Relative geo-position of the nodules
 - R** Stats about spatial distribution of the nodules
 - +** Average, Min, Max length of the secondary roots
 - +** Localization of the secondary roots (to the left or right of the main root)
 - +** Orientation degree of the secondary roots
- + trait dynamics (temporal analysis) if you acquire data frequently



Identifying Traits of Interest



Trait classification	
✓	RGB compatible traits
🔍	Exploratory traits



Root traits

- ✓ Root width and depth
- ✓ Major and minor axis
- ✓ Crown root angle
- ✓ Convex area
- ✓ Network area
- 🔍 Volume
- 🔍 Total root length
- 🔍 Total number of roots
- 🔍 Perimeter
- 🔍 Number of root tips
- 🔍 Root diameter (max/min/mean)

Derivatives

- Width/depth ratio
- Aspect ratio = minor axis/ major axis
- Solidity = network area/convex area
- Specific root length = length /root system volume
- Length distribution = upon 1 third TRL/TRL
- Bushiness = max to median number of roots
- Branching frequency = number of branch point/ TRL

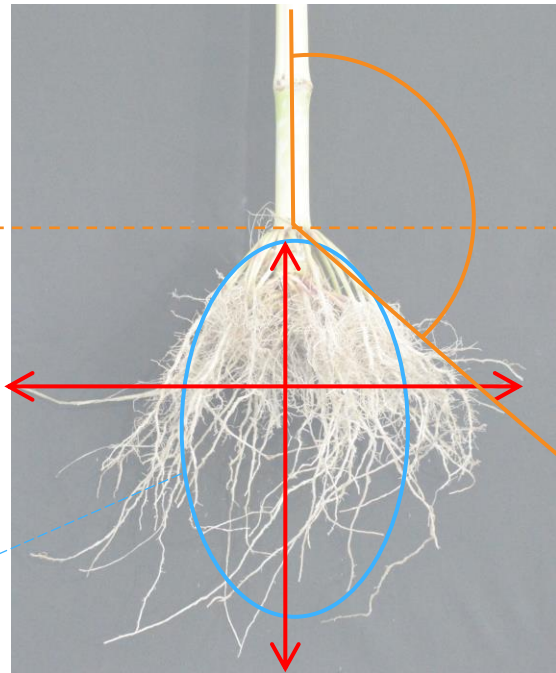
Defining Traits of Interest



RGB camera



Geometry assessment



Crown root angle

Root width and depth

Root major and minor axis

Density assessment



Global convex hull area and porosity



"Dense" convex hull area and porosity

Pilot: Construction of your data pipeline and validation process

Operational Deployment

Acquisition Protocols
Defined

Test Set of Images
Acquired

Test Set Pre-Processed
and Annotated

Acquire Images

Train New Model Until
Precision Acceptable

Re-annotate errors

Detection Model
Trained and Reviewed

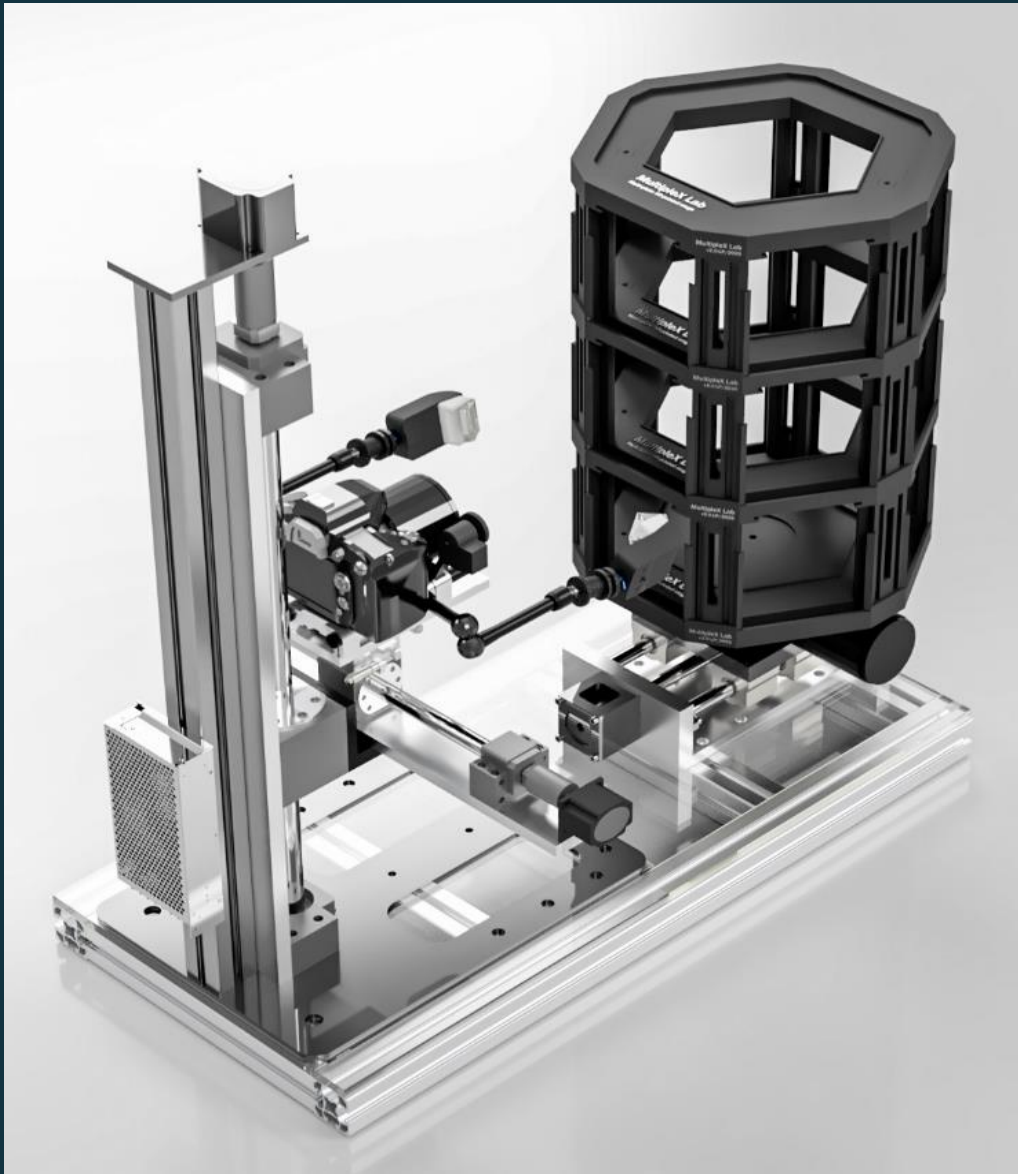
Images Processed
Automatically

Pipeline Ready For
Action 

Results Delivered via
Web Portal or API Calls

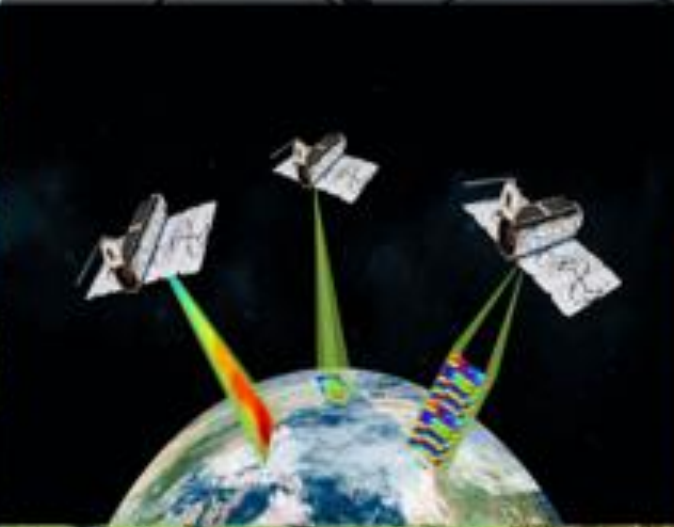
** Results delivered via web portal or posted via API calls.*

MultipleXLab - Vinicius Lube





FULL STACK IMAGE ANALYTICS



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Agricultural imaging solutions