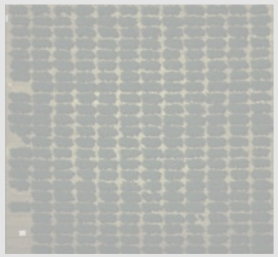
飞过无人机后怎么办？

Zhiwu Zhang

直播回放: https://wx.vzan.com/live/tvchat-423006122?jumpitd=1&fr=&v=1589389088864#/

Outline

- **Zhiwu Zhang Laboratory**
- UAV Image analyses
- Beyond UAV images



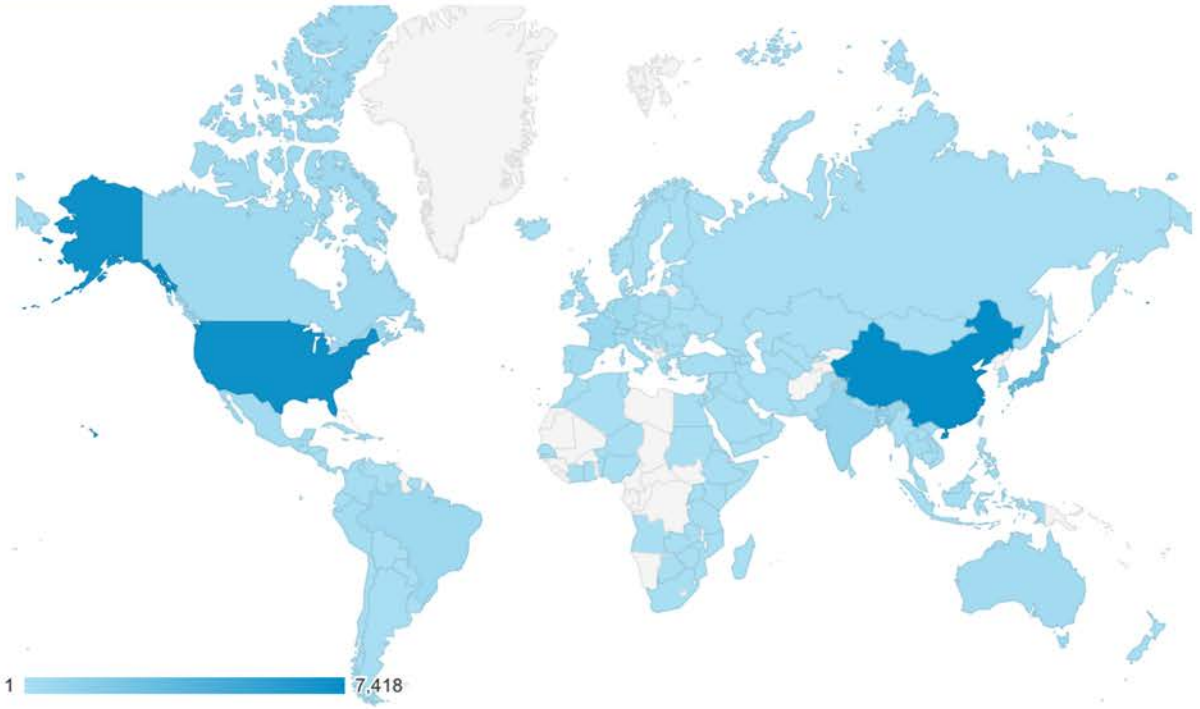
http://zzlab.net/share/UAV_ZZLab.pdf


Zhiwu Zhang Laboratory
for Statistical Genomics
Home
People
Publication
Research
Teaching
Software
Outreach
Jobs
CS-VMV
Culture: Trying to understand.
Strategy: Solve biological problems with analytical and computational challenges.
Vision: Sustainability of food production and health care relies on the usage of high throughput genomic and phenomic data.
Mission: When you have data, we help with our analytical methods, tools, and expertise.
Value: Every idea makes sense.
zzlab.net

Zhiwu Zhang Laboratory
Site Data

Try searching for "acquisition overview"

zzlab.net



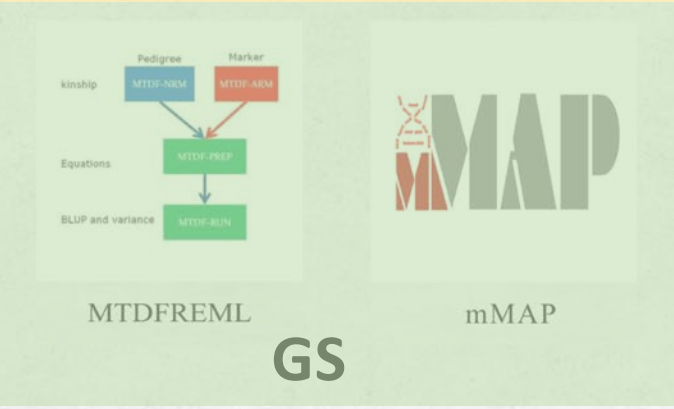
Primary Dimension: **Country** City Continent Sub Continent

Secondary dimension

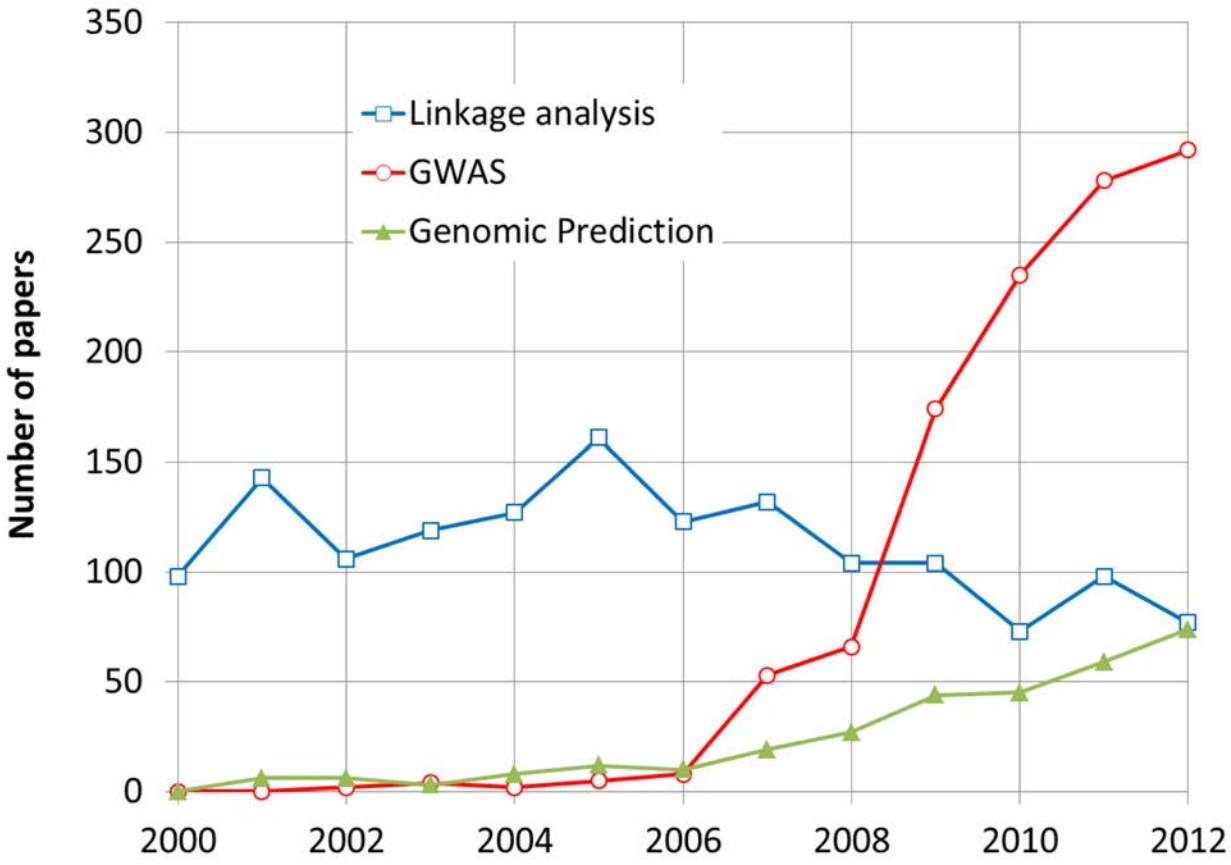
Country	Acquisition			Behavior			Conversions
	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Goal Conversion Rate
	25,855 % of Total: 100.00% (25,855)	25,914 % of Total: 100.11% (25,885)	47,522 % of Total: 100.00% (47,522)	60.54% Avg for View: 60.54% (0.00%)	2.74 Avg for View: 2.74 (0.00%)	00:02:12 Avg for View: 00:02:12 (0.00%)	0.00% Avg for View: 0.00% (0.00%)
1. China	**7,418** (28.41%)	7,359 (28.40%)	12,517 (26.34%)	60.93%	2.62	00:02:28	0.00%
2. United States	**7,030** (26.92%)	7,023 (27.10%)	16,033 (33.74%)	48.64%	3.51	00:02:32	0.00%

Zhiwu Zhang Laboratory
for Statistical Genomics

Home People Publication Research Teaching Software Outreach Jobs



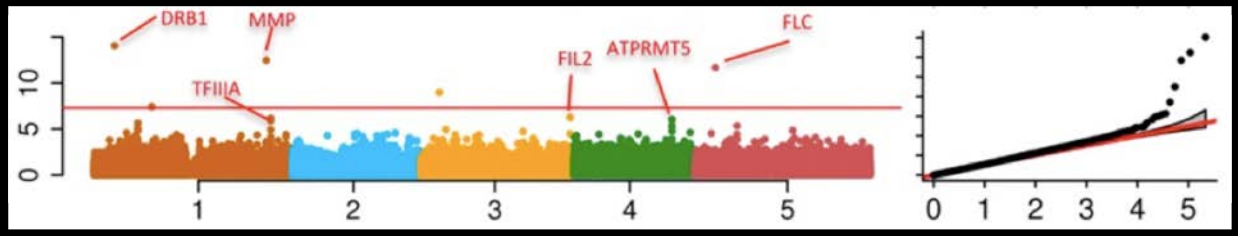
Research on GWAS and GS



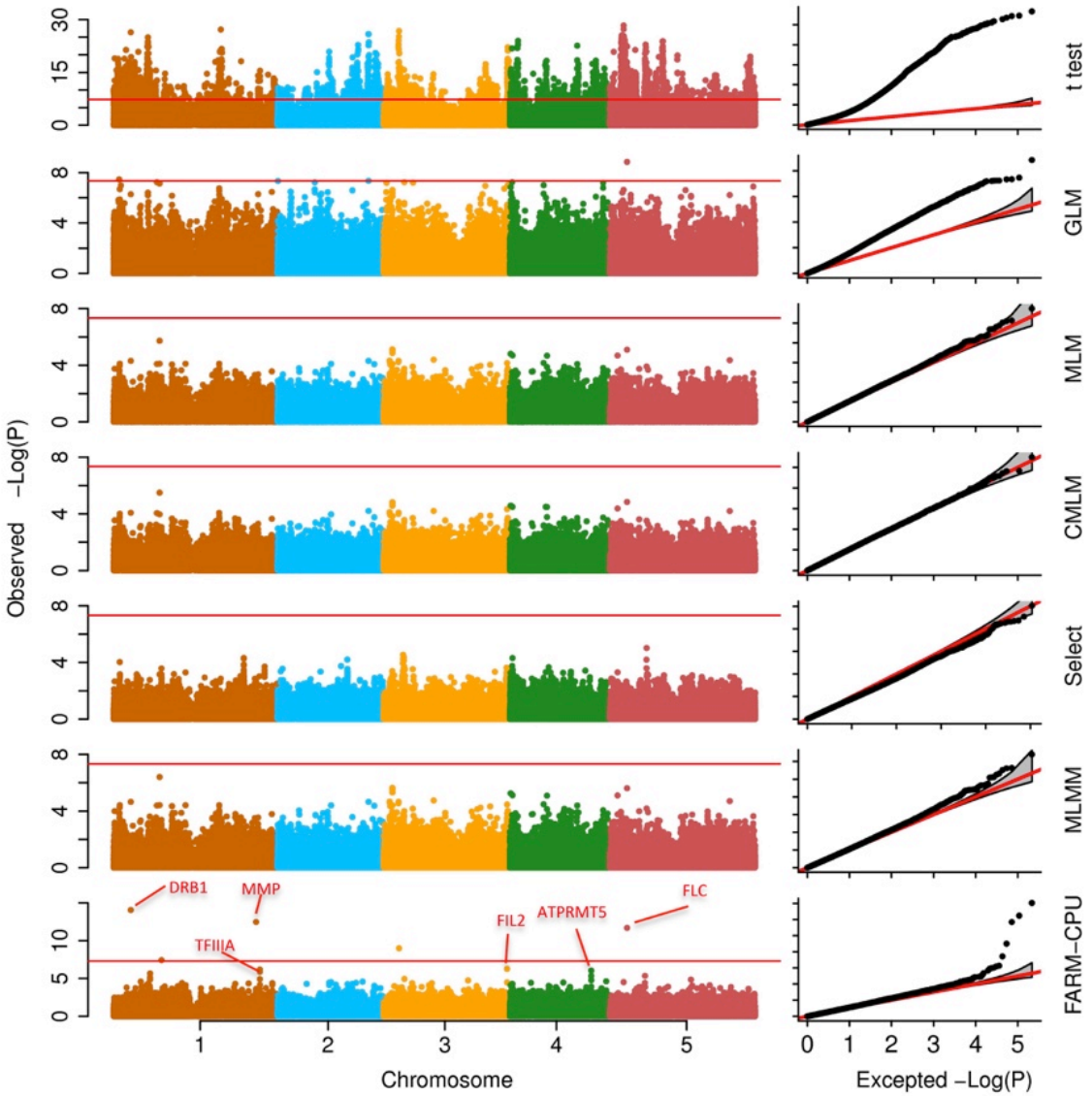
By May 31, 2013

Three Problems in GWAS

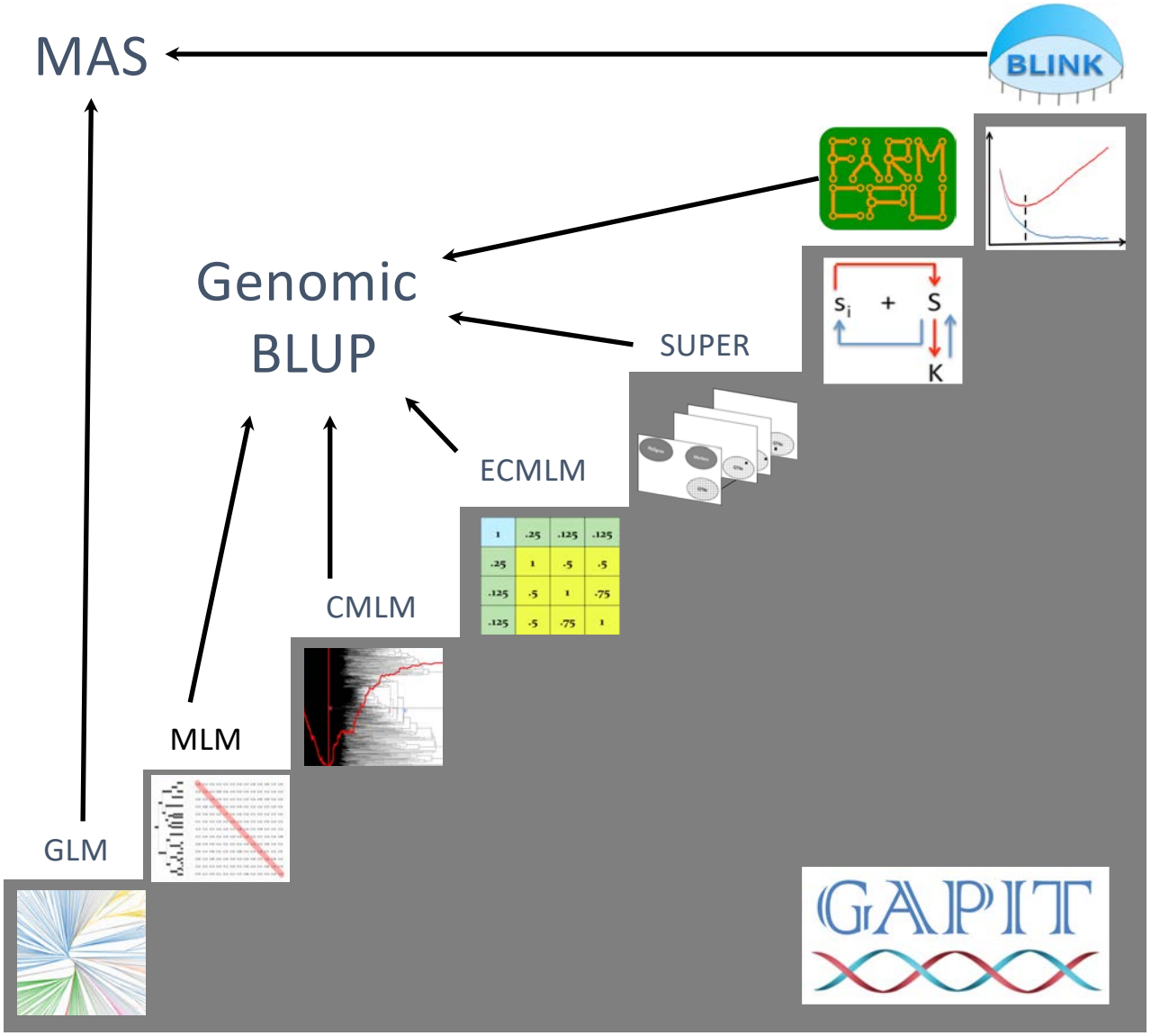
- Computing difficulties: millions of markers, individuals, and traits
- False positives, ex: “Amgen scientists tried to replicate 53 high-profile cancer research findings, but could only replicate 6”, Nature, 2012, 483: 531
- False negatives



Associations on flowering time

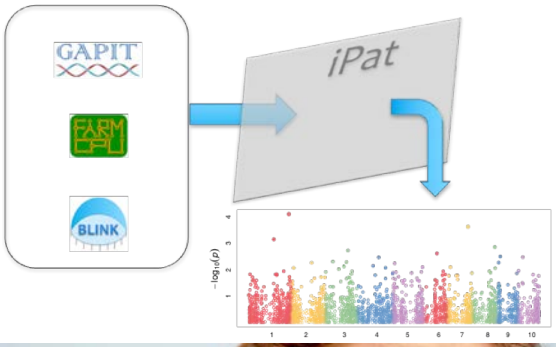


Liu et al, 2016, PloS Genetics


MAS
BLINK
FARM CPU
Genomic BLUP
SUPER
ECMLM
CMLM
MLM
GLM
GAPIT

Biologists challenged

Programming skills
Big data
Formatting
Modeling
…



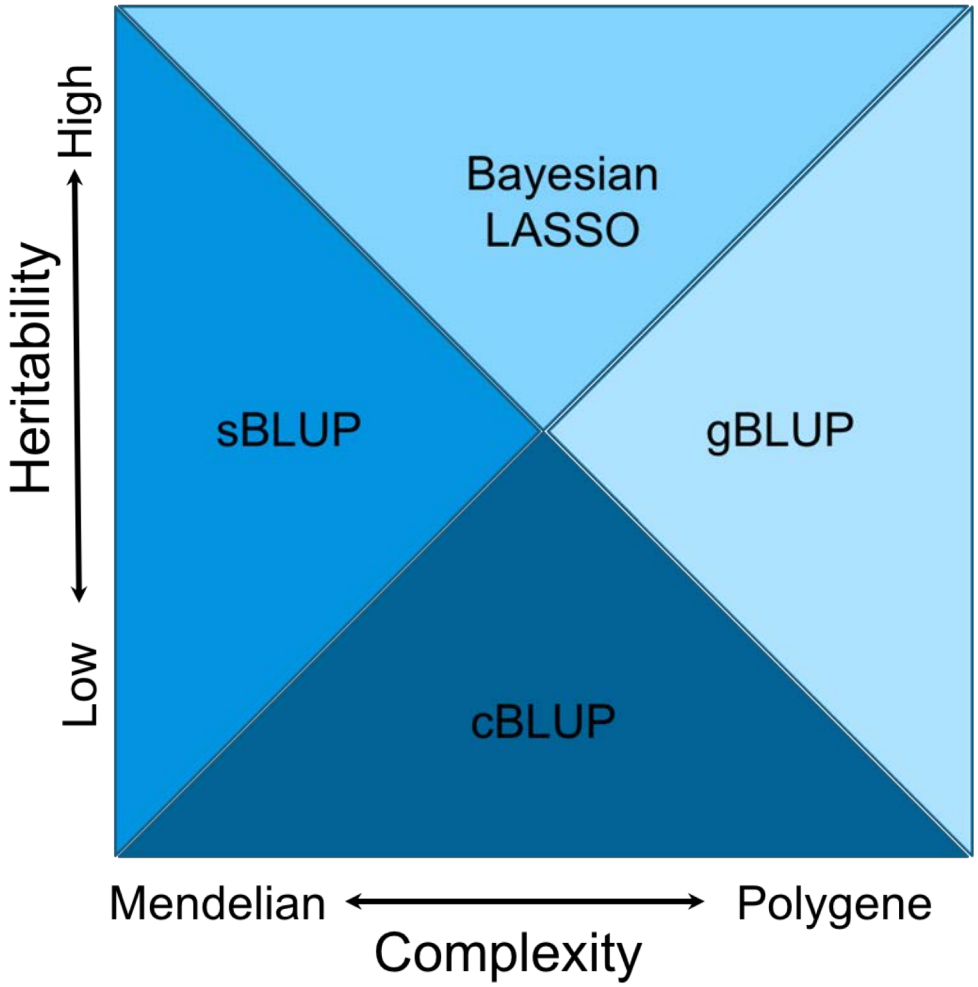
iPat

iPat makes it easier for biologists to analyze data and stay focused on biology

EASY WAY TO GWAS AND GS

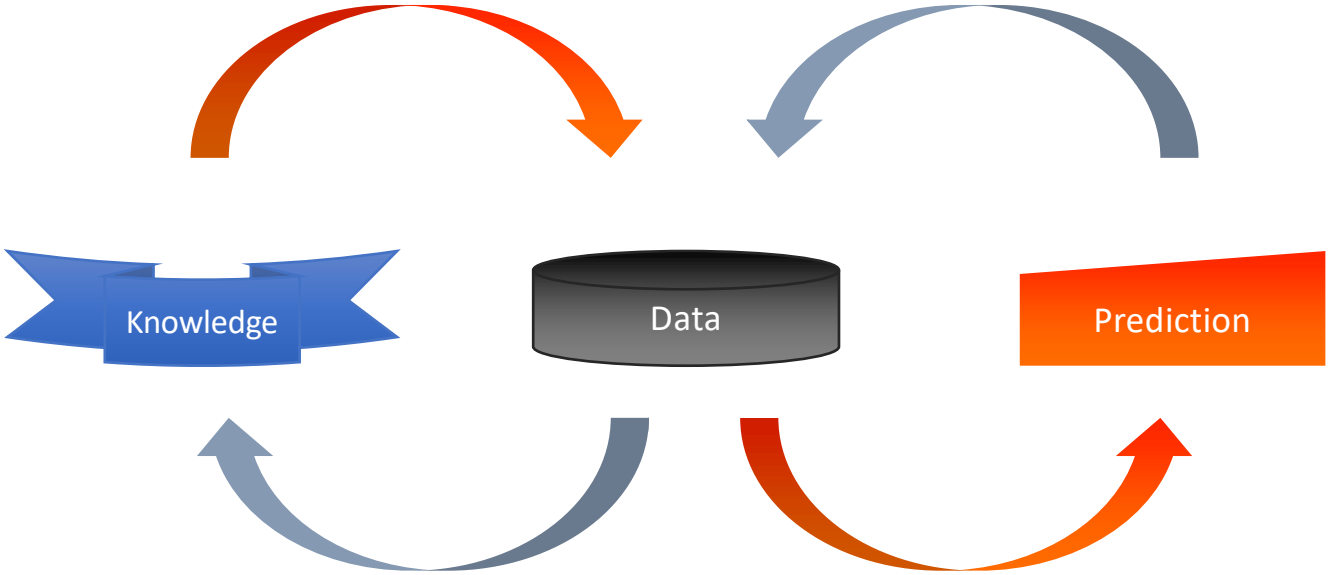

iPat
Right Click to Create a New Project

Best Genomic Selection Method depends on traits



Wang et al, 2019, Heredity

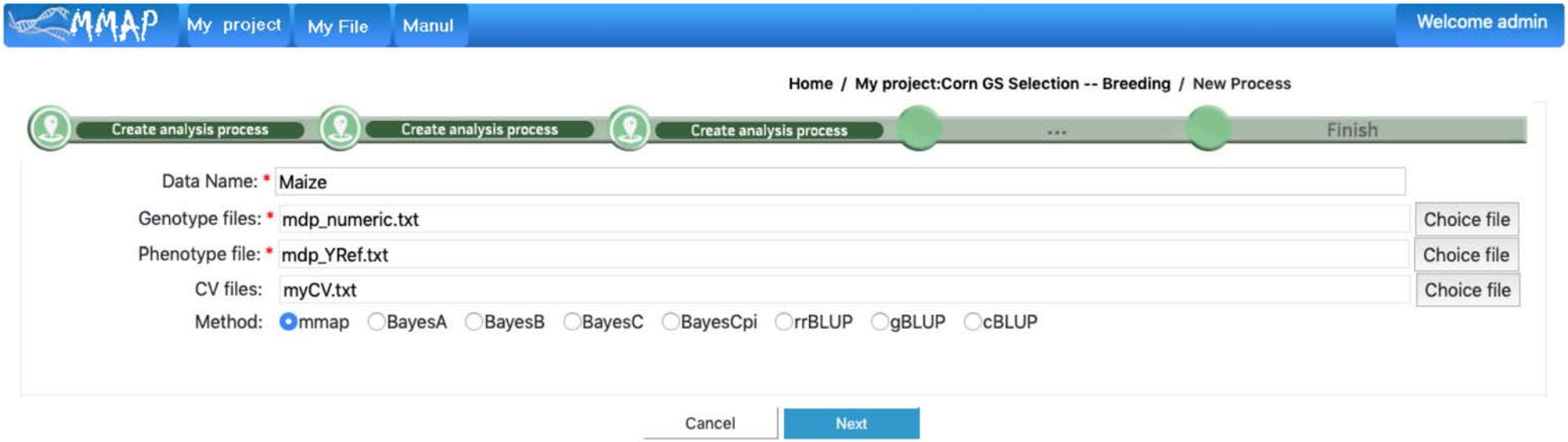
Automatic detection of the best method



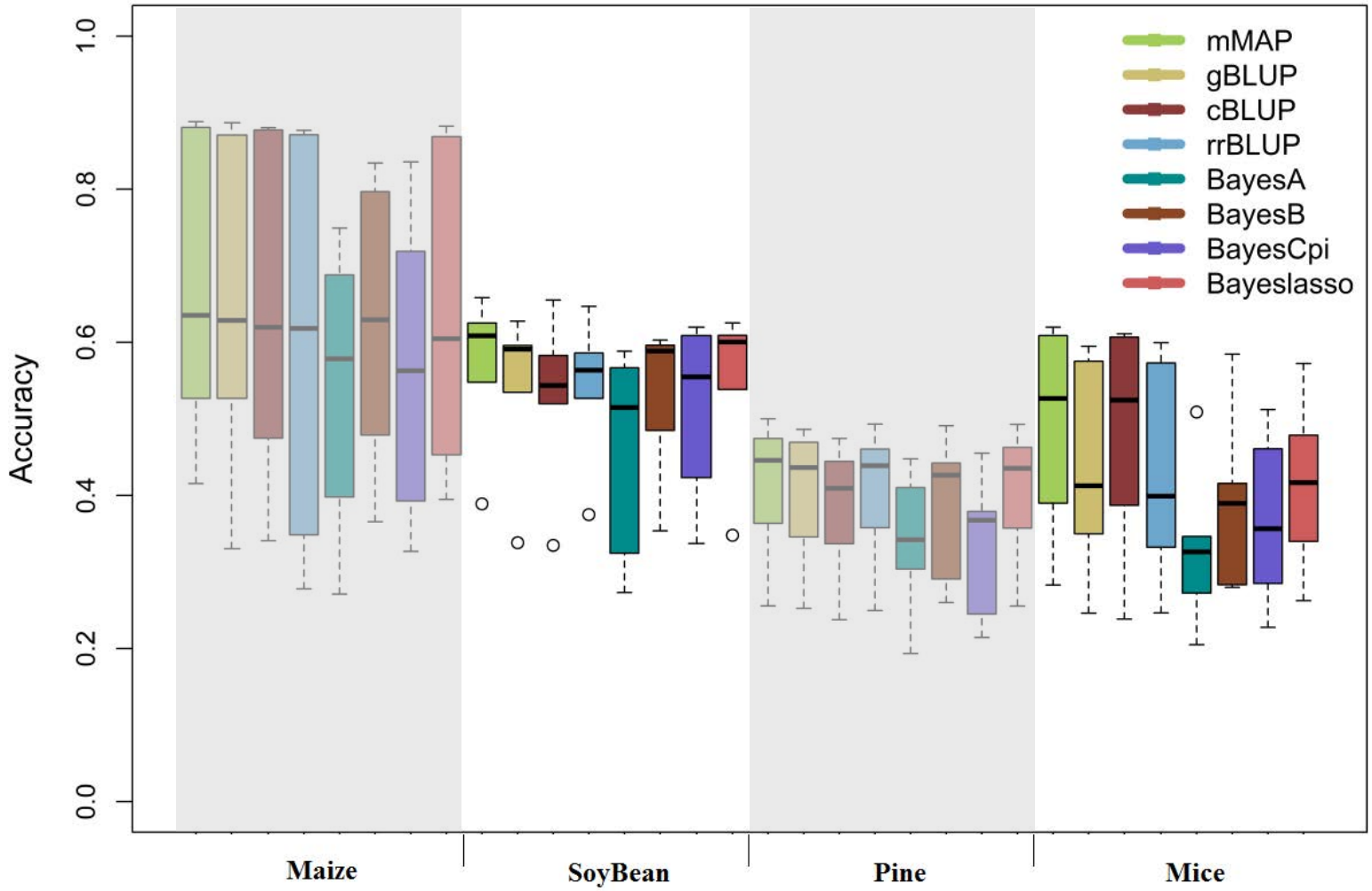
mMap: An Online Computing Platform to Transform Genotypes to Phenotypes by Mining the Maximum Accuracy of Prediction

You Tang

mMAP website: http://zzlab.net/MMAP



MMAP gives the highest average accuracy



Unpublished data

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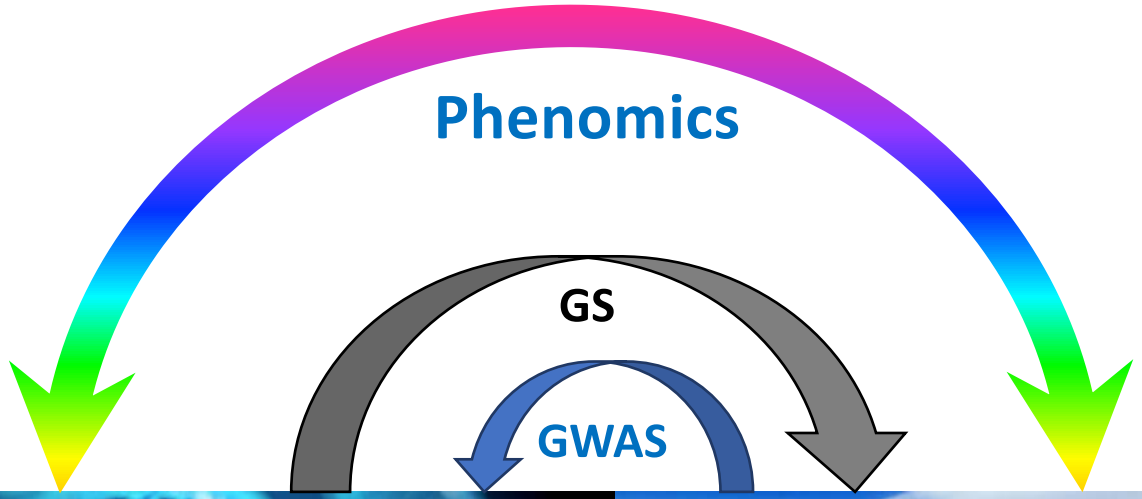
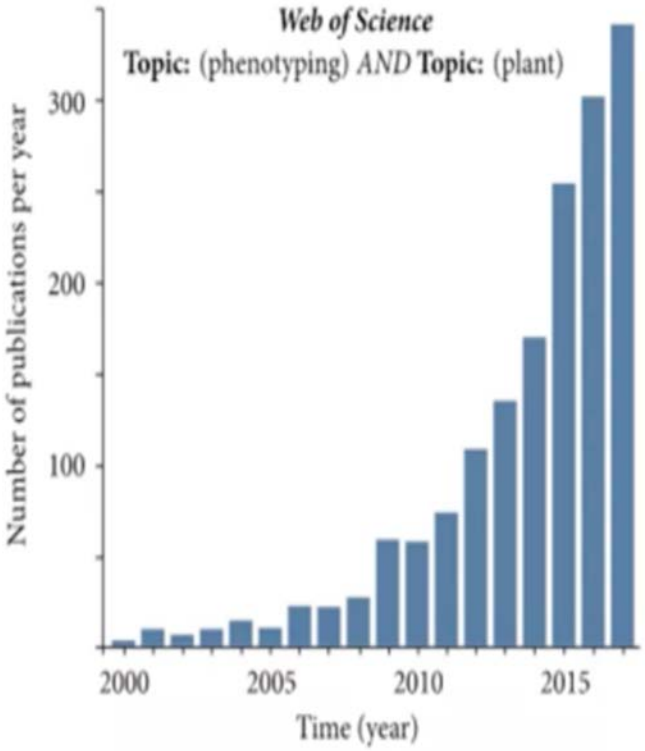
Big Picture





利用Web of Science检索的植物表型论文发表情况

WSU INSIDER

FOOD & AGRICULTURE
RESEARCH

Scientists solving inbreeding barrier to more sustainable, nutritious hay

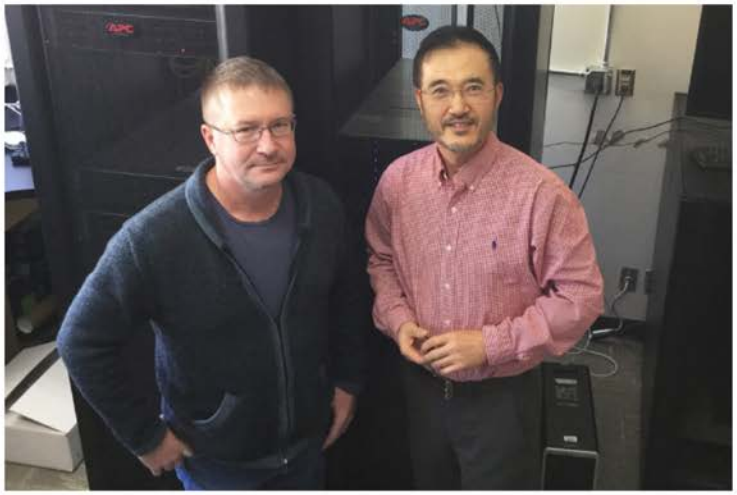
December 21, 2018

https://news.wsu.edu/2018/12/21/scientists-solving-inbreeding-barrier-sustainable-nutritious-hay

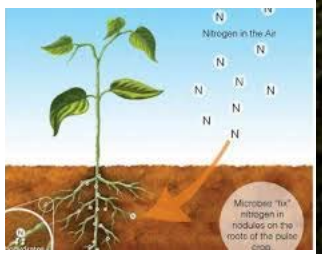
By Seth Truscott, College of Agricultural, Human, and Natural Resource Sciences

Helping provide a more valuable and sustainable hay crop for farmers and dairy producers, geneticists at Washington State University this fall launched a high-tech search for genetic keys unlocking improvements to alfalfa fertility.

Zhiwu Zhang, the Washington Grain Commission Distinguished Professor for Statistical Genomics in WSU's Department of Crop and Soil Sciences, leads the $250,000 research project, funded by the U.S. Department of Agriculture's National Institute for Food and Agriculture, aimed at solving a breeding bottleneck to better alfalfa.



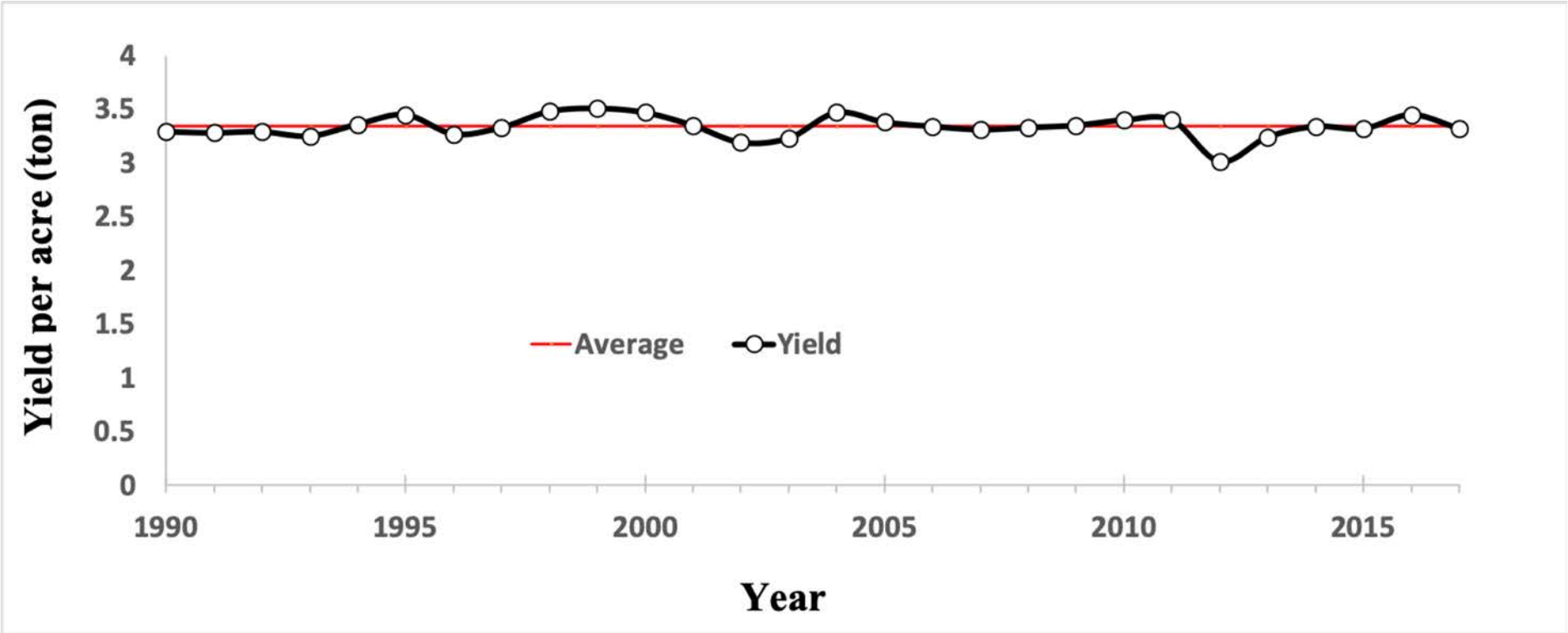
Using powerful computers and genome sequencers in their Washington State University lab, scientists Deven See and Zhiwu Zhang are part of a national team solving genetic hurdles to better alfalfa (Photo by Seth Truscott, WSU).



Alfalfa

- ✓The most widely cultivated forage legume (30M hectares)
- ✓US is the largest producer (1/3)
- ✓The most healthy feed for ruminant (cow and sheep)
- ✓Atmospheric nitrogen fixation
- ✓Deep root (up to 50 feet)
- ✓Habitat to many birds

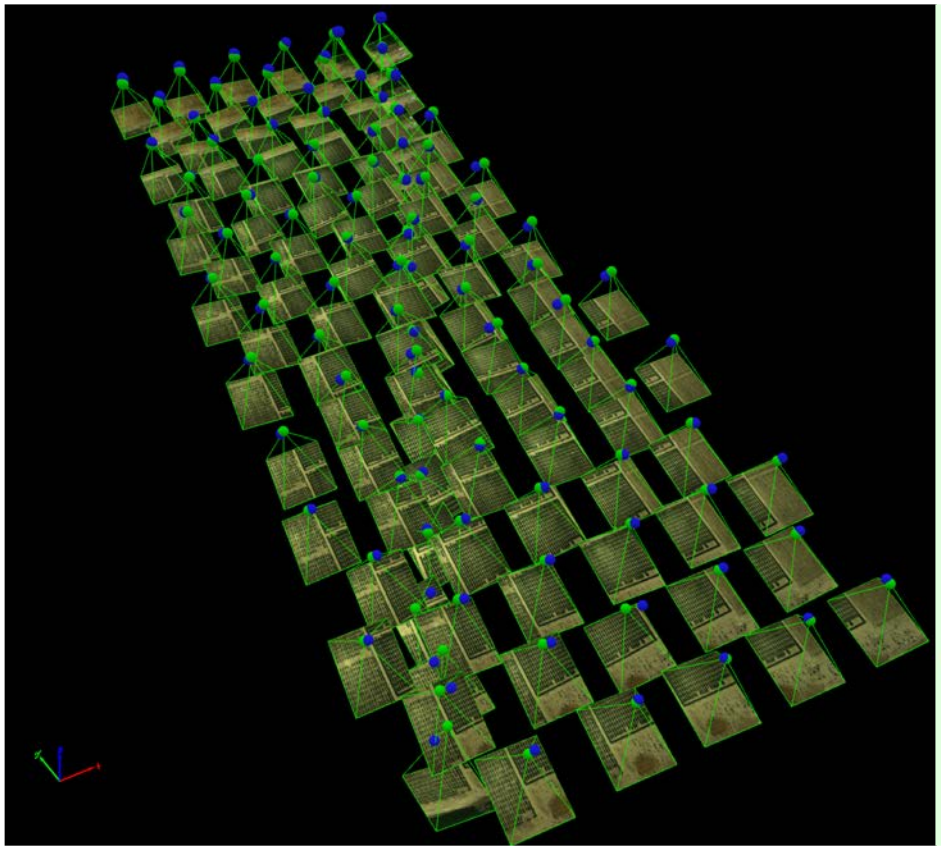
No yield improvement over last 30 years

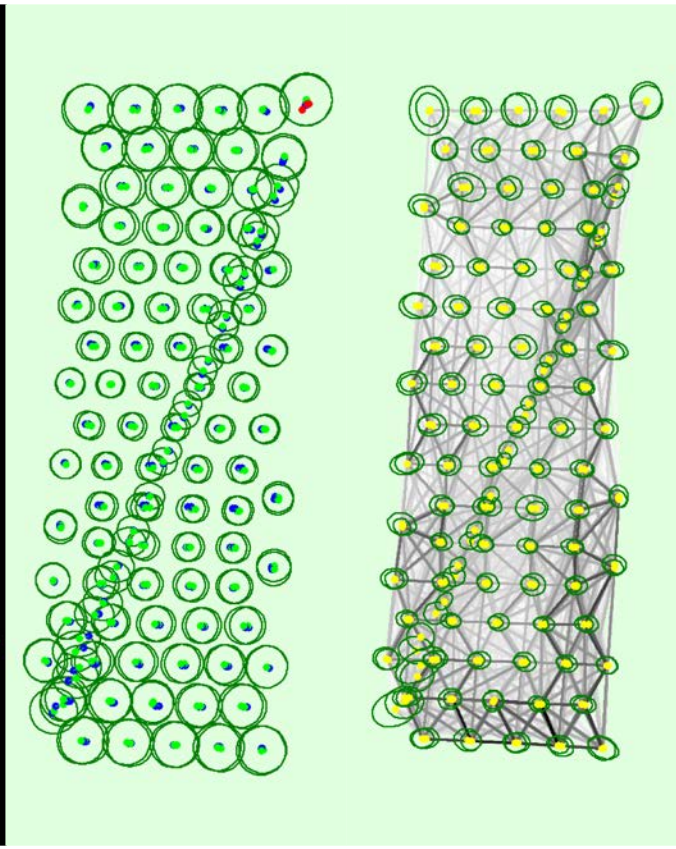


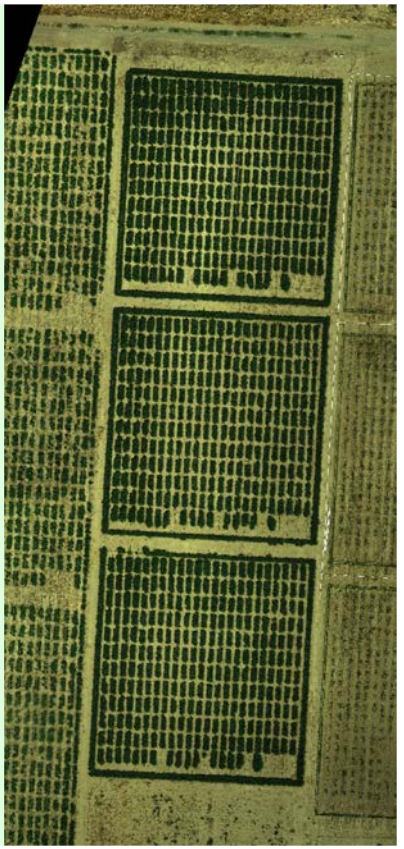
Phenotyping yield is labor and time expensive

High-Throughput Phenotyping Biomass in Alfalfa Experimental Fields

Orthomosaic image using PIX4D

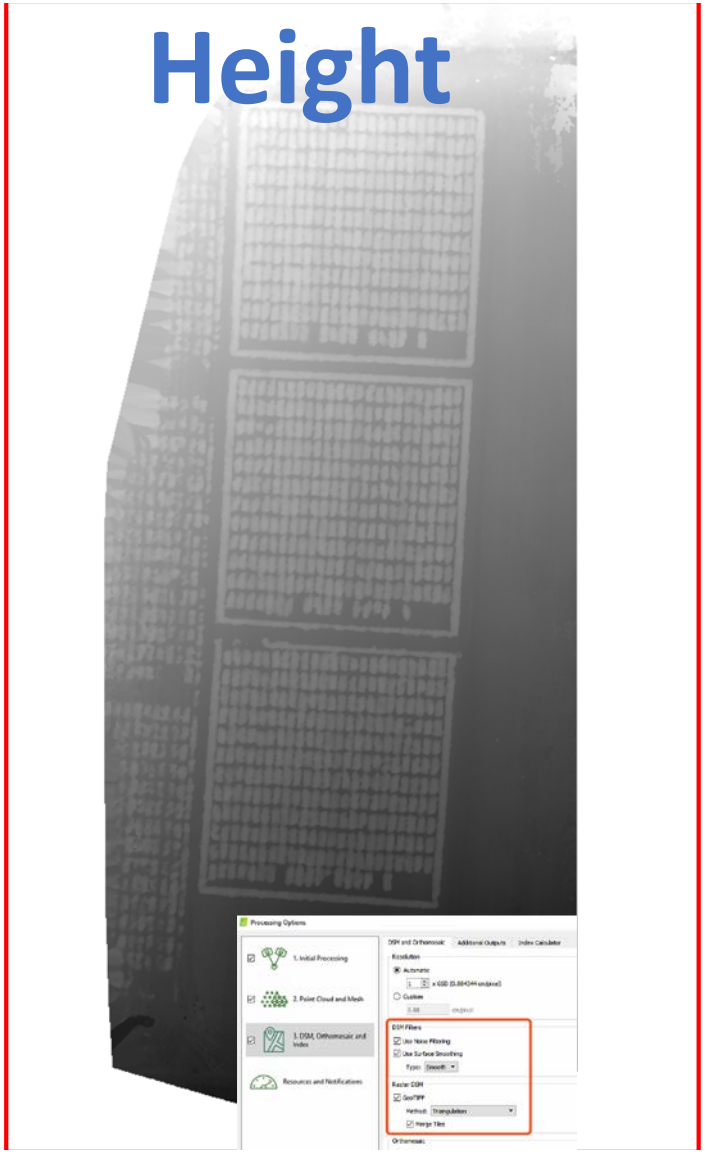


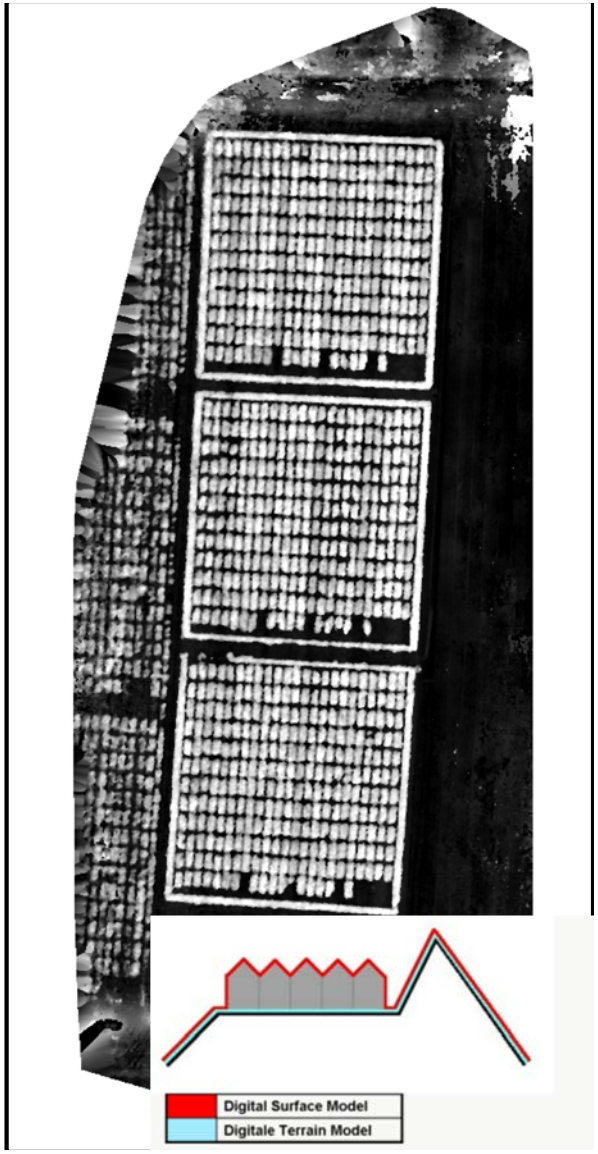




Original images → Layout → Matching → Orthomosaic

Height

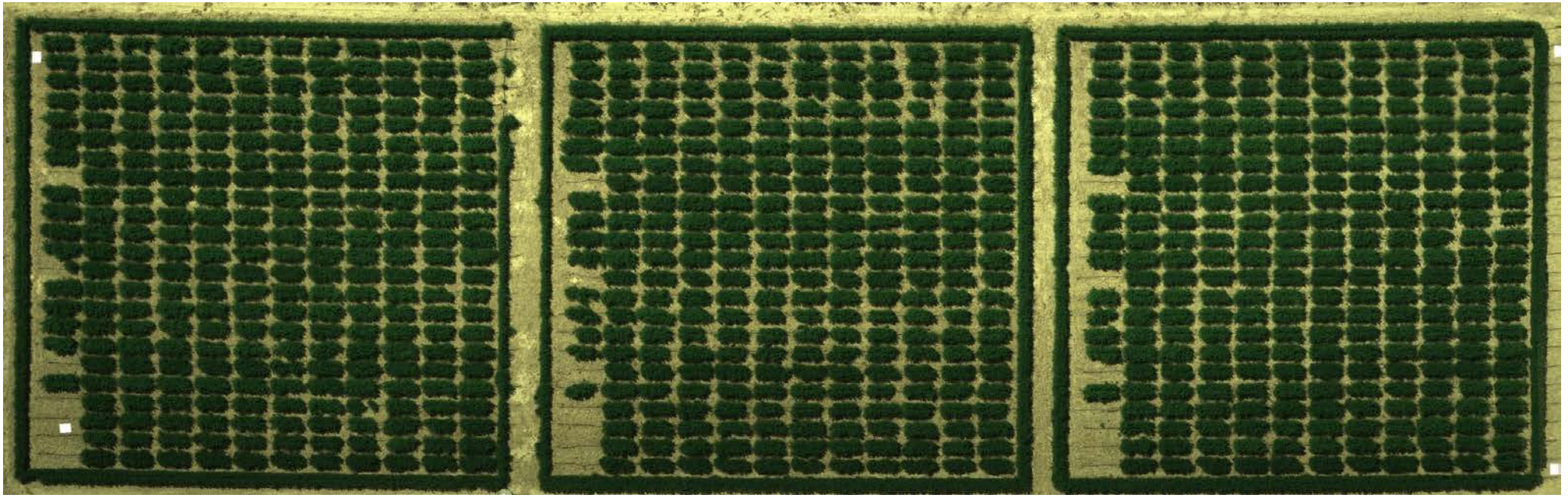




Drone images (RGB)

(May 5, 2019)

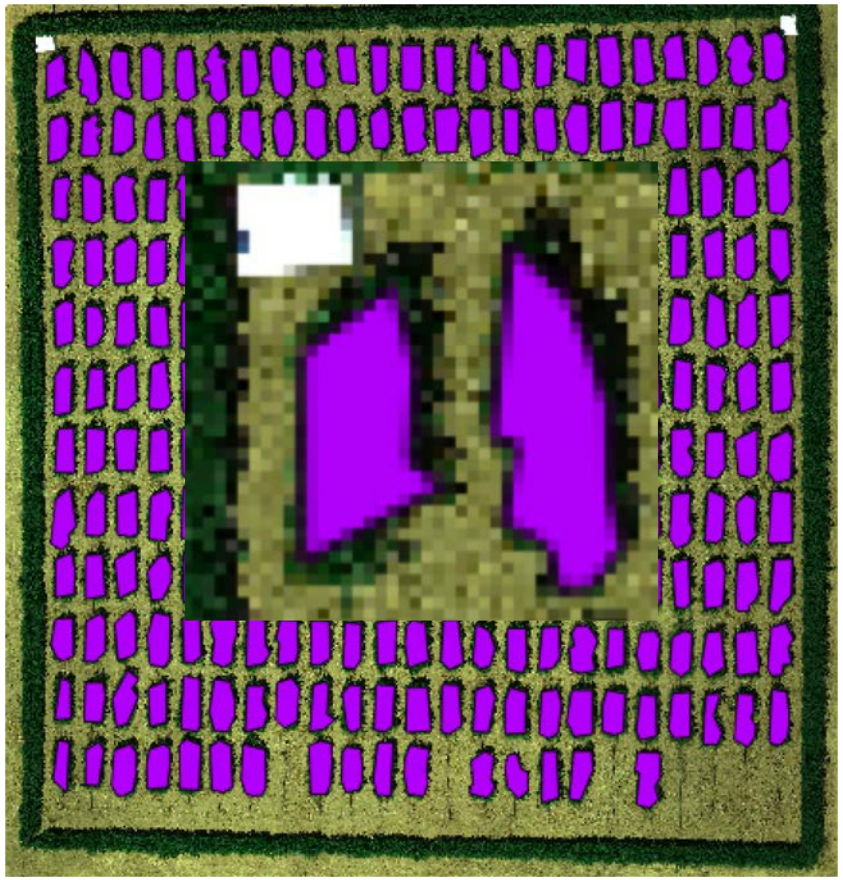
Replicate 3 Replicate 2 Replicate 1



100 feet, ten minutes, ~400 images, joined by PIX4D

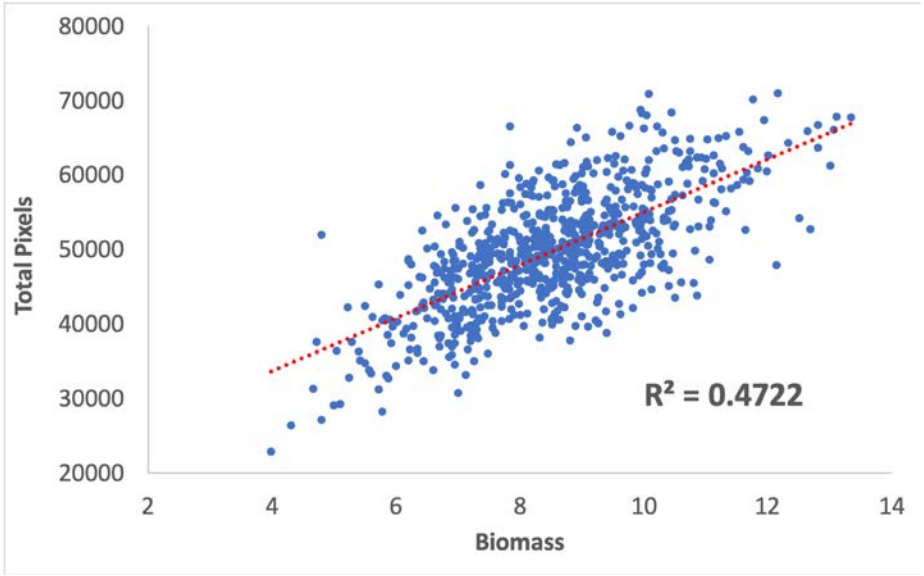
Manual Curation of shape file (QGIS)

Samuel
Revolinski



▲	count
1	48567
2	49278
3	46793
4	45305
5	53862
6	45842
7	46060
8	52505
9	57204
10	53092
11	50121
12	54065
13	36114
14	38371
15	41297
16	46786
17	43989

Canopy area explained 50% of biomass variation

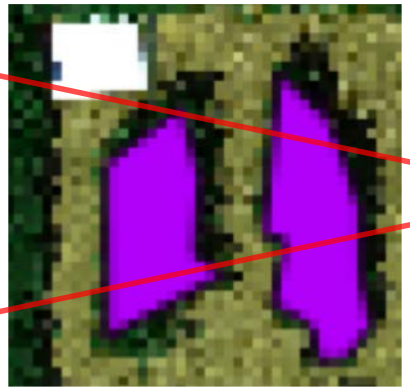


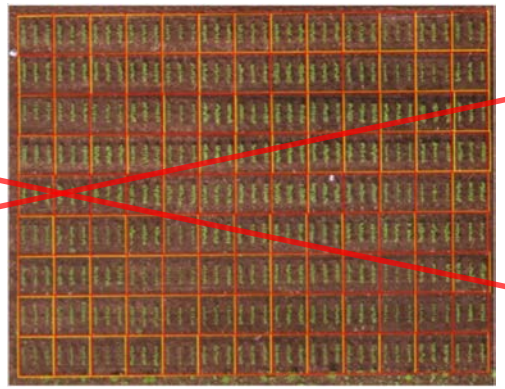
Unpublished data

Four Roadblocks for Using UAV Images

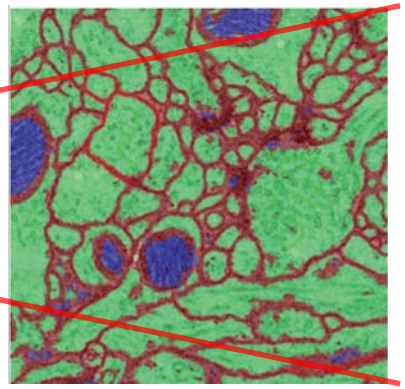
- Depend on ground devices for geographical information
- Manually draw polygons
- Manually draw lines
- Intensive training to extract pixels of interest

https://www.pix4d.com/blog/large-drone-map-yangtze

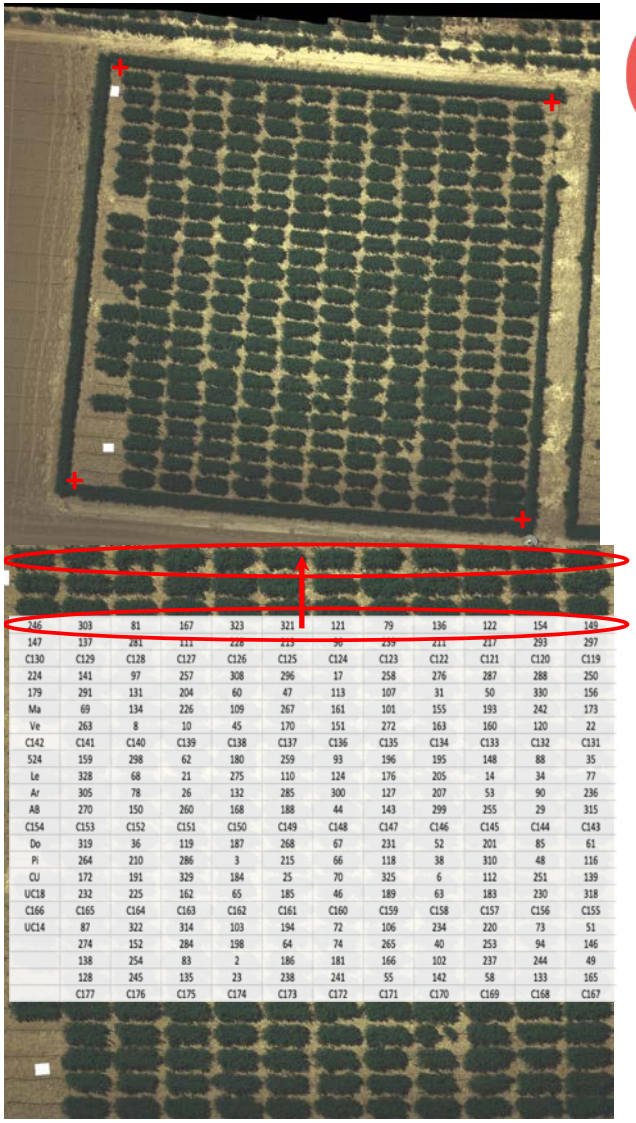




https://spj.sciencemag.org/plantphenomics/2019/2591849/

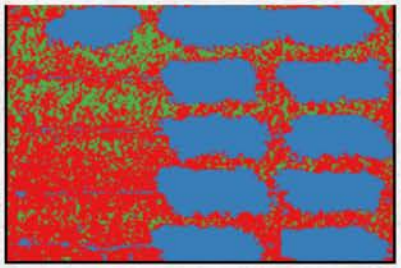


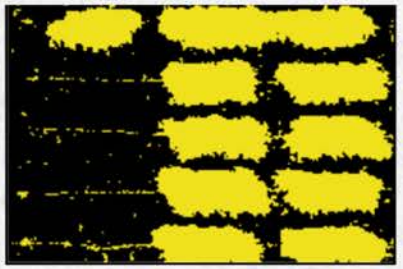
https://academic.oup.com/view-large/figure/118774504/btx180f1.tif

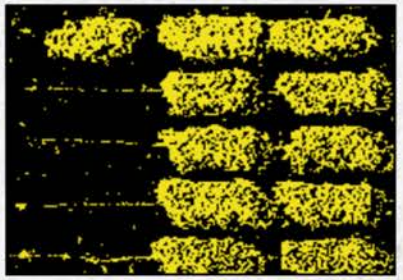


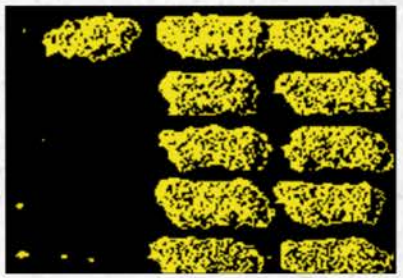
GRID

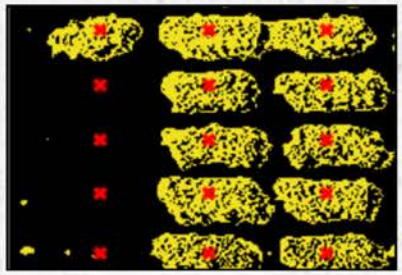
var	row	col	area_all	area_veg	ch_0	ch_1	ch_2	NDVI	CNDVI	RVI
246	0	0	7080	4879	62.02	68.40	60.84	0.05	0.03	1.11
303	0	1	7254	5078	63.59	71.31	62.29	0.06	0.04	1.13
81	0	2	7198	4535	63.95	71.63	62.67	0.06	0.04	1.13
167	0	3	7316	5457	64.00	72.76	63.09	0.07	0.04	1.14
323	0	4	6710	5011	63.62	71.98	62.72	0.06	0.04	1.14
321	0	5	6780	4521	64.98	73.68	63.85	0.07	0.04	1.14
121	0	6	6600	4381	64.51	73.65	63.53	0.07	0.04	1.15
79	0	7	6667	4442	63.73	72.96	63.10	0.07	0.05	1.15
136	0	8	7015	5109	63.87	72.55	62.87	0.07	0.04	1.14
122	0	9	7139	5349	62.76	71.82	62.30	0.07	0.05	1.15
154	0	10	6195	4512	61.77	69.70	61.37	0.06	0.04	1.13
149	0	11	7056	4491	62.50	71.24	62.06	0.07	0.04	1.15

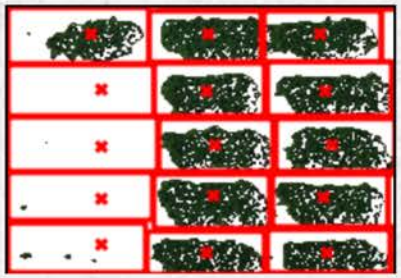












Easy Way to Extract Info. from **Aerial Images**

James Chen

DISCOVER MORE

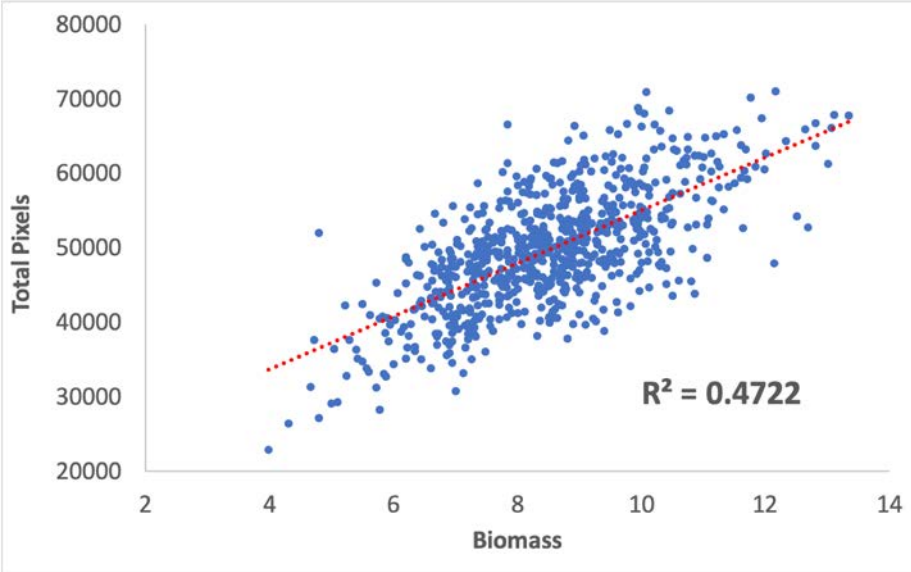
GRID

https://doi.org/10.3390/rs12111697

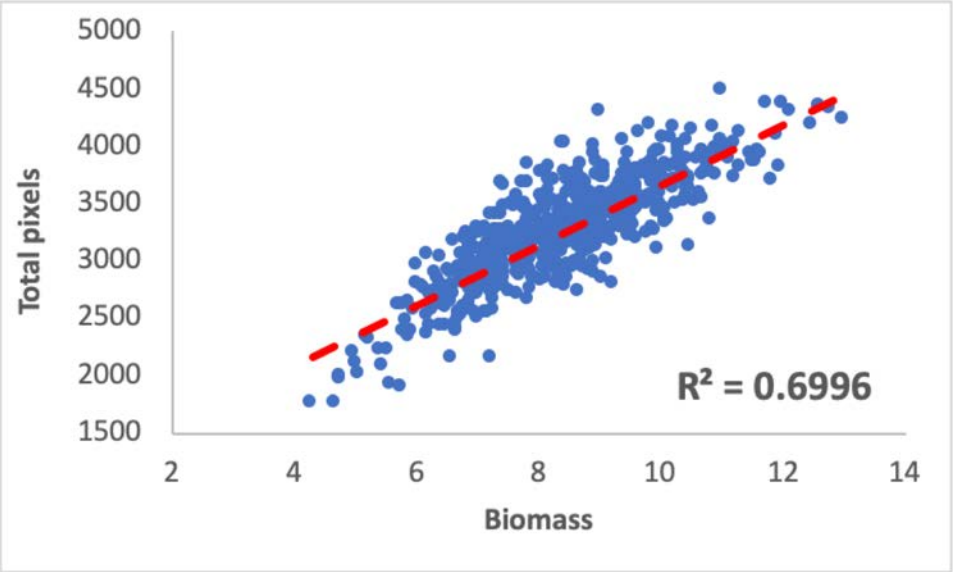
var	row	col	ch_0	ch_1	ch_2	area_veg	NDVI
ID_01	0	0	25.803	87.813	41.814	10144	0.551
ID_02	0	1	25.397	91.118	41.580	7018	0.569
ID_03	1	1	22.636	89.053	39.887	7090	0.598
ID_04	2	1	26.187	89.989	40.921	6465	0.555
ID_05	3	1	24.617	87.876	41.833	9786	0.567
ID_06	4	1	23.870	84.696	40.129	4979	0.568
ID_07	0	2	27.664	87.648	42.068	12526	0.525
ID_08	1	2	21.540	91.220	38.632	14689	0.625
ID_09	2	2	24.423	83.188	40.538	11962	0.552

Canopy area explained 70% of biomass variation

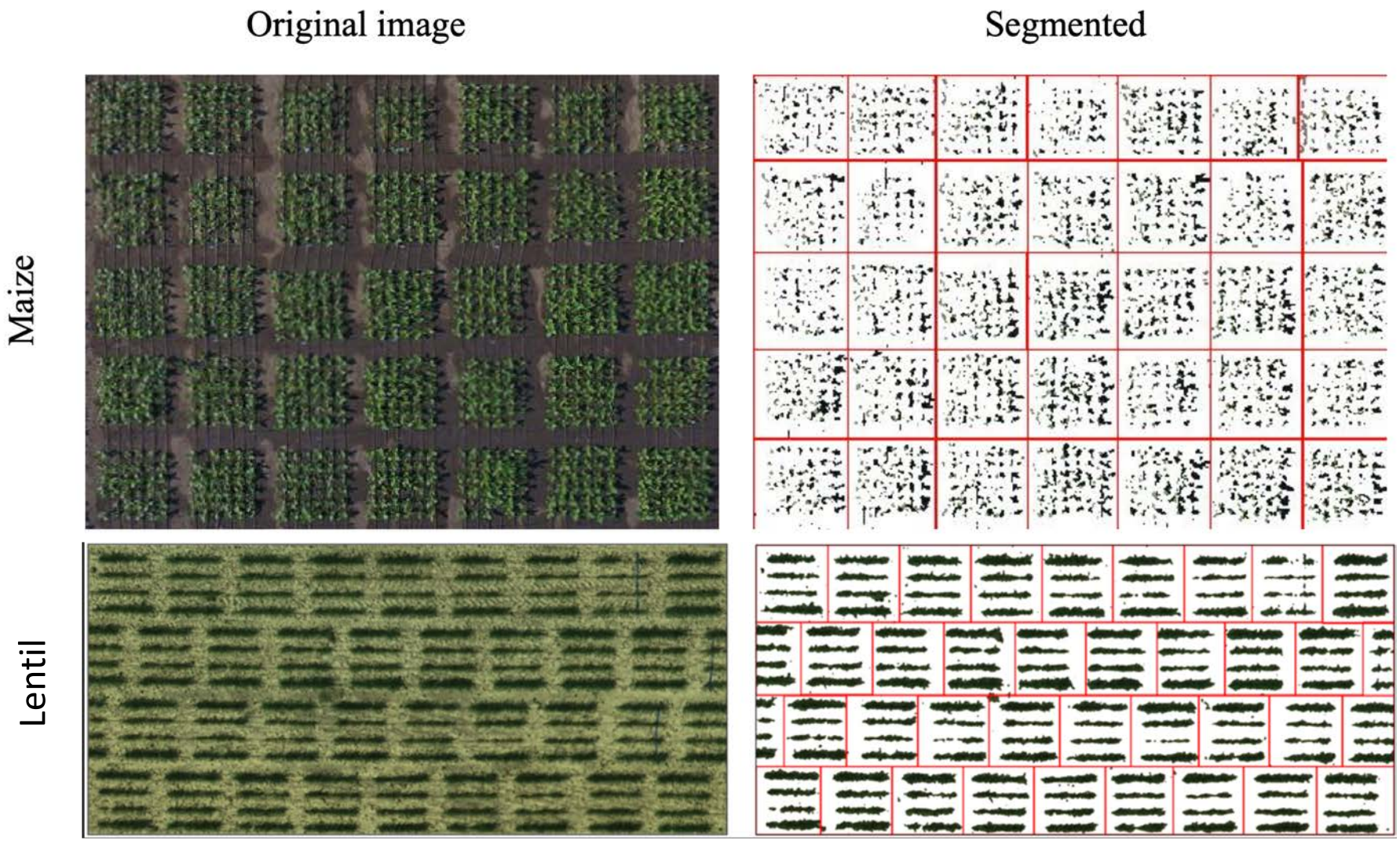
Manual

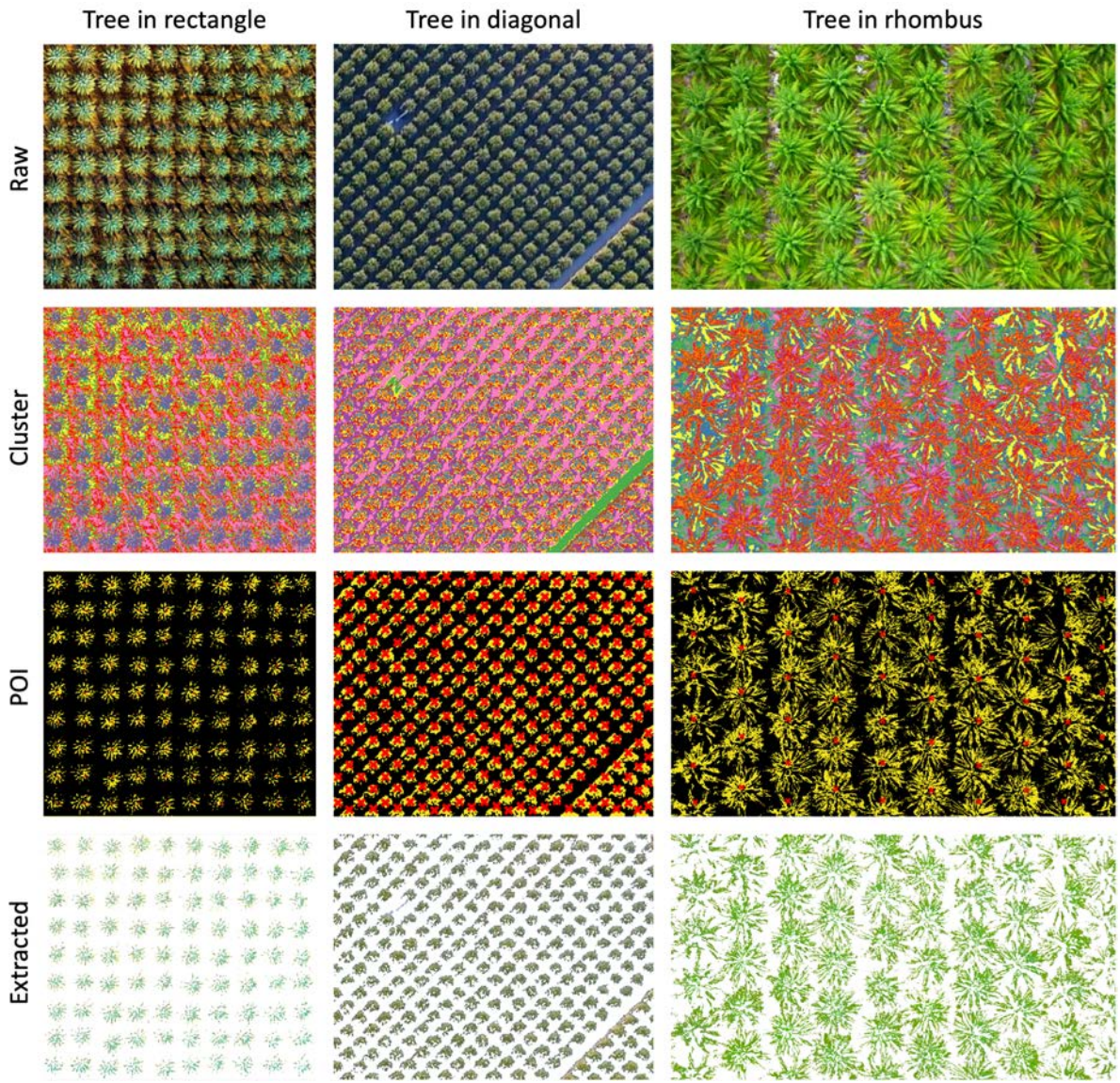


Automatic

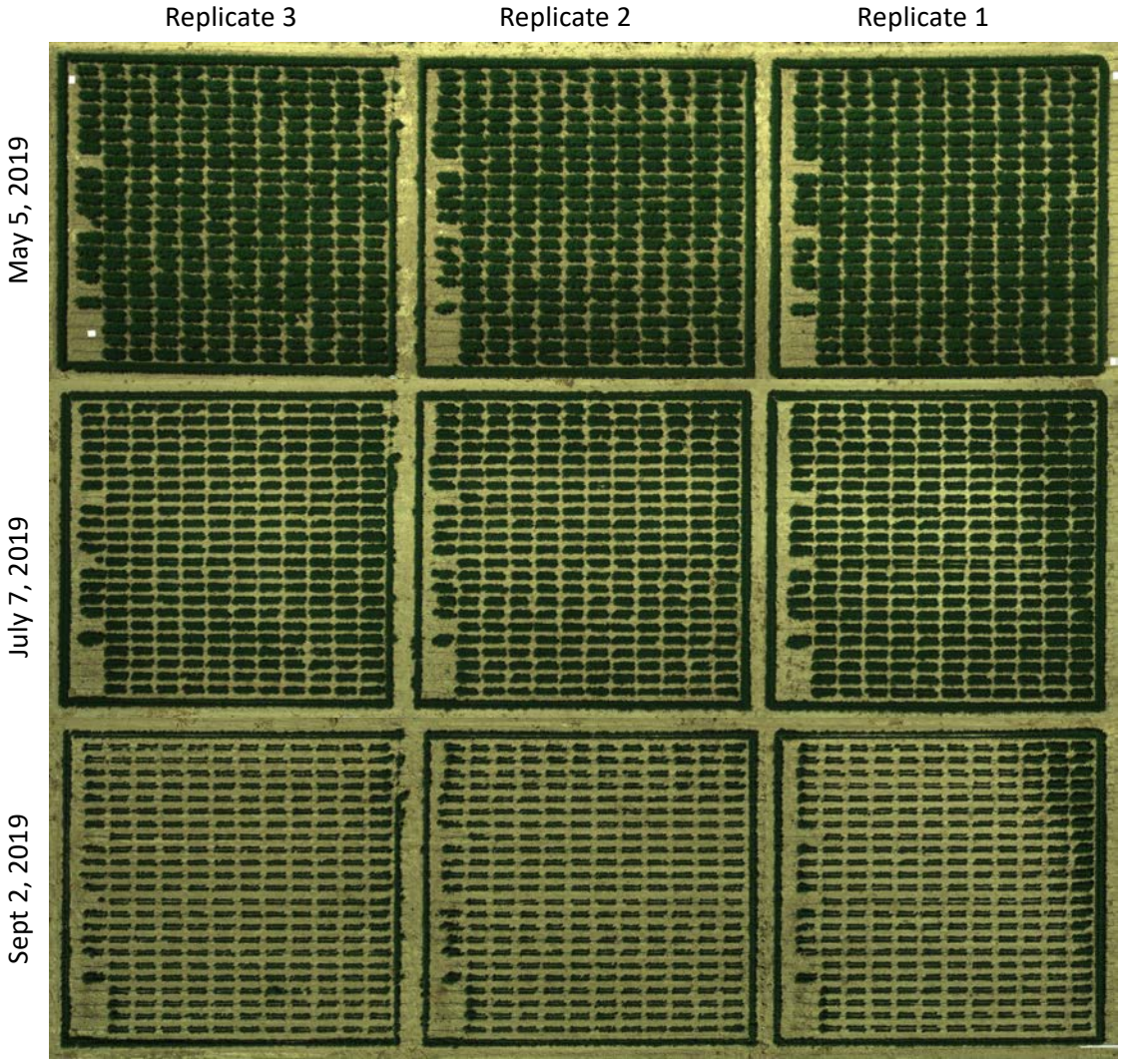


Unpublished data


Original image
Segmented
Maize
Lentil

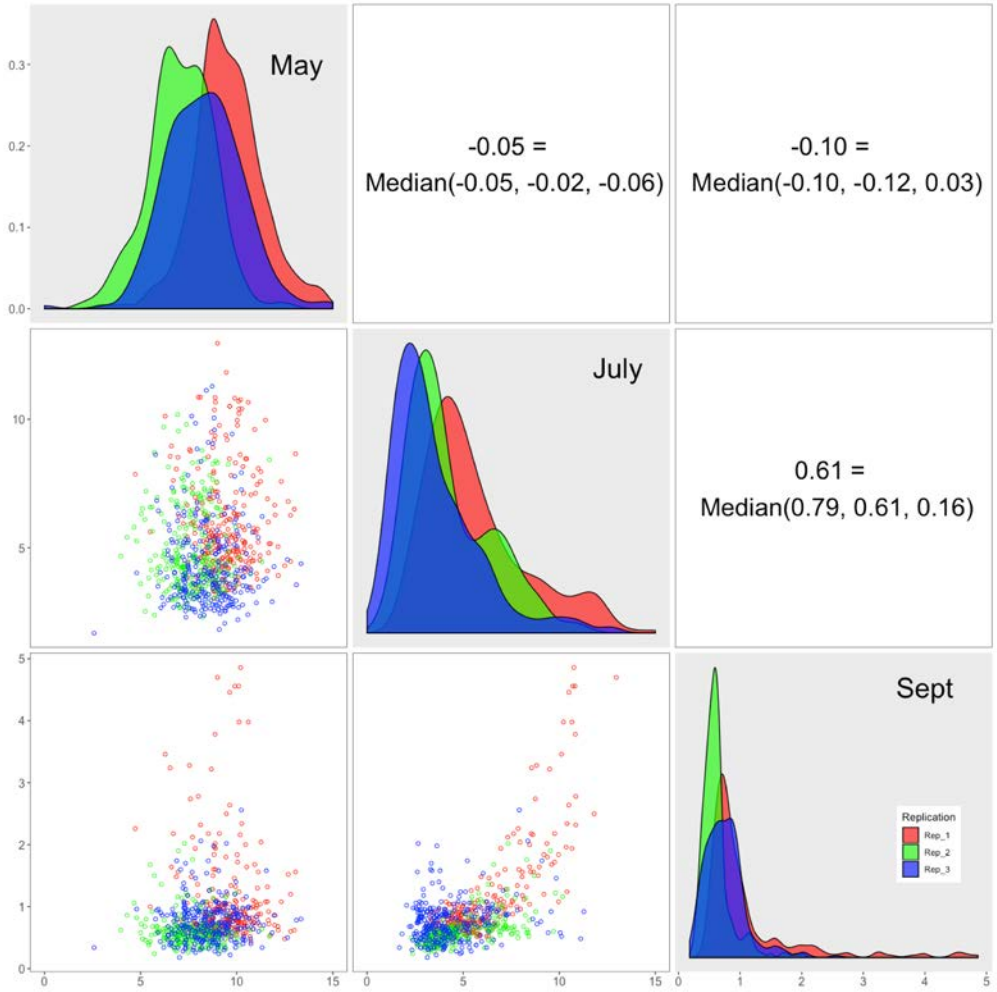

Tree in rectangle
Tree in diagonal
Tree in rhombus
Raw
Cluster
POI
Extracted

Zhou Tang



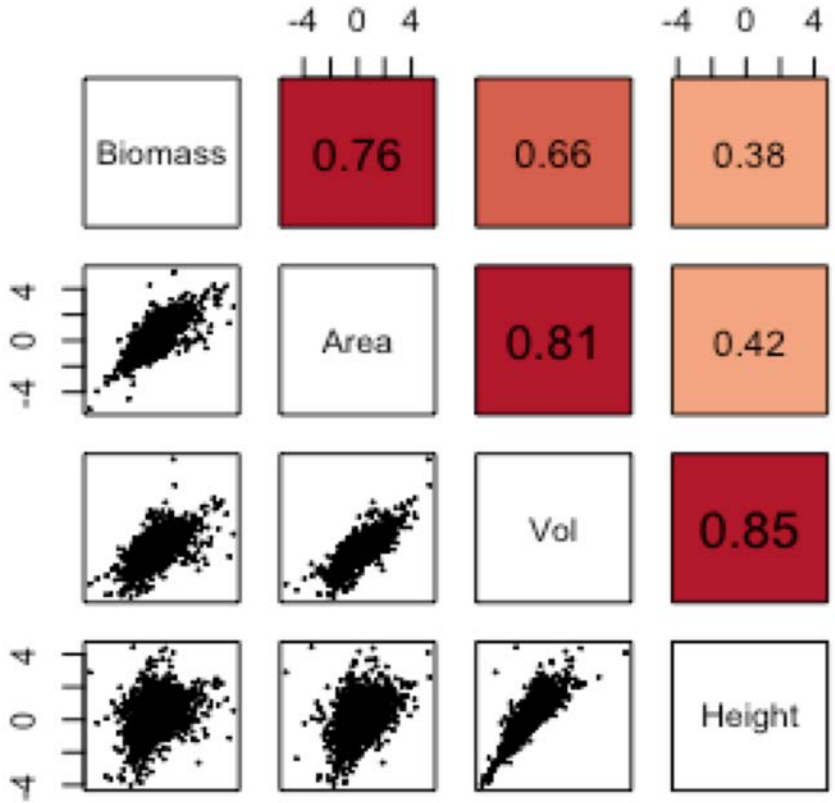
Unpublished data

Weak correlation of biomass across months



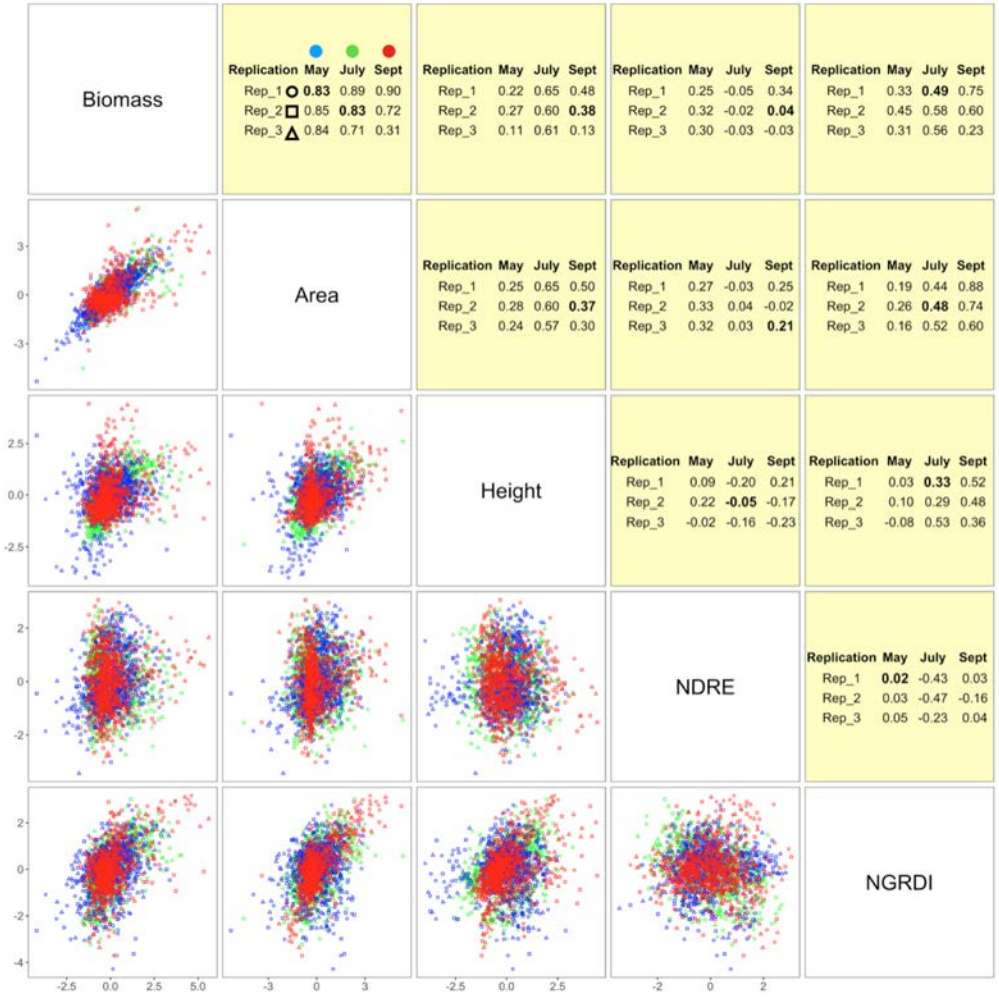
Unpublished data

Biomass is more correlated with area than volume



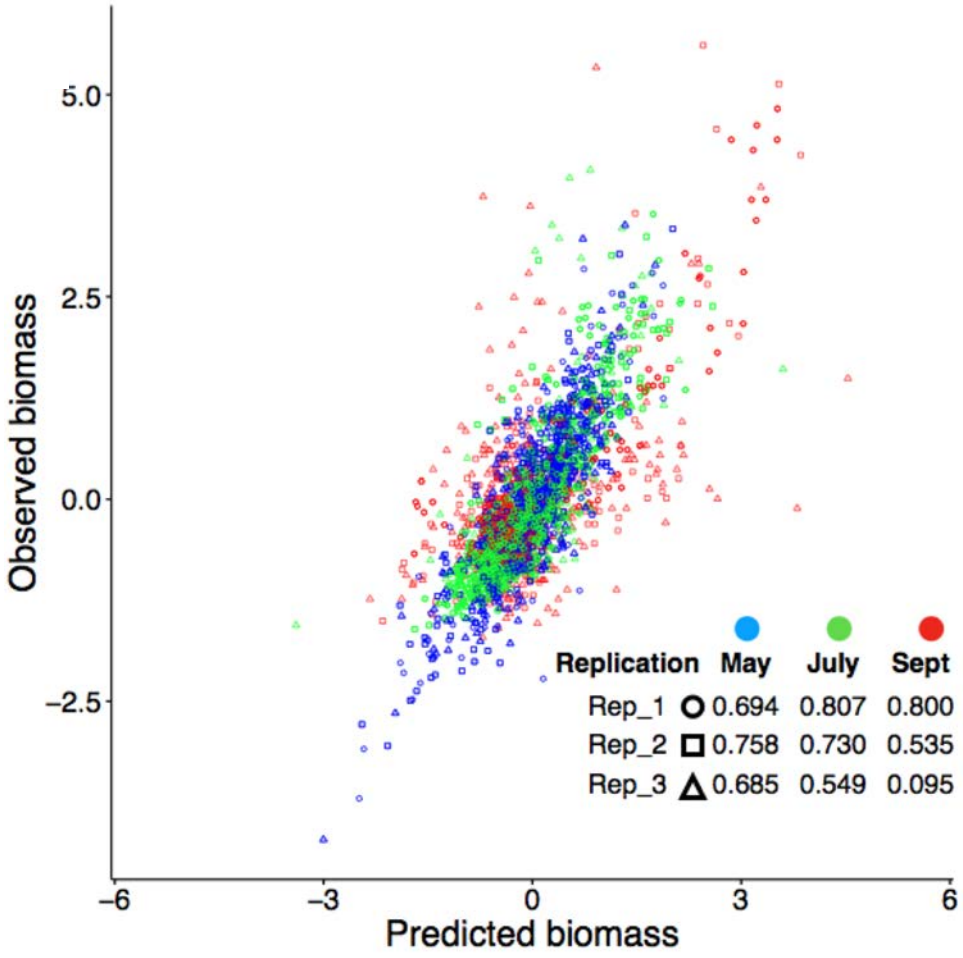
Unpublished data

Correlations among biomass and indices



Unpublished data

Predicting one month using other two months



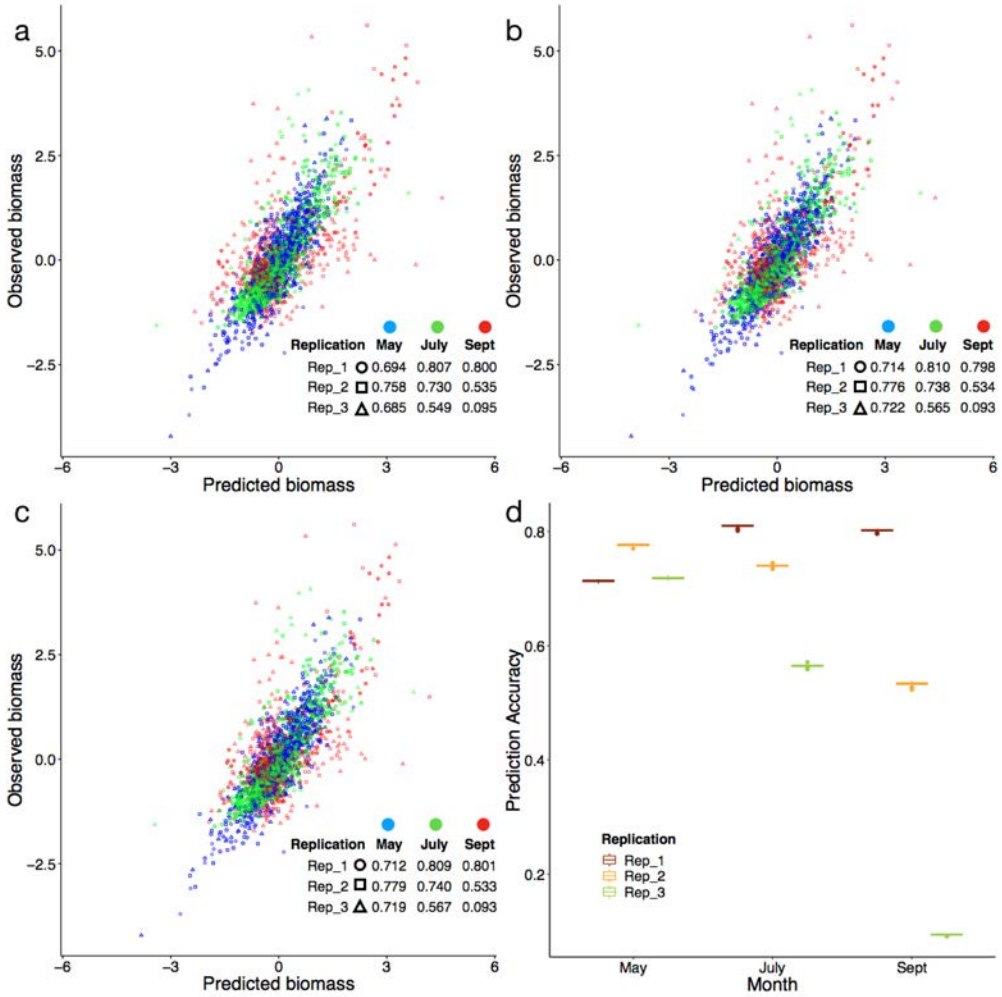
Unpublished data

Prediction accuracy

2M>1M

2Rep>1Rep

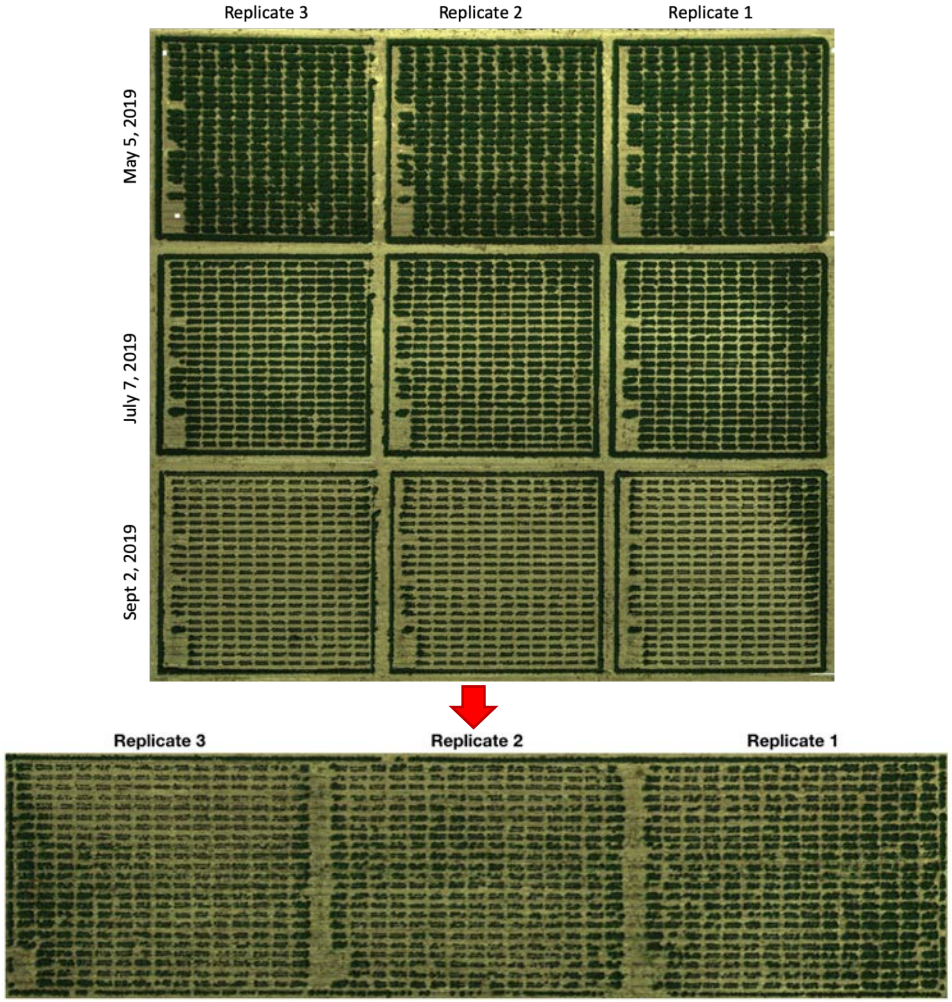
2Folds>1Fold

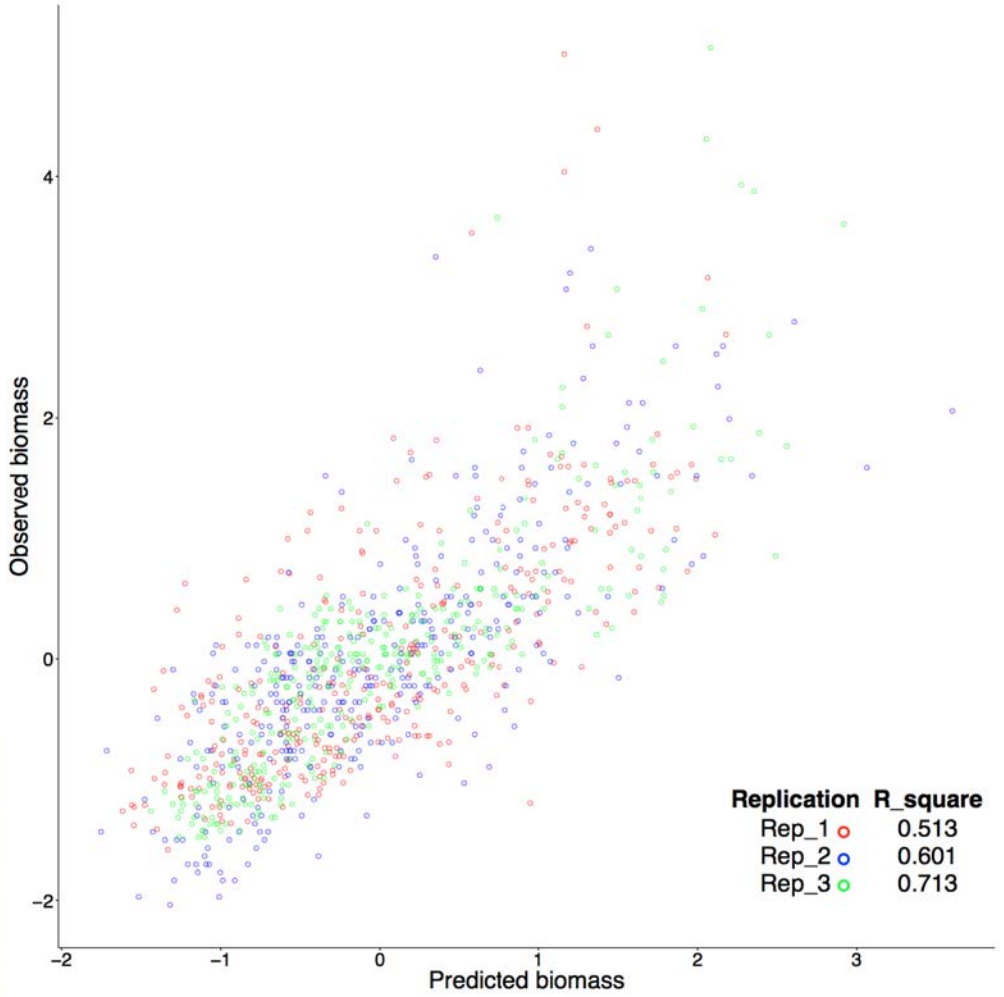


Unpublished data

Independent validation

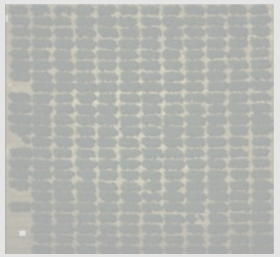
Unpublished data





Outline

- Zhiwu Zhang Laboratory
- UAV Image analyses
- **Beyond UAV images**



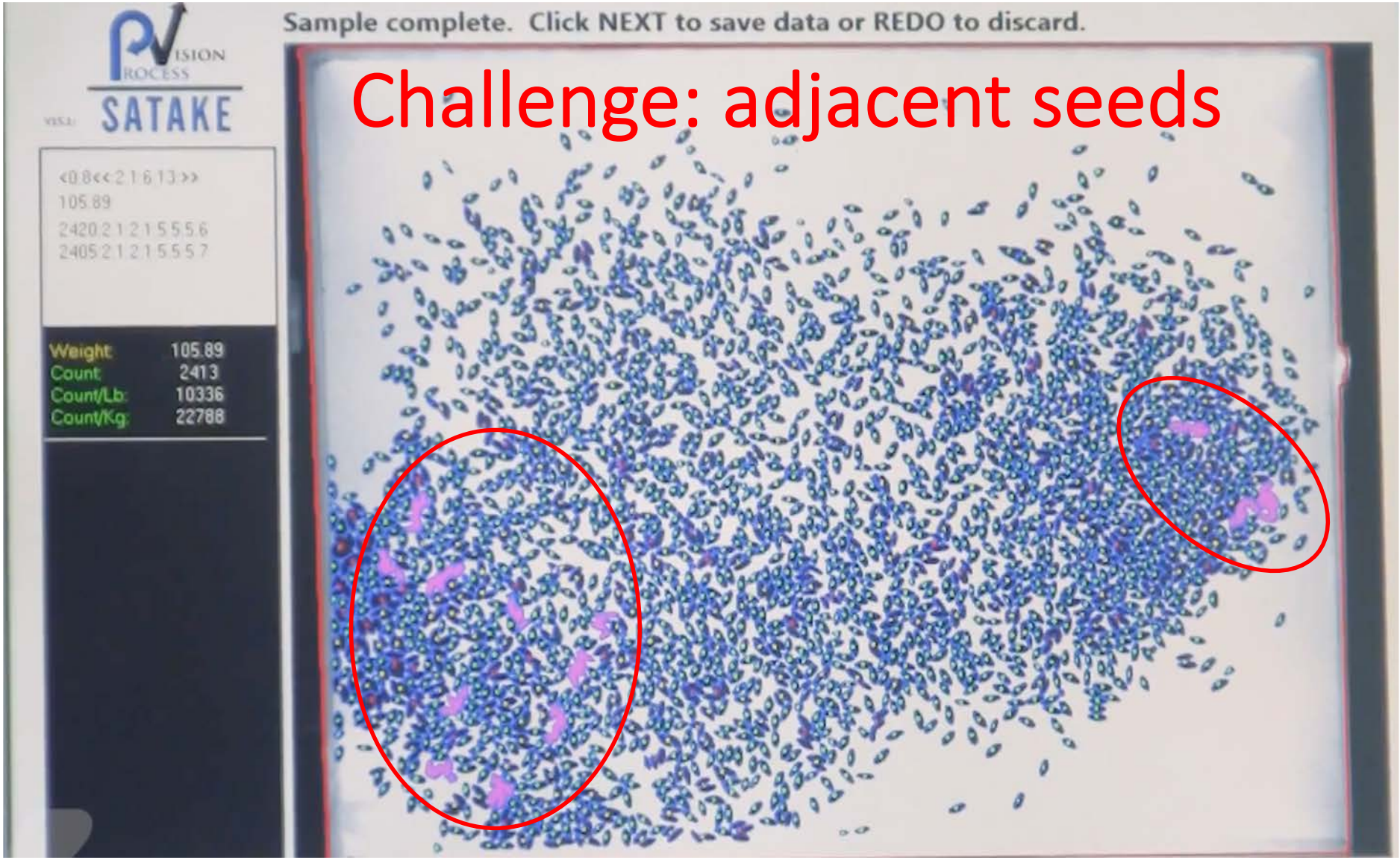
Motivation from counting seeds

I: Dark age

II:Mechanic age

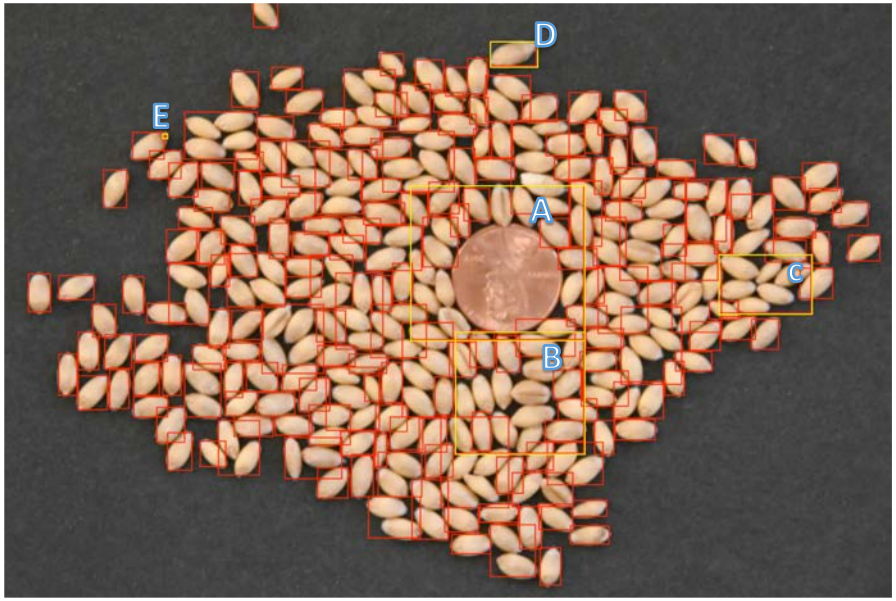
III: Electronic age

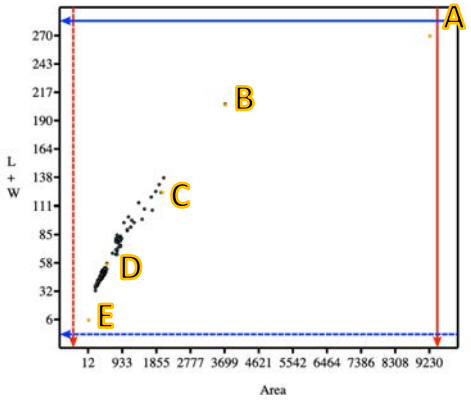
IV: Computer age


Sample complete. Click NEXT to save data or REDO to discard.
SATAKE
<0.8<<21613>>
105.89
2420212155556
2405212155557
Weight: 105.89
Count: 2413
Count/Lb: 10336
Count/Kg: 22788
Challenge: adjacent seeds

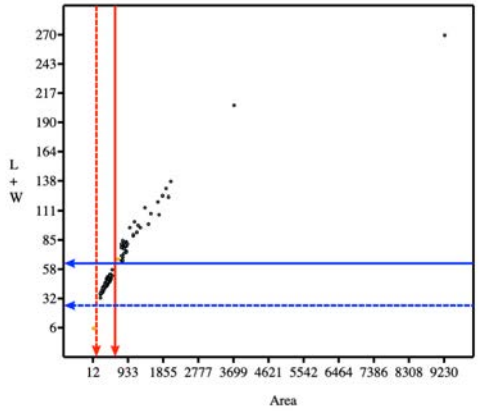
User interaction

Yang Hu

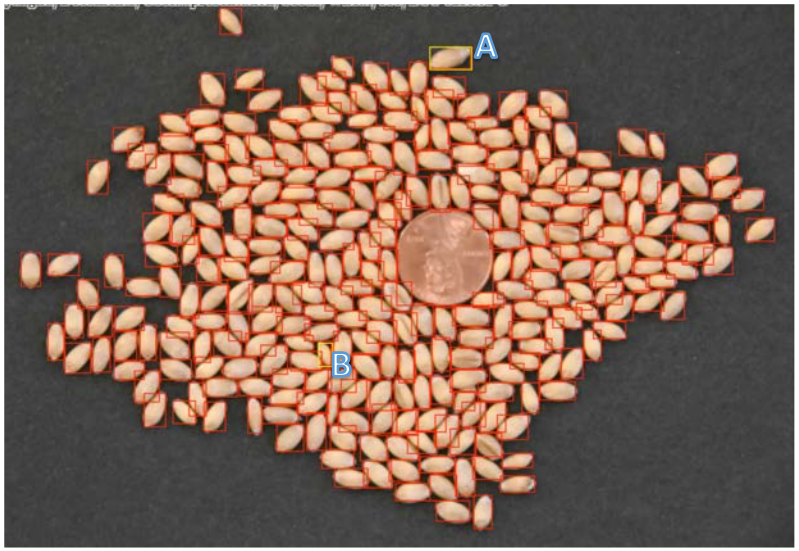


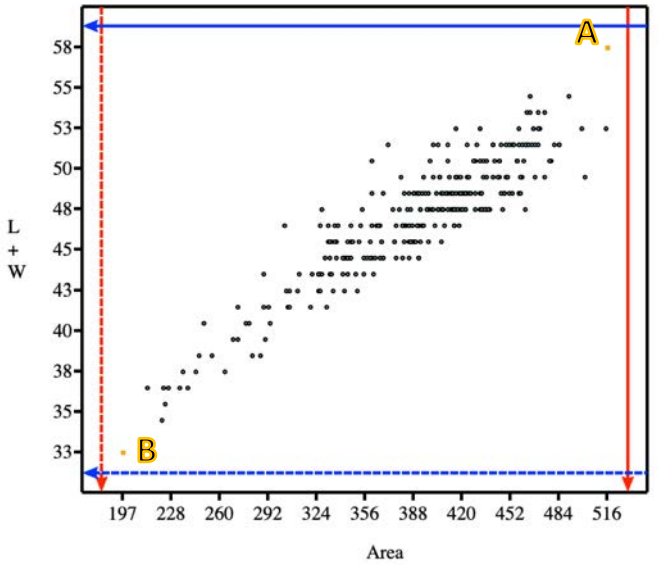


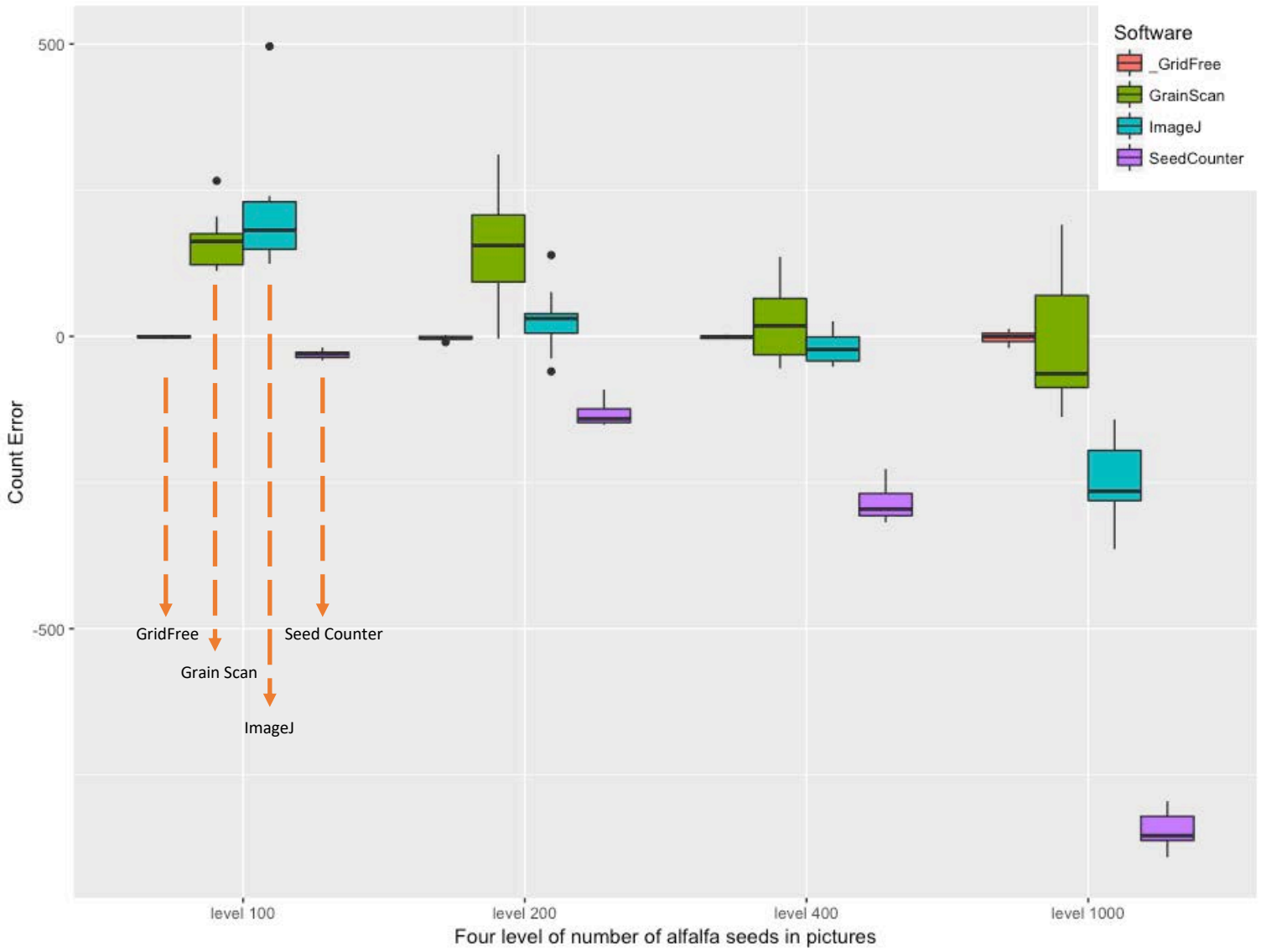
User resets thresholds



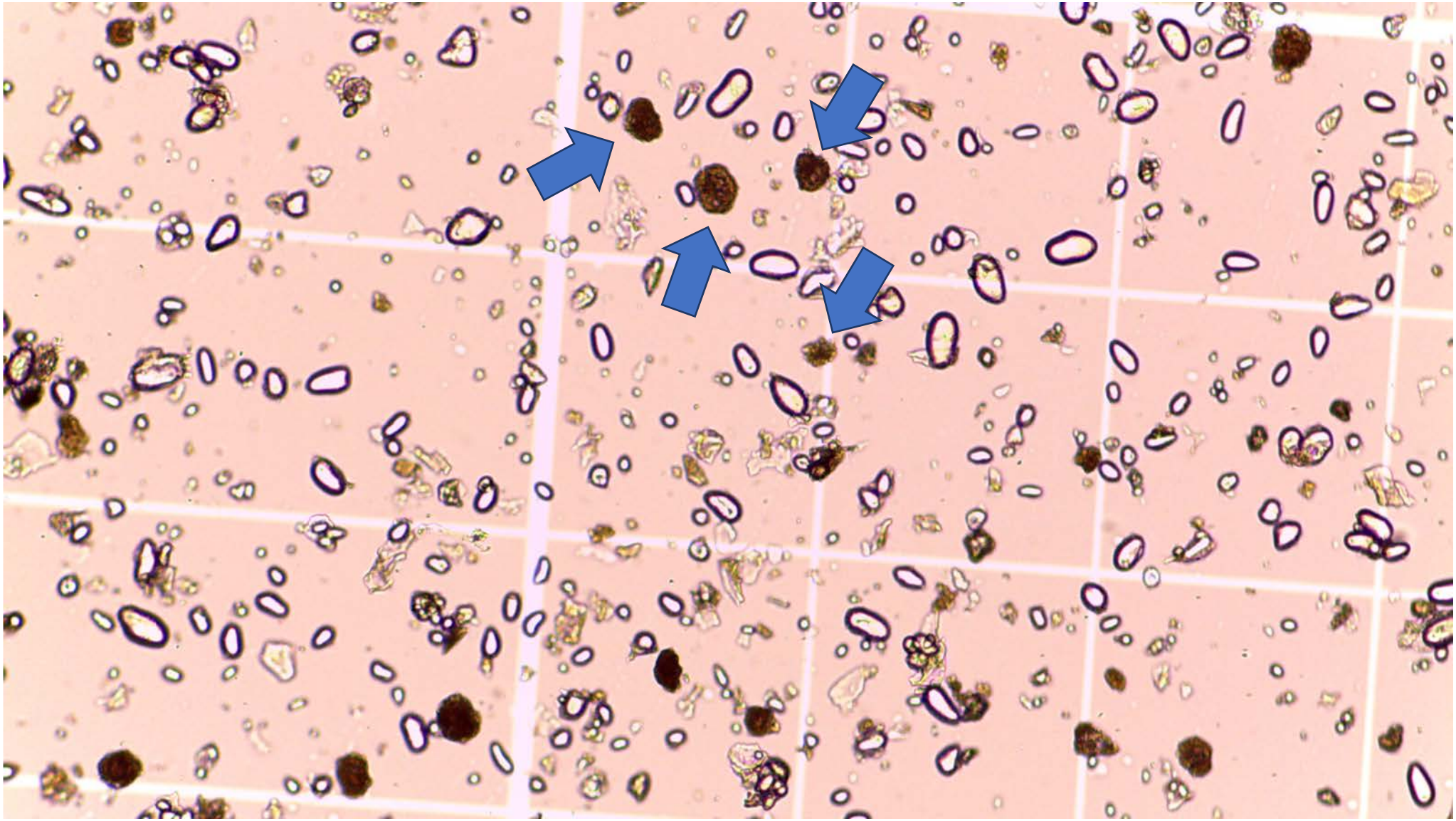
Results of user interaction

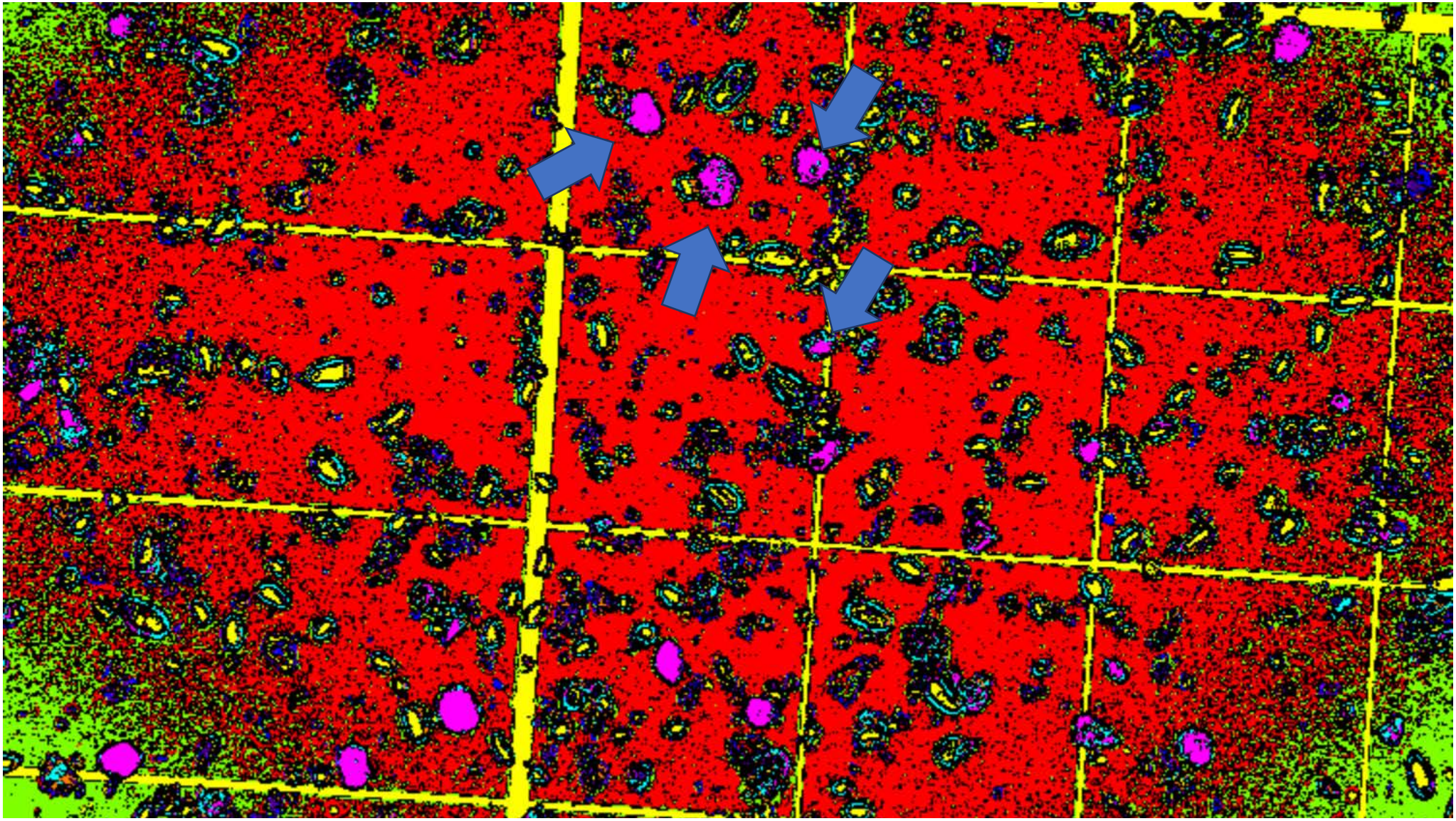


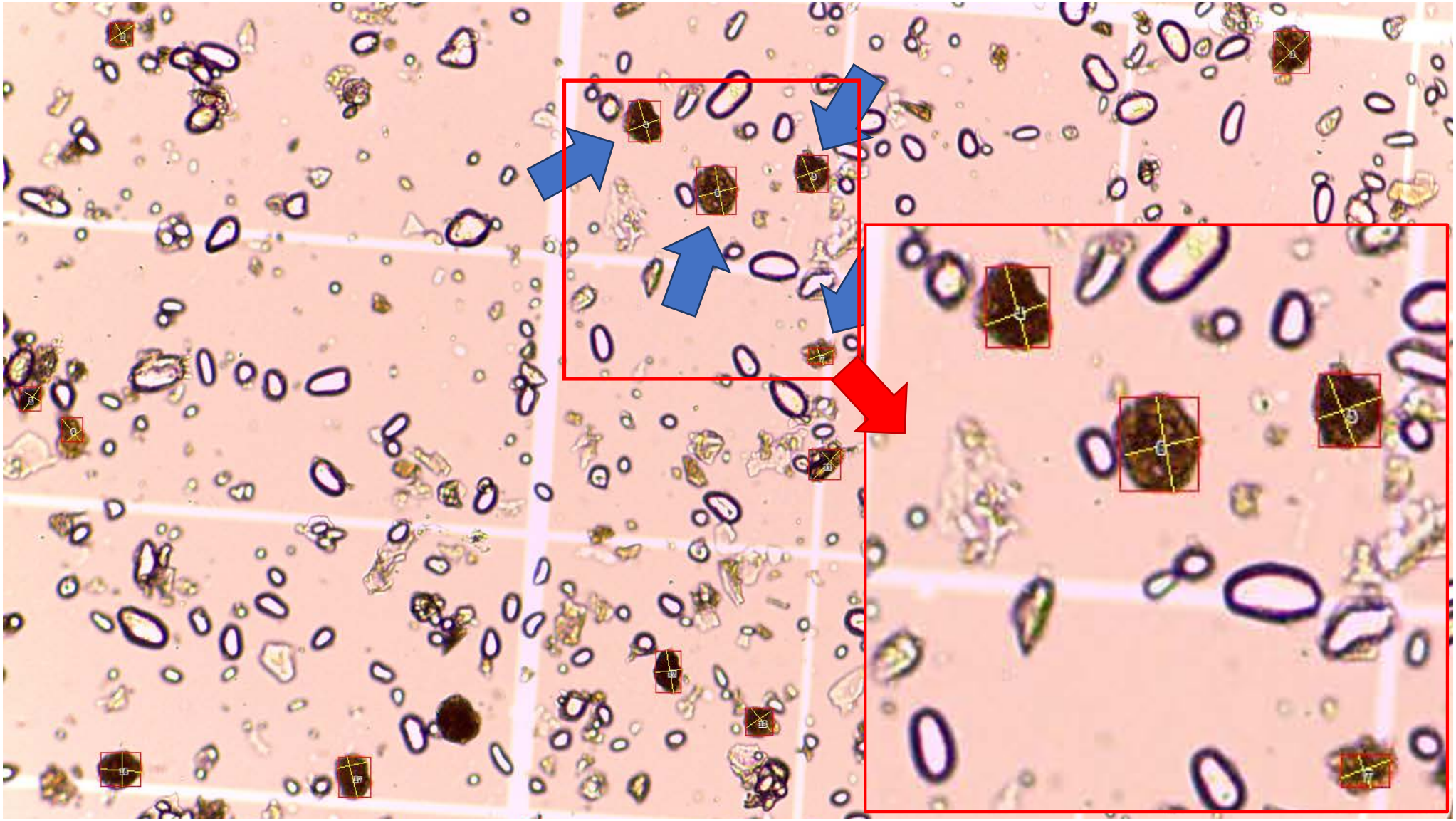


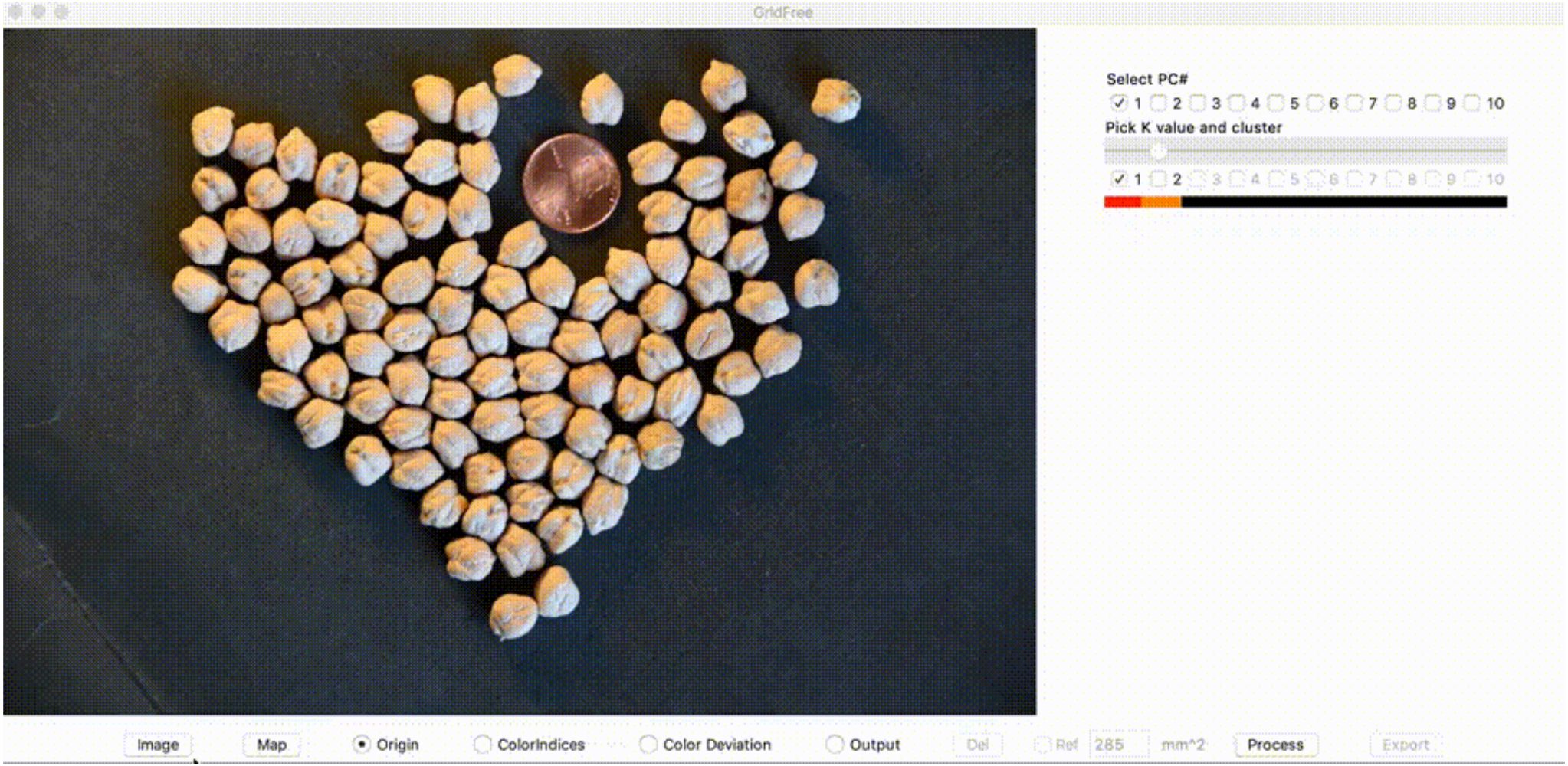


Unpublished data








GridFree
Select PC#
1 2 3 4 5 6 7 8 9 10
Pick K value and cluster
1 2 3 4 5 6 7 8 9 10
Image
Map
Origin
ColorIndices
Color Deviation
Output
Del
Ref
285
mm^2
Process
Export

Collaborators and funding


Arron Carter


Mike Pumphrey


Karen Sanguinet


Kawamu Tanaka


Sindhuja Sankaran


Longxi Yu


Jack Brown


Ananth Kalyanaraman


Kim Campbell


Deven See

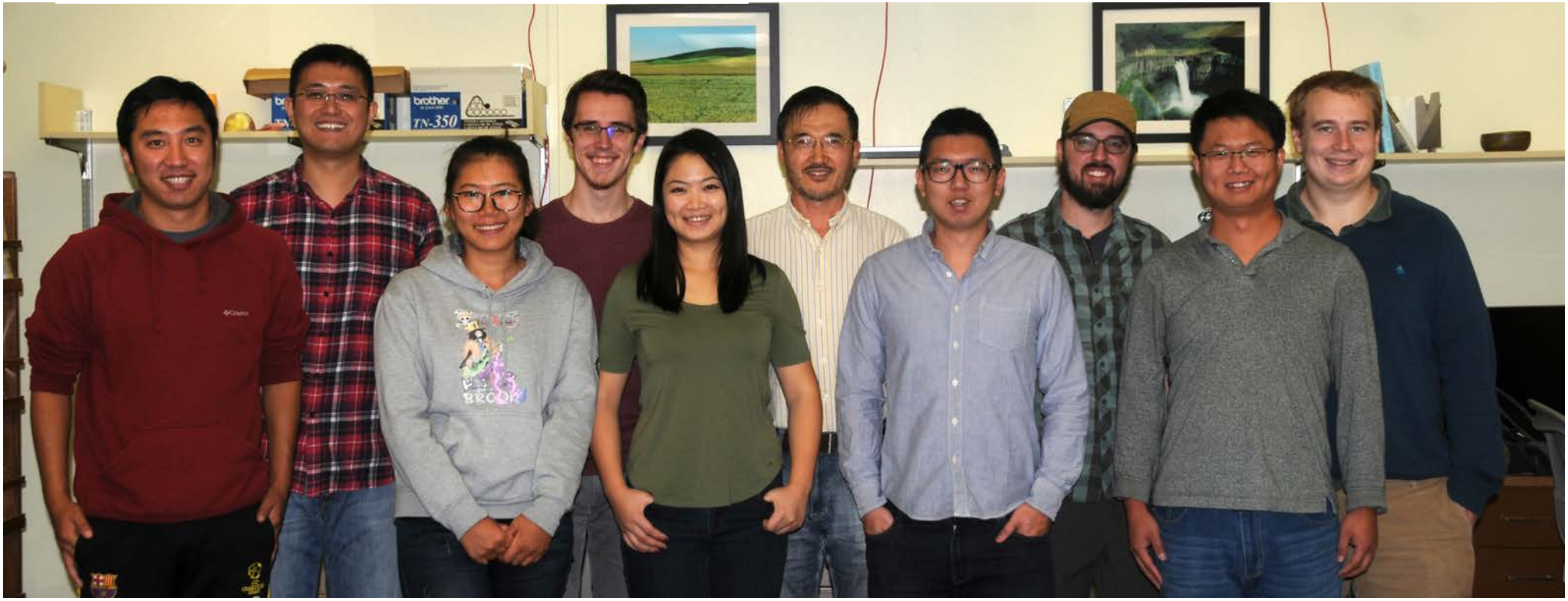

Camille Steber


Mike Peel

Zhiwu Zhang Laboratory

for Statistical Genomics

WASHINGTON STATE UNIVERSITY



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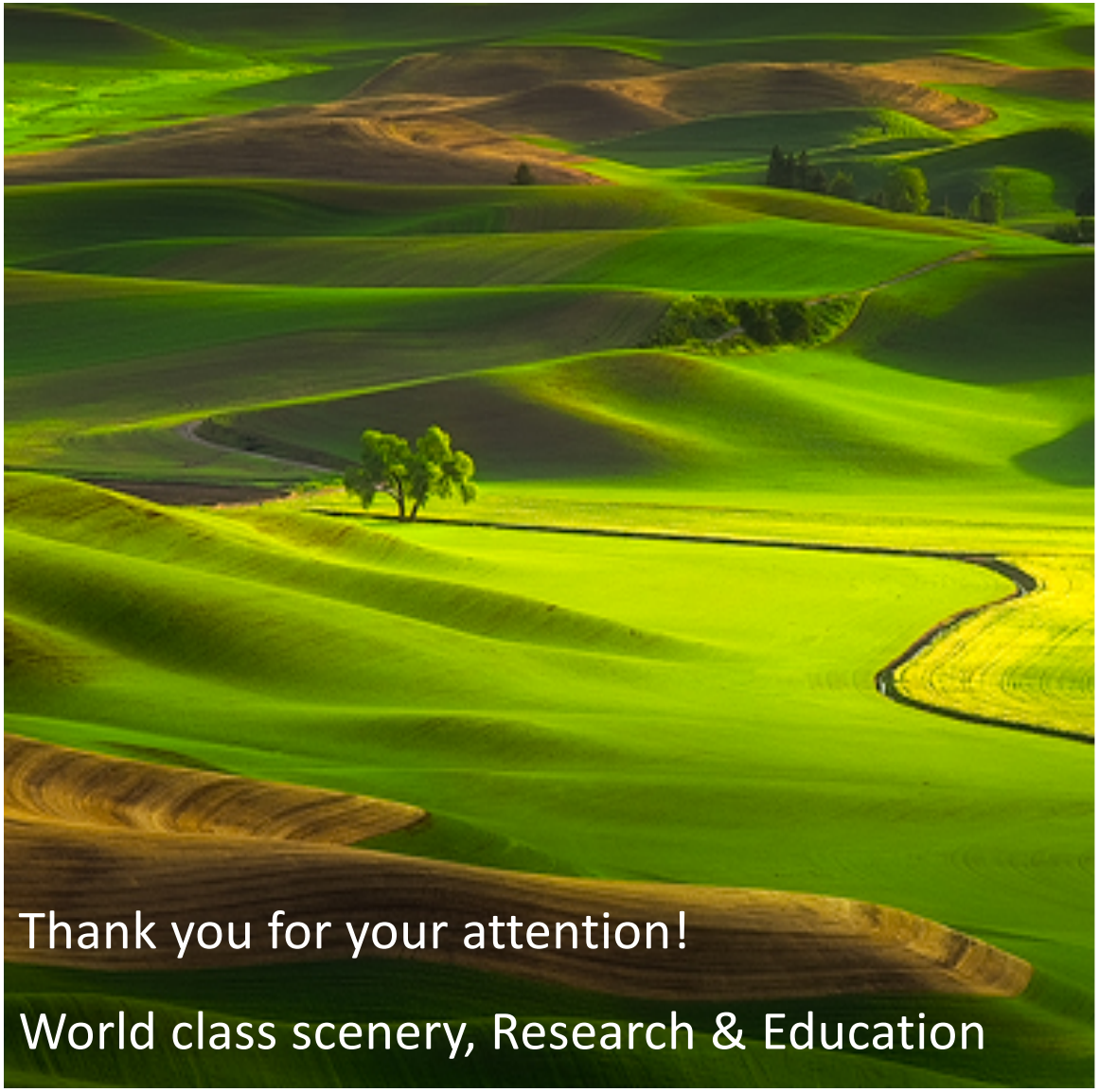

WASHINGTON STATE UNIVERSITY

Department of Crop and Soil Sciences

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招生对象： 国家留学基金委(CSC)奖学金(四年)获得者

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资助来源： 美国农业部、华盛顿州谷物协会和华盛顿州立大学研究生院

研究方向： 图像处理或核酸数据分析

偏重技能： AI, GIS, Fixed and Random Effect Mixed Model, Bayesian Analysis 与计算编程

申报条件： 英语 TOEFL 80 分或 IELTS 7 分以上(英语成绩和申请推荐信可后补)

递交申请： http://css.wsu.edu/graduate-studies：Financial aid 填写"Pending CSC Application"，CSC 申请与咨询致信(Zhiwu.Zhang@WSU.EDU)或微信(zhiwu-zhang)

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