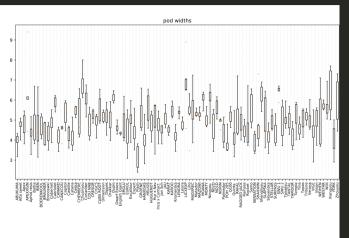
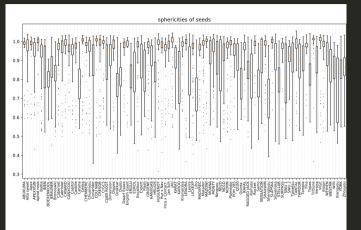
# Looking at microCT data of Brassica pods

I am not a biologist, please stop me and correct me if I say silly things.

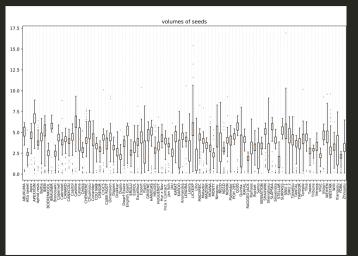
## Pod Width



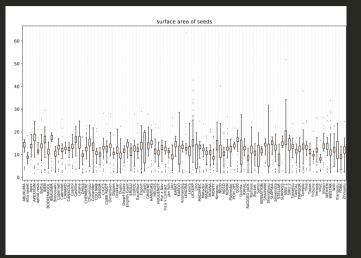
# Sphericity



### Volume



#### Surface Area



#### Correlations

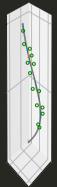
#### Filtering false seeds



- Image analysis produces many false seeds at the beak tip
- Density and size is comparable to seed
- Hard to recognise by graphical methods alone
- Recognise them by mathematical means instead

# **Spine fitting**

- For every CT slice we have the centroid of the object
- Fit X and Y position as cubic functions of z
- Define 'real z' as the distance measured along the fitted curve from the beak to the z coordinate of the point



# Classify beak tip and Real Seeds™

#### Failed approaches:

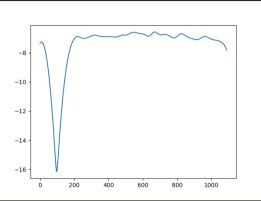
- 1. Assert that seeds must not be implausible Removed insufficiently many seeds
  - Too close to the ends of the pod
  - Too large given pod dimensions
- 2. Real z position of seeds of a pod is a sample from some probability distribution, fit and paramterize the distribution to classify seeds.
  - Sum of two normal(-ish) distributions noise at beak might be normal, everything else definitely is not
  - More complicated distribution too complicated
- 3. K-Means clustering Silly for 1 dimensional data
- 4. Jenks Natural Breaks Optimisation Should work in theory, did not work well in practice

# Break at Minimum Kernel Density Estimation (KDE)

- Beak has no Real Seeds<sup>™</sup> and low density
- Expect a gap in real z of detected seeds

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Use KDE to find density of seeds as function of real z



- First seed has real z less than 100?
- Find the local minimum at lowest real z where log(KDE)<-10
- Keep seeds with greater real z
- Profit

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### **Beak and Silique length**

Use the seed with lowest real z to mark the boundary of beak and silique:

