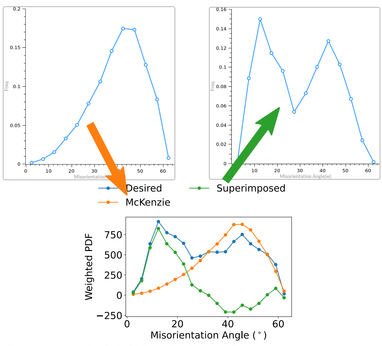
Statistics

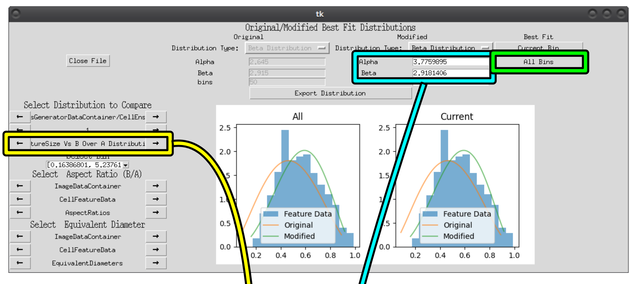
2. Format Reference - Retain only CellData/

BC	MAD
BS	Mask_Clear
Bands	Phases
Error	X
EulerAngles	Y

3. Extract Feature Attributes - Segment by misorientation to re-obtain grains and re-calculate morphological and crystallographic characteristics.
4. Create MDF - Create a superposition of the desired MDF and the negative of Dream3D's default McKenzie MDF.

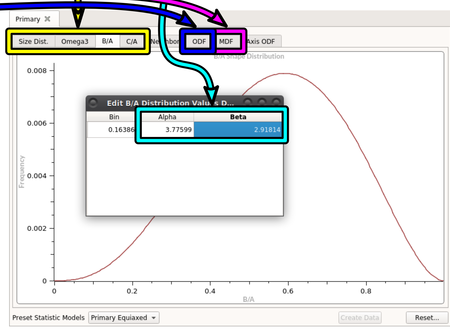


5. Generate Initial Statistics - Create a CellEnsembleData/Statistics directory in Dream3D file for utils_packing to access.
6. Grain Packing Utils - Generate the statistical distribution parameters of the morphological characteristics of the CGs.



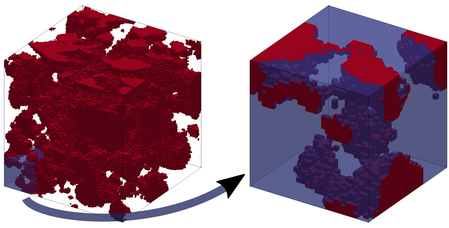
7. Generate Final Statistics - Create and populate the CellEnsembleData/Statistics directory that will be used to pack the SEVM with a statistically equivalent coarse grain structure.

- Auto-Fit via SciPy
- Fitting Parameters
- Morphological (Copy From 6)
- Crystallographic (Load from 3,4)

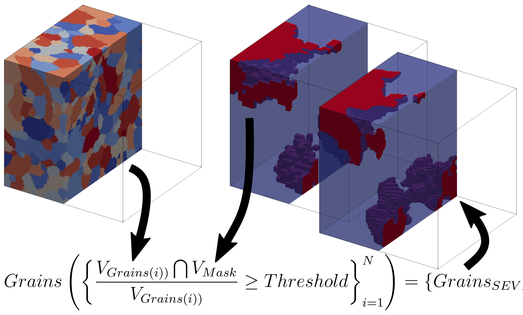


Morphology

8. Choose Subdomain - Sample a rectangular subdomain of the SliceGAN generated 3D bimodal mask.

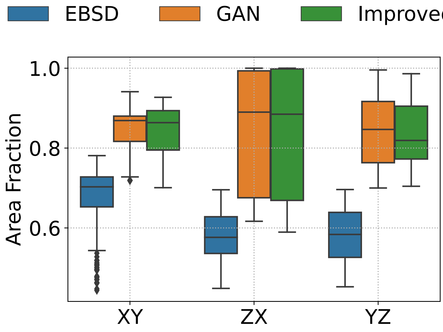


9. Format Boundaries - Remove unnecessary data from bimodal mask, and copy over the CellEnsembleData folder from 7.
10. Generate Grains - Generate a full cube of statistically equavalent CGs.
11. Create Improved Mask - Generate a new mask from the intersection of the CGs and the SliceGAN mask.



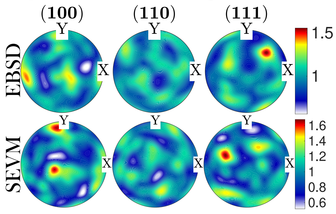
$$Grains\left(\left\{\frac{V_{Grains(i)}\bigcap V_{Mask}}{V_{Grains(i)}} \geq Threshold\right\}_{i=1}^{N}\right) = \{Grains_{SEVM}\}$$

12. Apply Improved Mask - Delete all grains outside of the improved mask.
13. Compare Area Fractions - Compares the area fractions of orthogonal slices of the improved mask to investigate the anisotropic density.

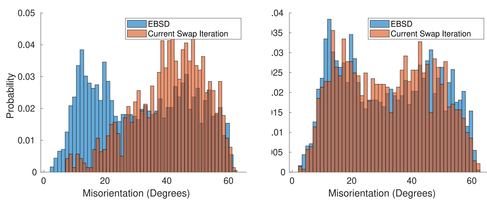


Crystallography

14. Generate Crystallography - Assigns crystallographic orientations from the ODF and MDF created by 3, 4. Created crystallography found to be unreliable. Used here only to initialize crystallography variables.
15. Replace Crystallography - Use MTEX to build an ODF from the EBSD file, then replace the existing Euler angles with random samples from the ODF.



16. Grain Swap - Swap the crystallographic orientations of two random grains until the Kolmogorov Smirnov (KS) statistic of the MDF is less than some given threshold.



17. Grain Swap Import - Import the results of 16 to the *.dream3d file.
18. Lattice Constants Import - Import the crystallographic lattice constants from 3 that match the remaining materials.

Compare

19. Extract Feature Attributes Synthetic - Calculate all the dependent grain characteristic attributes.
20. Compare Stats - Compare the grain characteristic attributes between the EBSD file and the SEVM.