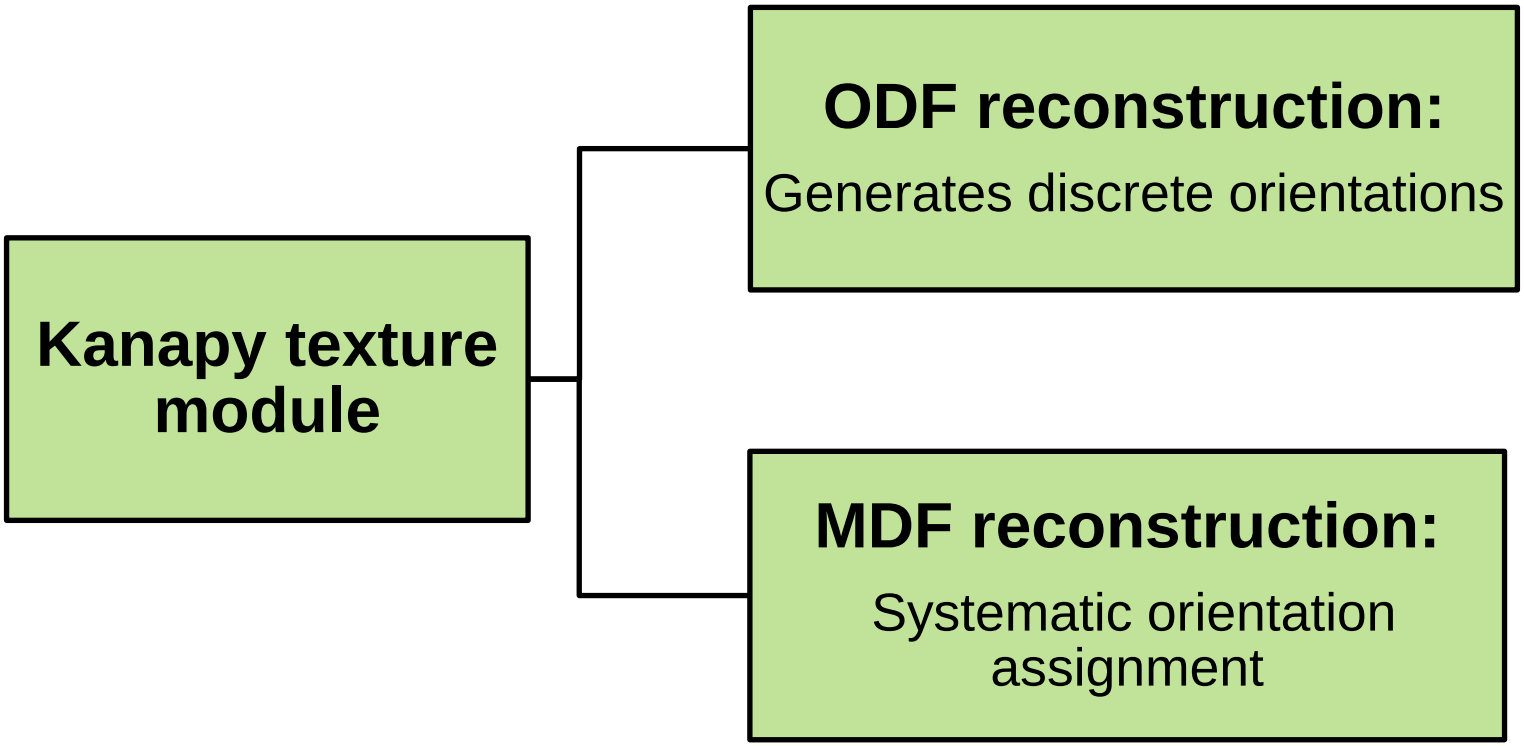
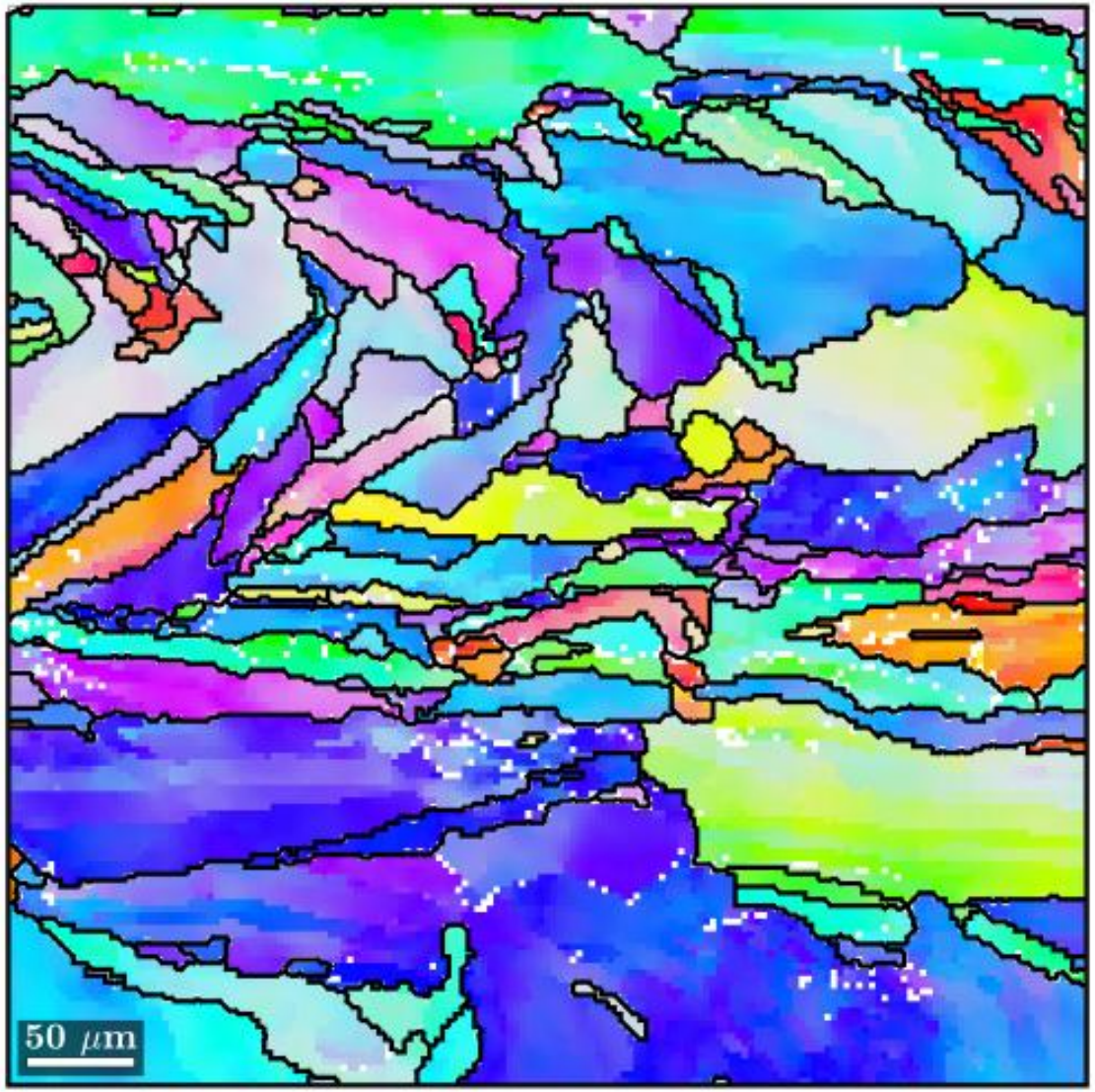
Kanapy texture module: elements



ODF: orientation distribution function
MDF: misorietnation distribution function

Example

- 316L stainless steel
- Single phase: Austenite
- Number of grains: 197



Biswas et. al. 2020

Kanapy geometry module

```
(knpy) $ kanapy genStats -f stat_input.json
```

- Shows the probability density functions

```
(knpy) $ kanapy genRVE -f stat_input.json
```

- Creates json files consisting of grain dimensions

```
(knpy) $ kanapy pack
(knpy) $ kanapy voxelize
(knpy) $ kanapy abaqusOutput
(knpy) $ kanapy outputStats
(knpy) $ kanapy plotStats
```

Exercise: geometry module

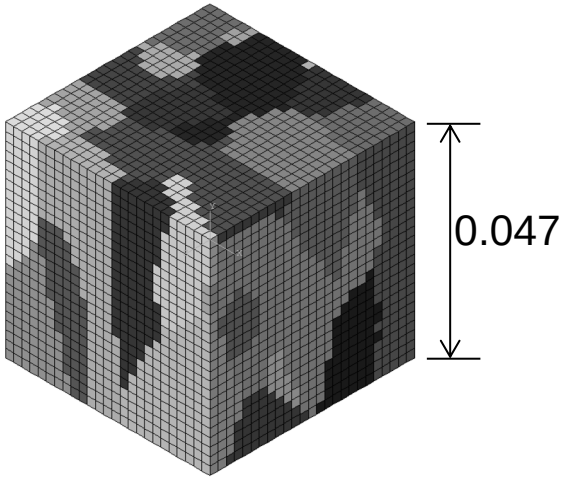
- Change the parameters controlling the RVE dimensions and use genRVE

```
"RVE":
   {
     "sideX": …,
     "sideY": …,
     "sideZ": …,
     "Nx": ..,
     "Ny": ..,
     "Nz": ..
   }
```

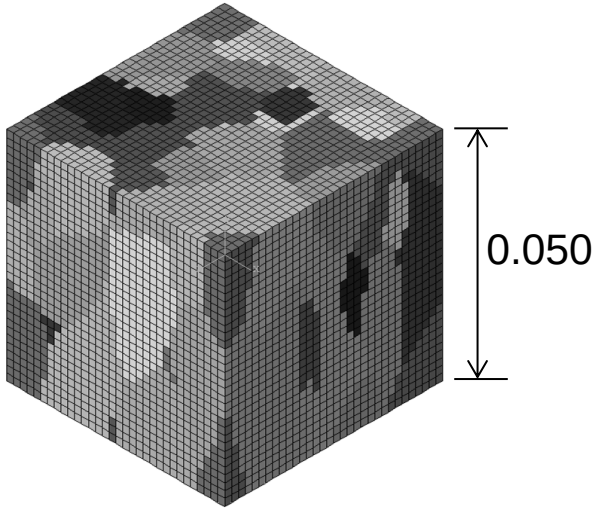
- Hint: start by changing the side length of the RVE

Example: Solution

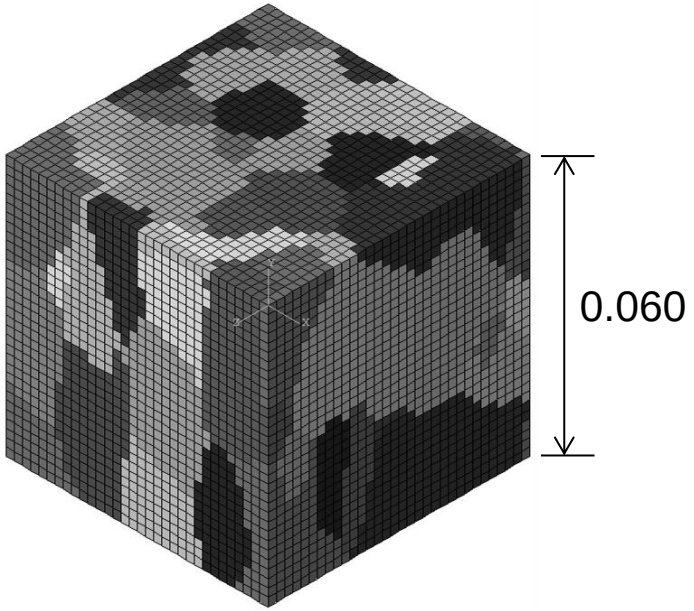
40 grains



62 grains



85 grains



Kanapy texture module: ODF reconstruction

- Essential inputs :
  - Crystallographic orientation: EBSD (*.mat file)

```
$ kanapy reduceODF –ebsd <.mat>
```

- Kernel halfwidth
  - Grains as (*.mat file) –grains <*.mat>
  - Option –kernel <halfwidth in radians>

- Provide integer value for number of orientations

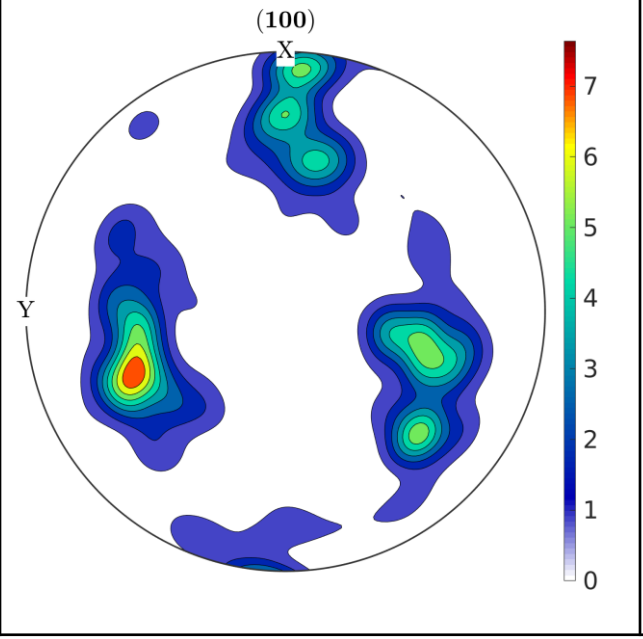
- Refer *.log file for status

Exercise: texture reconstruction

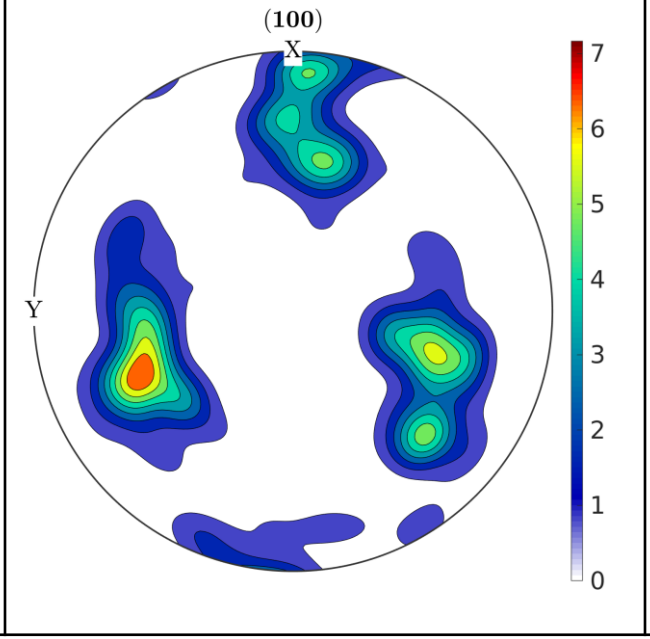
- Make reduced reconstruction with 40 discrete orientations
- What happens to $\left\| f - \tilde{f} \right\|_1$ as the number of discrete orientations ($\widetilde{N}$) increase ?

Exercise: Solution

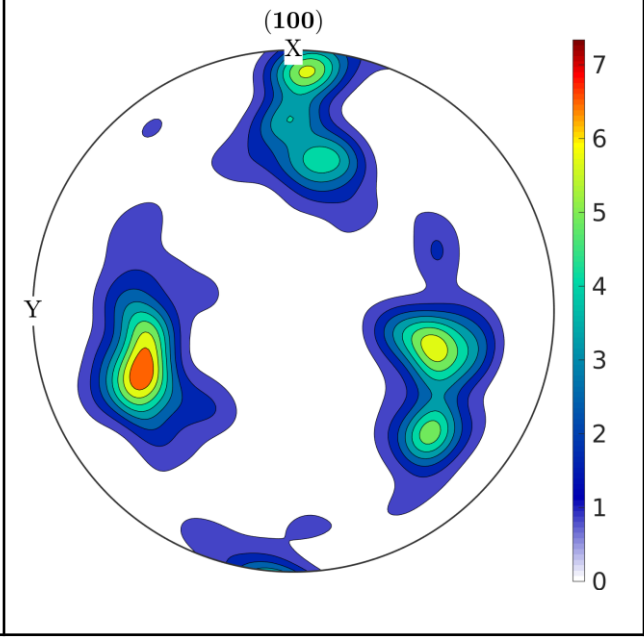
ODF (EBSD)



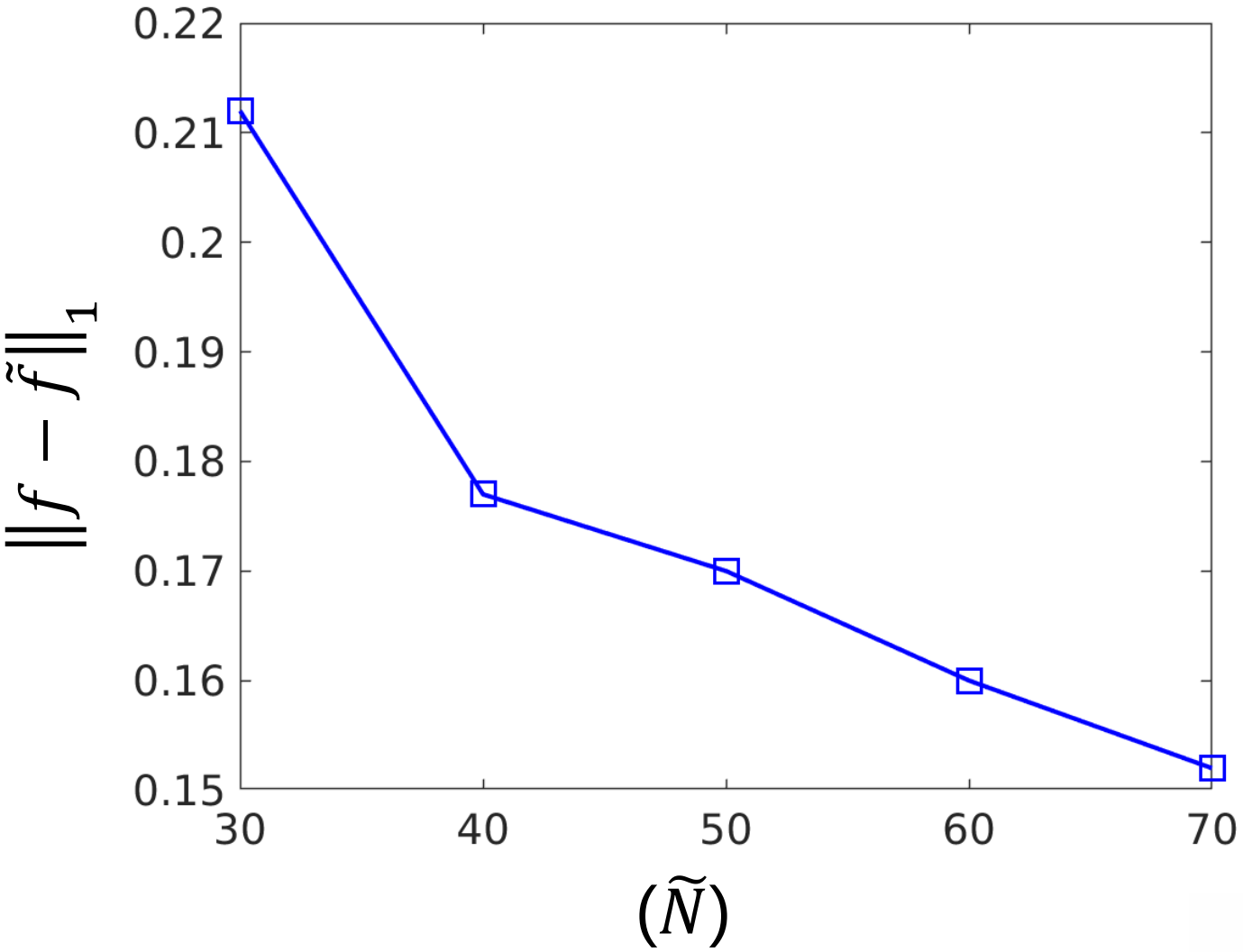
$\widetilde{N} = 40$



$\widetilde{N} = 70$



Exercise: Solution



Kanapy texture module: MDF reconstruction

- Focuses on misorientation angle distribution
- Systematic assignment of crystallographic orientation

```
(knpy) $ kanapy reduceODF -ebsd ebsd_316L.mat -grains
grains_316L.mat -fit_mad yes
```

Kanapy texture module: MDF reconstruction

- Option

```
(knpy) $ Will generate <N> reduced orientations, continue(yes/no):
```

- Generates discrete orientations (ODF reconstruction)

```
(knpy) $ Please provide the number of bins required for MDF fitting
(integer, Default=13):
```

- Provide the resolution of misorientation angle distribution

```
(knpy) $ Found a shared surface area file in the current directory
under: '/json_files', continue(yes/no):
```

- Looks for the grain boundary shared surface are file

Kanapy texture module: MDF reconstruction

(knpy) $ During MAD fitting, grain orientations can be weighted based on their volumes. This option required (yes/no):

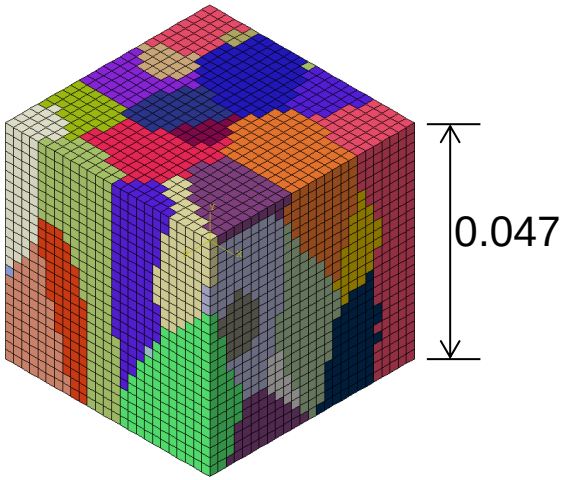
- Corrects the ODF of represented by the synthetic microstructure due to grain size distribution

Exercise: MDF

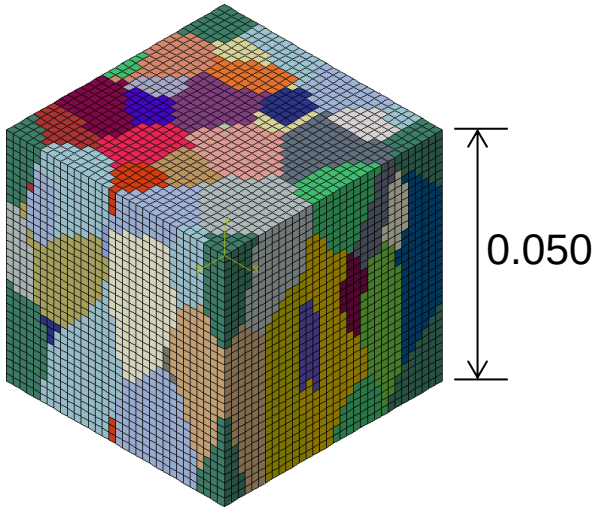
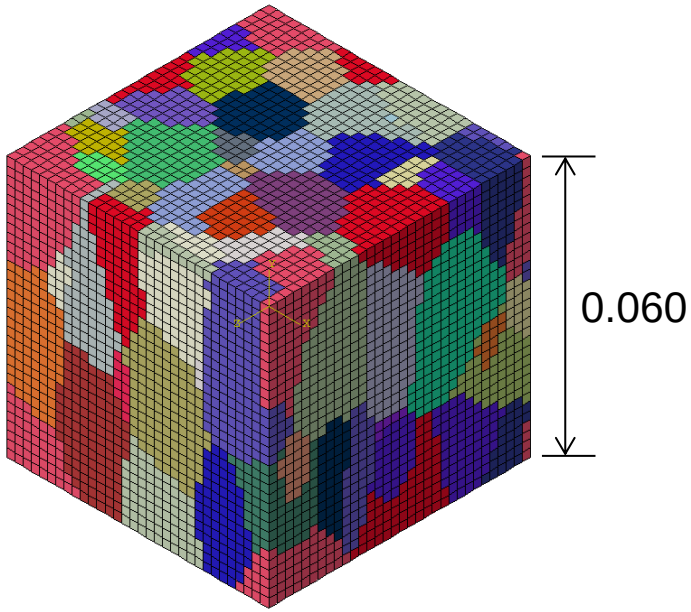
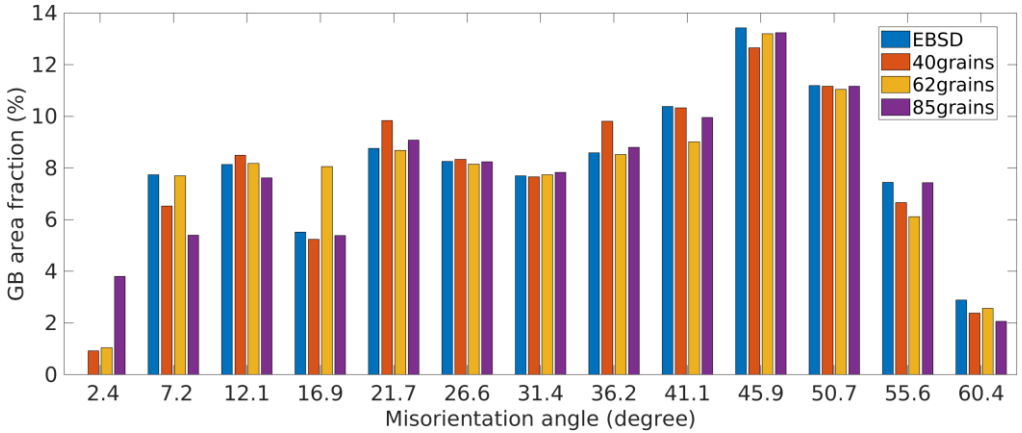
- Increase RVE dimensions to include more grains and perform the MDF fitting

Example: Solution

40 grains



62 grains



85 grains