DEBS ACM Team Running Notes

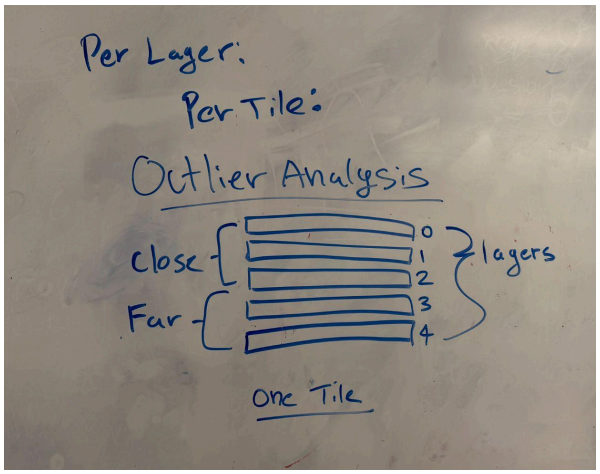
Feb 13th (90 Minute Meeting)

Goal: Detect a high degree of porosity (amount of empty spaces left inside the material) during a simulation, which may severely impact the durability of the object being created.

Given Data: Each optical tomography image contains, for each point P = (x, y), the temperature T(P) at that point, measured layer by layer (z). In our input stream, we are given tiles, layer by layer.

Processing Pipeline

1. **Saturation analysis.** Within each tile, detect all points that surpass a threshold value of 65000.
2. **Windowing.** For each tile, keep a window of the last three layers.
3. **Outlier analysis.** Within each tile window, for each point P of the most recent layer, compute its local temperature deviation as *difference between the mean temperature T(P) of its close neighbors* (Manhattan distance 0 <= d <= 2 considering the 3 layers stacked on top of each other) *and that of its outer neighbours* (Manhattan distance 2 < d <=4) in absolute value. Let us call this value D. We define an outlier as a point for which D > 5000.
4. **Outlier clustering.** Using the outliers computed for the last received layer, find clusters of nearby outliers using DBScan, considering the Euclidean distance between points as the distance metric.



Output

For each input (tile) received from the stream, your solution should return:

1. The number of saturated points.
2. The centroid (x, y coordinates) and size (number of points) of the top 10 largest clusters.

Source of Error:
The system receives as input a stream of optical tomography images, indicating the temperature of the powder bed for each layer during the manufacturing process. It must compute the probability that the object being created presents defects in some areas, enabling rapid reactions in the case of problems.