Self-Supervised Global-Local Segmentation for 3D Out-of-Distribution Detection

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Inpainting Masks: Ellipsoids

An ellipsoid is defind by the equation

$$E^t_{abc}: \quad \frac{(x_1 - t_1)^2}{a} + \frac{(x_2 - t_2)^2}{b} + \frac{(x_2 - t_3)^2}{c} \leq 1,$$

where $t = (t_1, t_2, t_3)$. Each single ellipsoid is shown in the Figure. Parameters $a, b, c \in \mathbb{N}$ and $t_i \in \mathbb{R}$ where generated in a random fashion and each ellipse was rotated by a random angle between 0° to 90° before adding to the full mask. This was iterated until the number of pixels that lie inside an elliposid exceeded a manually set threshold.

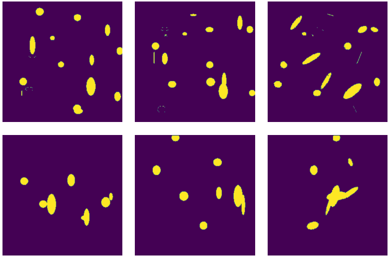

Figure: Visualization of 3D ellipsoid inpainting masks. The projections onto the first, second and third axis, respectively.

Inpainting Masks: α-shapes

First, we randomly select a number of points $x_i, i = 1, \ldots N$, that satisfy

$$\epsilon_1 \leq \left\| x_i - x_j \right\|_2 \leq \epsilon_2,$$

for all $i, j = 1, \ldots, N$ and manually chosen $\epsilon_1, \epsilon_2 > 0$. We then used the Python package α-shape (`https://pypi.org/project/alphashape/`) to create the α-shape of the set $\{x_1, \ldots x_N\}$. For $\alpha = 0$, the algorithm producedes the convex hull. Examples on the right where calculated for $\alpha = 3$.

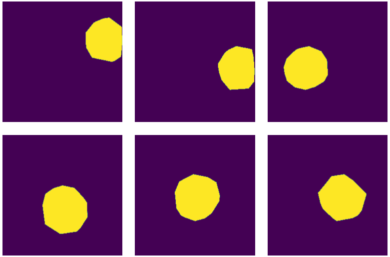

Figure: Visualization of concave inpainting masks. Two examples are shown in the top and bottom row. The projections onto the first, second and third axis, respectively.

Thank you for your attention!

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