**Generation of Patches**

**Step 1: Extract bounding-boxes of tumors**

Grade 2: 28

Grade 3: 36

Grade 4: 102

**Step 2: Extract more bounding-boxes via morphology method (dilation and erosion)**

If the size of a box is smaller than threshold, its erosion will be dropped

Grade 2: 28 \* 3 (dilation, erosion, origin)

Grade 3: 36 \* 3 (dilation, erosion, origin)

Grade 4: 102 \* 3 (dilation, erosion, origin)

**Step 3: Resize bounding-boxes into same shape**

Shape: ***[59, 59, 59, 4]***

**Step 4: Create mirrors and modify intensity**

Mirrors: horizontal flip, vertical flip, axisymmetric flip

Modify intensity of each voxel in four channels respectively, via ***increasing or decreasing intensity by*** ***5% to 10%***

Grade 2: 28 \* 3 \* 4 (horizontal, vertical, axisymmetric, origin)

Grade 3: 36 \* 3 \* 4 (horizontal, vertical, axisymmetric, origin)

Grade 2: 102 \* 3 \* 2 (origin and, randomly select one from horizontal, vertical or axisymmetric flip)

**Step 5: Extract partial volumes from whole volume, the shape of partial box is *[49, 49, 49, 4]***

Extract partial boxes randomly from 15 optional volumes

Grade 2: 28 \* 3 \* 4 \* 7 (randomly choose 7 partial boxes from 15 options)

Grade 3: 36 \* 3 \* 4 \* 6 (randomly choose 6 partial boxes from 15 options)

Grade 4: 102 \* 3 \* 2 \* 4 (randomly choose 4 partial boxes from 15 options)

Thus, all patches are generated for three grade groups.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Tumors in**  **BraTS2017** | **Grade** | **Amount** | **Morphology** | **Mirror**  **&**  **Intensity**  **Modification** | **Partial**  **Boxes** | **Total**  **Patches** |
| 2 | 28 | 3 | 4 | 7 | 2268 |
| 3 | 36 | 3 | 4 | 6 | 2424 |
| 4 | 102 | 3 | 2 | 4 | 2360 |

**Generation of Training and Validating Dataset**

|  |  |  |
| --- | --- | --- |
| **Grade** | **Training** **Set** | **Validating** **Set** |
| 2 | randomly select 14 cases  with their patches | the other 14 cases  with their patches |
| 3 | randomly select 18 cases  with their patches | the other 18 cases  with their patches |
| 4 | randomly select 51 cases  with their patches | the other 51 cases  with their patches |