
Algorithm 1 BLS-Siamese net

Input: Training data $(I_{left}, I_{right}, I'_{left}, I'_{right})$, Y , feature extractor Siamese Net
Conv1 and Conv2, number of feature mapping nodes $N1$, mapping window
size $N2$, number of enhancement nodes $N3$.

Output: Weight of BLS W .

- 1: $AI_{pet} = |Conv1(I_{left}) - Conv1(I_{right})|$
 - 2: $AI_{mri} = |Conv2(I'_{left}) - Conv2(I'_{right})|$
 - 3: $AI_{pr} = |Conv1(I^{left} - Conv2(I'_{right})|$
 - 4: $AI_{rp} = |Conv1(I^{left'} - Conv1(I_{right})|$
 - 5: $X = [AI_{pet}, AI_{mri}, AI_{pr}, AI_{rp}]$
 - 6: **for** $I=1, 2, \dots, N1$ **do**
 - 7: Random generate weight and bias W_{f_i}, β_{f_i} with size $N2$
 - 8: calculate $Z_i = \phi_i(XW_{f_i} + \beta_{f_i})$
 - 9: **end for**
 - 10: set feature mapping group $Z \equiv [Z_1, Z_2, \dots, Z_{N1}]$
 - 11: **for** $j=1, 2, \dots, N3$ **do**
 - 12: Random generate weight and bias W_{e_j}, β_{e_j}
 - 13: Calculate $H_j = \xi_j(ZW_{e_j} + \beta_{e_j})$
 - 14: **end for**
 - 15: set $H \equiv [H_1, H_2, \dots, H_{N3}]$
 - 16: $A = [Z|H]$
 - 17: compute hidden weight W by ridge regression
 - 18: Returns
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