Rotation Axis Focused Attention Network (RAFA-Net) for Estimating Head Pose

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Supplementary Material

Tables 5 and 6 show the quantitative outputs of our model trained on 300W-LP and tested on the respective AFLW2000 and BIWI datasets. This has been presented in section 4.5 (Ablation Study) and Figure 7 of the main paper.

Similarly, Table 7 represents the quantitative outputs of our model trained and tested on BIWI dataset. Figure 8 visualises these outputs using the effect of bounding box margin (control with parameter $0 \leq \gamma \leq 0.5$) on the average pose estimation error in degrees (y-axis) on different angle ranges (x-axis) for yaw, pitch and roll.

Table 5: The average pose estimation error in degrees using our RAFA-Net, which is trained on 300W-LP dataset and tested on AFLW2000 dataset. The effect of the bounding box margin (control with parameter $0 \leq \gamma \leq 0.5$) on pose estimation error in degrees on different angle ranges for yaw, pitch and roll.

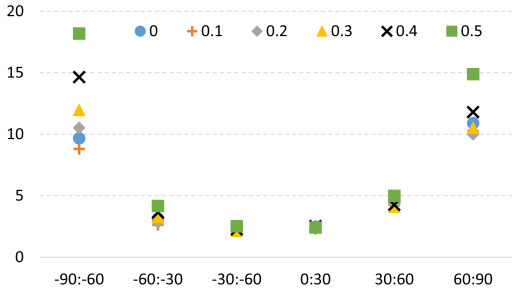
Angle	**Yaw** ($0 \leq \gamma \leq 0.5$)						**Pitch** ($0 \leq \gamma \leq 0.5$)						**Roll** ($0 \leq \gamma \leq 0.5$)					
Bin	0.0	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.2	0.3	0.4	0.5
-90:-60	5.8	4.6	4.9	5.6	6.0	6.1	34.6	33.1	32.4	31.5	32.8	37.5	35.8	30.3	31.5	32.6	35.2	37.5
-60:-30	5.1	4.3	4.1	4.1	4.2	4.3	10.1	9.1	9.2	8.8	9.3	11.5	10.2	9.4	9.3	9.3	10.0	11.5
-30:0	3.5	3.0	2.9	2.9	2.9	3.1	3.7	3.5	3.5	3.5	3.6	2.6	3.0	2.7	2.6	2.5	2.6	2.6
0:30	3.5	3.1	2.9	2.8	2.8	2.9	6.0	5.5	5.4	5.2	5.2	2.8	3.2	2.9	2.9	2.8	2.8	2.9
30:60	5.2	4.8	4.5	4.8	4.6	4.5	20.8	18.6	17.9	18.2	18.9	11.9	12.1	10.5	10.2	10.5	11.2	11.9
60:90	6.1	6.1	6.2	6.5	6.4	6.3	39.3	38.6	41.8	43.4	42.6	48.2	52.6	49.1	48.6	48.2	47.6	48.2

Table 6: The average pose estimation error in degrees using our RAFA-Net, which is trained on 300W-LP dataset and tested on BIWI dataset. The effect of the bounding box margin (control with parameter $0 \leq \gamma \leq 0.5$) on pose estimation error in degrees on different angle ranges for yaw, pitch and roll.

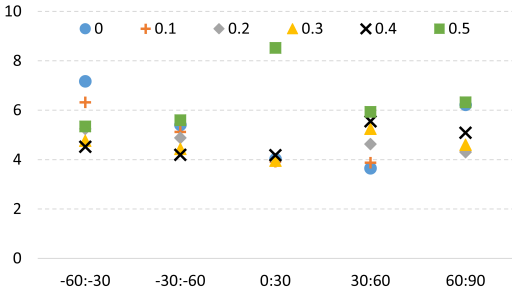
Angle	**Yaw** ($0 \leq \gamma \leq 0.5$)						**Pitch** ($0 \leq \gamma \leq 0.5$)						**Roll** ($0 \leq \gamma \leq 0.5$)					
Bin	0.0	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.2	0.3	0.4	0.5
-90:-60	4.1	4.1	4.2	4.3	4.6	4.5	19.6	20.5	18.4	18.6	18.8	20.8	-	-	-	-	-	-
-60:-30	9.1	8.7	8.3	8.0	7.7	7.9	7.5	6.9	6.4	6.4	6.5	7.1	13.6	12.2	10.8	10.4	10.7	12.6
-30:0	10.2	7.9	6.8	6.5	6.7	7.1	3.4	3.2	3.3	3.1	3.0	3.1	4.1	3.8	3.5	3.4	3.5	3.6
0:30	9.2	5.9	5.0	4.9	4.9	5.0	6.0	5.6	5.4	5.4	5.4	5.5	3.4	3.2	3.0	2.9	2.8	2.9
30:60	6.4	5.2	5.1	4.9	4.9	5.1	13.4	9.7	8.6	8.4	8.8	10.1	17.8	13.1	11.6	11.8	12.7	14.1
60:90	6.0	6.1	6.4	6.8	7.3	7.8	52.9	48.8	42.9	40.8	40.0	42.2	35.0	30.1	28.1	26.4	29.6	29.2

Table 7: The average pose estimation error in degrees using our RAFA-Net, which is trained and tested on BIWI dataset. The effect of the bounding box margin (control with parameter $0 \leq \gamma \leq 0.5$) on pose estimation error in degrees on different angle ranges for yaw, pitch and roll.

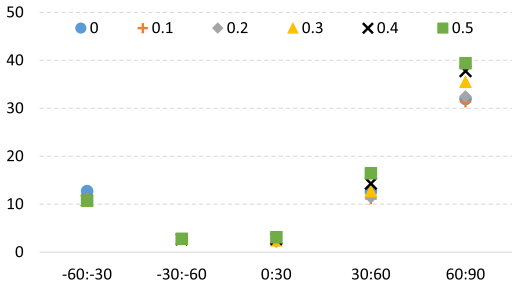
Angle	**Yaw** ($0 \leq \gamma \leq 0.5$)						**Pitch** ($0 \leq \gamma \leq 0.5$)						**Roll** ($0 \leq \gamma \leq 0.5$)					
Bin	0.0	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.2	0.3	0.4	0.5	0.0	0.1	0.2	0.3	0.4	0.5
-90:-60	9.7	8.8	10.5	12.0	14.6	18.2	-	-	-	-	-	-	-	-	-	-	-	-
-60:-30	3.1	2.6	2.8	3.3	3.6	4.2	7.2	6.3	5.2	4.8	4.5	5.3	12.8	11.2	10.7	10.7	10.8	10.7
-30:0	2.4	2.2	2.2	2.1	2.3	2.5	5.4	5.1	4.9	4.4	4.2	5.6	2.8	2.8	2.8	2.8	2.7	2.8
0:30	2.5	2.4	2.3	2.4	2.5	2.4	4.0	3.9	4.0	4.0	4.2	8.5	2.4	2.2	2.2	2.5	2.8	3.1
30:60	4.5	4.2	4.3	4.1	4.3	5.0	3.7	3.9	4.6	5.2	5.6	5.9	12.6	11.2	11.4	12.7	14.3	16.5
60:90	10.9	10.3	10.0	10.5	11.8	14.9	6.2	4.3	4.3	4.6	5.1	6.3	32.0	31.4	32.5	35.5	37.8	39.4



(a) Yaw: error in degrees (y-axis) on different angle ranges (x-axis)



(b) Pitch: error in degrees (y-axis) on different angle ranges (x-axis)



(c) Roll: error in degrees (y-axis) on different angle ranges (x-axis)

Fig. 8: Using RAFA-Net, the effect of bounding box margin (control with parameter $0 \leq \gamma \leq 0.5$) on the average pose estimation error in degrees (y-axis) on different angle ranges (x-axis) for yaw, pitch and roll. This model was trained on BIWI and tested on BIWI. It is observed that the yaw and roll lean towards inconsiderate to the γ values for smaller angles, however they tend to be sensitive for larger angles. For this dataset, it is also observed that pitch is sensitive to the γ values for a wide range of angles.