1 Online course

The summary of the online course is attached to the end of this report.

2 Exercises

2.1 Practice exercises for consolidation of the learning on the V1 mechanisms for visual saliency.

(A) $O_C = O_B$

(B) $C_C > C_B$

(C) $CO_C > CO_B$

(D) $\text{SMAP}_C = \max(C_C, O_C, CO_C) = \max(C_C, CO_C)$

(E) $O_O > O_B, C_O = C_B, CO_O > CO_B$

(F) $\text{SMAP}_O = \max(C_O, O_O, CO_O) = \max(O_O, CO_O)$

(G) $O_C < O_{CO} = O_O$,
$C_C = C_{CO} > C_O$,
$CO_{CO} \geq CO_O, CO_{CO} \geq CO_C$

(H) $\text{SMAP}_{CO} = \max(C_C, O_O, CO_{CO}) = \max(\text{SMAP}_C, \text{SMAP}_O, CO_{CO})$

(I) $\text{RT}_{CO} \leq \min(\text{RT}_C, \text{RT}_O)$

2.2 Probability and cumulative distribution of RT_C, RT_O and RT_{CO}

The probability density of RT_C, RT_O and RT_{CO} are shown in Fig. 1, and the cumulative distribution are shown in Fig. 2. It can be seen that the distribution of three of them are clearly different from each other, where RT_{CO} concentrated at lower values than the other two. It can roughly be inferred that RT_{CO} is smaller than both RT_C and RT_O, while RT_O is smaller than RT_C.

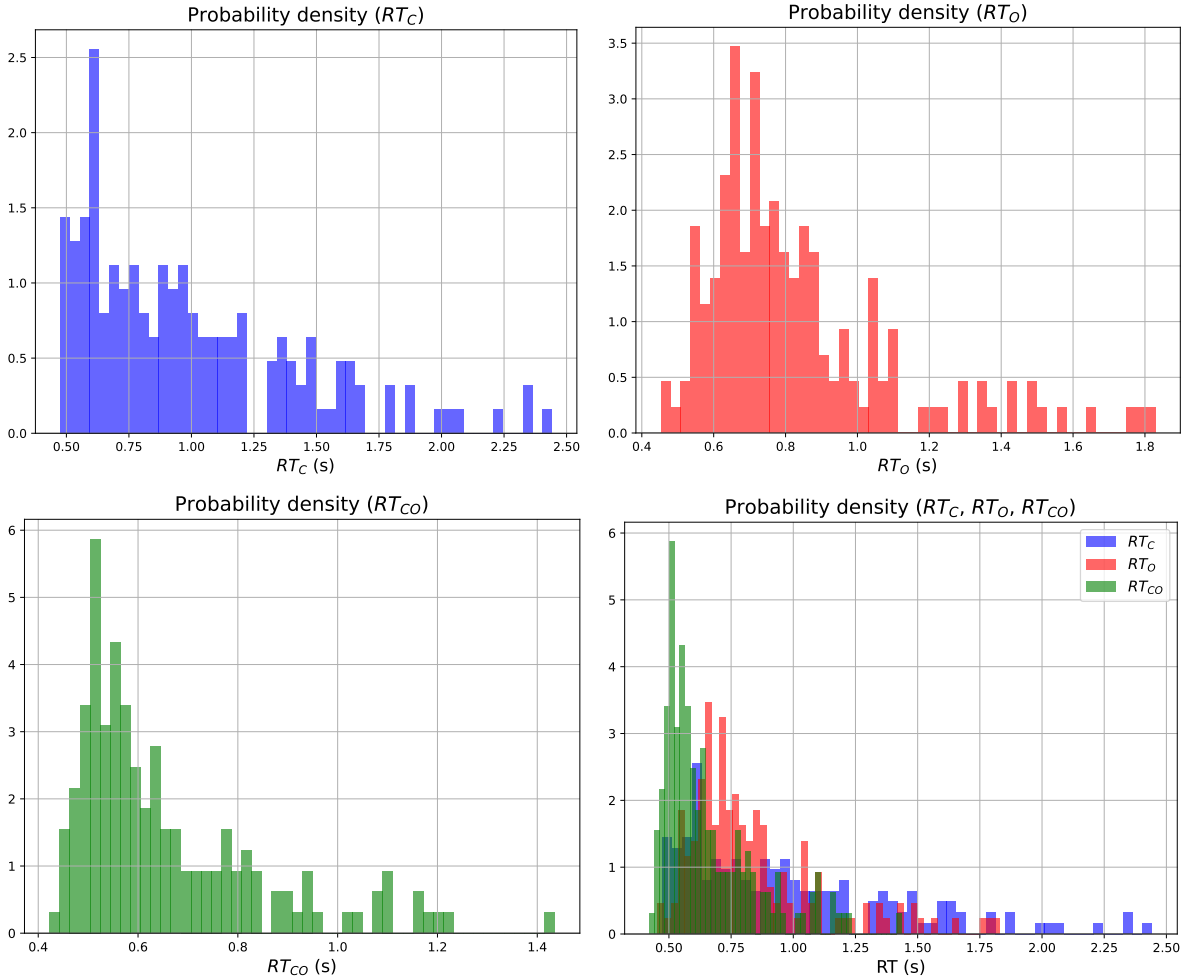

Fig. 1: Probability density of RT_C, RT_O and RT_{CO}

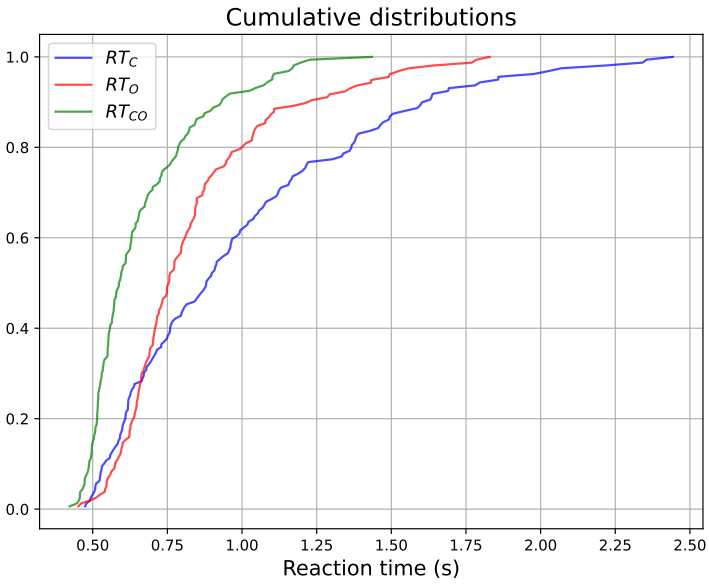

Fig. 2: Cumulative distribution of RT_C, RT_O and RT_{CO}

2.3 Race model

Use Monte Carlo simulation to generate the distribution of RT_{CO}^{race}, which is the minimum of randomly sampled RT_C and RT_O and repeated for 10000 times. The probability density and cumulative distribution of RT_{CO}^{race} and RT_{CO} are shown in Fig. 3. The distribution of RT_{CO}^{race} is slightly different from that of RT_{CO}, where RT_{CO} is more concentrated at lower values and their cumulative distribution nearly overlap when $RT > 0.9$.

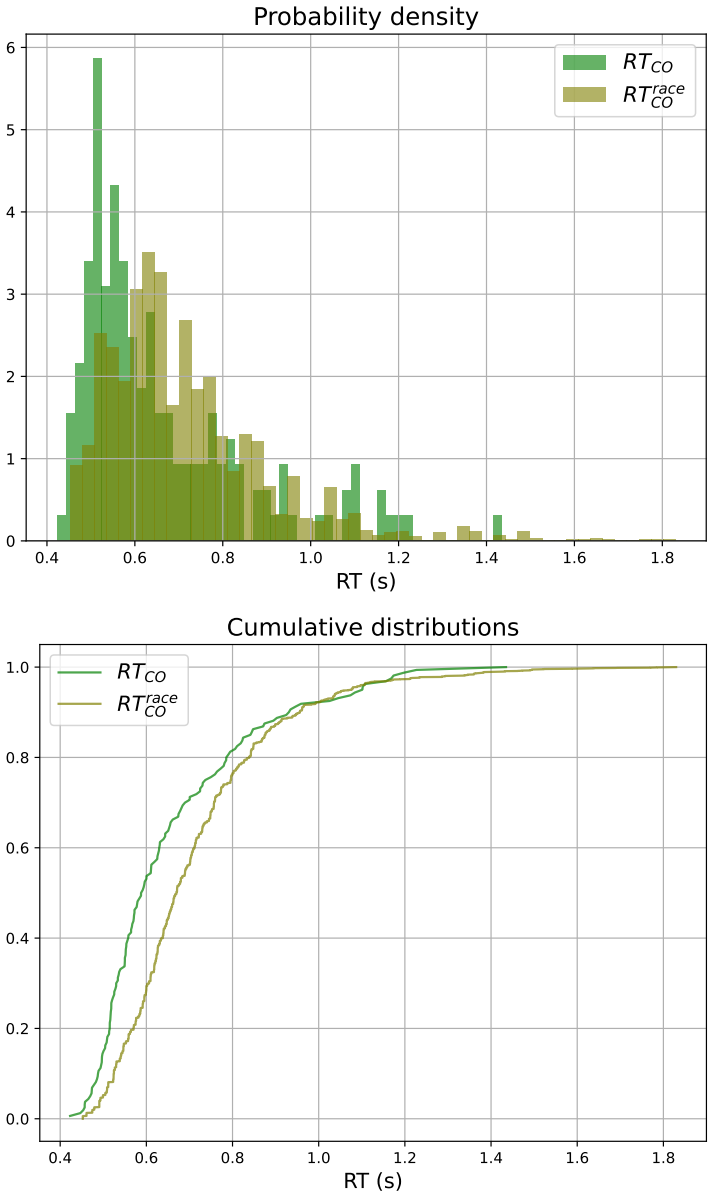

Fig. 3: Probability density Cumulative distribution of RT_{CO}^{race} and RT_{CO}

To further compare the two distributions, the mean, standard deviation and median of RT_{CO}^{race} and RT_{CO} are calculated and shown in the table below. It shows that the mean and median of RT_{CO} is smaller than that of RT_{CO}^{race}, indicating that the actual reaction time when both features are present is faster than the prediction by the race model.

	Mean	SEM	Median
RT_{CO}	0.659	0.015	0.590
RT_{CO}^{race}	0.714	0.002	0.670

A scatter plot and a violin plot are generated in Fig. 4 to visualize the comparison. T-test is also performed to get $p = 0.000282 < 0.05$, indicating that the two distributions are significantly different, with RT_{CO} being smaller than RT_{CO}^{race}.

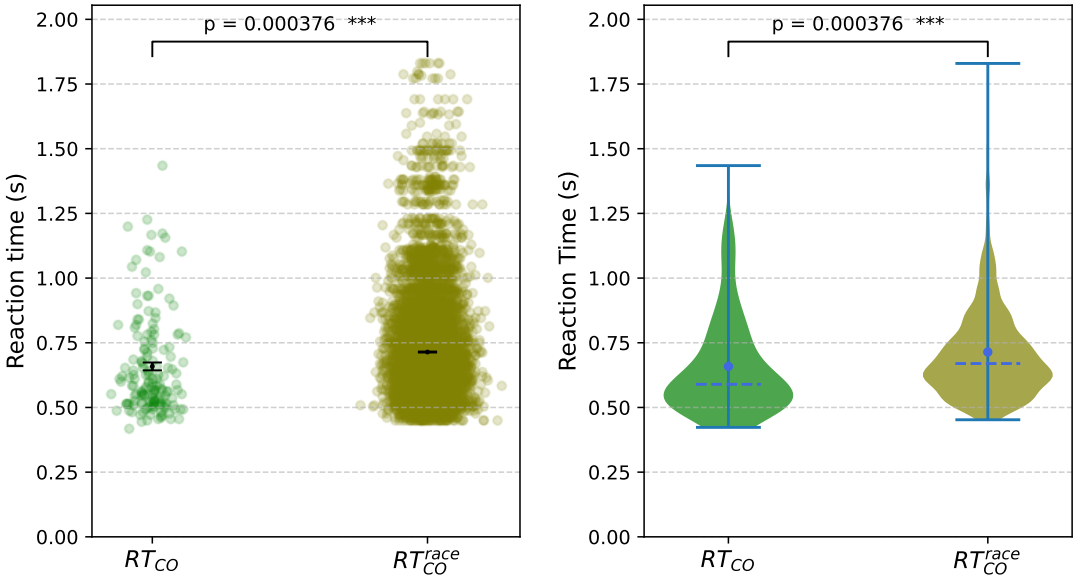

Fig. 4: scatter plot and violin plot of RT_{CO}^{race} and RT_{CO}