Weighted mAP:

- AP score is defined as the mean precision at the set of 11 equally spaced recall values, $R_i = [0, 0.1, 0.2, \cdots, 1.0]$

$$\text{AP} = \frac{1}{11} \sum_{\text{R}_i} \text{Precision}(\text{R}_i)$$

where $\text{Precision}(\text{R}_i) = \mathbf{max}_{\text{R}_{i'}:R_{i'} \geq R_i} \text{Precision}(\text{R}_{i'})$

- Anomaly detections are determined to be true or false depending upon the Intersection over Union (IoU) threshold.
- In order to give more weightage to early detections, we modify this IoU value using the following function.

$$w_f = 1 - \frac{1}{1 + \exp(-\frac{x - l/2}{2})}$$

where l is the length of actual window.

$$\text{Weighted IoU} = w_f * IoU$$

If two anomaly detections have same IoU but different starts then this metric would be able to give more weightage to the early detection.

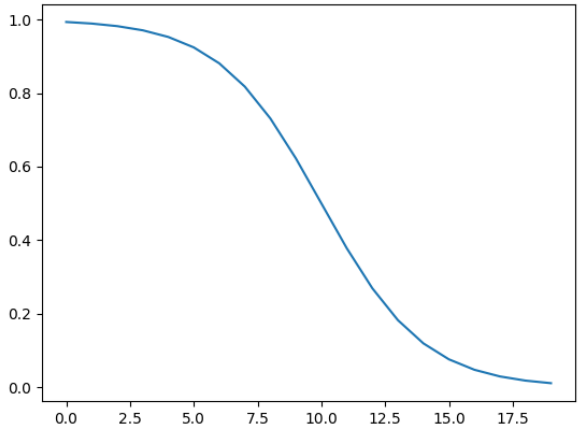

Figure 1: Variation of weights with the difference between actual and predicted start of anomaly with window length = 20

- Weighted Mean Average Precision score is calculated by taking the mean AP over all IoU thresholds. We can have 10 weighted IoU thresholds varying uniformly between 0.5 and 0.95.