Imperial College London



Introduction and motivation

In recent years, gaze estimation methods have made substantial progress. However, these methods typically assume that the subject's eyes are open; for closed eyes, gaze estimation methods provide irregular gaze estimates.







Landmark Right eye extraction

No blink detection



estimation

Previous methods for blink detection have not been integrated with gaze estimation methods, and have used separate datasets that significantly differ from those used by gaze estimation methods.

A new dataset for blink estimation

> We annotate over 200,000 images of the RT-GENE dataset (Fischer et al. ECCV2018) that was introduced for gaze estimation in natural settings with large camera-subject distances and less constrained subject motion.





Uncertain images (annotator disagreement)

RT-BENE: A Dataset and Baselines for **Real-Time Blink Estimation in Natural Environments**

Kévin Cortacero, Tobias Fischer and Yiannis Demiris www.imperial.ac.uk/PersonalRobotics

Method overview







- \succ We experiment with deep networks that have different backbones, i.e. DenseNet, ResNet and MobileNet.
- > We propose to use **ensemble networks** as they improve the blink estimates significantly, however they come with increased computational cost.

Semantic labelling of the eye region

> We present preliminary results on using Mask R-CNN to semantically label the eye region.



Paper, Dataset & Code Download:

This represents first steps towards unifying gaze & blink estimation.

www.imperial.ac.uk/ **PersonalRobotics**

www.tobiasfischer.info

Experimental results

- dataset (left, 36% improvement) and previous datasets such as Eyeblink8 (right, 17% improvement) and Researcher's Night.
- datasets (F1=0.66 vs F1>0.9)



 \succ The proposed models still perform very well in significantly different scenarios that were not seen at training time (here: Talking Face dataset).



Training: RT-BENE

Conclusions

- > We introduce a **new challenging dataset** for blink estimation.
- > Our ensemble methods outperform the state-of-the-art.
- \succ We take steps towards unifying gaze estimation and blink estimation methods.



State-of-the-art performance on both the newly proposed RT-BENE

RT-BENE is a much more challenging dataset compared to previous





Testing: Talking Face