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Feature Fusion-Based Deep Learning for Driver Fatigue Monitoring

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Abstract

Driver fatigue monitoring remains challenging due to subtle fatigue behaviors, domain variability, and limited labeled data. This dissertation investigates the problem from three perspectives: spatiotemporal representation learning, domain-adaptive data annotation, and multi-modal semantic modeling.

An efficient multi-stream spatiotemporal network is proposed to capture fatigue-related facial cues through global-local feature modeling and temporal fusion. A domain-adaptive pseudo-label annotation framework is further developed to construct customized fatigue datasets under domain shifts through cross-domain adaptation and pseudo-label refinement. In addition, a multi-modal semantic alignment and fusion framework is proposed to exploit complementary information from synchronized EEG and facial video signals through shared-specific semantic modeling and contrastive semantic alignment. Experimental results demonstrate the effectiveness of the proposed approaches for robust and scalable driver fatigue monitoring.

[사용언어: 영어]