Project title:

NFL Helmet assignment

Project description:

In 1980, the National Football League (NFL) started building an injury surveillance system which has dramatically improved player safety. Their database of injuries have inspired rules such as the Helmet Rule that reduced reported concussions by 29%.[[1]](#footnote-1) Currently, the NFL manually annotates a subset of plays each year to determine a sample of exposures per player. To increase the speed and scale at which they can answer complex research questions regarding helmet impact and mitigate unnecessary injuries in the future, the NFL hopes to skip the mapping step. Thus, in this project, we hope to automatically assign specific players to each helmet from video footage such that each player’s exposures throughout a game can be accurately identified.

Dataset:

<https://www.kaggle.com/c/nfl-health-and-safety-helmet-assignment/data>

Source: NFL

* videos of game footage with two views
* images of helmets with labelled bounding boxes
* baseline helmet detection model output trained from images and labels
* 10 Hz tracking data for each player during provided plays

Teammates and work division:

* Niklas 孟念 180092850
  + Object tracking algorithms, such as DeepSORT; Dataset input preparation
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  + Optimization algorithms to combine tracks identified by object tracking with the players – Greedy vs Non-greedy approaches; Dataset output combination
* Teo En Qi 张恩绮 1800092854
  + Object detection algorithms (commonly also mixed with tracking) such as FairMOT; Dataset improvement (Augmentations; Re-labelling)

Potential methodologies:

Multiple object tracking

* Supervised: DeepSORT - Simple Online and Realtime Tracking (SORT) (<https://arxiv.org/pdf/1703.07402.pdf>)
  + SORT: Kalman filtering in image space and frame-by-frame data association using the Hungarian method with an association metric that measures bounding box overlap
  + DeepSORT: SORT integrated with a CNN
* Unsupervised: SimpleReID – re-identification (<https://arxiv.org/pdf/2006.02609.pdf>)
  + Reduces annotating costs by generating tracking labels using SORT and training a ReID network to predict generated labels using crossentropy loss

1. <https://www.sporttechie.com/nfl-injury-surveillance-system-database-football-rule-changes-concussion-mouthguards-cleats> [↑](#footnote-ref-1)