



NomadZ: Open Research Challenge 2022

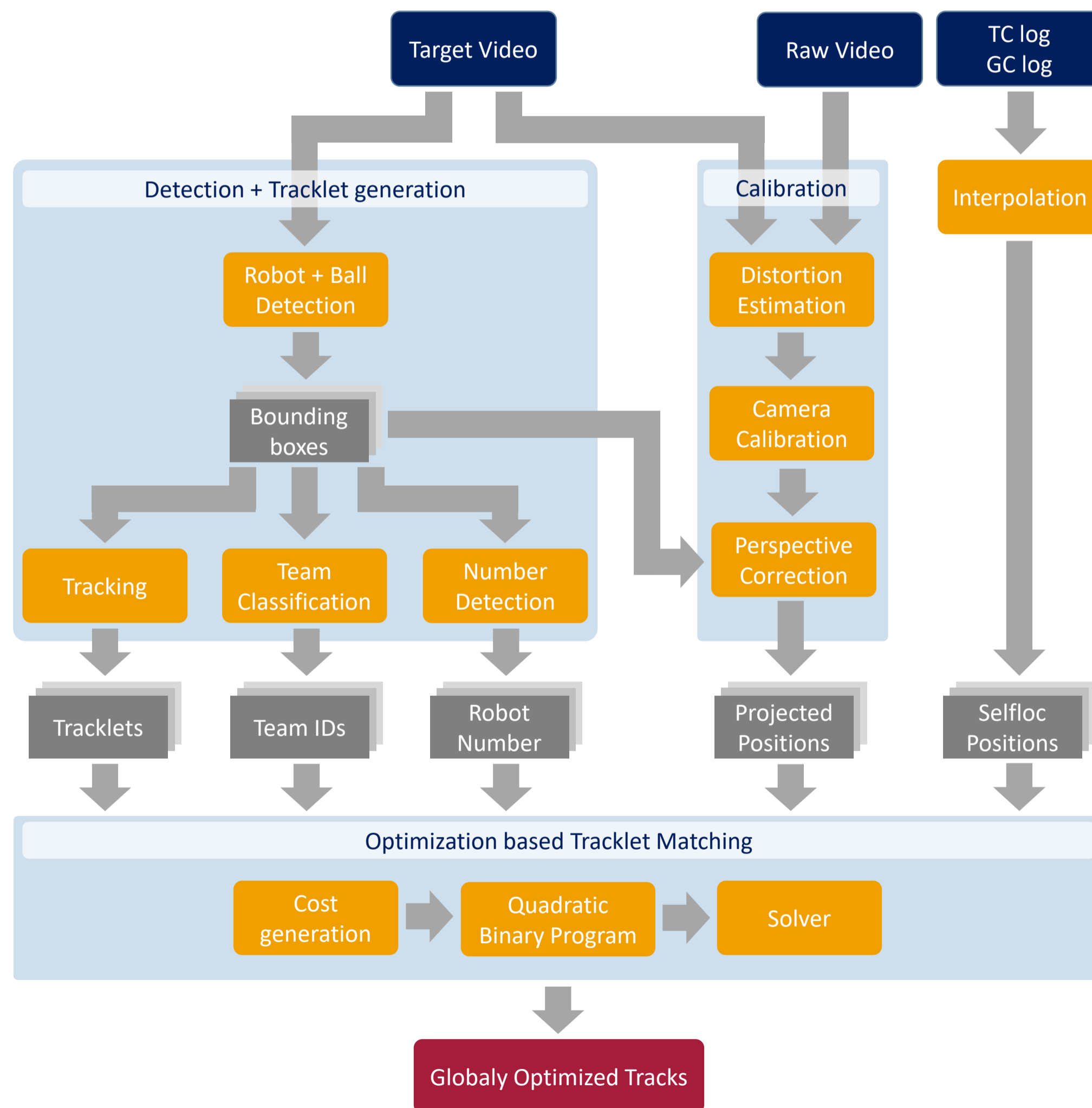
ETH zürich



AUTOMATIC CONTROL LABORATORY IFA



Pipeline



Modules

Detection + Tracklet generation

- Robot + Ball Detection: Faster R-CNN trained on provided data
- Tracking: IoU based, no training required
- Team Classification: VGG16 on detected robots
- Number Detection:
 - YOLO-V5 on detected robots
 - Trained on SVHN dataset + self-annotated robot numbers

Calibration

- Distortion Estimation: Radial distortion from field lines in single view
- Camera Calibration:
 - Based on median filtered video → Robust to occlusions
 - Line detection with SOLD2 + masking
 - Intrinsic + extrinsic calibration from line intersections
- Perspective correction: Maps image detections to field coordinates

Optimization based Tracklet Matching

- Merges tracklets into long tracks with known team + robot number
- Quadratic binary program solved with Gurobi
 - Track matching: self localization error, jersey color, jersey number
 - Tracklet matching: temporal distance between tracklets
 - Tracklet weighting: duration of tracklet