



# NomadZ: Open Research Challenge 2022

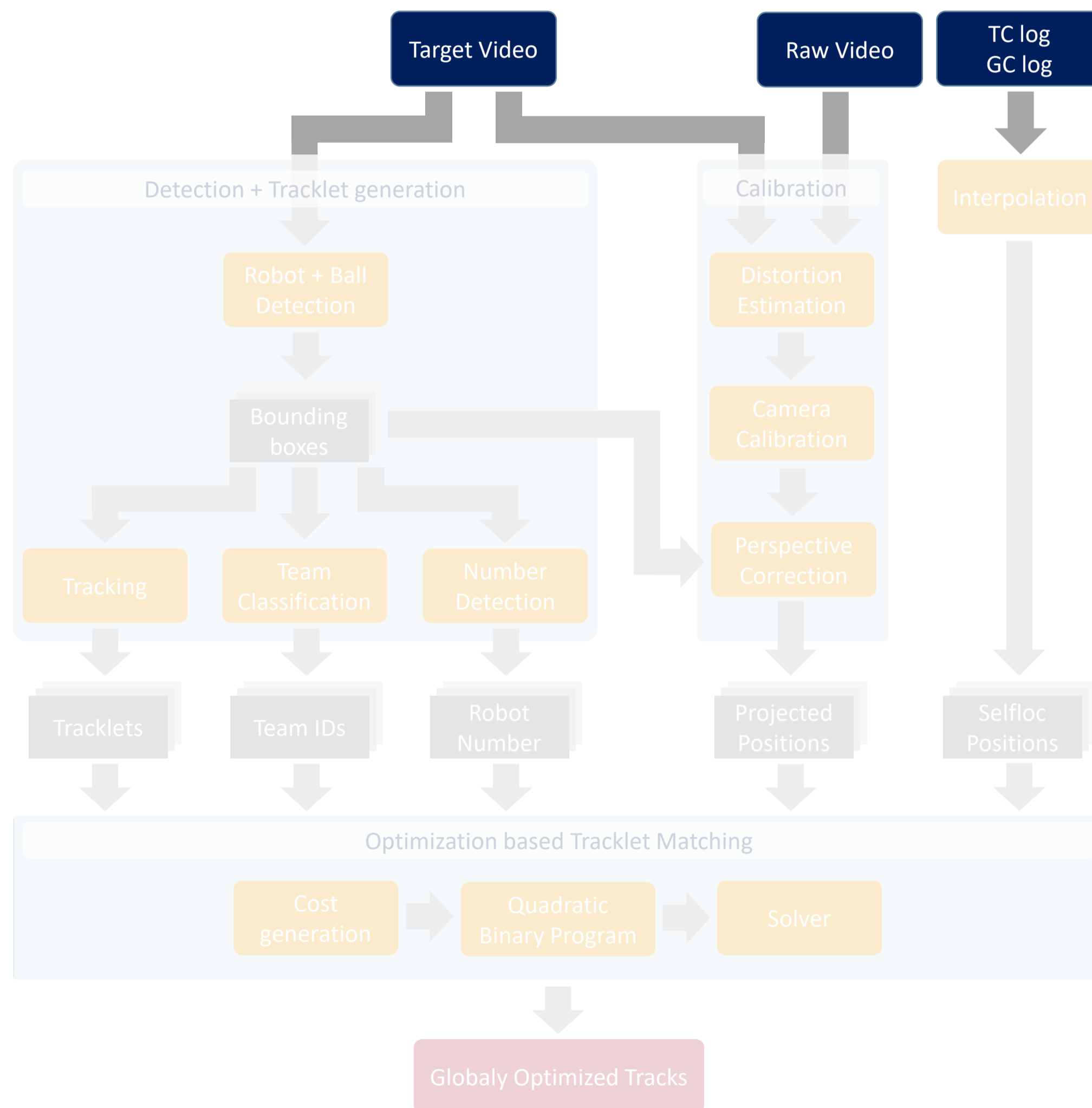
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AUTOMATIC CONTROL LABORATORY IFA



## 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



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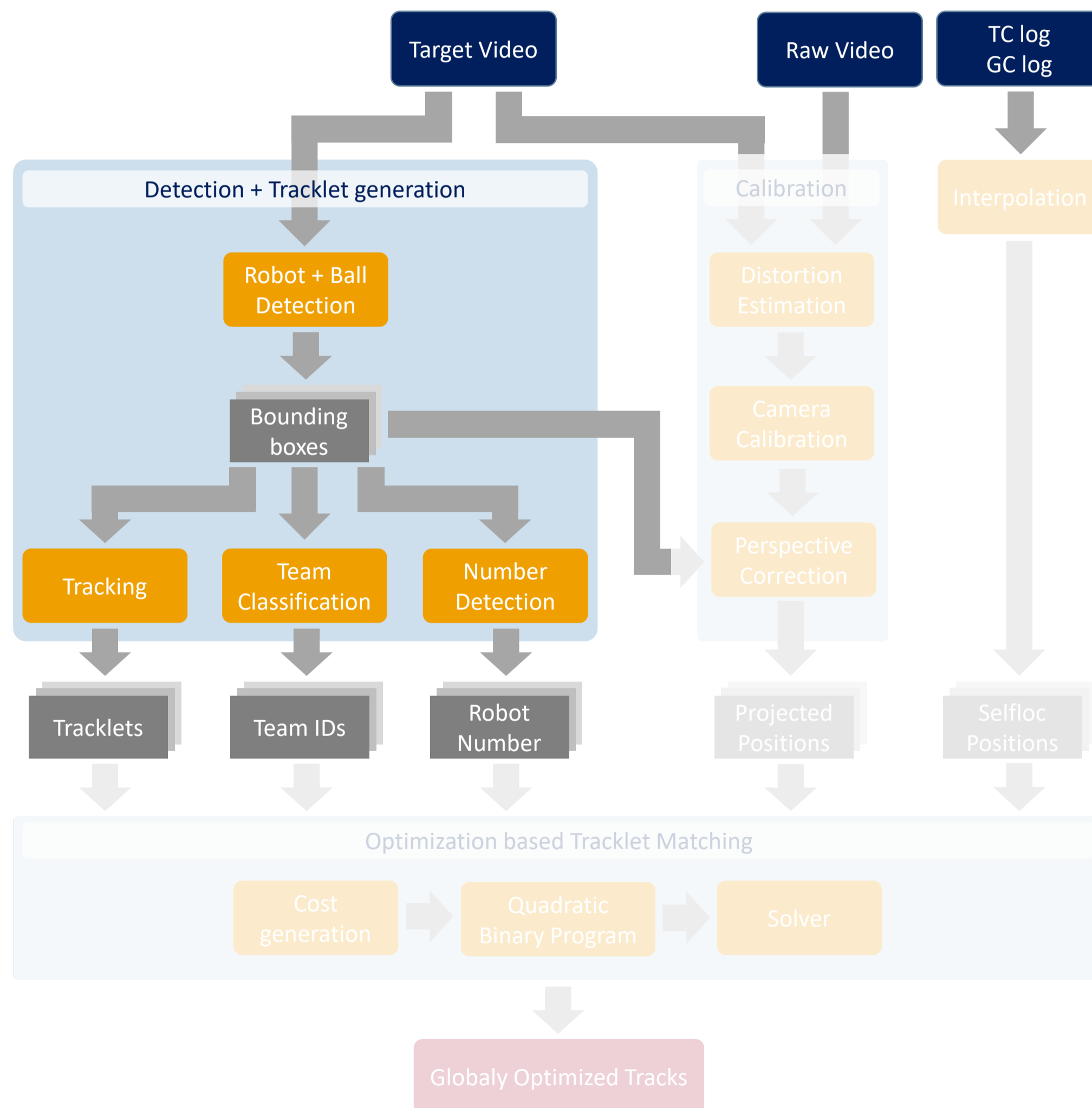
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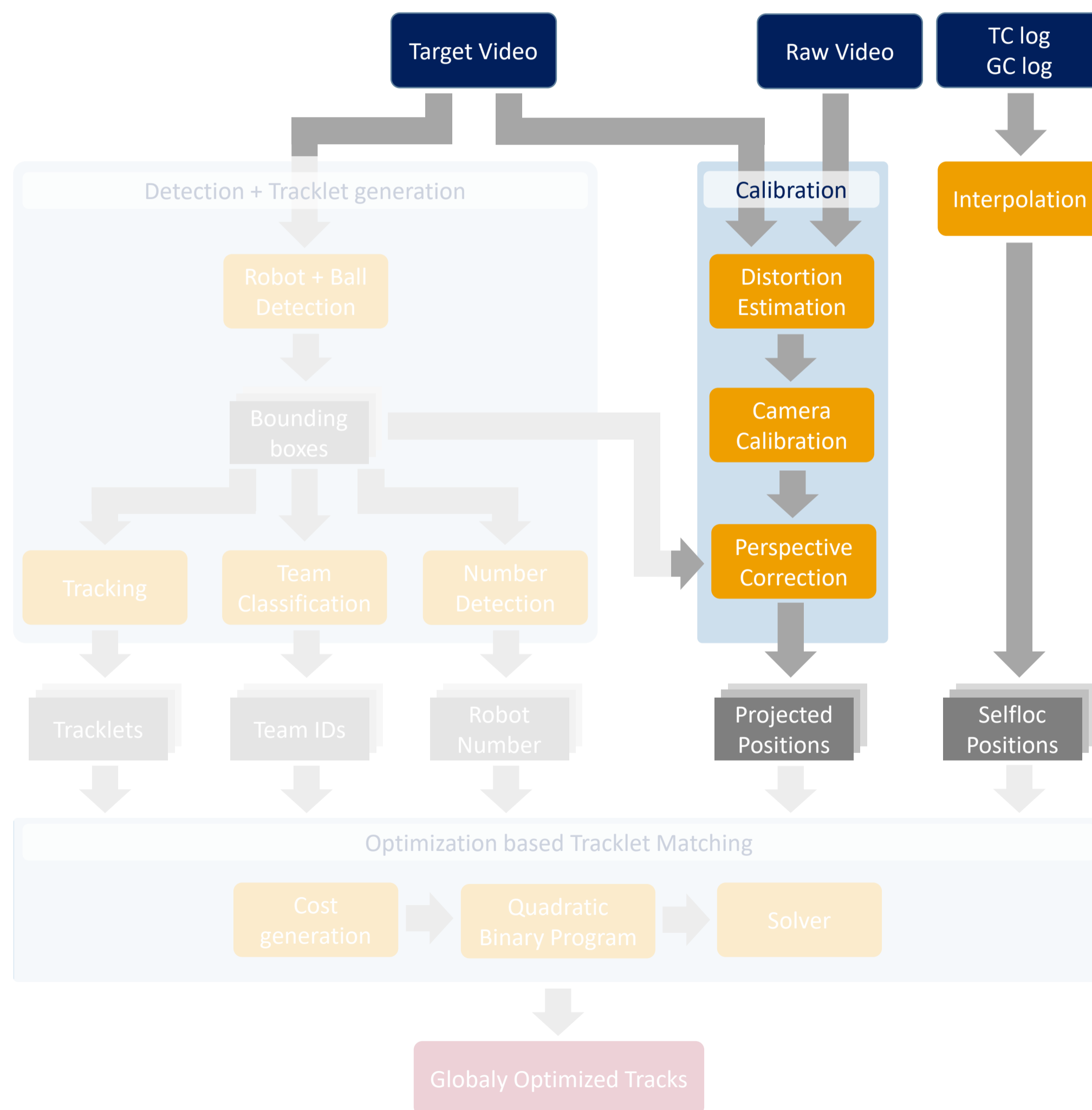
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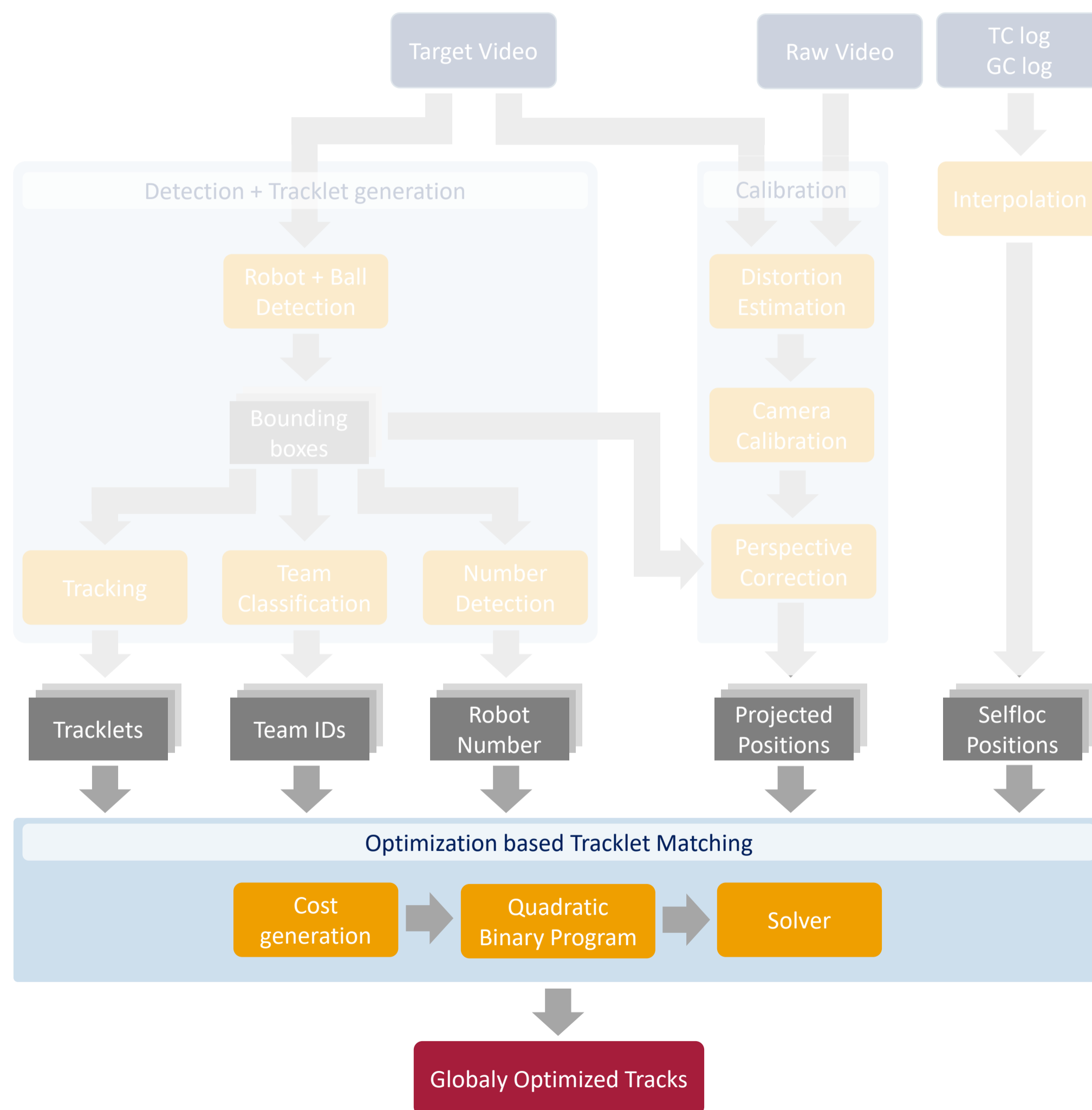
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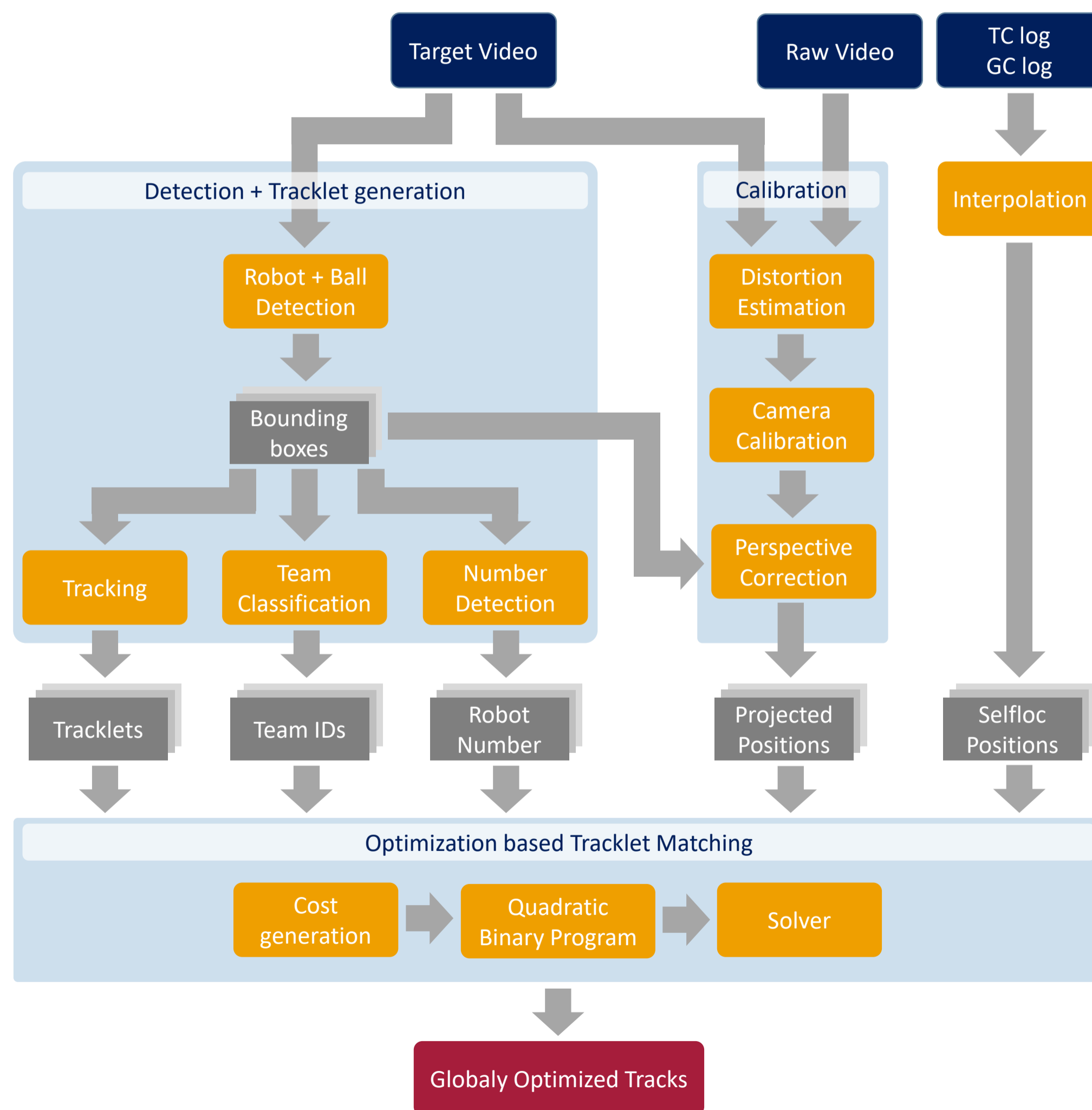
CVL



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