

A Study of TransTrack for Multi-Object Tracking and Its Robustness Evaluation

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Introduction



This project is a study on the Multi-Object Tracking (MOT) based on the Trantrack and examines its robustness under adverse conditions.

- ▶ Why TransTrack? Why a Transformer based architecture?
- ▶ How it performs in challenging environments that may be encountered in reality Light, motion blur, snow.
- ▶ Improvement.

We augment the MOT17 dataset and apply transfer learning to evaluate its impact on tracking accuracy. Our results highlight:

- ▶ Strengths of TransTrack in real-world applications
- ▶ Limitations under adverse conditions

These insights provide direction for improving future MOT systems.

Architecture

TransTrack uses a transformer with two decoders to detect new objects and track previous ones, enhancing multi-object tracking accuracy across frames

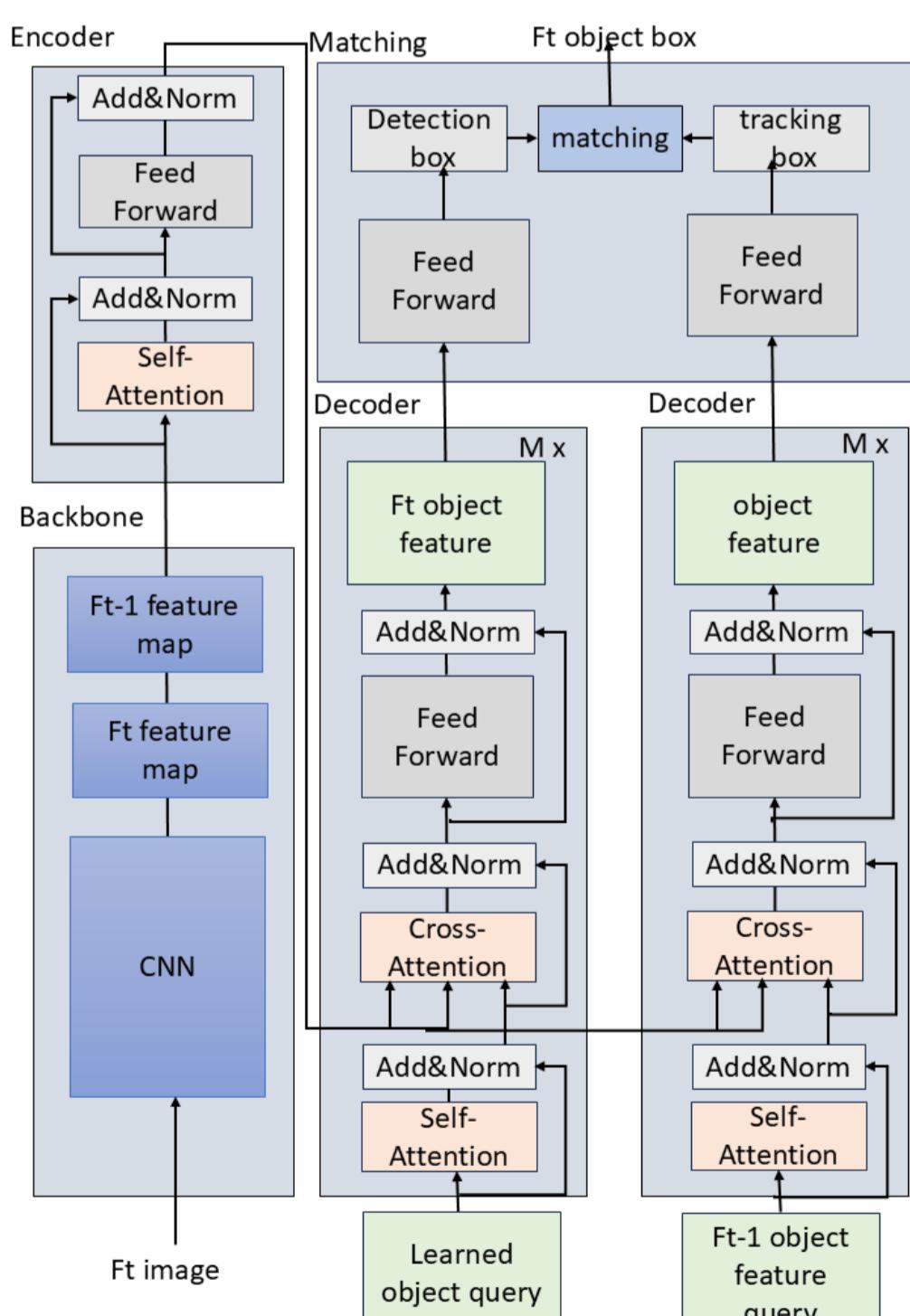
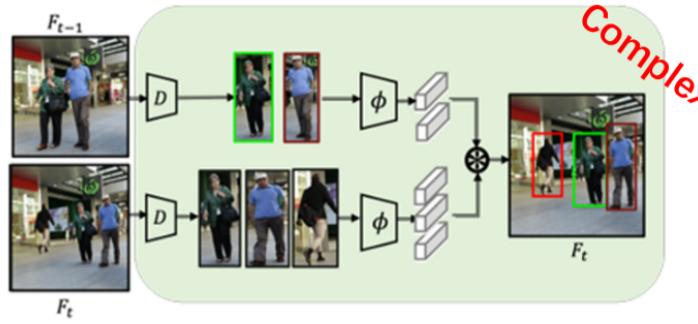


Figure 1: TransTrack architecture overview showing detection and tracking mechanisms

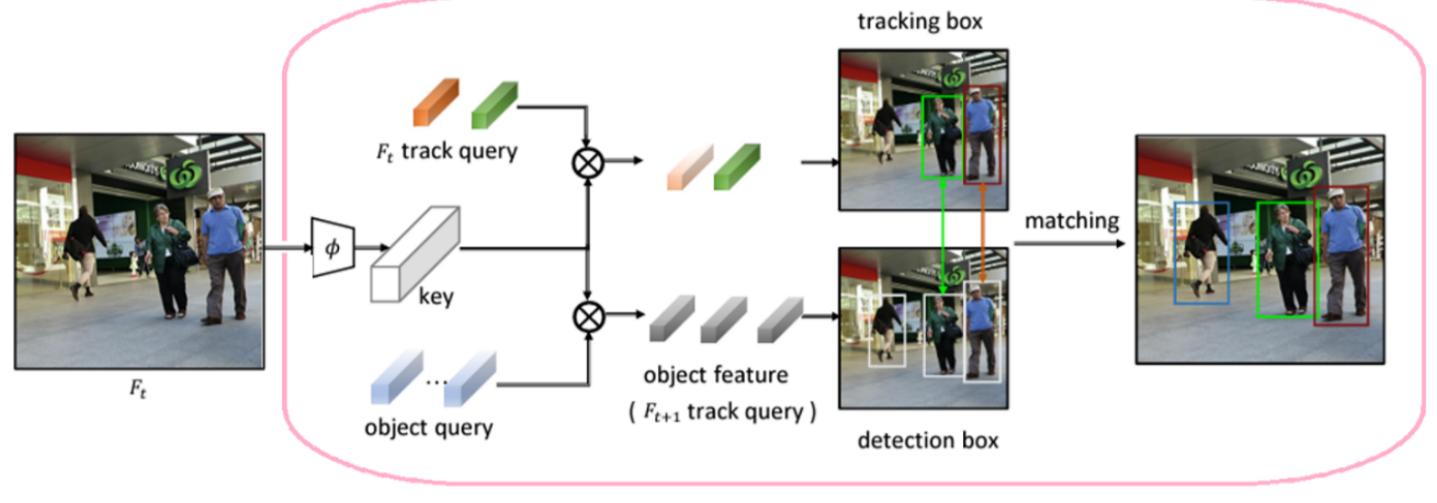
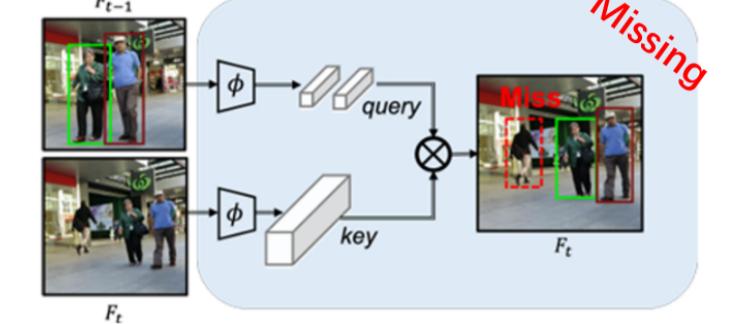
How does TransTrack handle occlusion challenges effectively?

Motivation of Pipeline

Traditional tracking-by-detection MOT pipeline



Directly migrating the query-key mechanism



Pipeline of TransTrack

Figure 2: Development of pipeline

Adverse Conditions



Figure 3: visual of challenge

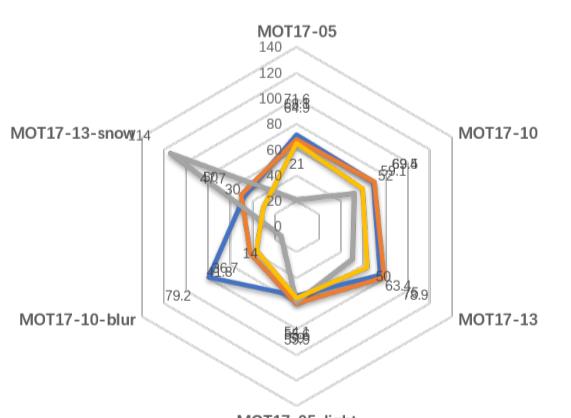
How does detection perform under different conditions?

- ▶ Lighting effects
- ▶ Snow effects
- ▶ Motion blur effects

Some parameters to evaluate performance

IDP Recall IDs MOTA

— IDP — Rcll — IDs — MOTA



— IDP — Rcll — IDs — MOTA

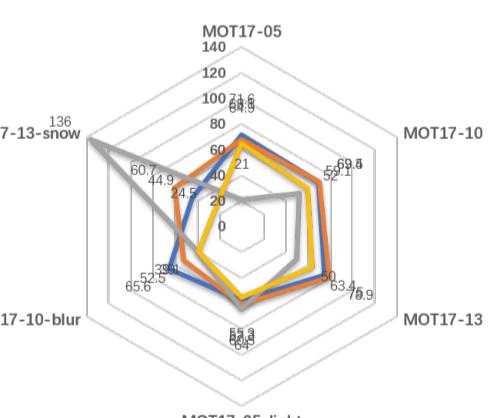


Figure 4: Performance before(left) and after(right) transfer learning

Trying to improve performance through transfer learning and fine-tuning
MOTA vs Recall
Other methods?

References

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P. Sun, J. Cao, Y. Jiang, R. Zhang, E. Xie, Z. Yuan, C. Wang, and P. Luo, "TransTrack: Multiple-Object Tracking with Transformer," arXiv preprint arXiv:2012.15460, 2020.