SiamMT: Real-Time Arbitrary Multi-Object Tracking

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Why arbitrary multi-object tracking?

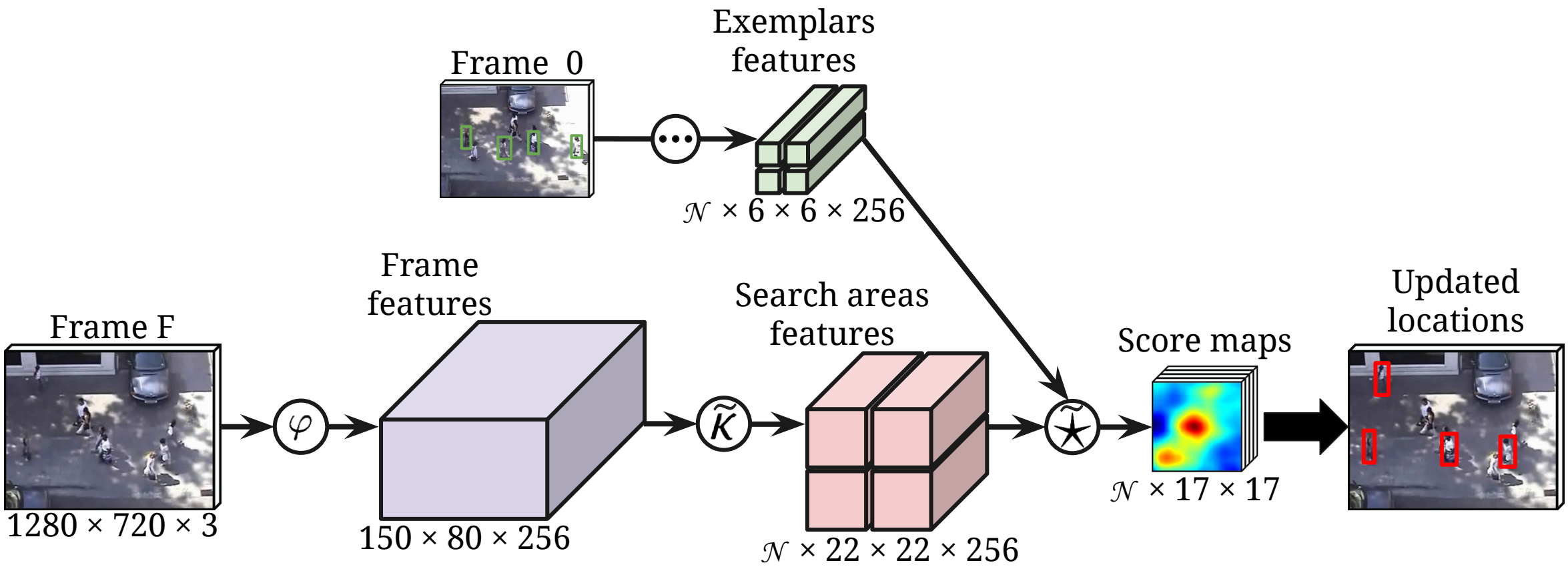
- Single-object trackers
  - ✔ Many operate in real-time
  - ✔ Most of them support arbitrary objects
  - ✘ Can only handle one target at a time
- Multi-object trackers
  - ✘ Detector limits their speed
  - ✘ Arbitrary objects are not supported
  - ✔ Can handle several dozen objects

There is a need for arbitrary multi-object trackers

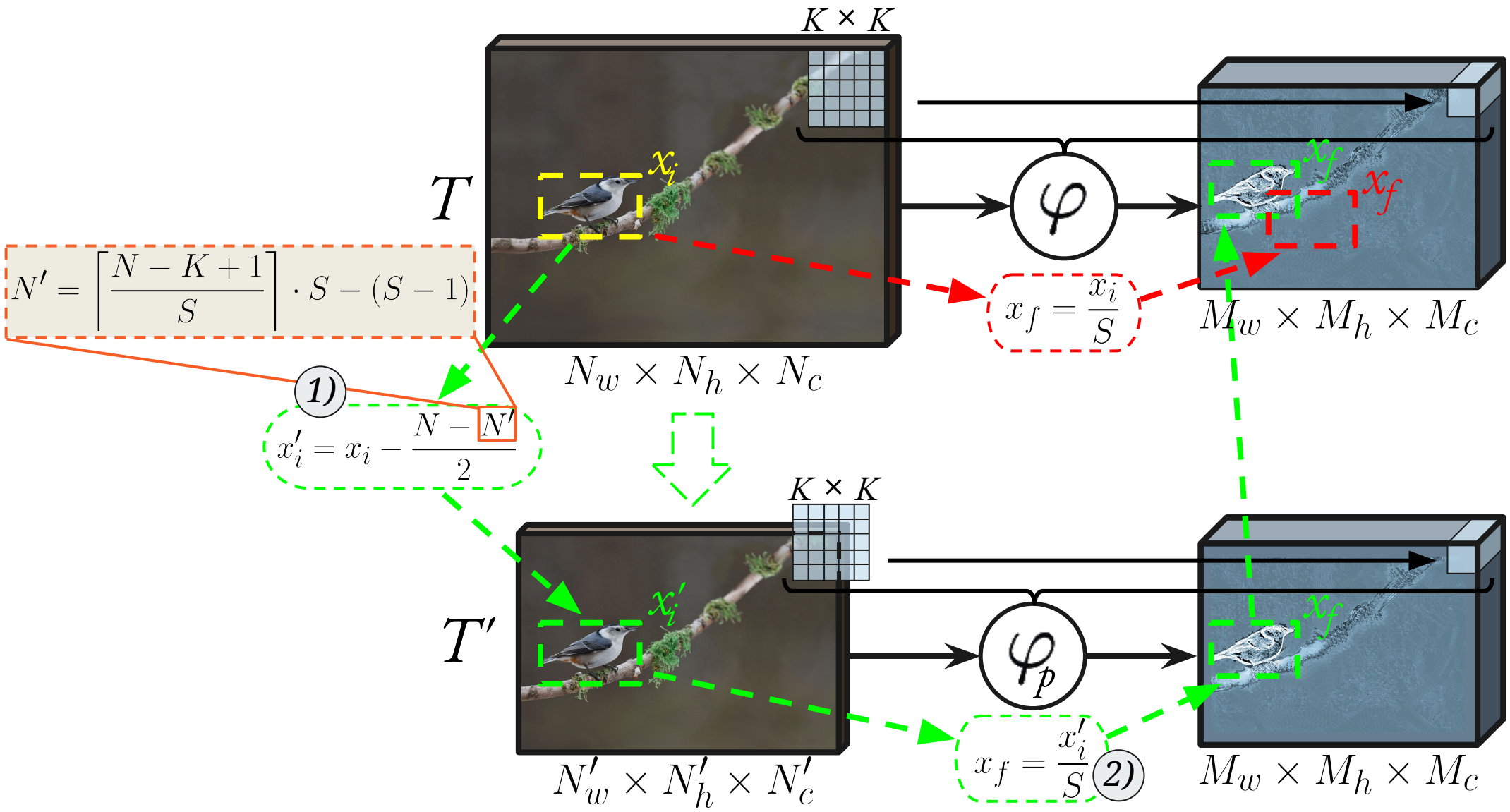
Video surveillance

Assisted video annotation

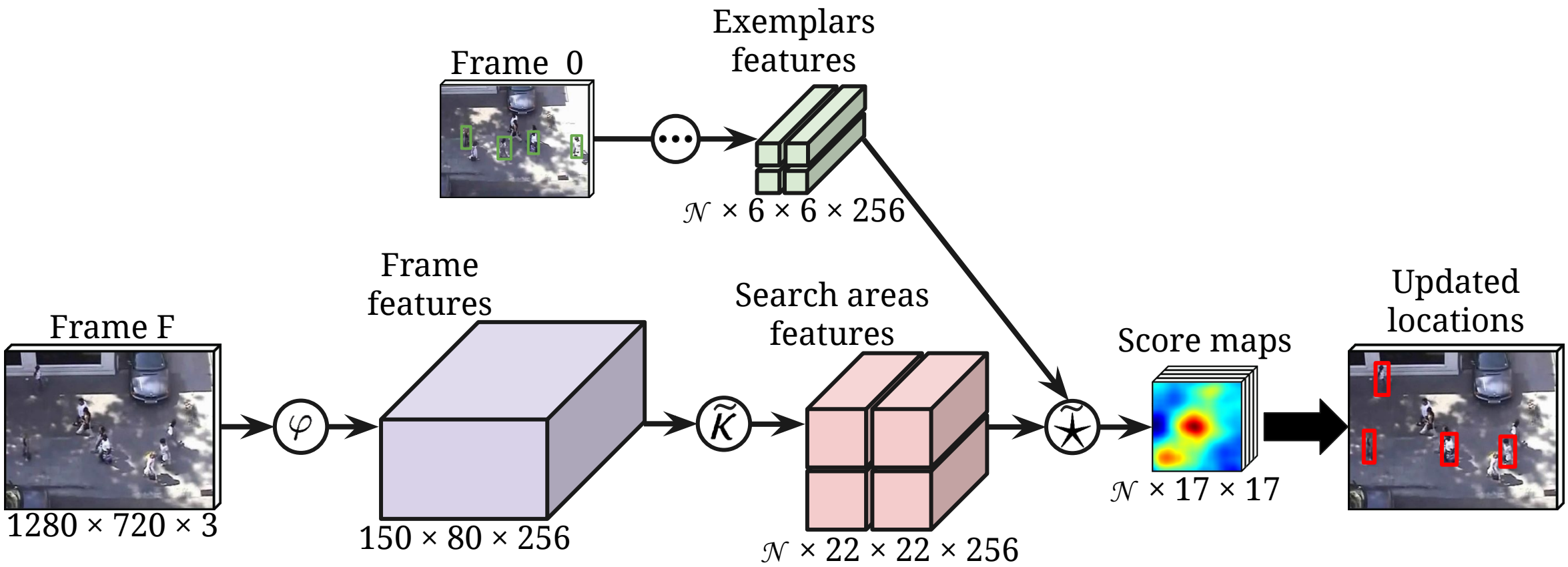
SiamMT's network architecture



Cropping and resizing of features



Similarity operation



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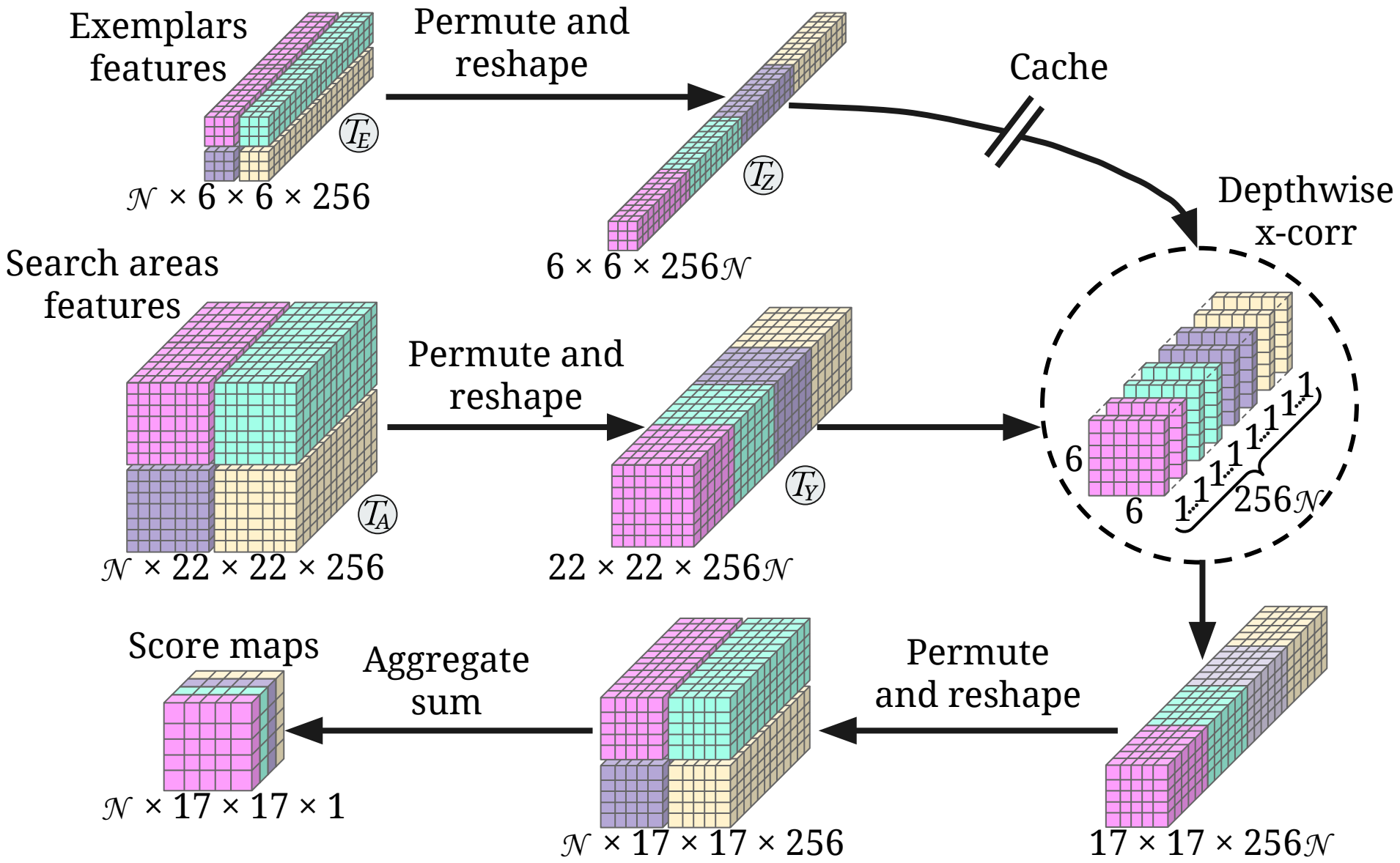


Tracking quality evaluation

TRACKING QUALITY IN SINGLE-OBJECT BENCHMARKS

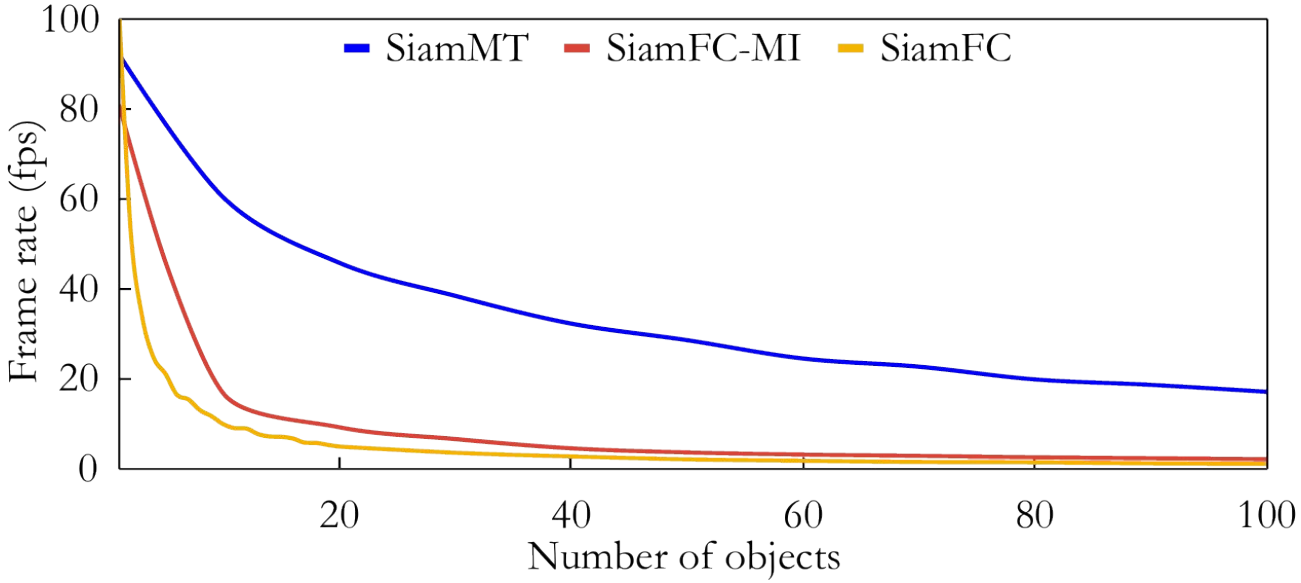
		SiamMT	SiamMT-W	SiamFC
OTB-15	Precision	73.52	72.37	77.12
	AUC	53.32	51.04	58.27
	fps	32.64	31.26	96.20
VOT-15	Accuracy	50.78	48.38	53.35
	Robustness	84.67	84.79	88.67
	fps	31.99	29.98	93.43

TRACKING QUALITY IN MULTI-OBJECT BENCHMARKS

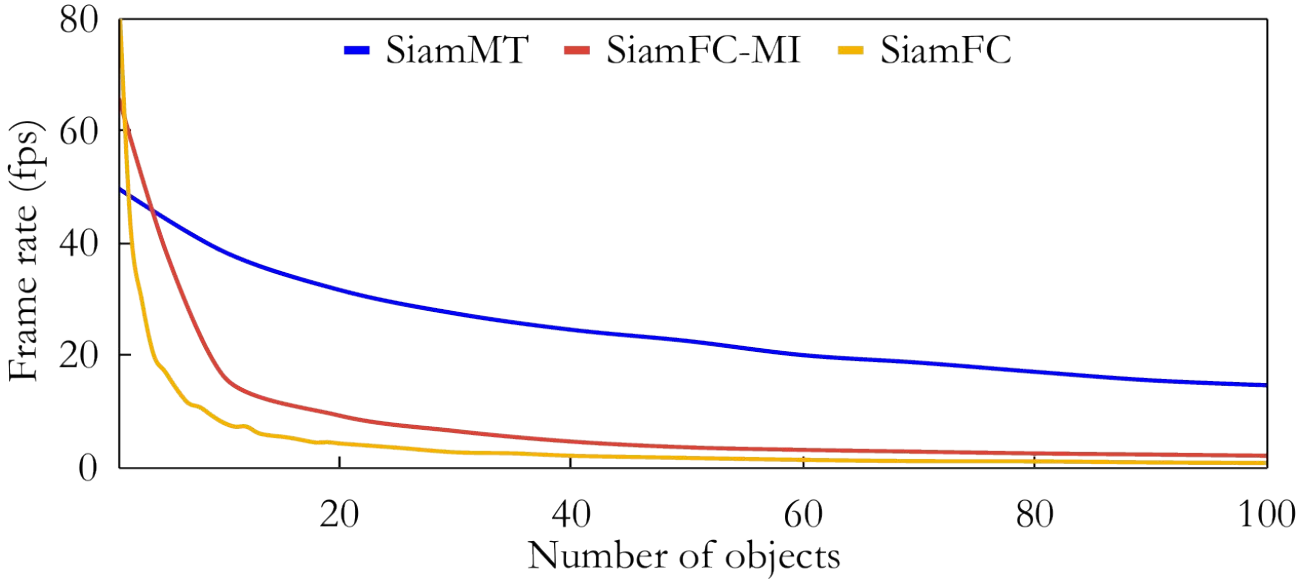
		SiamMT	SiamMT-W	SiamFC
MOT-15	Accuracy	50.05	51.77	55.39
1125×679	Robustness	68.31	62.04	69.24
7.3 ob/im	fps	31.02	30.51	7.89
MOT-16	Accuracy	51.01	51.18	50.68
1718×986	Robustness	69.24	66.33	68.17
20.8 ob/im	fps	15.42	14.53	2.74
MOT-20	Accuracy	46.91	48.63	49.68
1620×1026	Robustness	76.27	71.37	71.17
149.7 ob/im	fps	6.11	5.56	0.53

Tracking speed evaluation

MT-VGA benchmark



MT-HD benchmark



Conclusions

- SiamMT is the first deep-learning-based arbitrary multi-object tracker
  - Global extraction of frame features
  - Reformulation of the RoIAlign operator
  - Optimized similarity operation
- Tracking quality similar to SiamFC
- Remarkable speed with multiple simultaneous objects
- Able to reuse weights learned for SiamFC

Any questions?

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