北京大学数字媒体研究所
INSTITUTE OF DIGITAL MEDIA, PEKING UNIVERSITY

Graph Networks for Multiple Object Tracking

Jiahe Li, Xu Gao, Tingting Jiang

https://github.com/yinizhizhu/GNMOT.

Motivation

- Most graph models are static
  - Nodes and edges are fixed

- Graph Network
  - Has the ability of reasoning
  - Nodes and edges will be updated iteratively and reasonably

Contributions

- We propose a new near-online MOT method with an end-to-end graph network framework followed by strategies for handling missing detections.

- The updating mechanism is carefully designed in our graph networks.

- The proposed method achieves encouraging performance.

Graph Network

- Battaglia et al. Interaction networks for learning about objects, relations and physics. NIPS, 2016
  - Graph network has the ability of reasoning

- Battaglia et al. Relational inductive biases, deep learning, and graph networks. arXiv, 2018.
  - General graph network framework
  - The node, the edge and the global variable
  - Updating modules for each component

Our 4-step graph network

Our 4-step graph network

Edges

Edge
Updating
Module

Our 4-step graph network

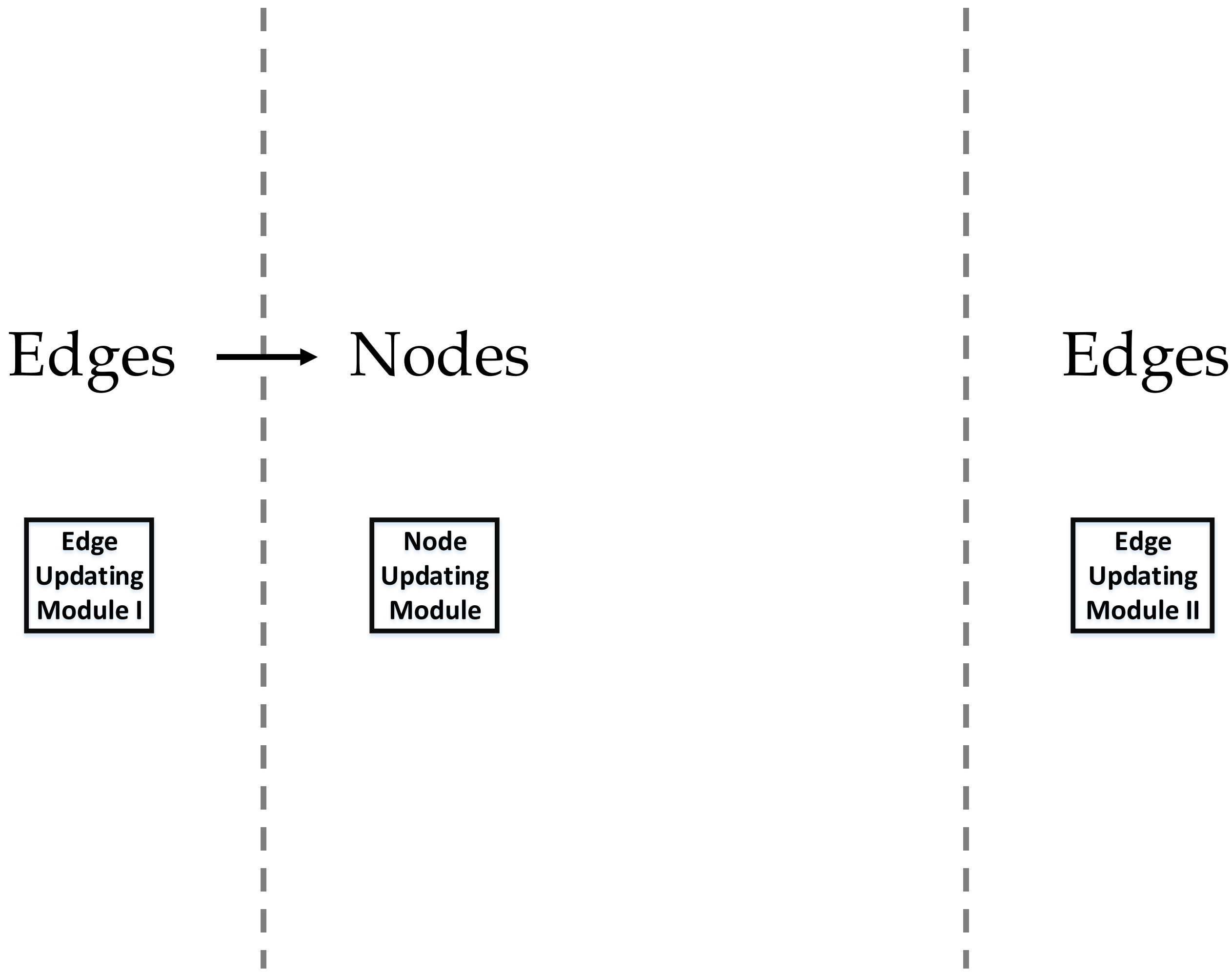
Nodes

Node Updating Module

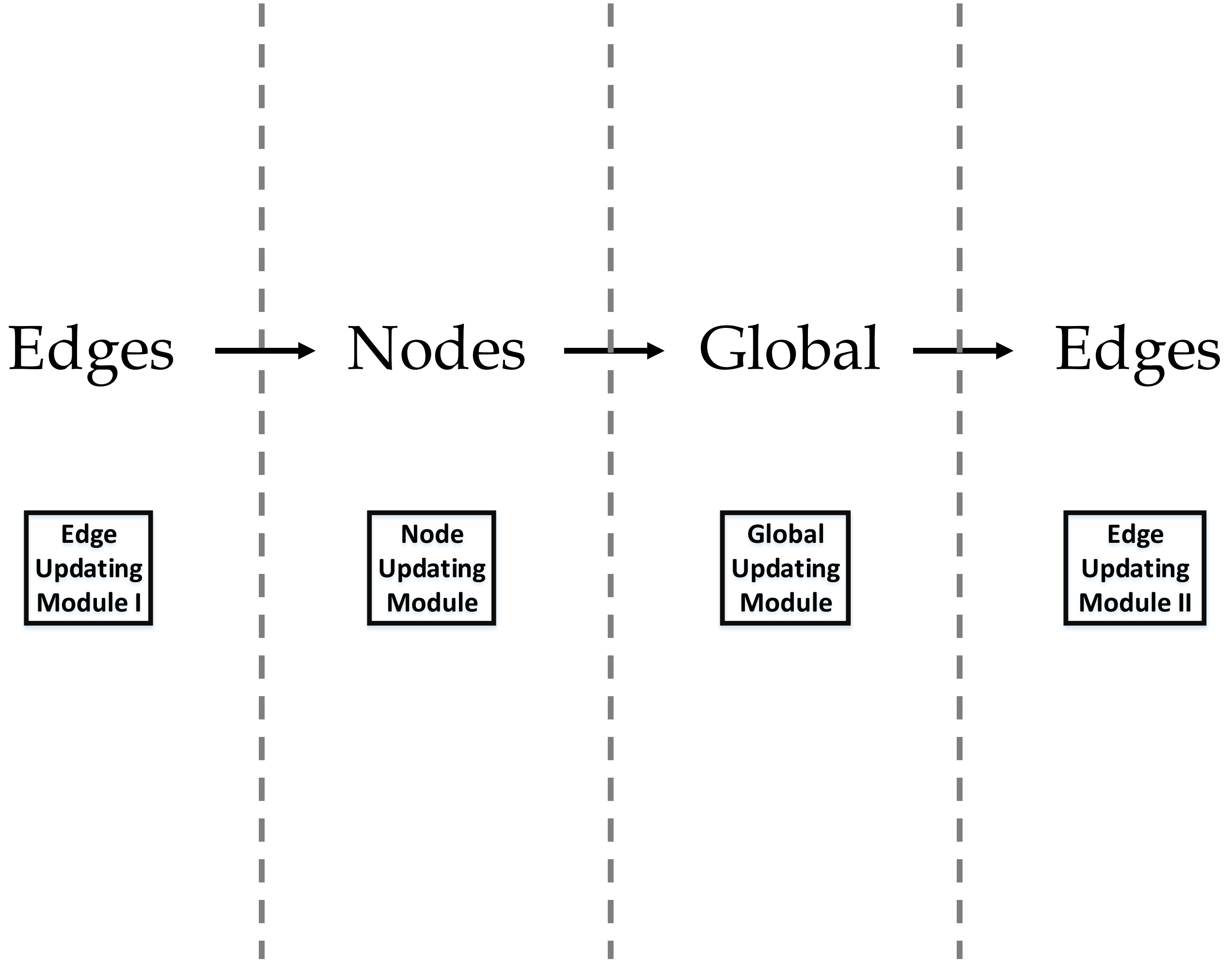
Edges

Edge Updating Module

Our 4-step graph network

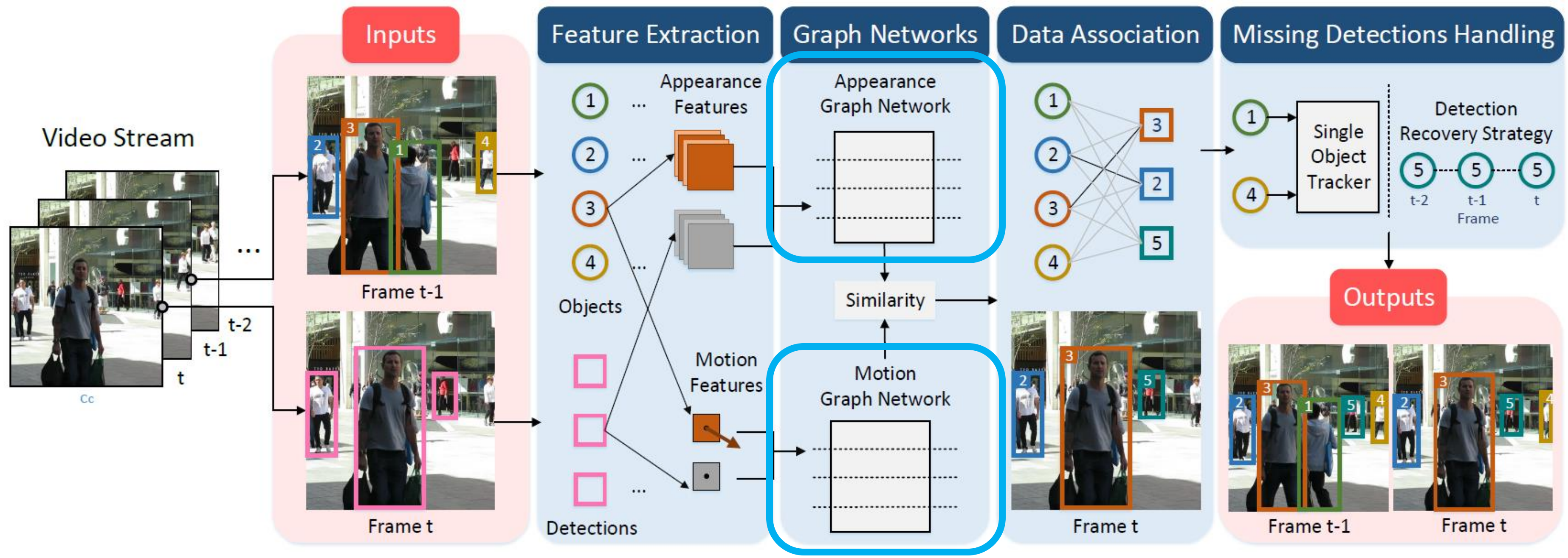


Our 4-step graph network

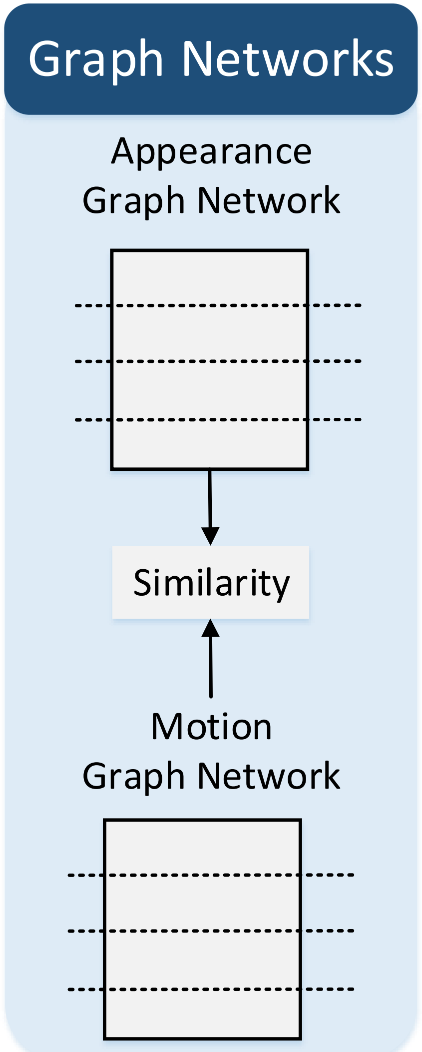


The pipeline of our method

- Appearance Graph Network
- Motion Graph Network



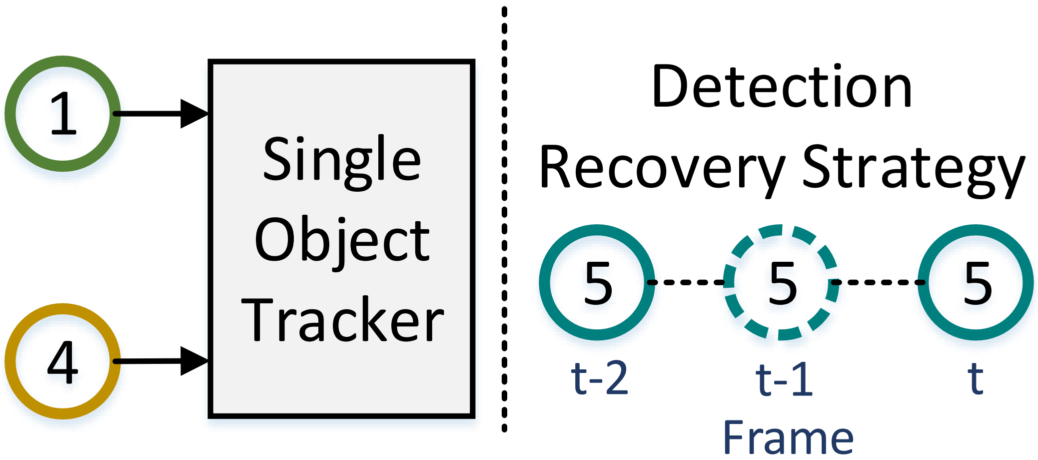
Weighted Strategy



$$S = \alpha AGN + (1 - \alpha)MGN$$

AGN and **MGN** denote the appearance similarity and the motion similarity respectively.

Missing Detection Handling



Main Results

Dataset	Detection	Methods	MOTA	IDF1	MT	ML	FP	FN	IDS	FM
MOT16	Public	LINF, *ECCV 2016*	41.0	45.7	11.6%	51.3%	7896	99224	430	963
		MHT_bLSTM*, *ECCV 2018*	42.1	47.8	14.9%	44.4%	11637	93172	753	1156
		NOMT, *ICCV 2015*	46.4	**53.3**	**18.3%**	41.4%	9753	87565	**359**	**504**
		Ours without SOT	47.4	42.6	14.5%	34.4%	**7795**	86178	1931	3389
		Ours	**47.7**	43.2	16.1%	**34.3%**	9518	**83875**	1907	3376
	Private	**Ours without SOT**	**58.4**	**54.8**	**27.3%**	**23.2%**	**5731**	**68630**	**1454**	**1730**
MOT17	Public	MHT_bLSTM*, *ECCV 2018*	47.5	**51.9**	18.2%	41.7%	25981	268042	**2069**	**3124**
		Ours without SOT	50.1	46.3	18.6%	33.3%	**25210**	250761	5470	8113
		Ours	**50.2**	47.0	**19.3%**	**32.7%**	29316	**246200**	5273	7850

Table 1. Experiments on MOT16 and MOT17 test set. The best result in each metric is highlighted in bold, and the second best result is underlined. * indicates the use of additional training data.

Thanks