



MonoNeRF: Learning a Generalizable Dynamic Radiance Field from Monocular Videos

ICCV23

PARIS

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Fengrui's website

Code

Video



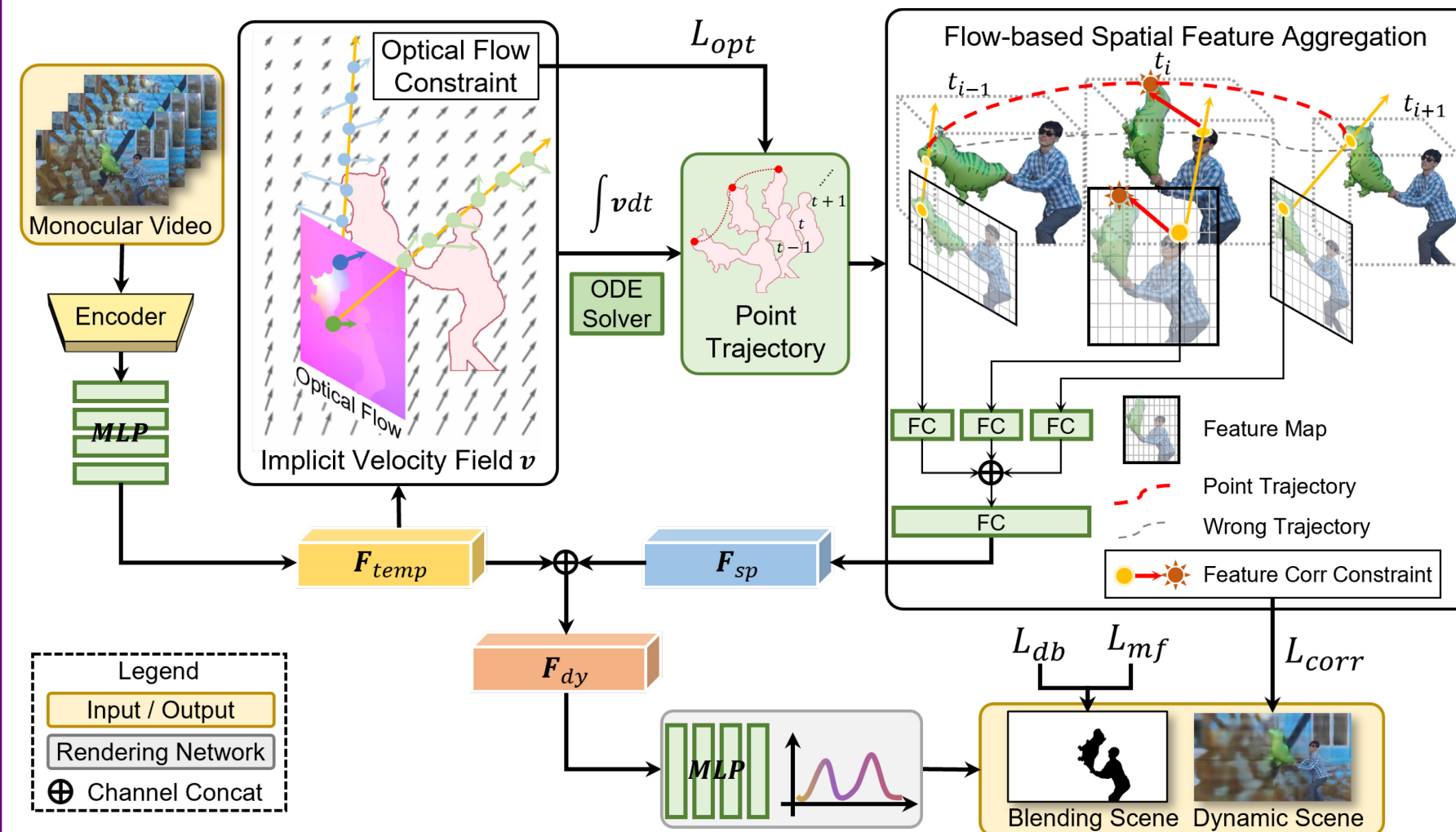
TL; DR: We propose a radiance field that could **generalize** to multiple dynamic scenes.

Fengrui Tian is also **looking for Ph.D. positions** in computer vision in Fall 2024!

Motivation

- Learning dynamic radiance fields from monocular videos suffers from 2D-to-3D ambiguity problem.
- Previous works (such as DynNeRF [1]) use positional embedding to break the ambiguity, but have limited transferable ability to multiple scenes.
- Learn a **generalizable** dynamic radiance field.

Overview



1. Learn an implicit velocity field from F_{temp} .
2. Exploit the spatial feature F_{sp} with flow-based spatial feature aggregation module.
3. Incorporate F_{temp} and F_{sp} as the point feature F_{dy} for rendering dynamic scene.

Spatio-temporal Constraints

- Spatial constraint

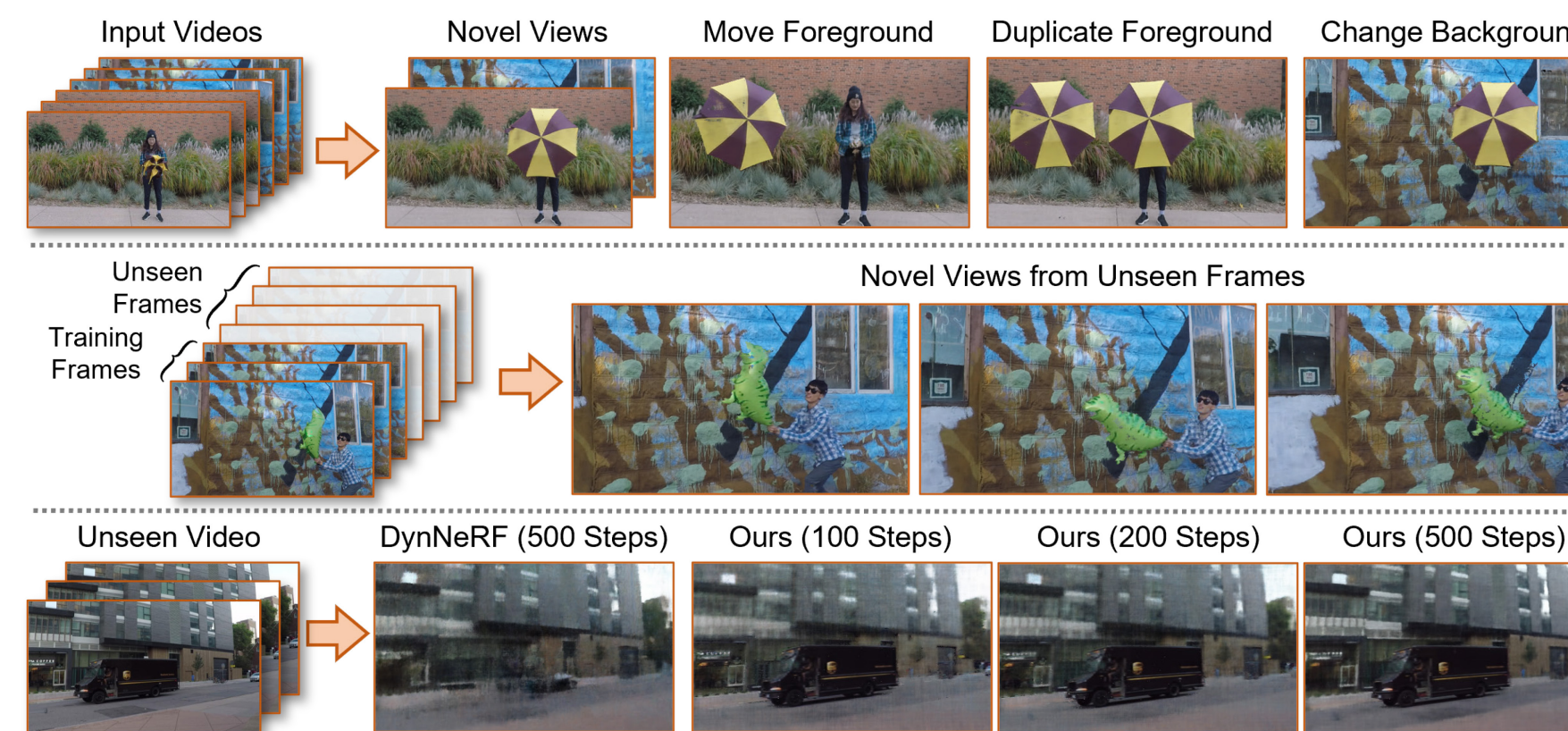
$$L_{\{bw,curr,fw\}} = \sum_r \|\mathbf{C}_{dy}(\mathbf{r}_{\{bw,curr,fw\}}) - \mathbf{C}_{dy}^{gt}(\mathbf{r})\|_2$$

$$L_{corr} = L_{bw} + L_{curr} + L_{fw}$$

- Temporal constraint

$$L_{opt} = \sum_r \left(f_{\{bw,fw\}}(\mathbf{r}) - f_{\{bw,fw\}}^{gt}(\mathbf{r}) \right)$$

New Applications

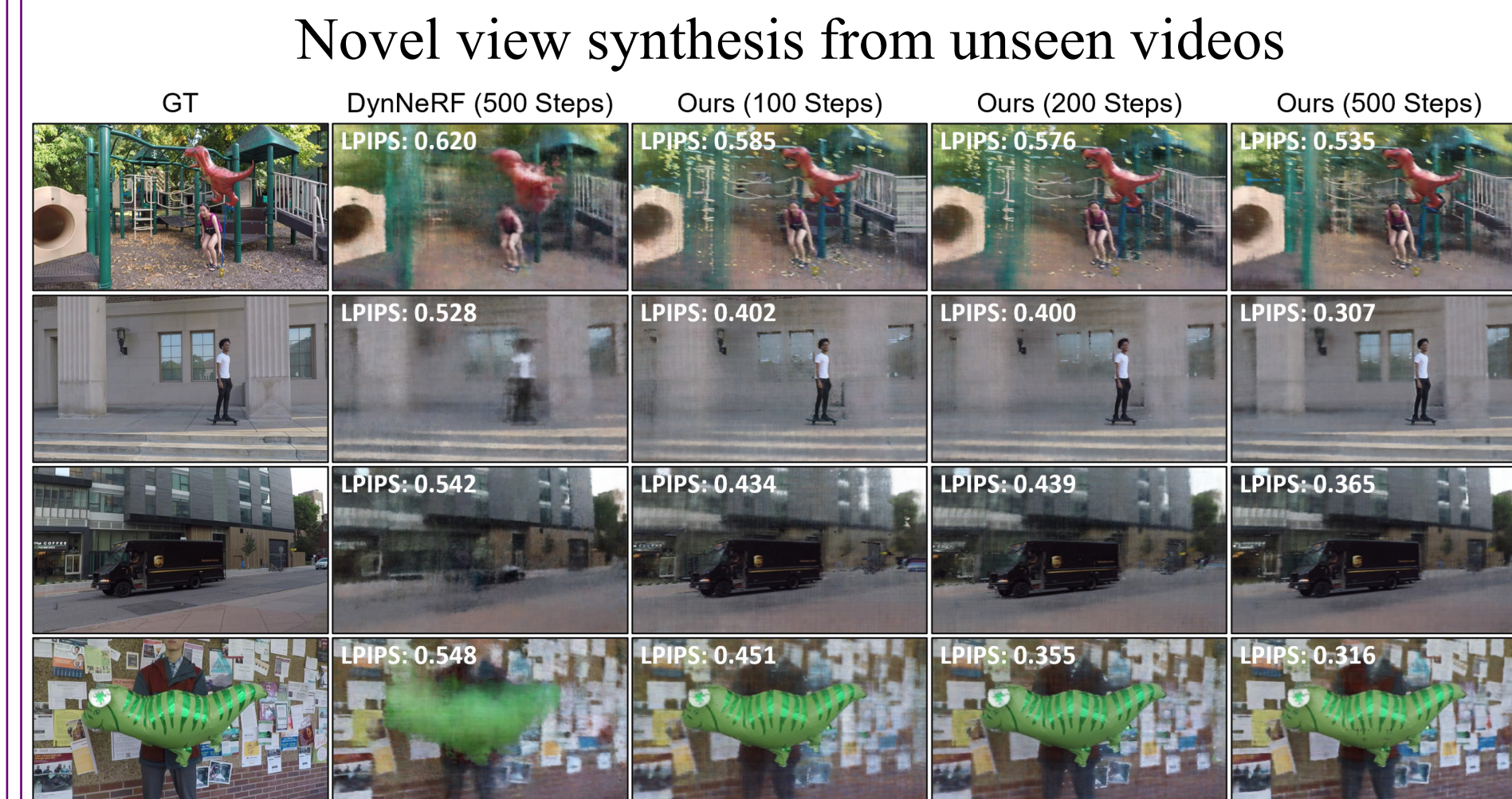
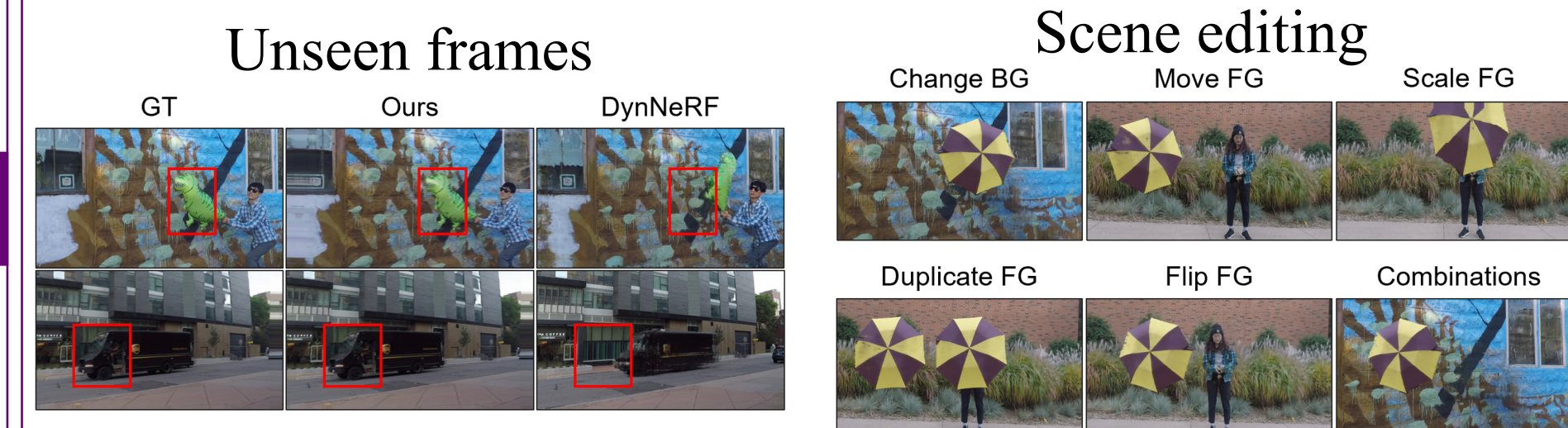
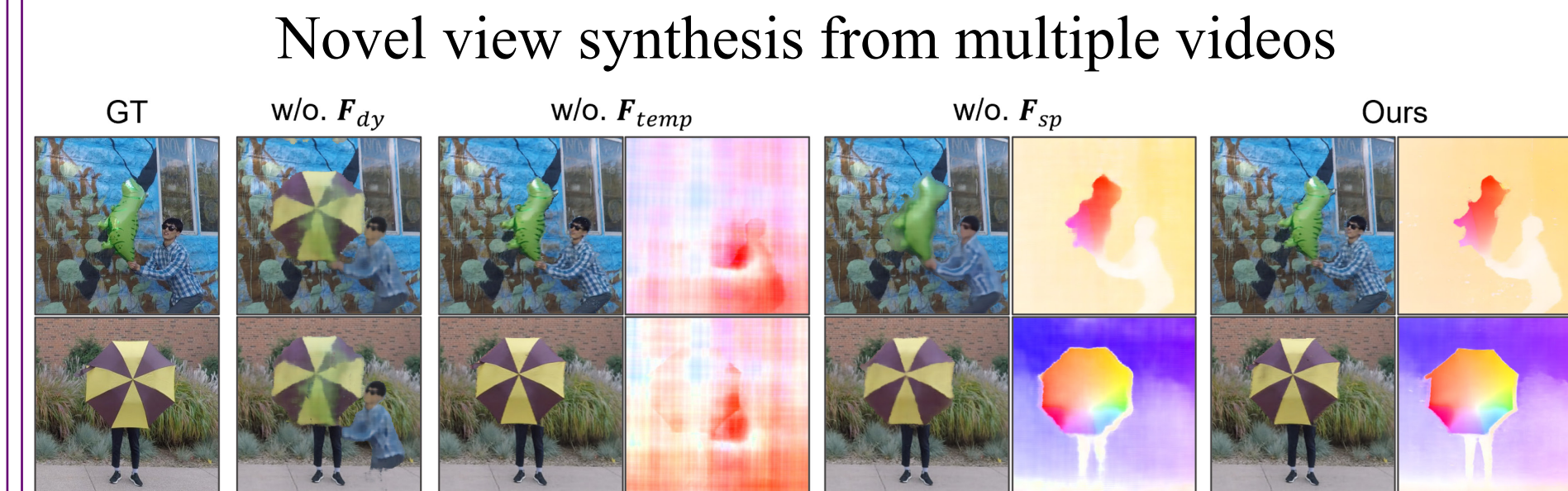


- Scene editing (**Top**)
- Unseen frame synthesis (**Middle**)
- Novel scene adaption (**Bottom**)

Reference: [1] Gao, C., et al. Dynamic view synthesis from dynamic monocular video. *In ICCV*, 2021.

Experimental Results

We strongly recommend to watch our Youtube Video.



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