

# DynIBaR

## Neural Dynamic Image-Based Rendering

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CVPR 2023 (Award Candidate)

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# Space-Time View Synthesis

- Given a monocular video of dynamic scene, our goal is to synthesize novel views in space and time.



# Limitations of Prior Work

- Long time duration
- Uncontrolled camera paths
- Complex object motions



Rendering from recent Dynamic NeRFs methods





# Comparisons to State of the Art



DVS Gao et al, ICCV 2021  
NSFF Li et al, CVPR 2021

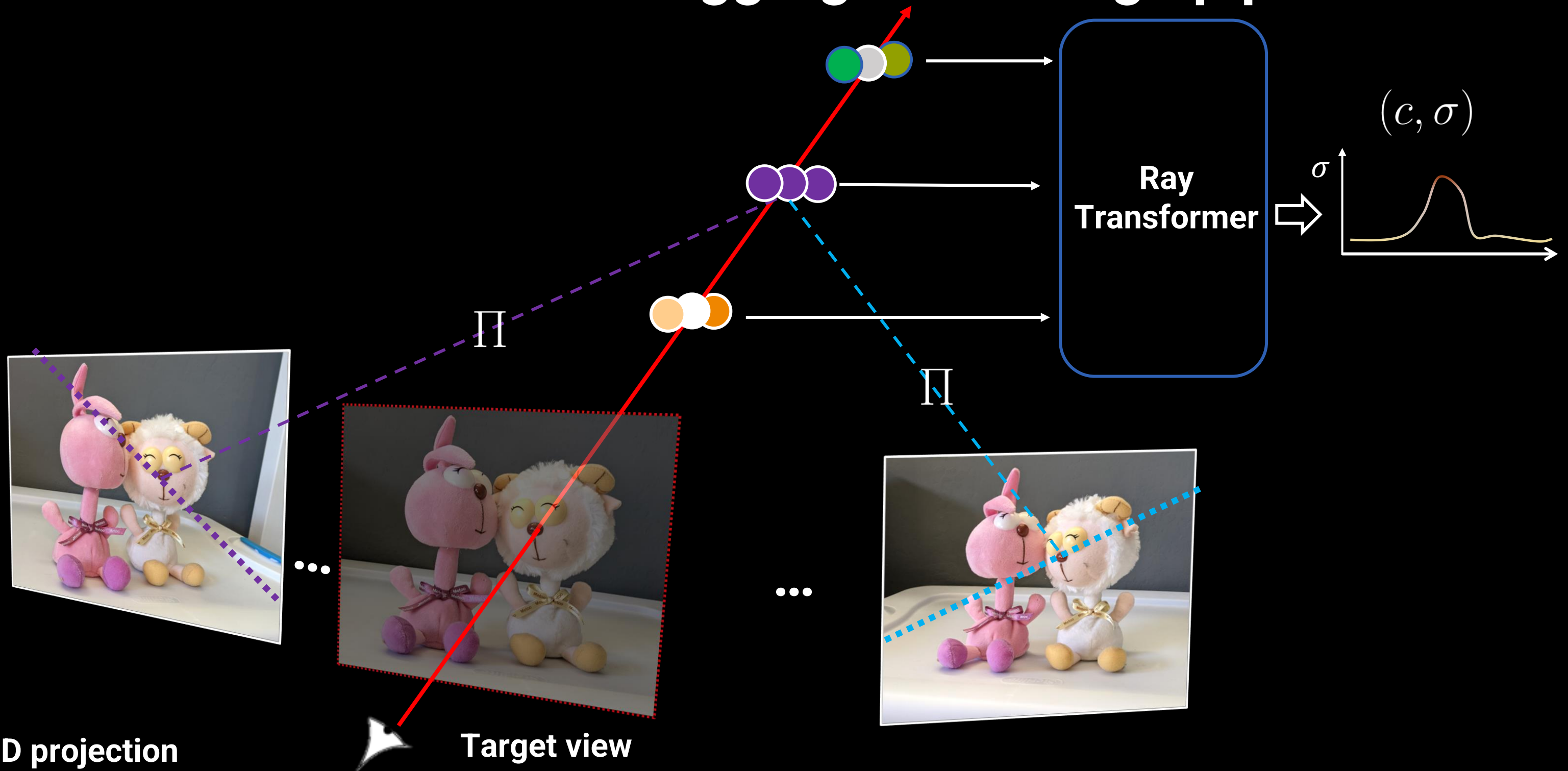








# Static Scene: Feature Aggregation along Epipolar line



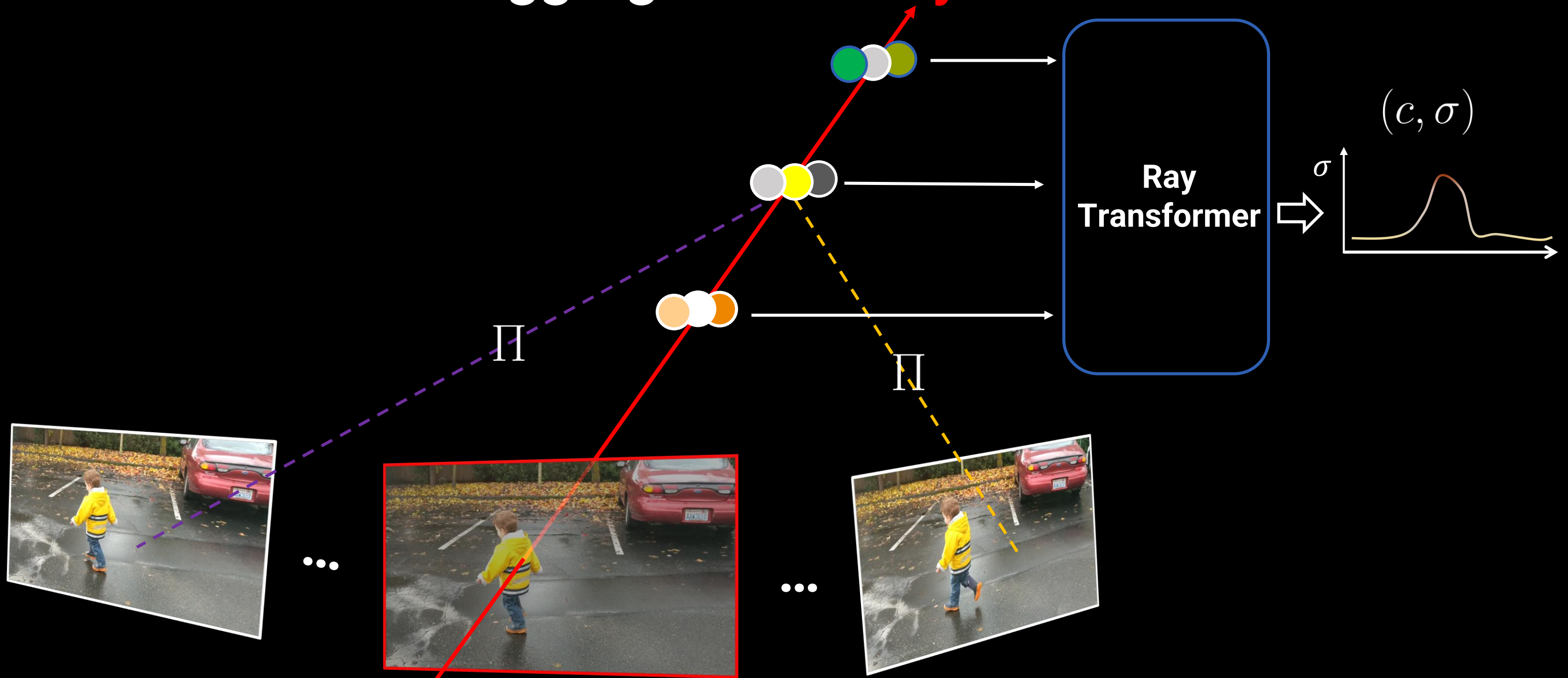
# Feature Aggregation for **Dynamic** Scene?



Input video



# Feature Aggregation for **Dynamic** Scene?

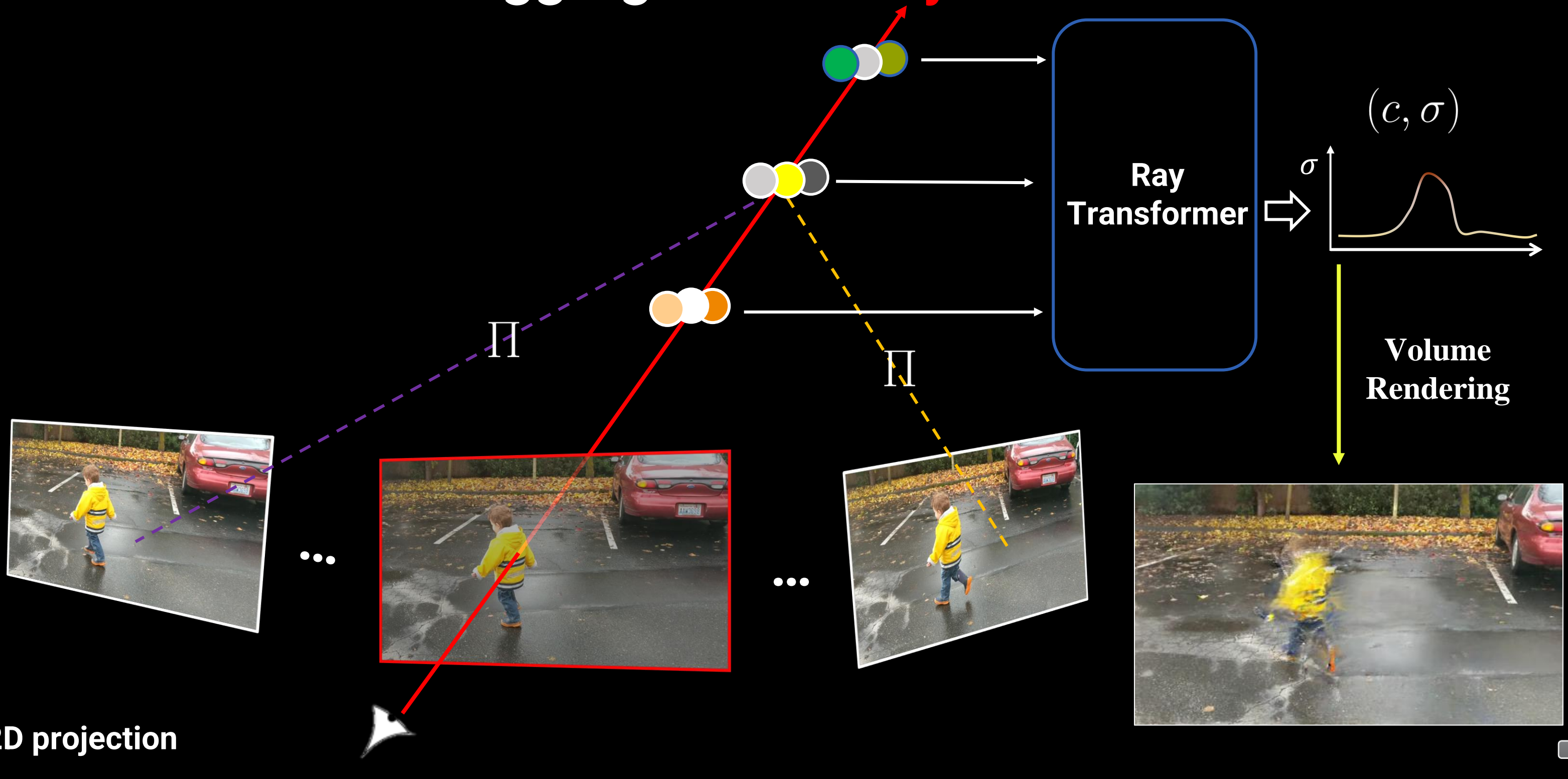


$\Pi$  2D projection

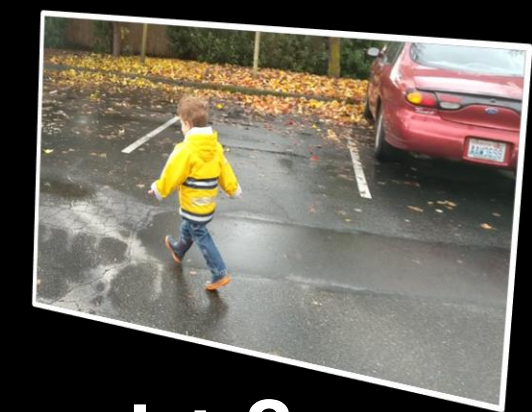




# Feature Aggregation for **Dynamic** Scene?



# Rendering dynamic Scenes



$t + 3$

...



$t + 1$



$t$



$t - 1$

...



$t - 3$

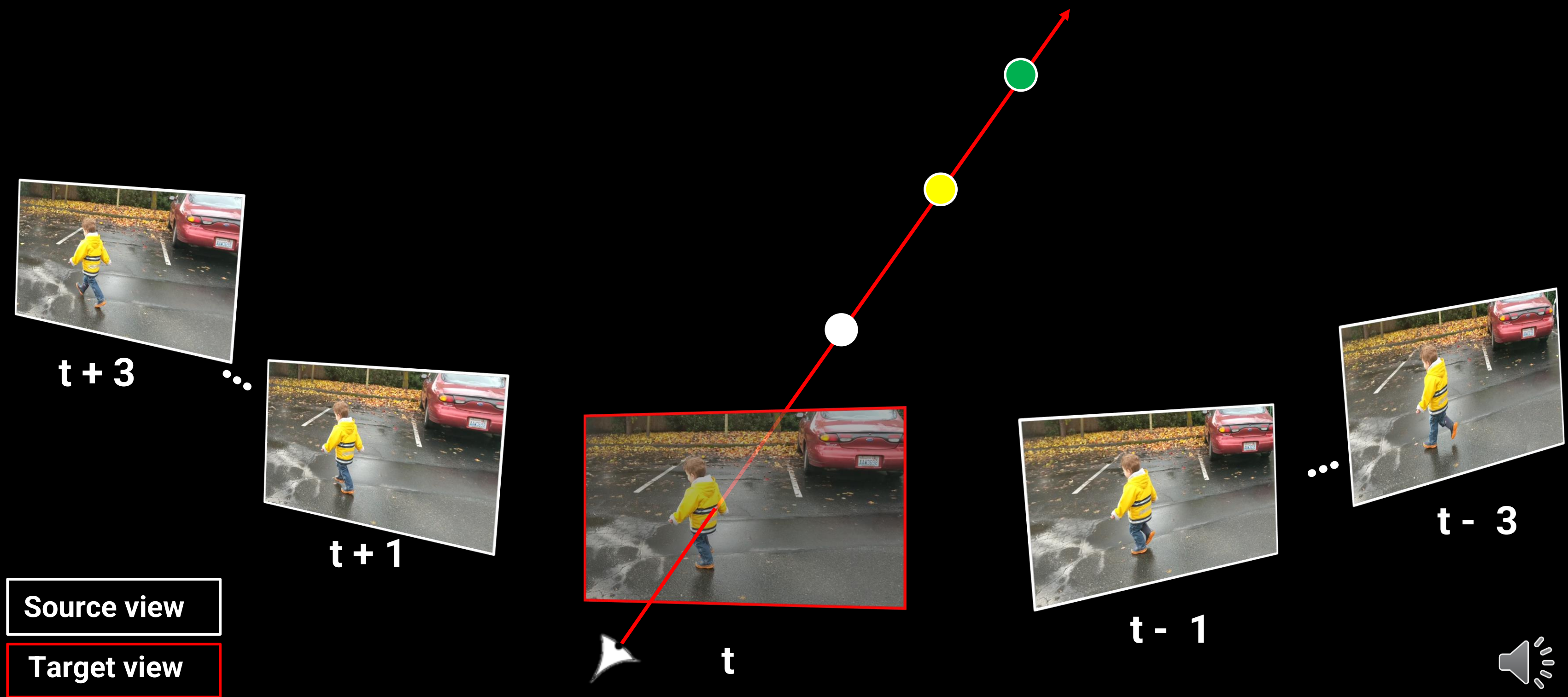
Source view

Target view



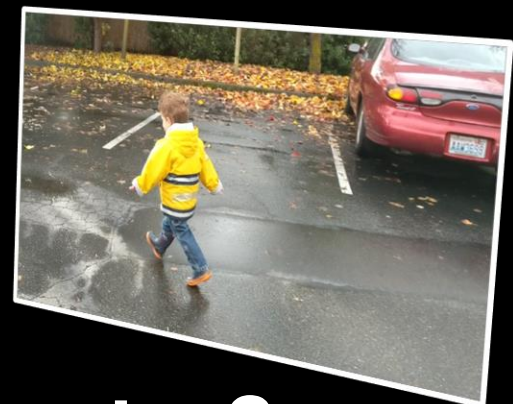


# Rendering dynamic Scenes



# Motion Representation

motion trajectory  
at time  $t$



$t + 3$

...



$t + 1$



$t$



$t - 1$

...



$t - 3$

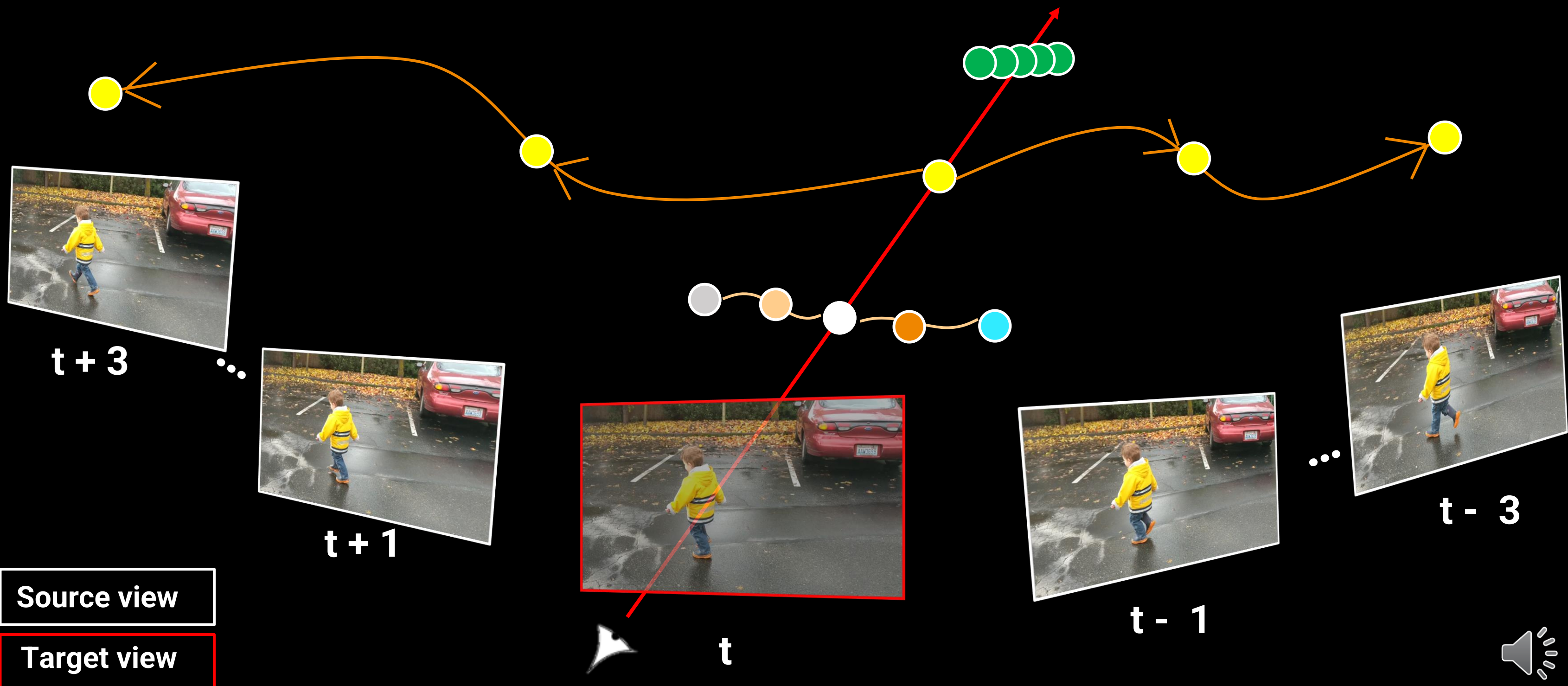
Source view

Target view





# Motion Representation

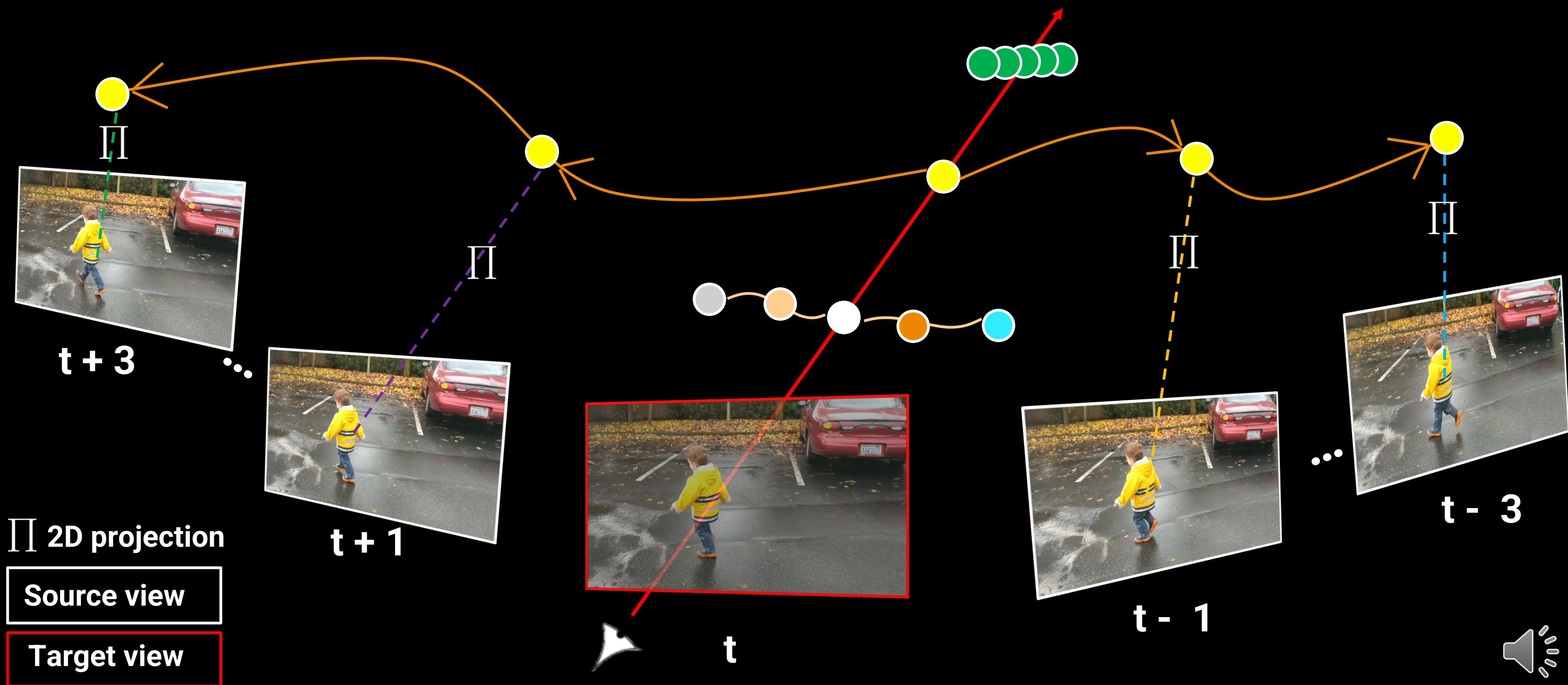


Source view

Target view

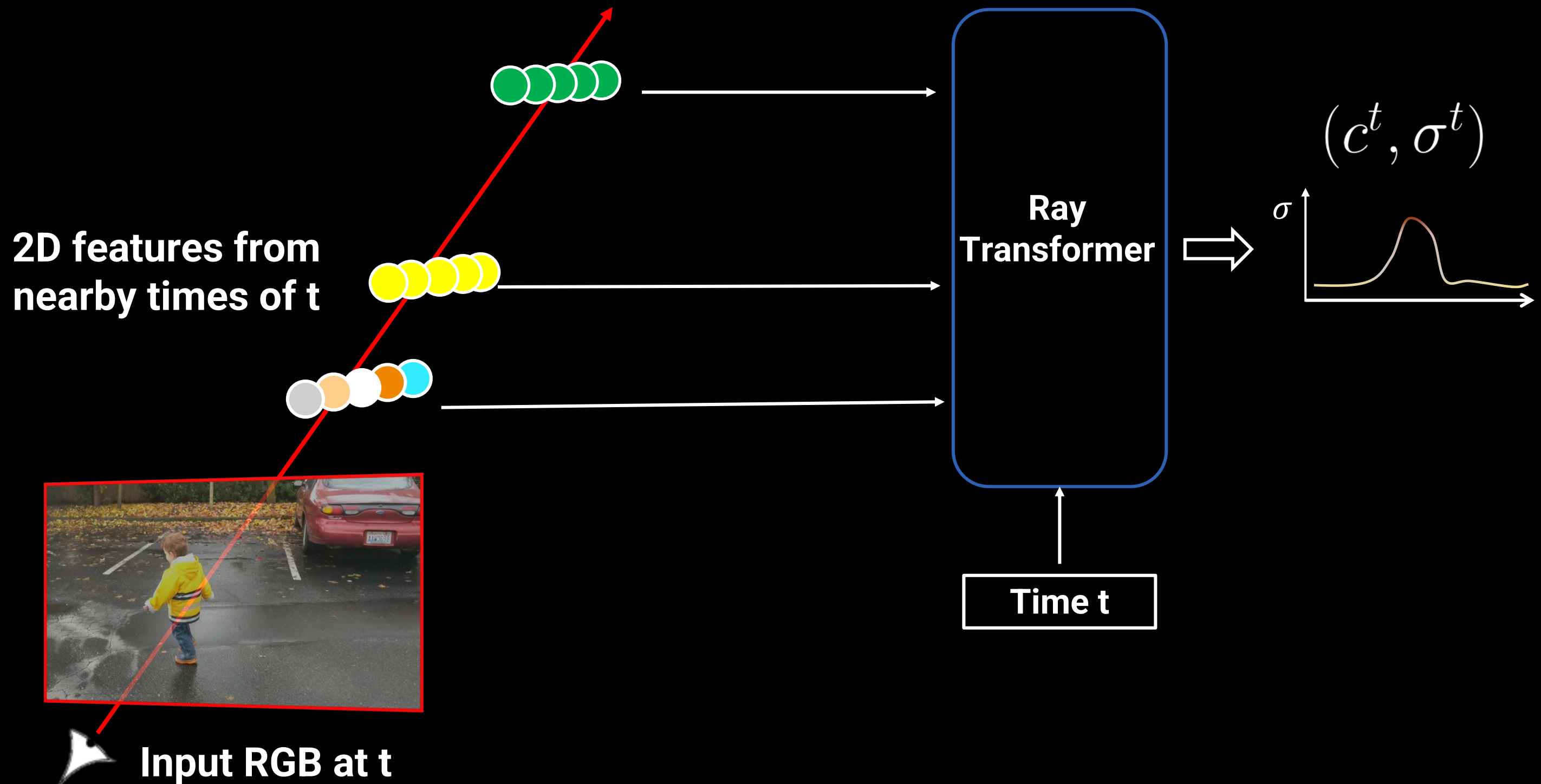


# Motion Representation

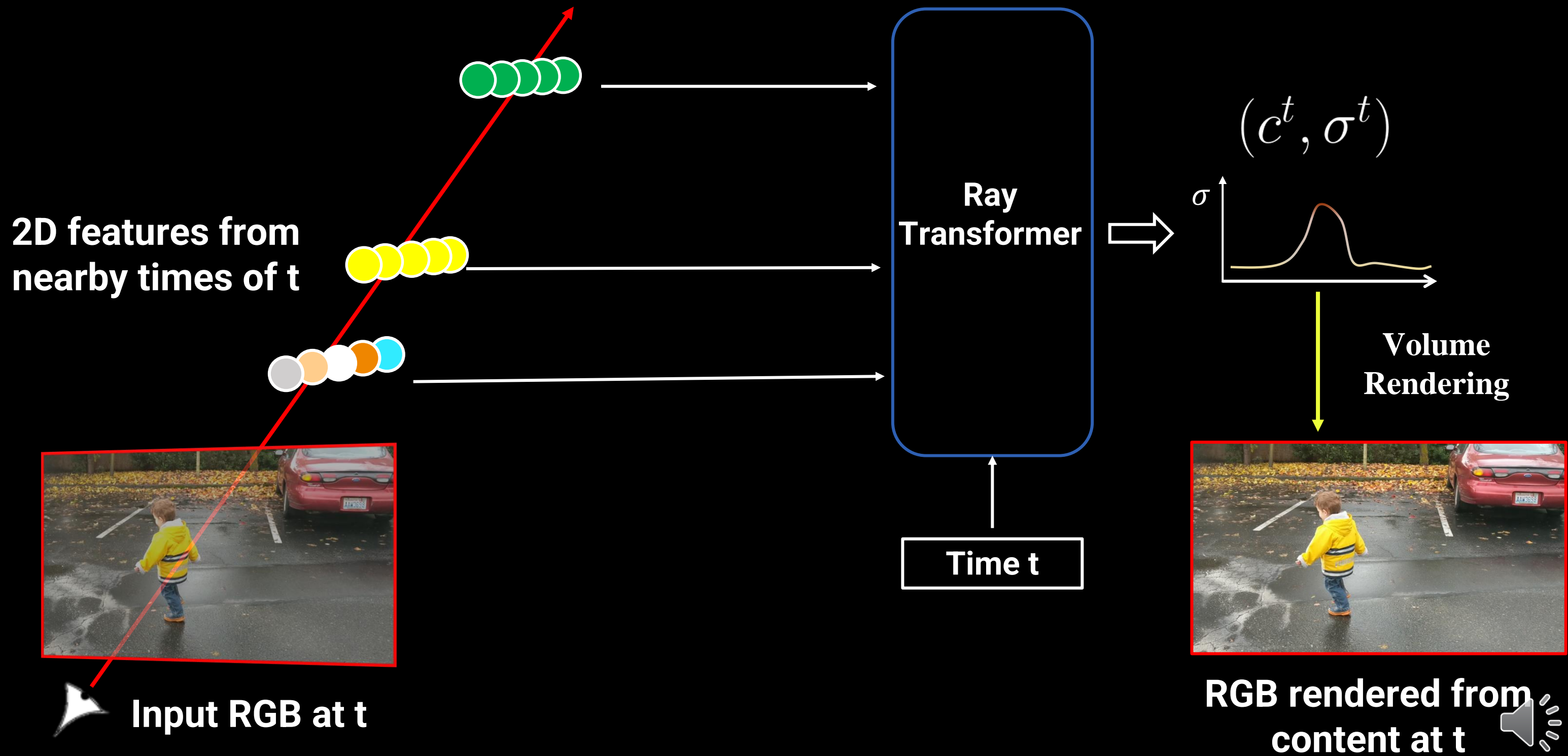




# Rendering dynamic Scenes

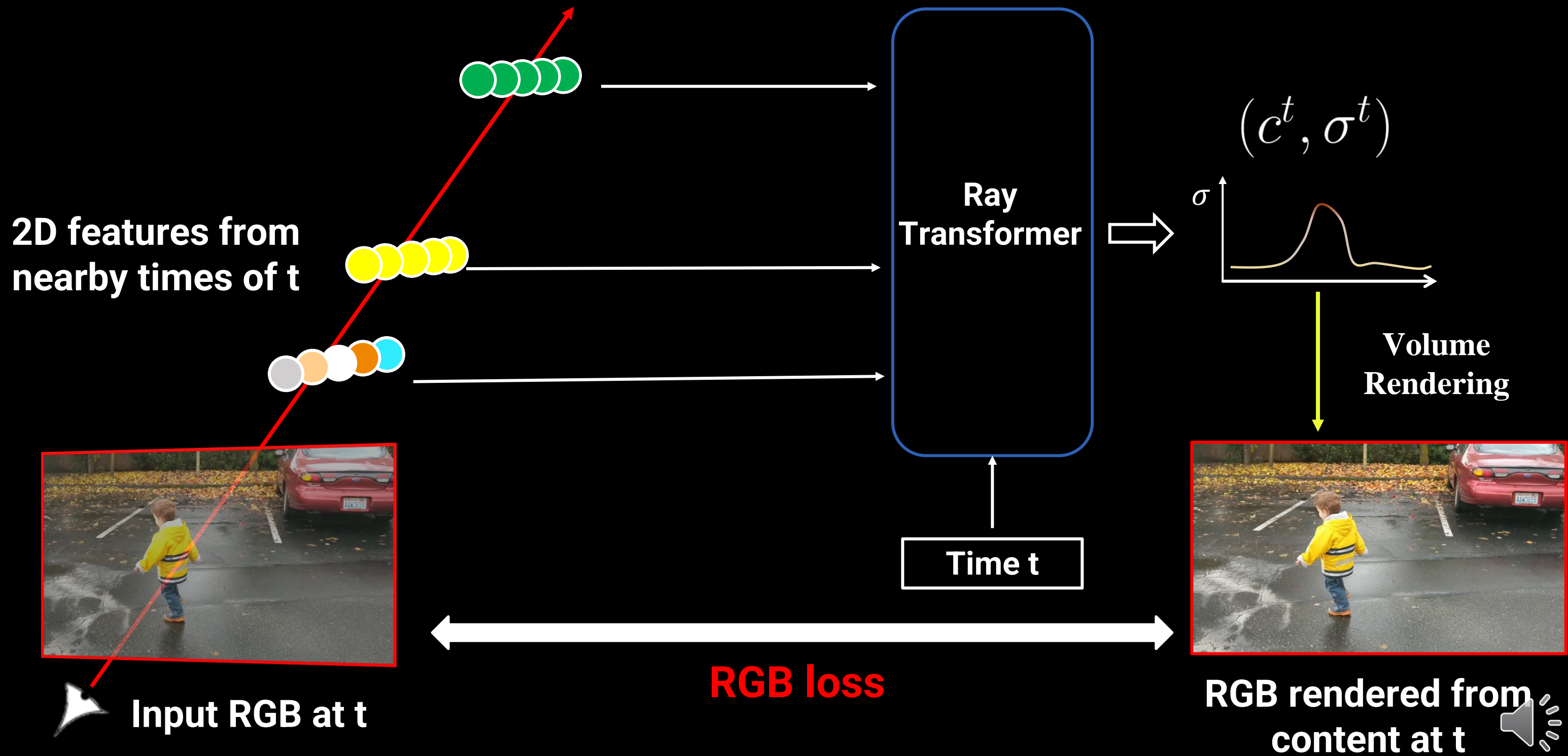


# Rendering dynamic Scenes





# Rendering dynamic Scenes



# Rendering dynamic Scenes





# Temporal consistency via cross-time rendering



Source views

Target views



# Temporal consistency via cross-time rendering

color and density at  $t'$



...



...



Source views

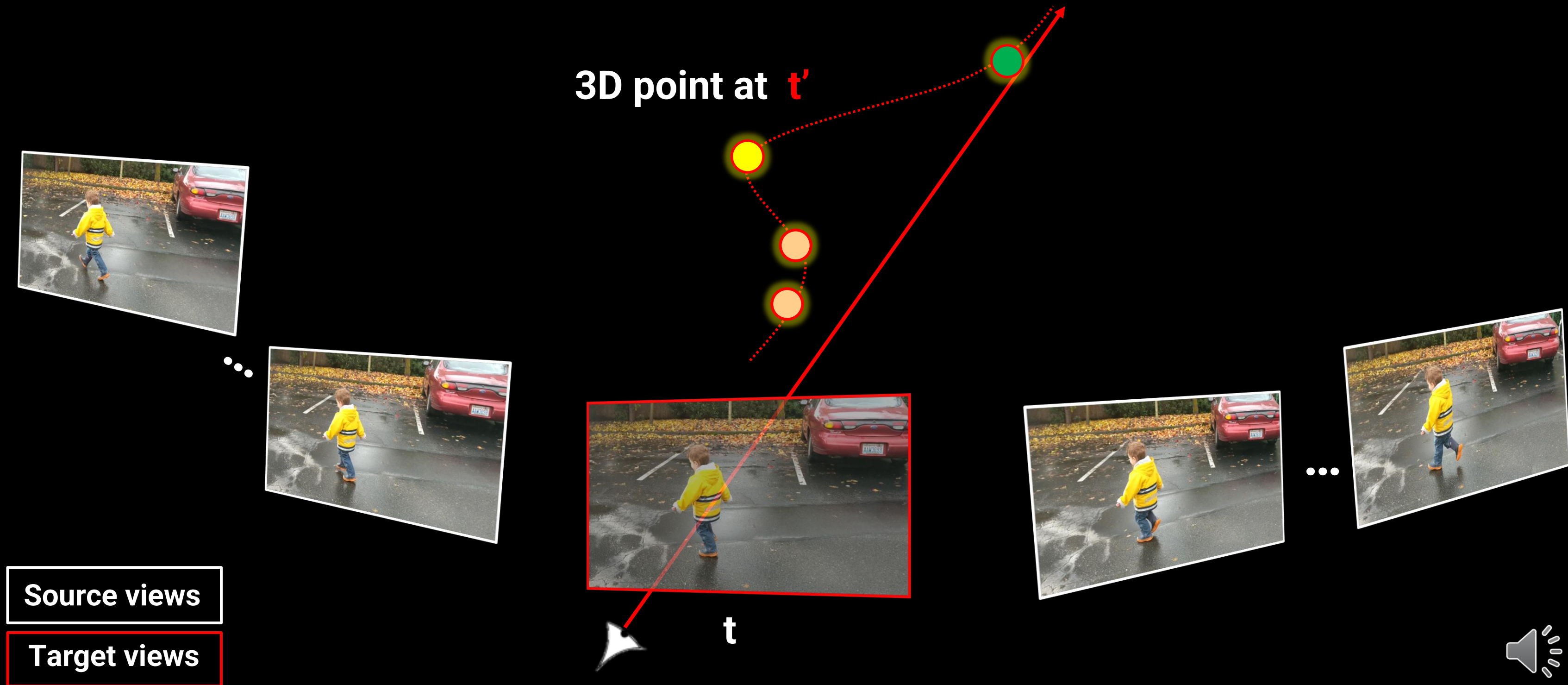
Target views

$t$

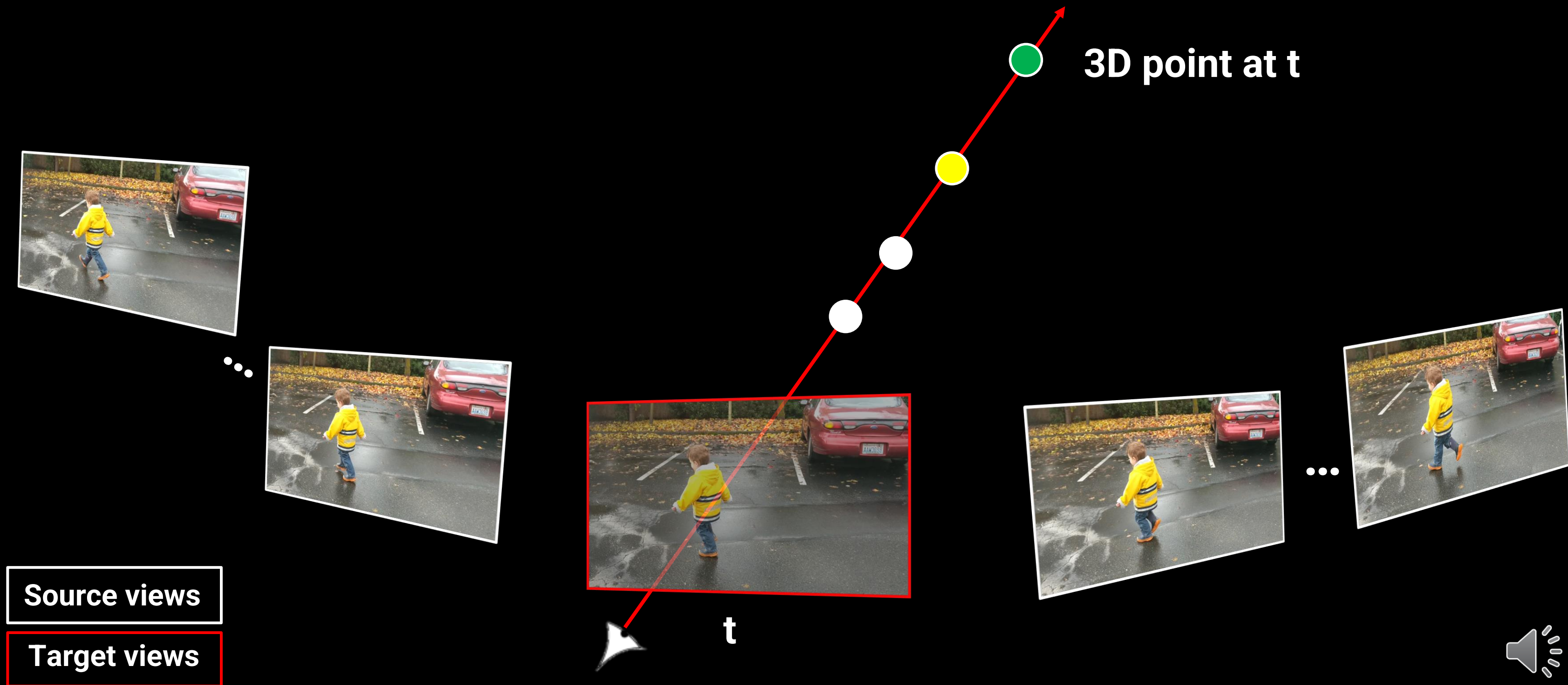




# Temporal consistency via cross-time rendering

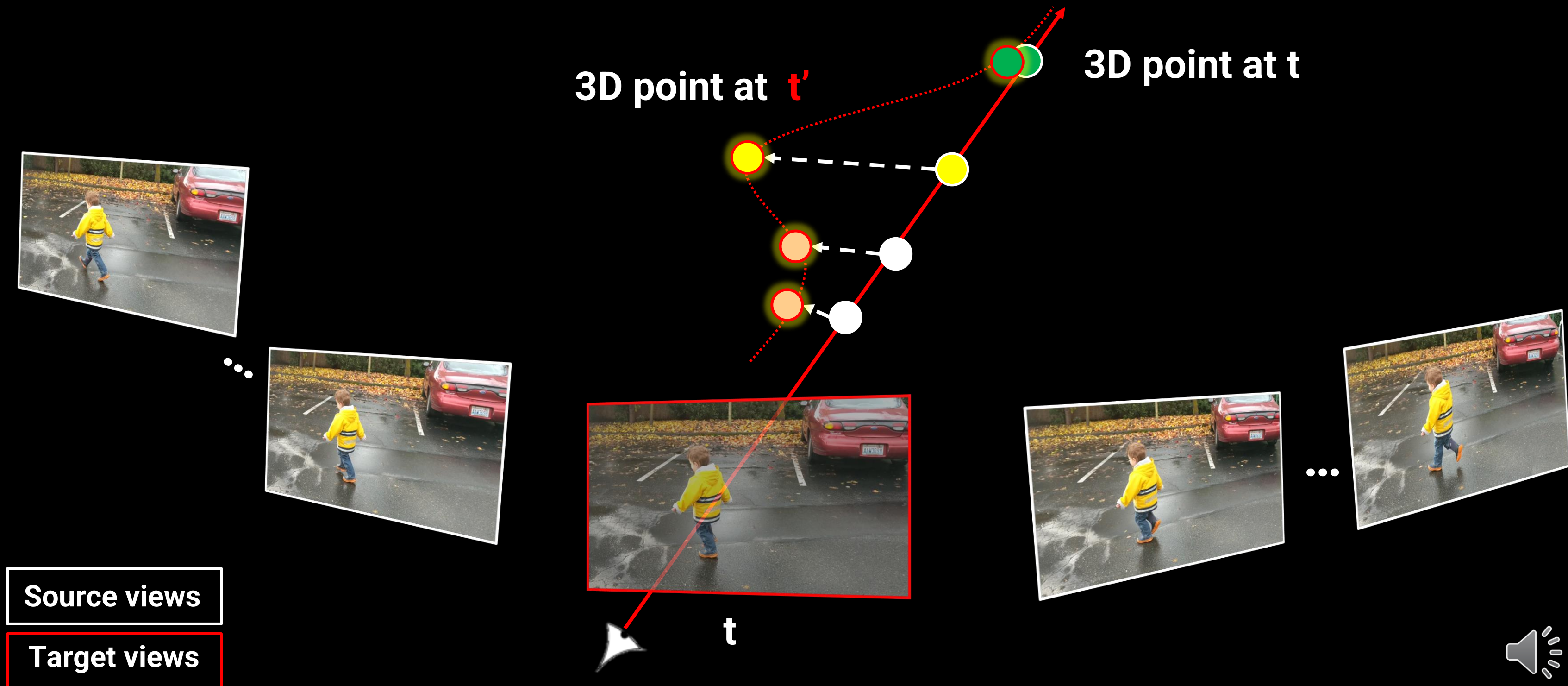


# Temporal consistency via cross-time rendering





# Temporal consistency via cross-time rendering



# Temporal consistency via cross-time rendering

motion trajectory at time  $t'$



Source views

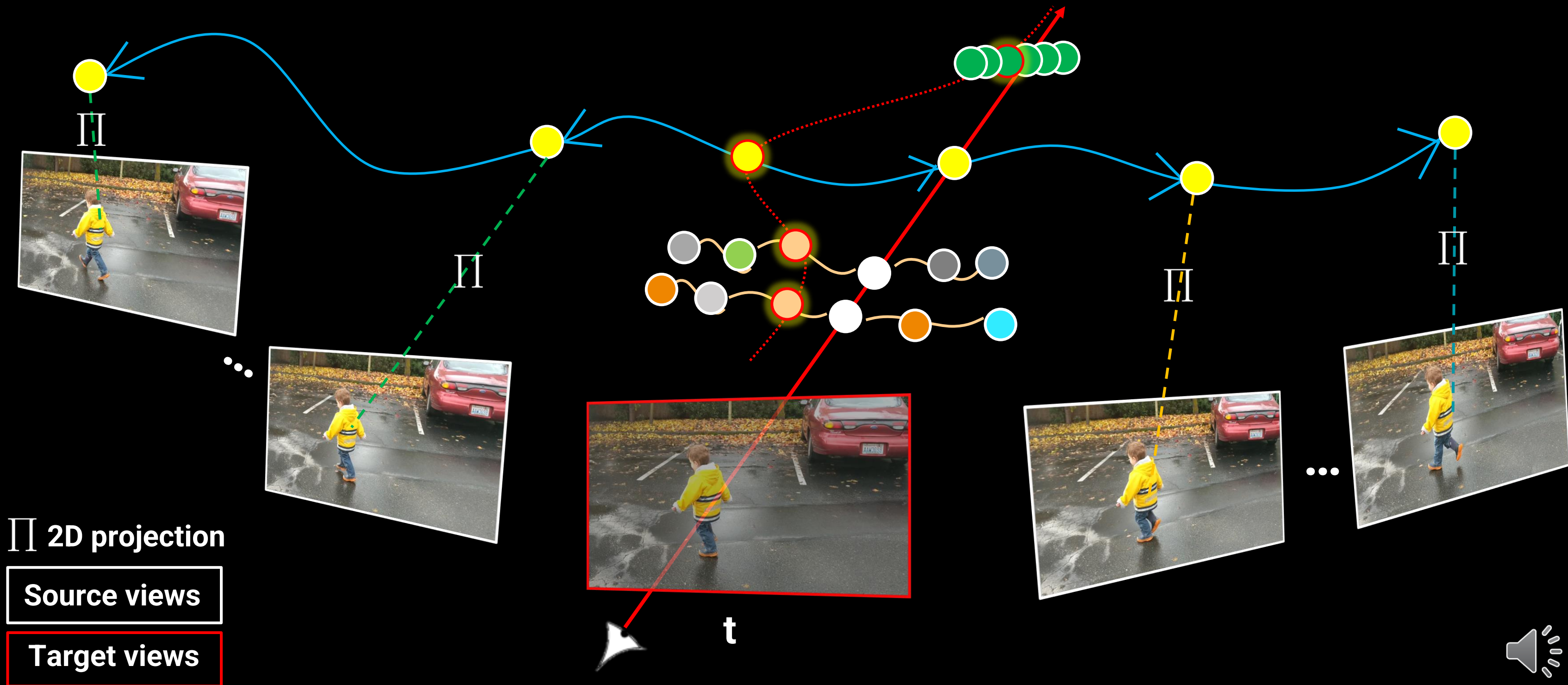
Target views

$t$

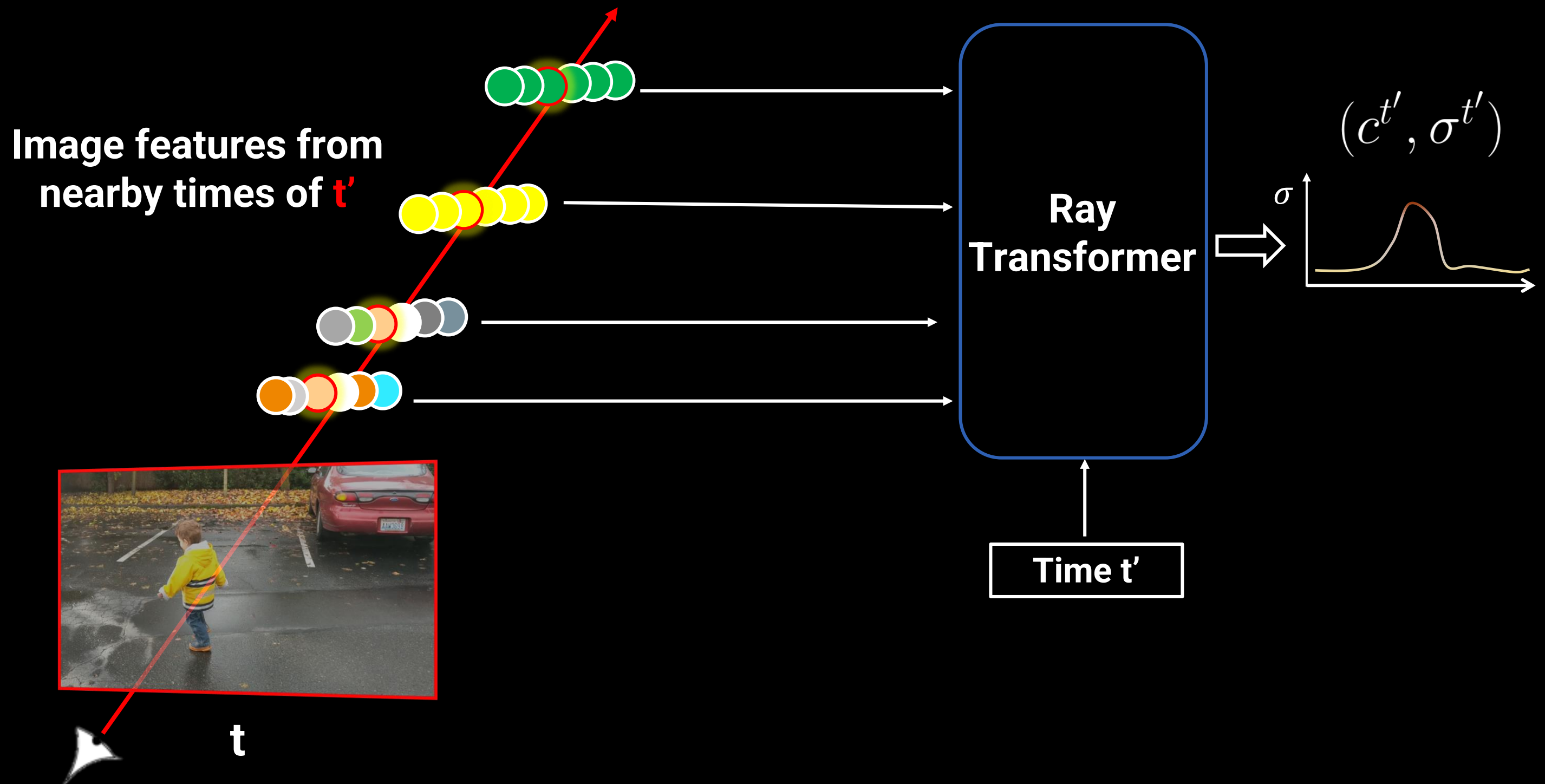




# Temporal consistency via cross-time rendering

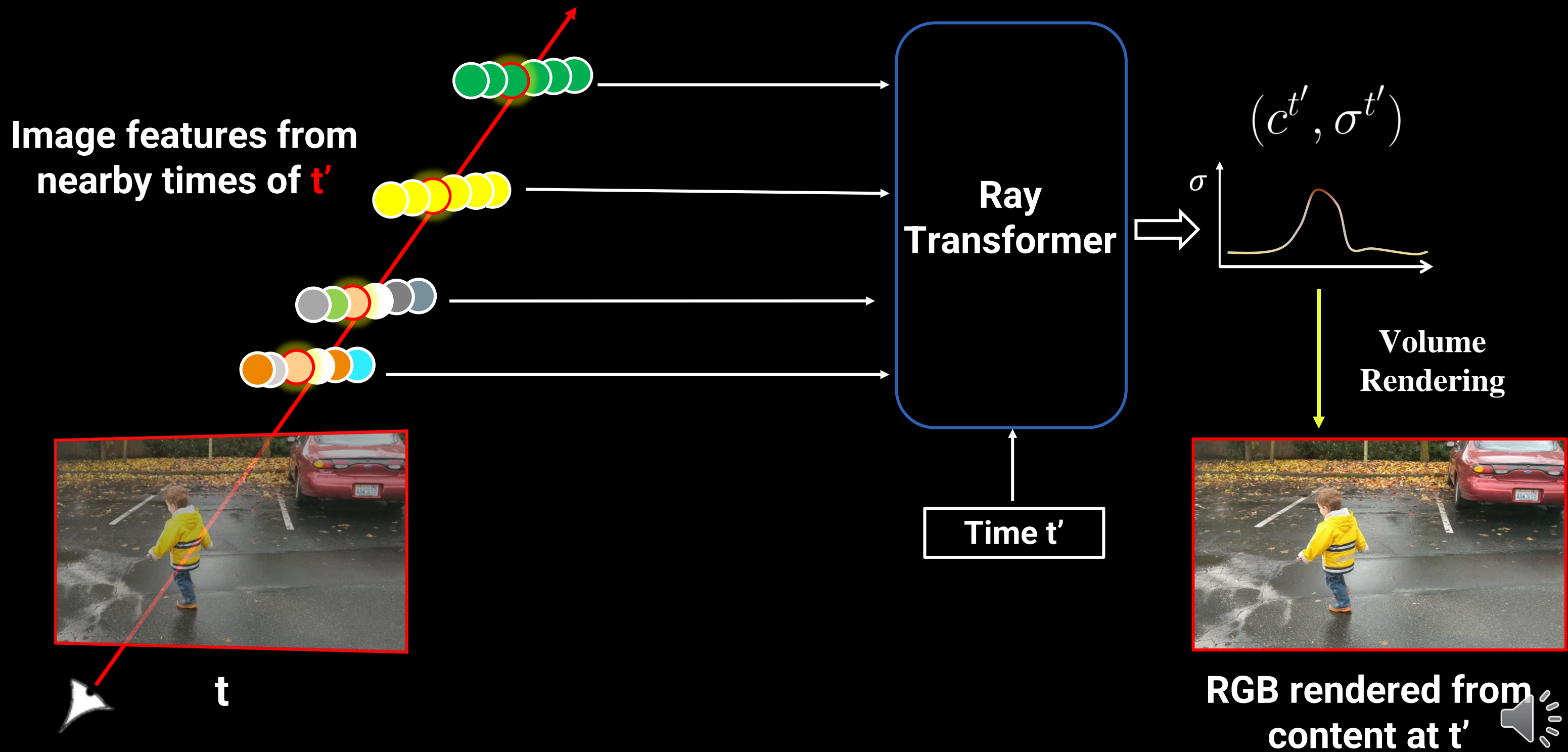


# Temporal consistency via cross-time rendering

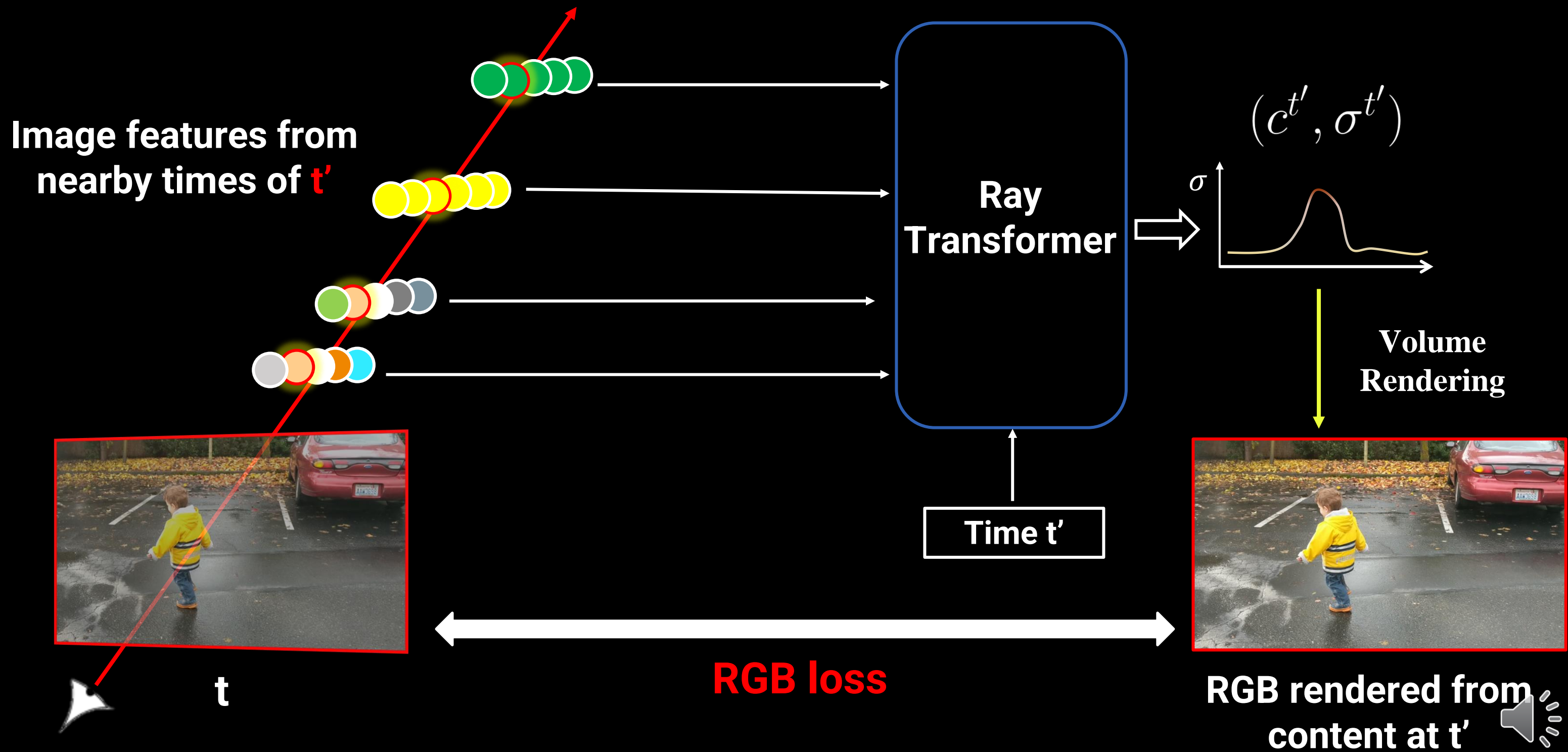




# Temporal consistency via cross-time rendering



# Temporal consistency via cross-time rendering







**Rendering from Consistent Depth**



**NSFF**



**Ours**

**Consistent Depth** Zhang et al, TOG 2021  
**NSFF** Li et al, CVPR 2021







**Rendering from Consistent Depth**



**NSFF**



**Ours**

**Consistent Depth** Zhang et al, TOG 2021  
**NSFF** Li et al, CVPR 2021







**Rendering from Consistent Depth**



**NSFF**



**Ours**

**Consistent Depth** Zhang et al, TOG 2021  
**NSFF** Li et al, CVPR 2021







Shaky Input



DIFRINT



FuSta



DynIBaR (Ours)











**Shaky Input**



**HyperNeRF**



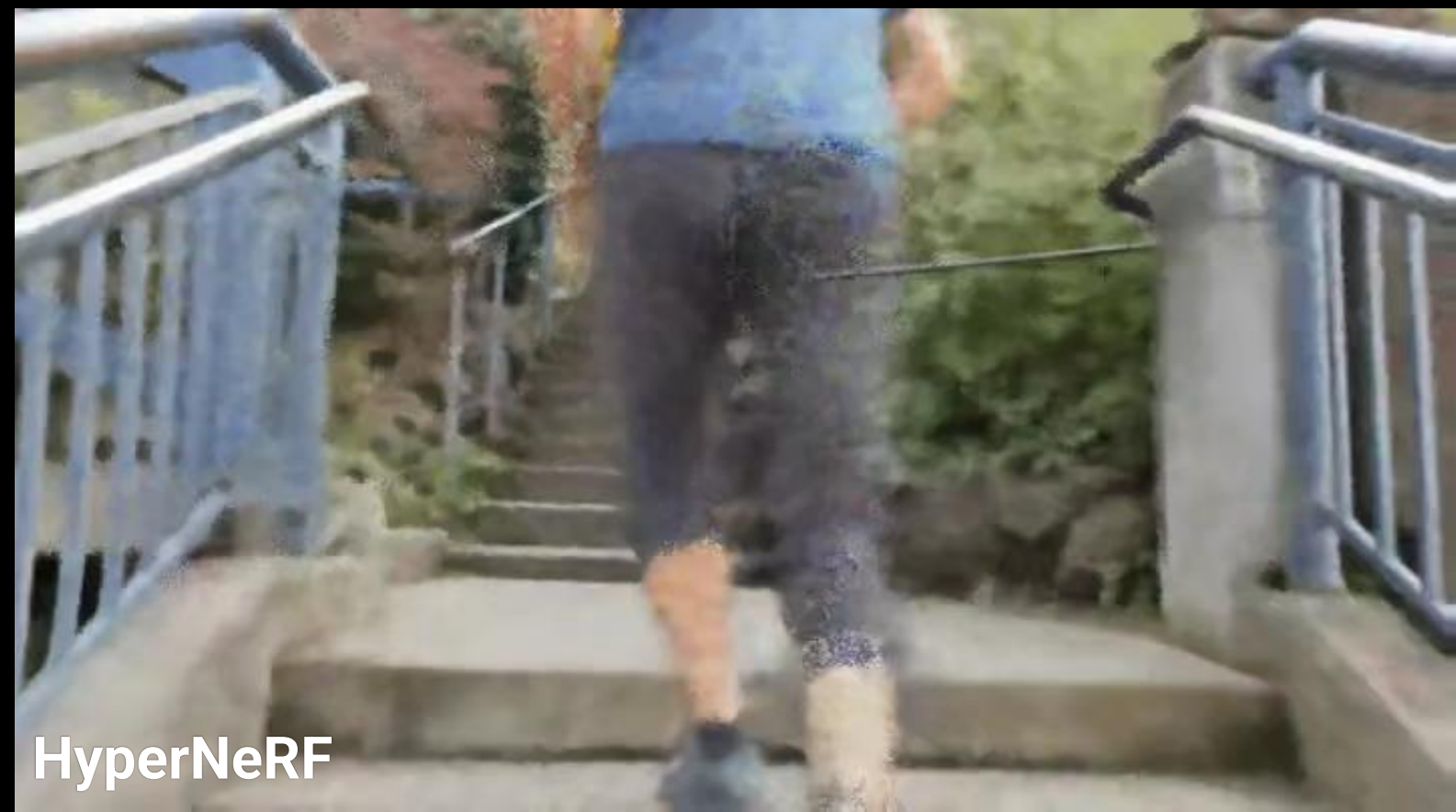
**NSFF**



**DynIBaR (Ours)**









# Dolly Zoom & Bullet Time







Input

Fixed viewpoint





# Novel View Synthesis + 5x Slow-Mo







**Input**

**Dolly + 5x Slow-Mo**





# Video Bokeh





# Stereo Video Generation



Right

Left



Right

Left





**Thank you for watching!**

