



# Computational Photography



**Dr. Irfan Essa**

Professor

School of Interactive Computing

Study the basics of computation and its impact on the entire workflow of photography, from capturing, manipulating and collaborating on, and sharing photographs.



# Video Textures: (Part 2 of 2)

## How to work with Video Textures?



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How can we manipulate  
Video Textures and  
extend them?

# Lesson Objectives

- ★ Explain in your own words how to control transitions in Video Textures to generate different videos and to preserve motions.
- ★ Describe in your own words how blending, fading, and cuts are applied to generate Video Textures.
- ★ Describe in your own words the two (3) extensions of Video Textures.



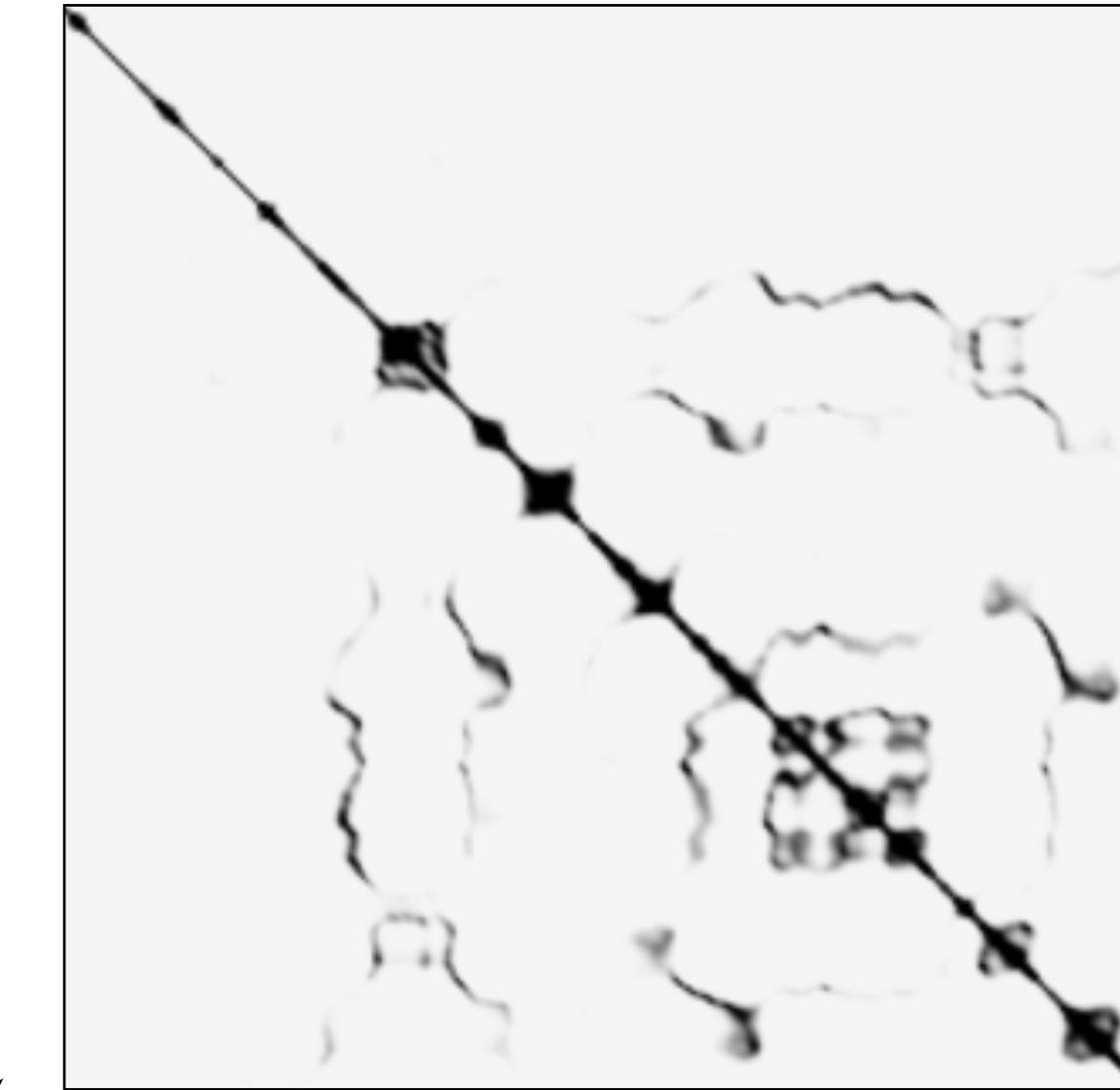
**REVIEW:**  
**Infinitely**  
**long Video**  
**Texture**



**REVIEW:**  
**Infinitely**  
**long Video**  
**Texture**

# Representing a Chain of Transitions

vs. —————→ Frame *i*



Frame *j*

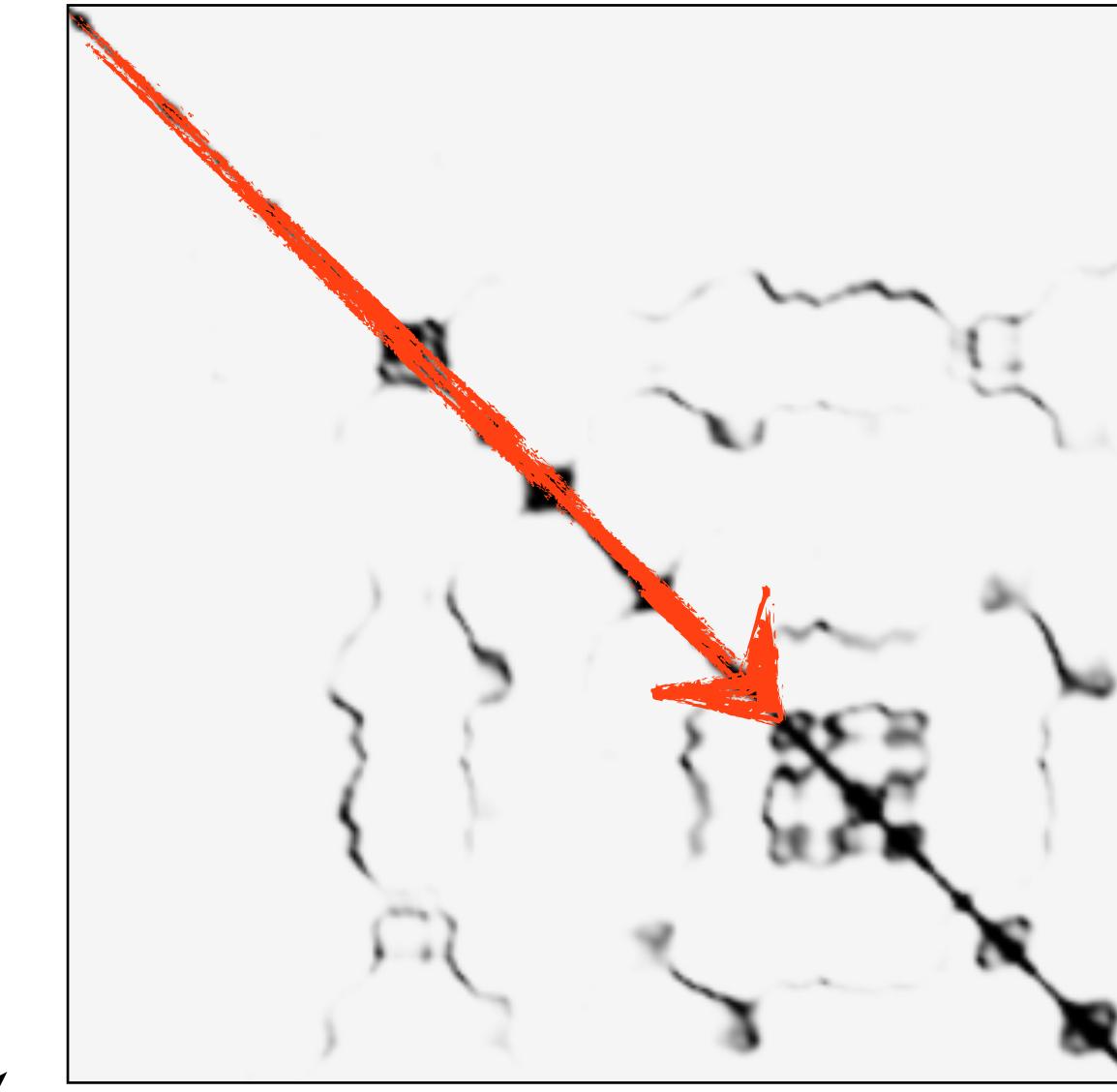
Markov Chain

Black: Similar Frames

White: Dissimilar Frames

# Representing a Chain of Transitions

vs. —————→ Frame  $i$



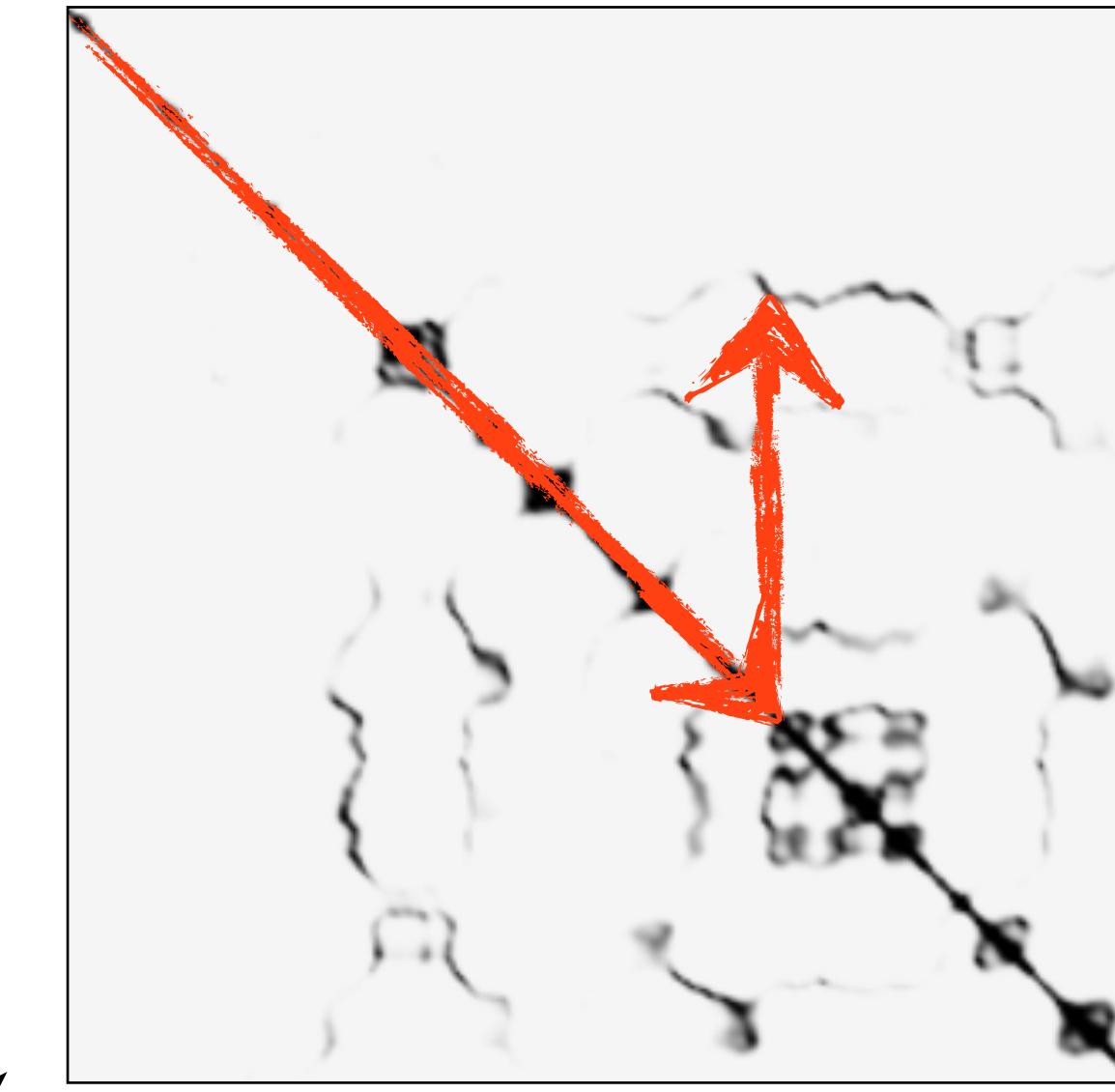
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Frame  $j$

# Representing a Chain of Transitions

vs. —————→ Frame  $i$



Frame  $j$

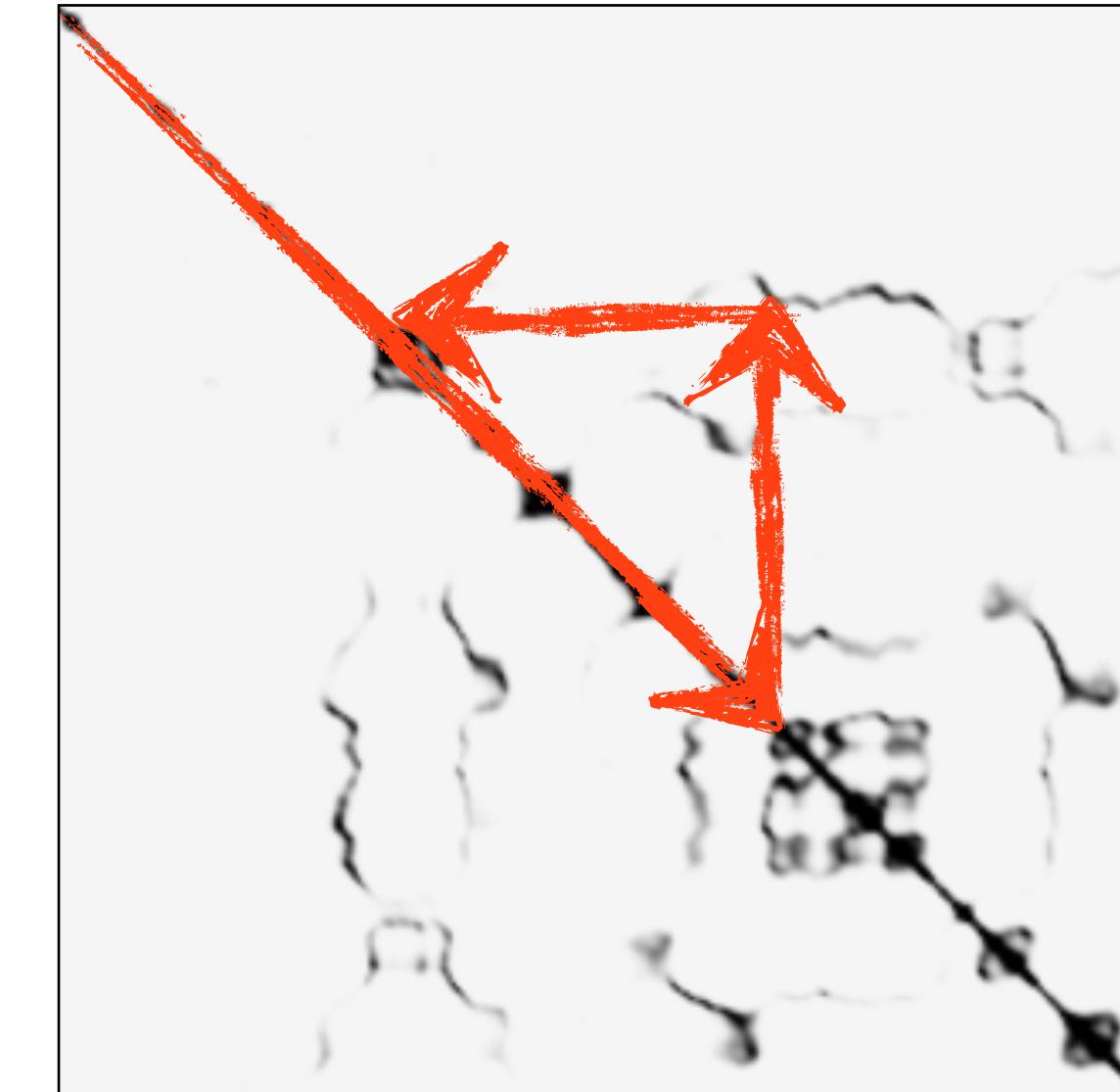
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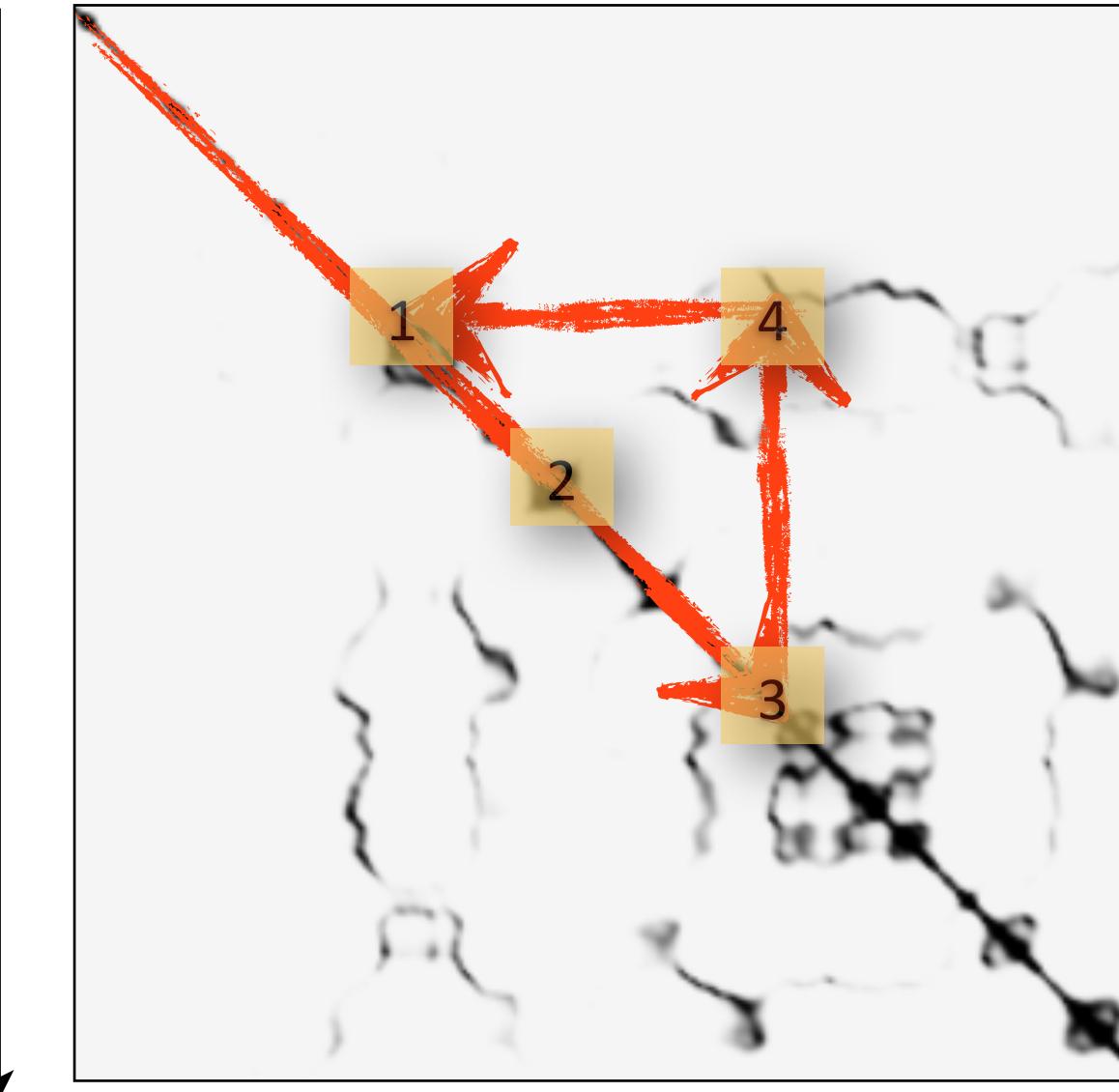
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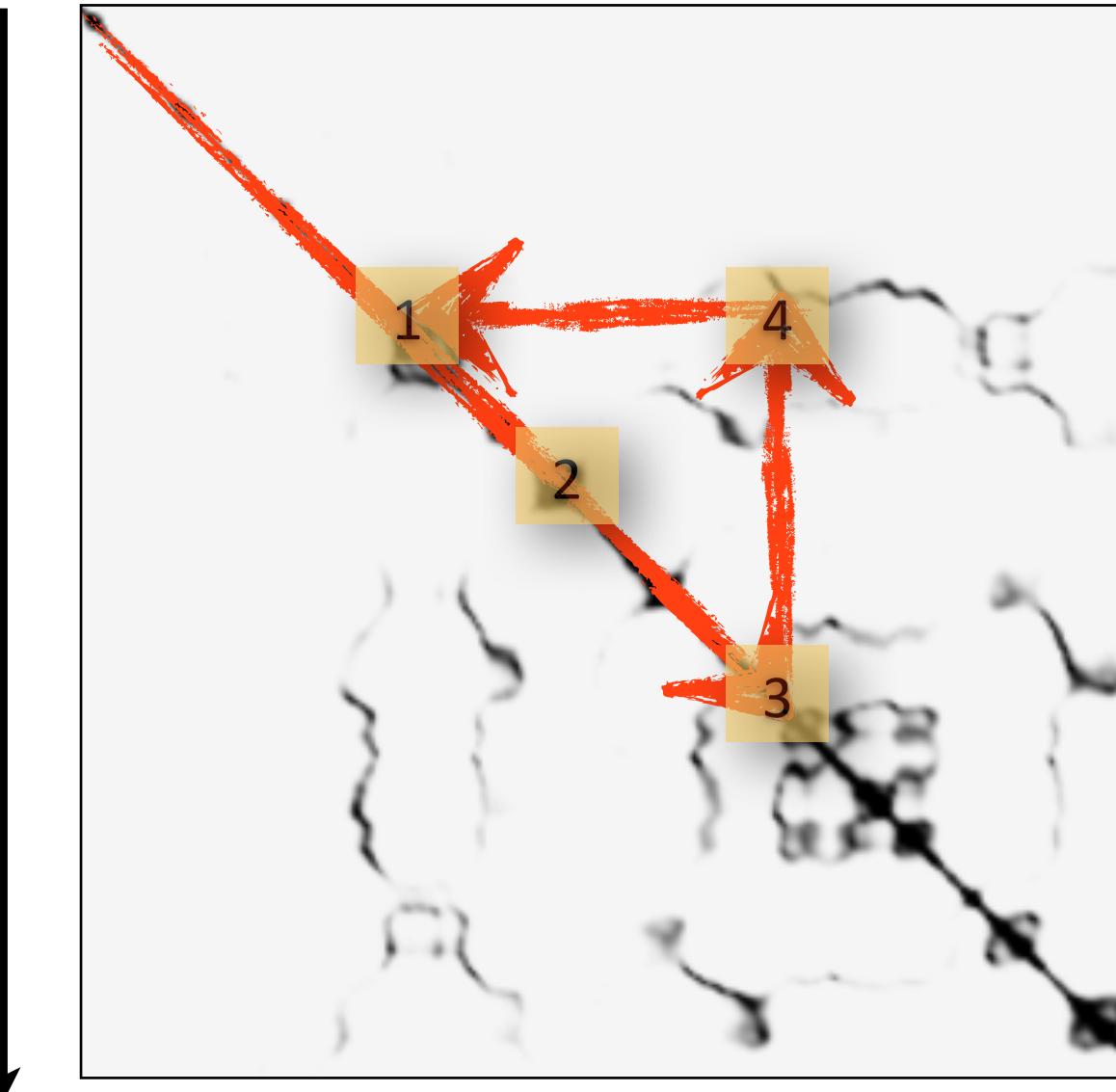
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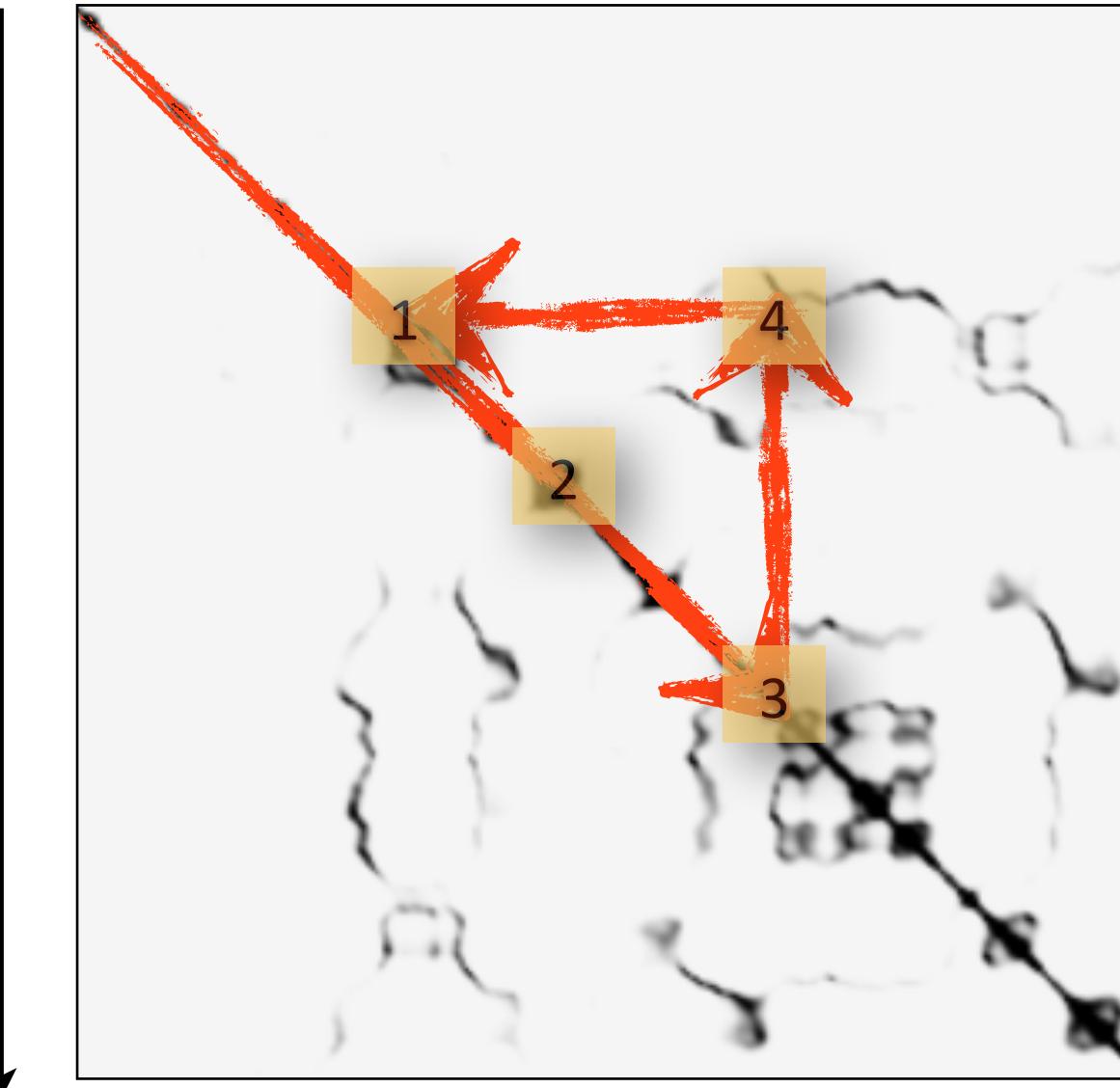
Frame  $j$



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Frame j

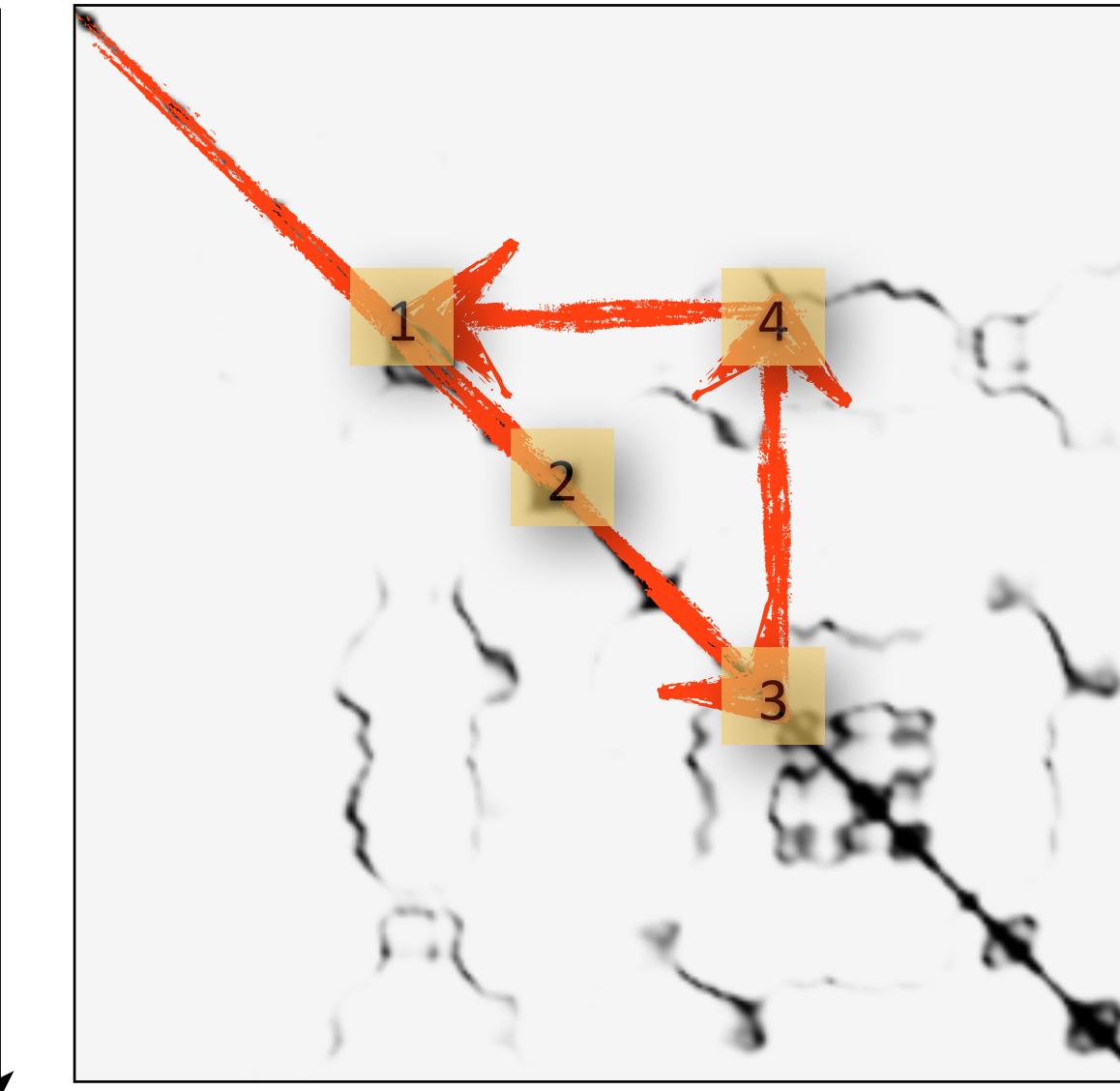
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White: Dissimilar Frames



Markov Chain

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Frame j

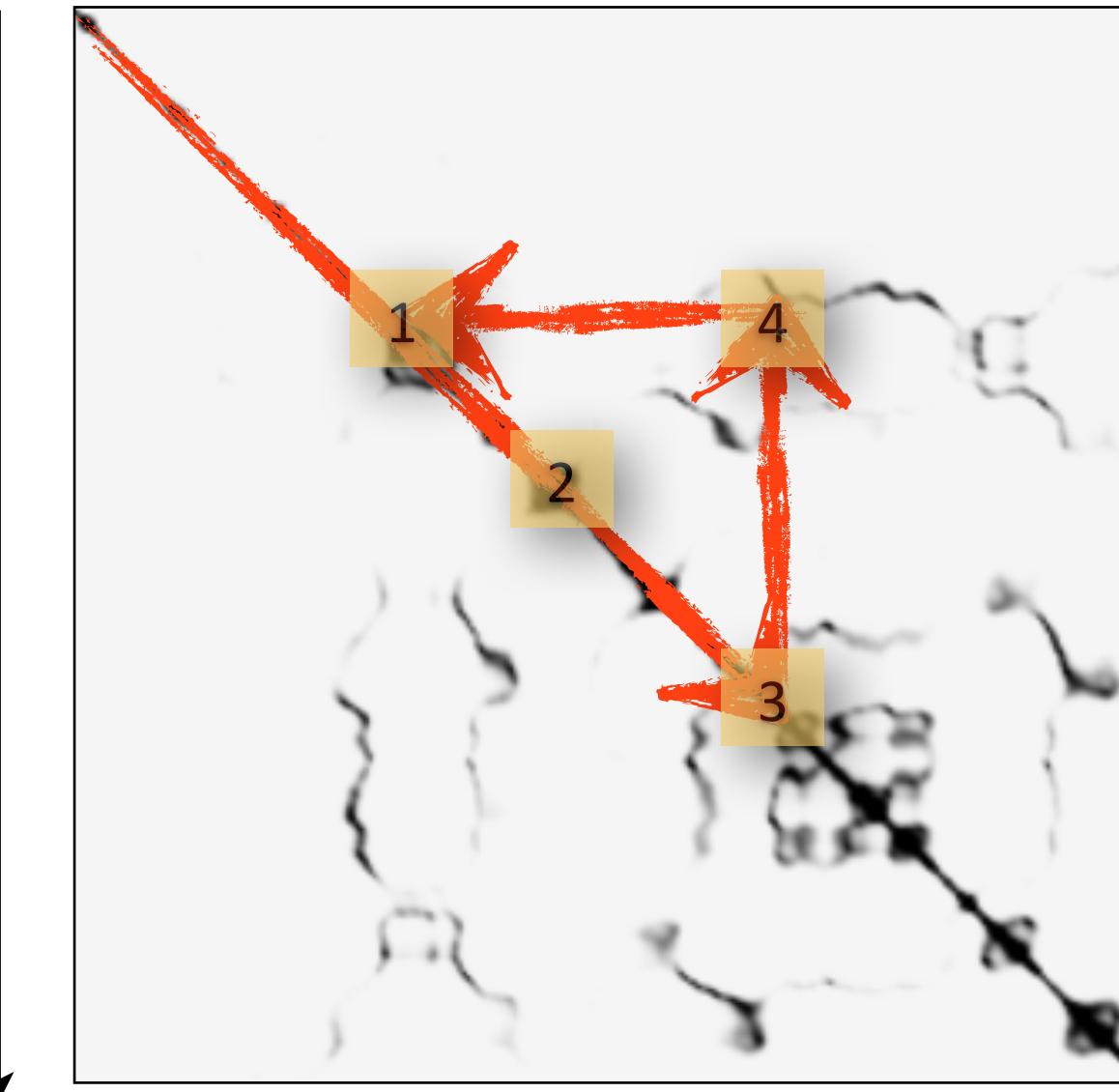
Black: Similar Frames  
White: Dissimilar Frames



Markov Chain

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vs. ————— Frame i

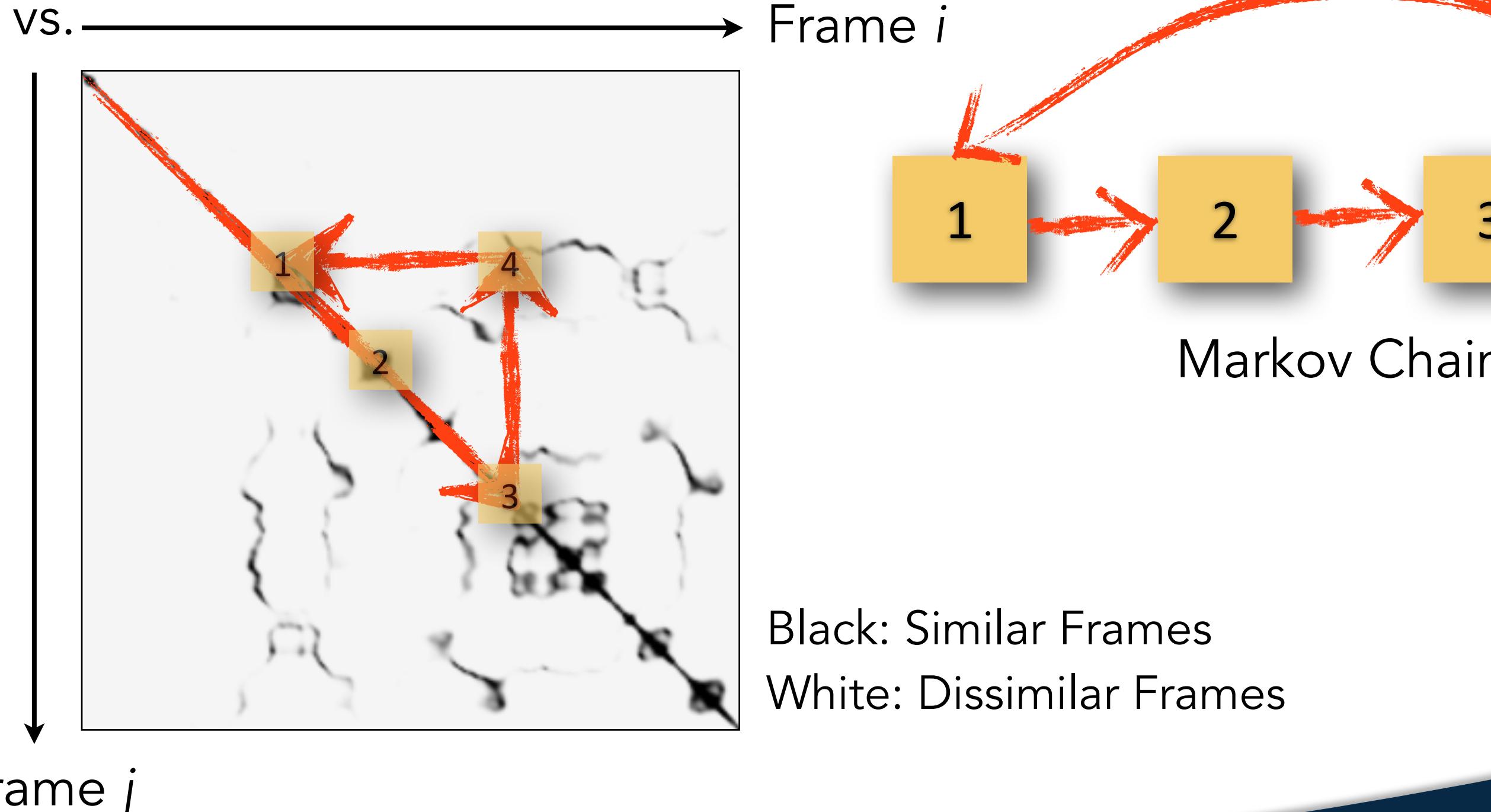


Markov Chain

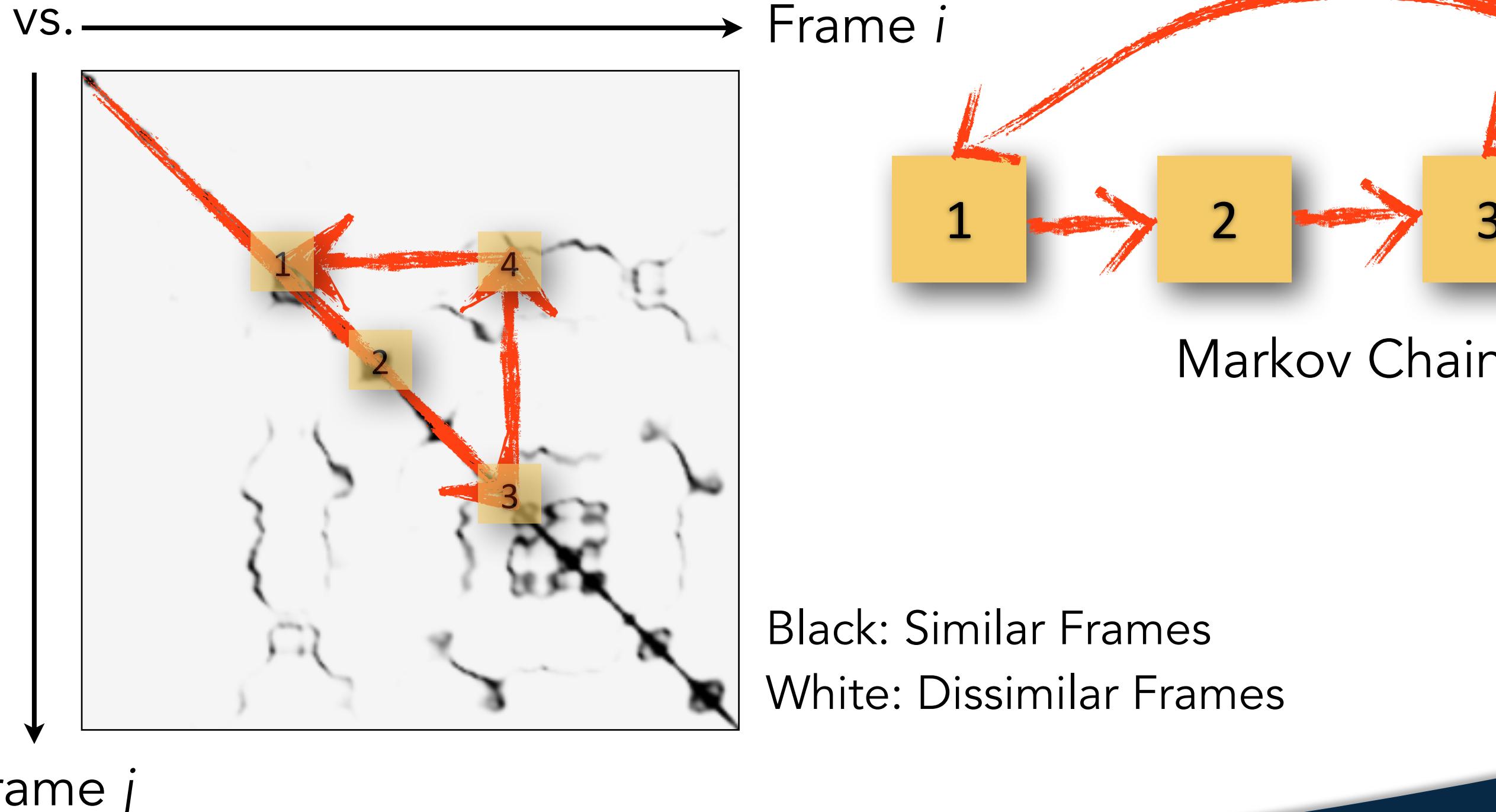
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Frame j

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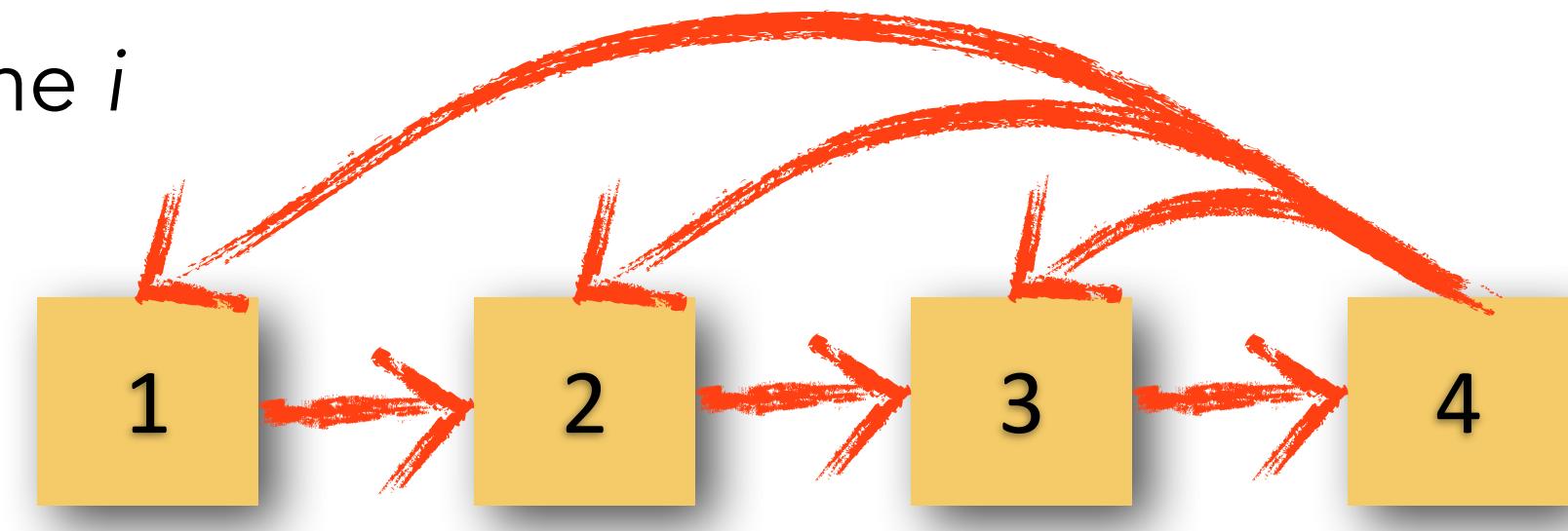
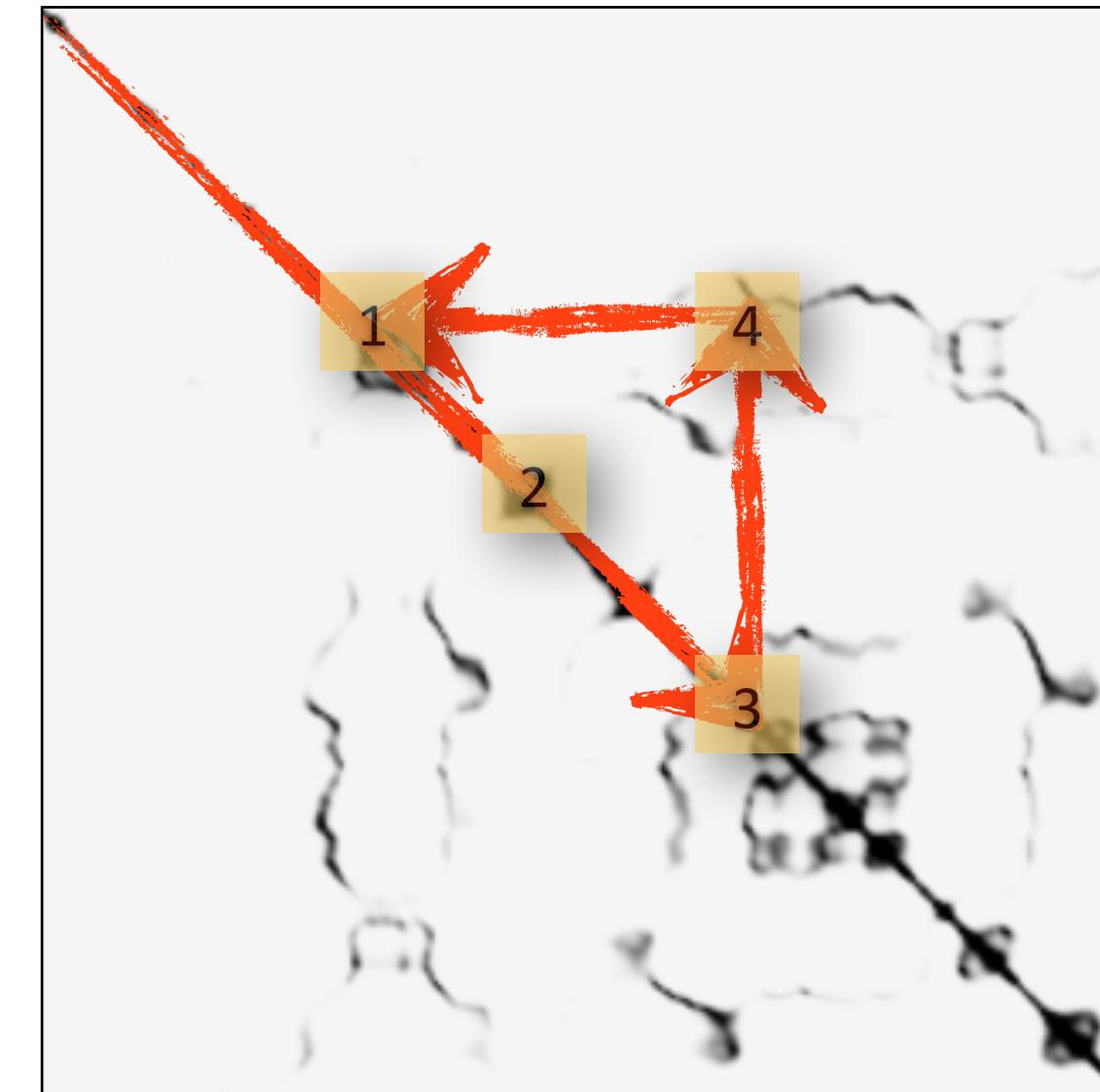


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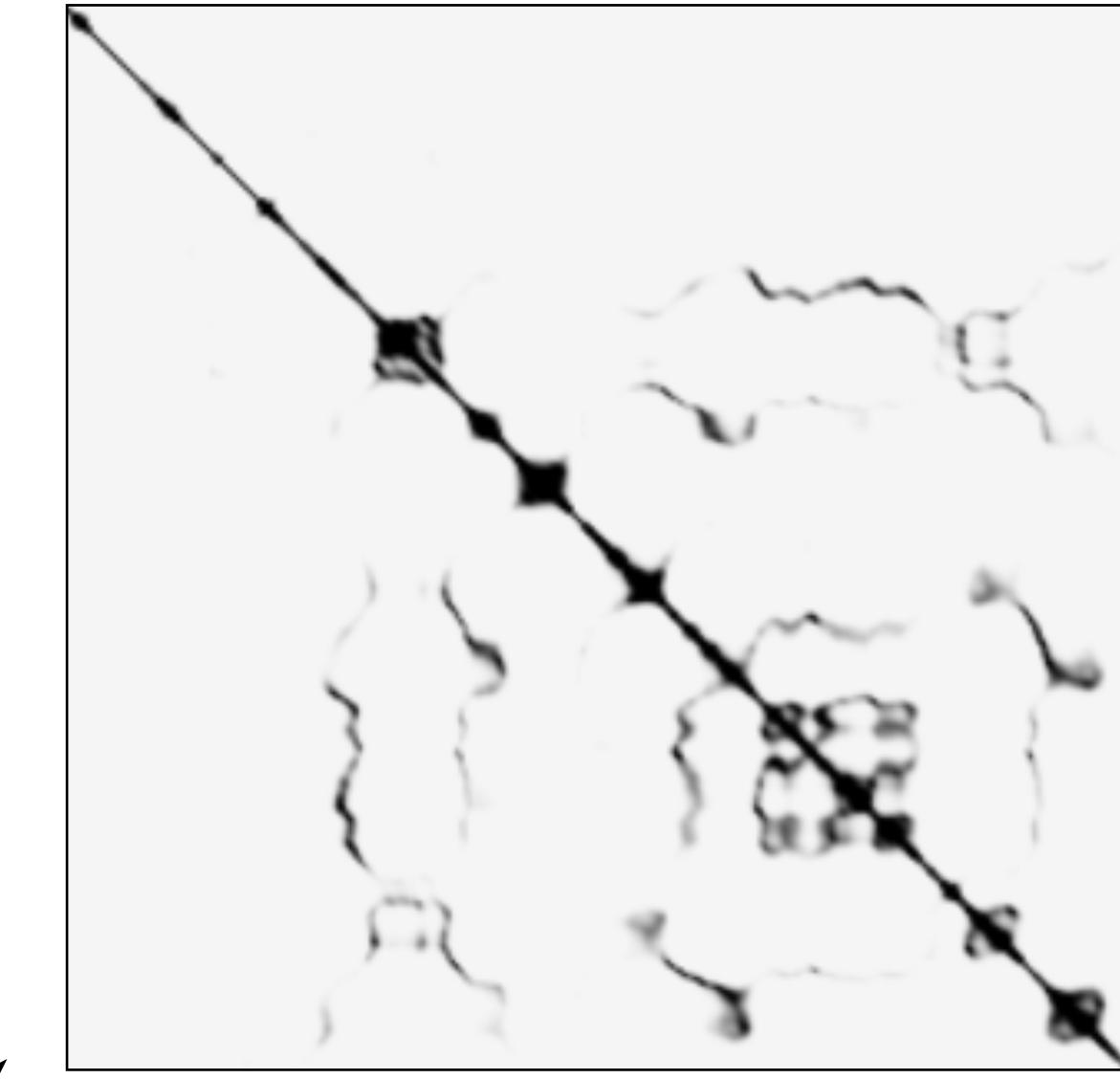
vs.



Black: Similar Frames  
White: Dissimilar Frames

# Controlling Rates of Transitions

vs.  Frame  $i$

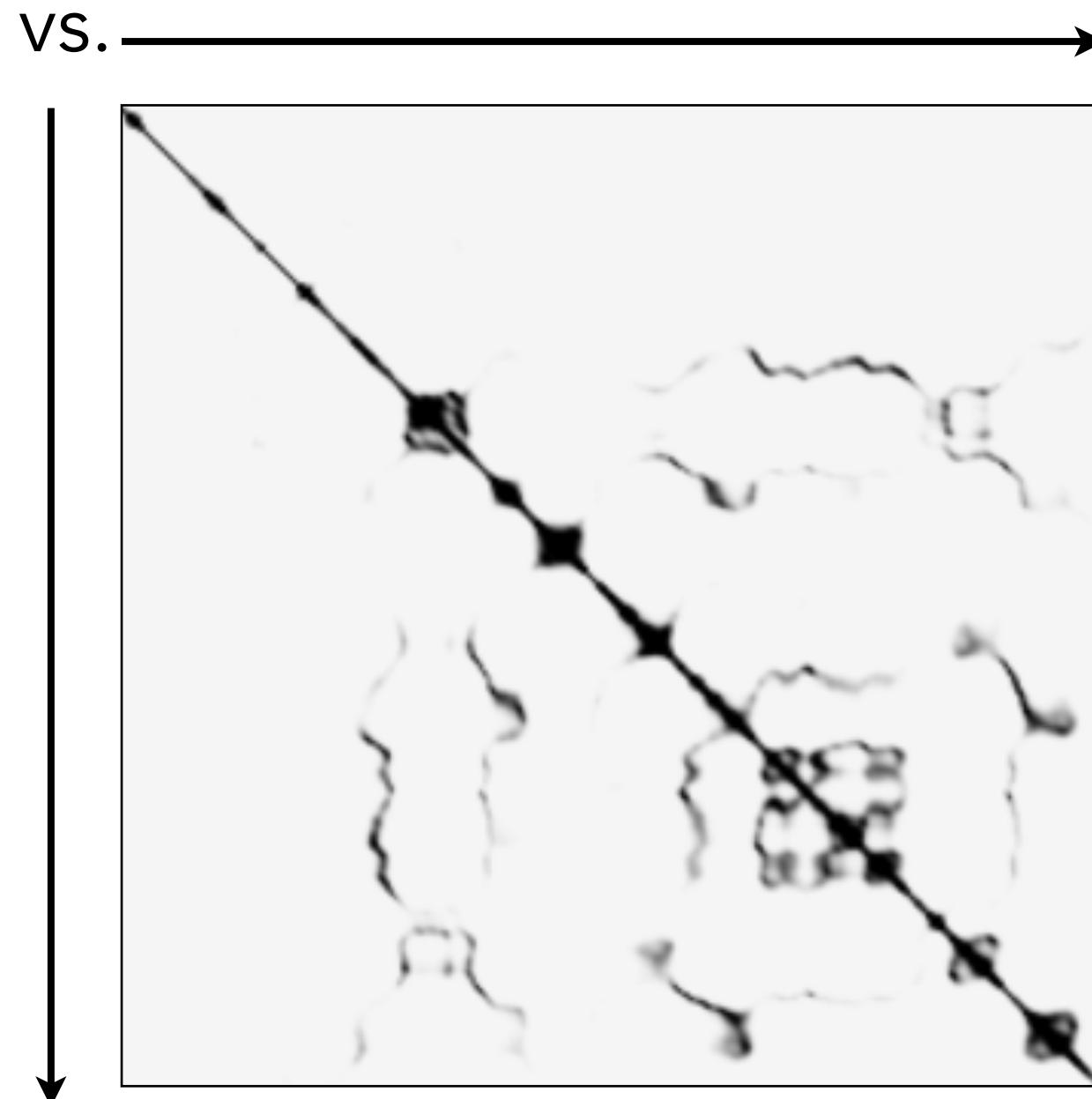


Black: Similar Frames  
White: Dissimilar Frames

Frame  $j$

# Controlling Rates of Transitions

VS.



Frame  $i$

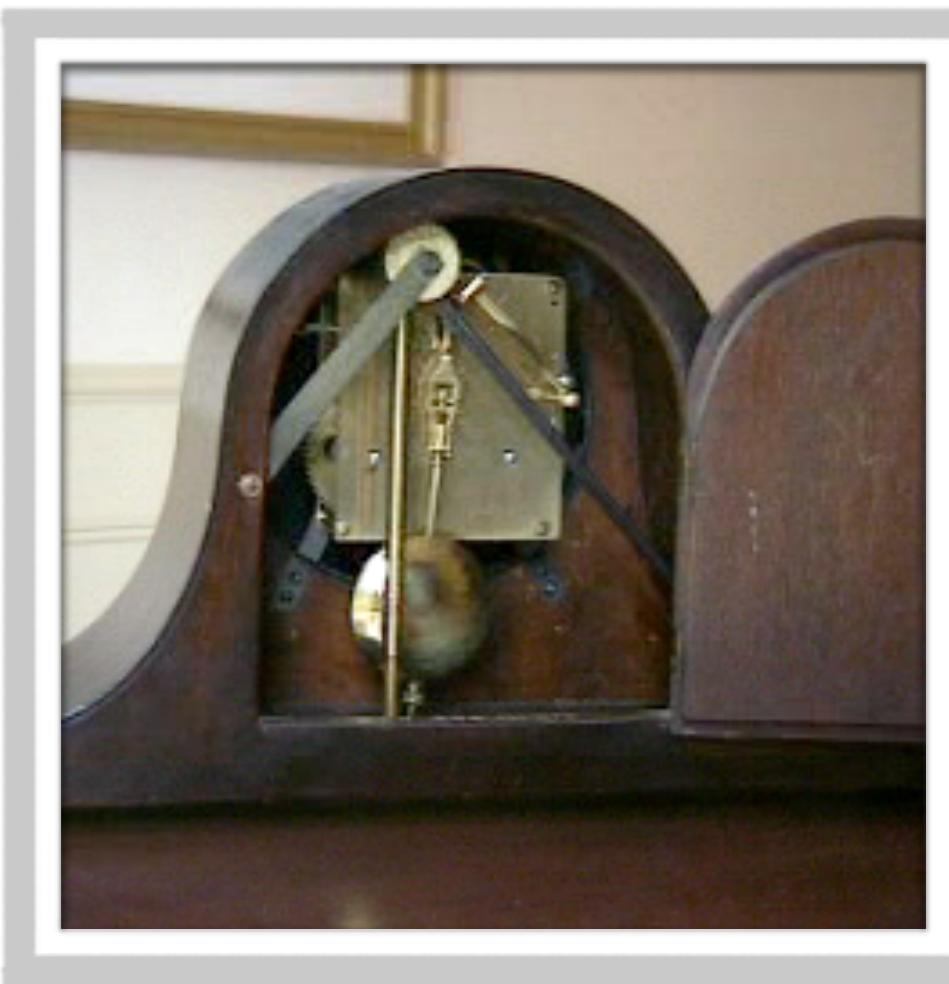
Frame  $j$



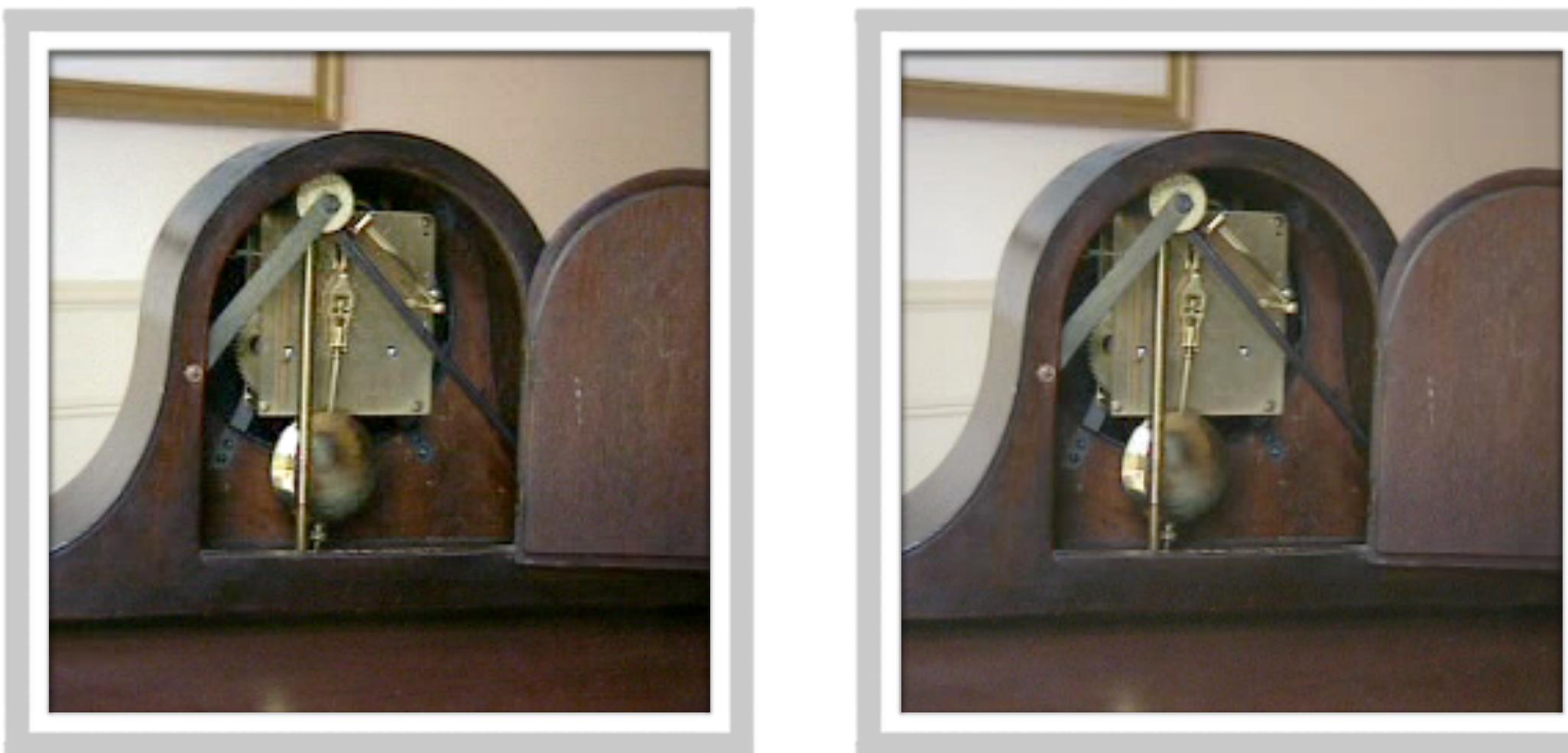
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White: Dissimilar Frames

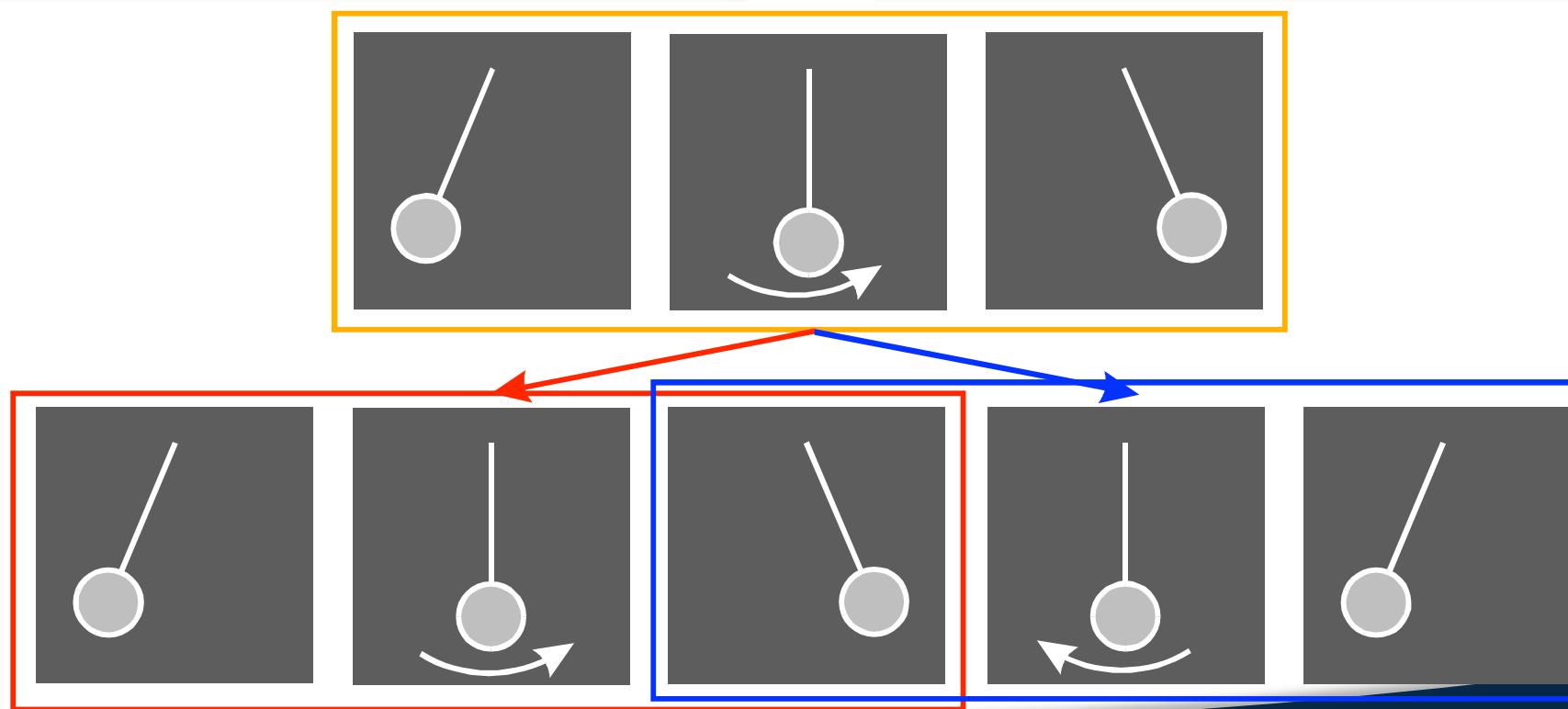
# Preserving Dynamics with Transitions

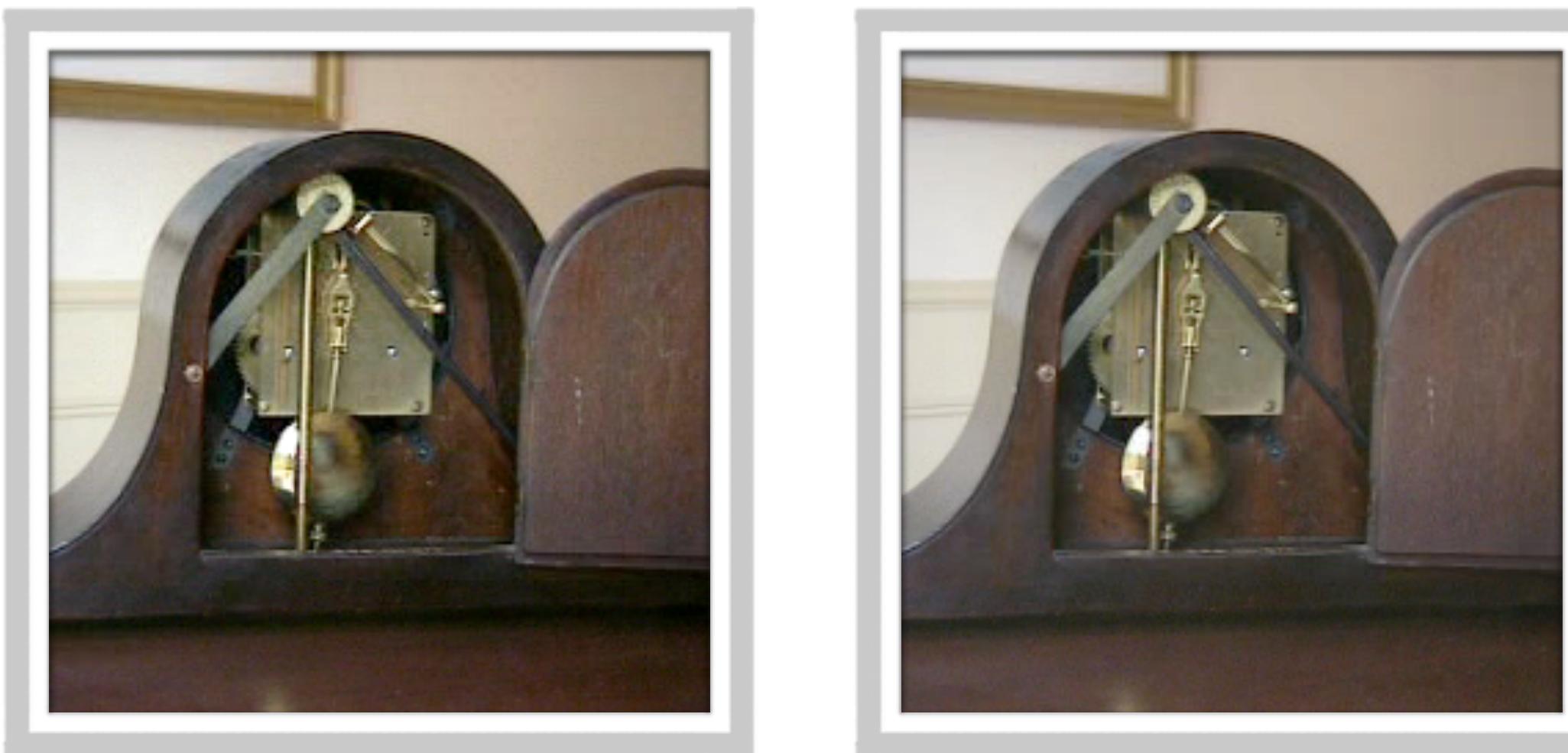


# Preserving Dynamics with Transitions

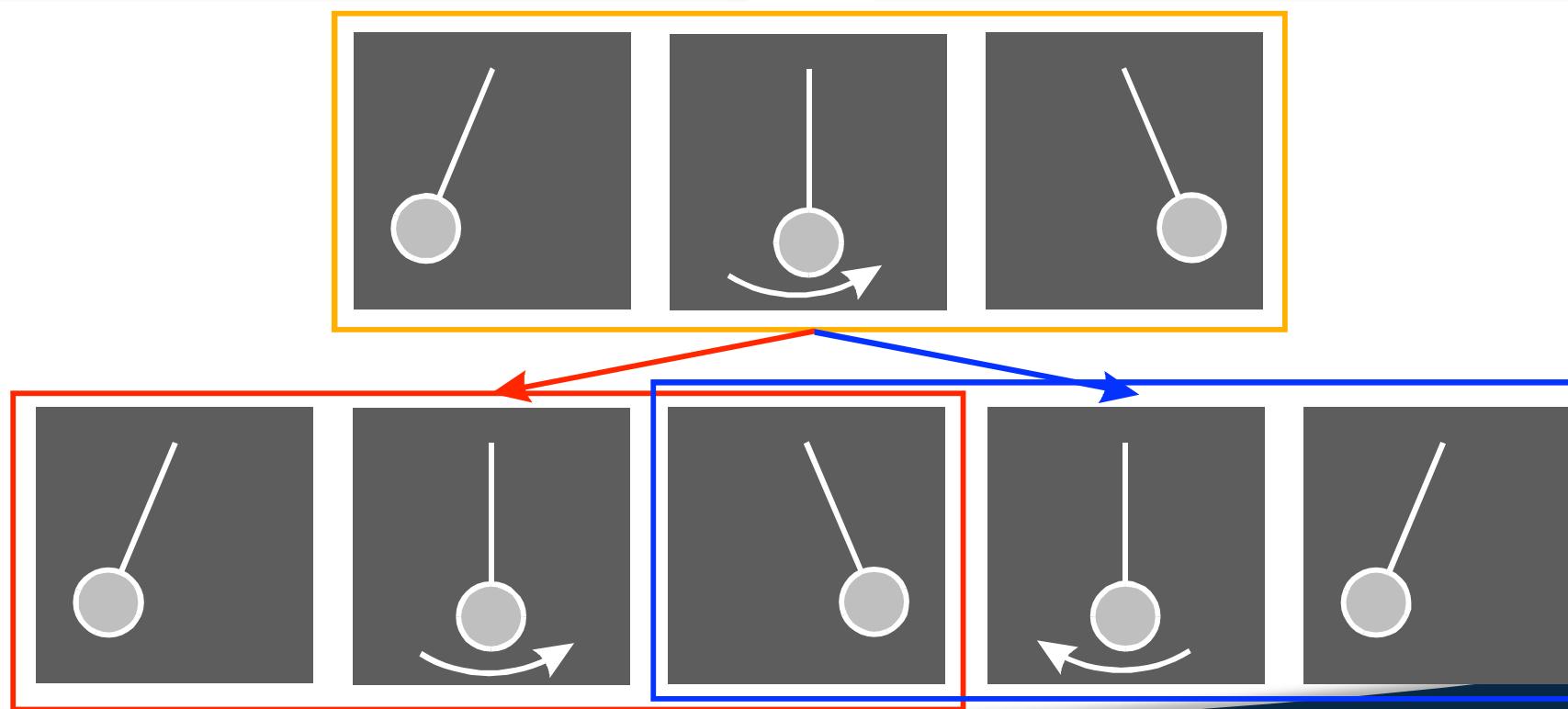


# Preserving Dynamics with Transitions





# Preserving Dynamics with Transitions



Cut

Fade

Morph/Feather

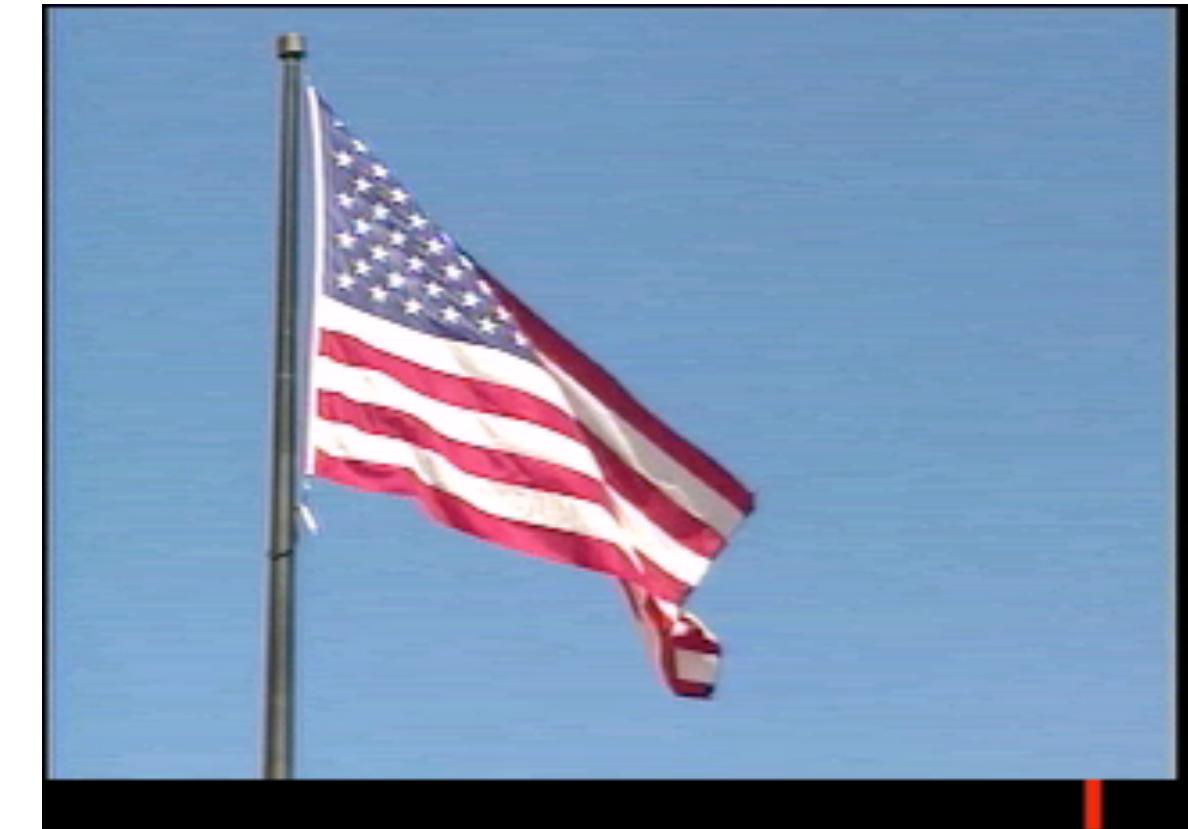
# Fading and Blending in Video



Cut

Fade

Morph/Feather



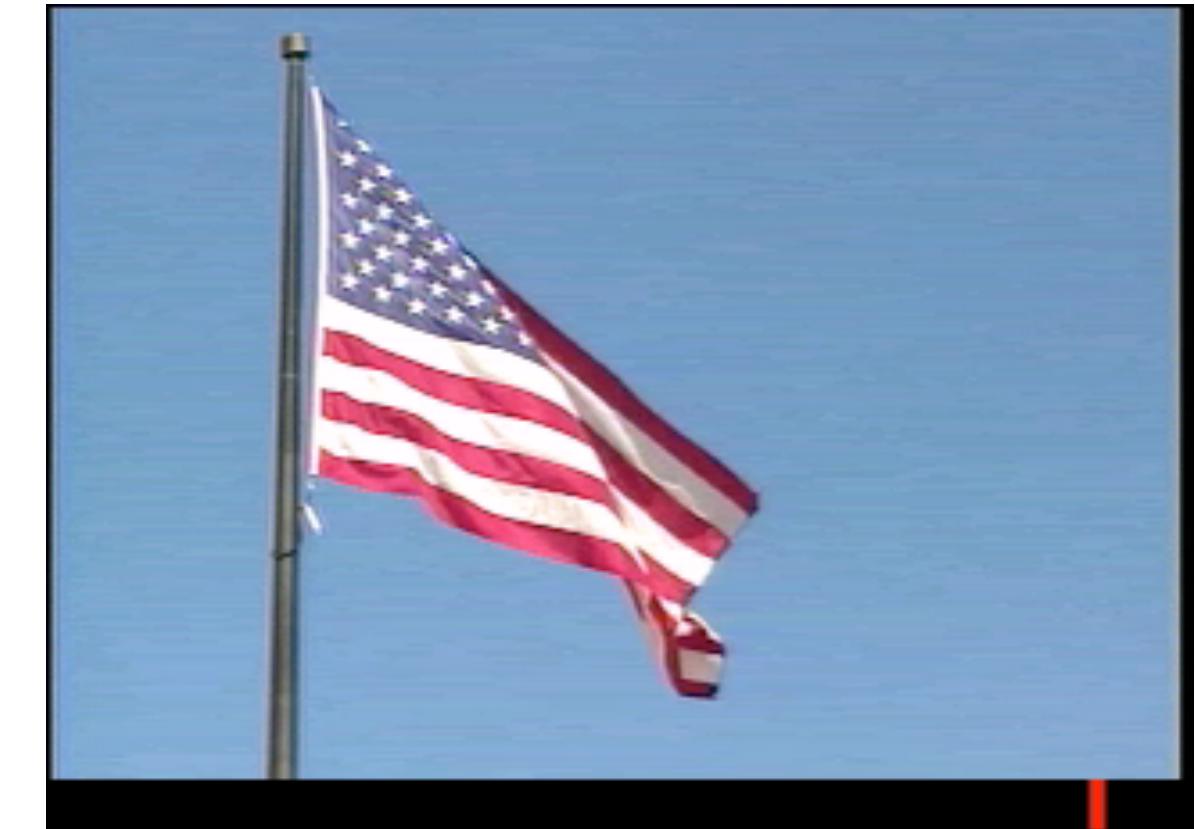
# Fading and Blending in Video



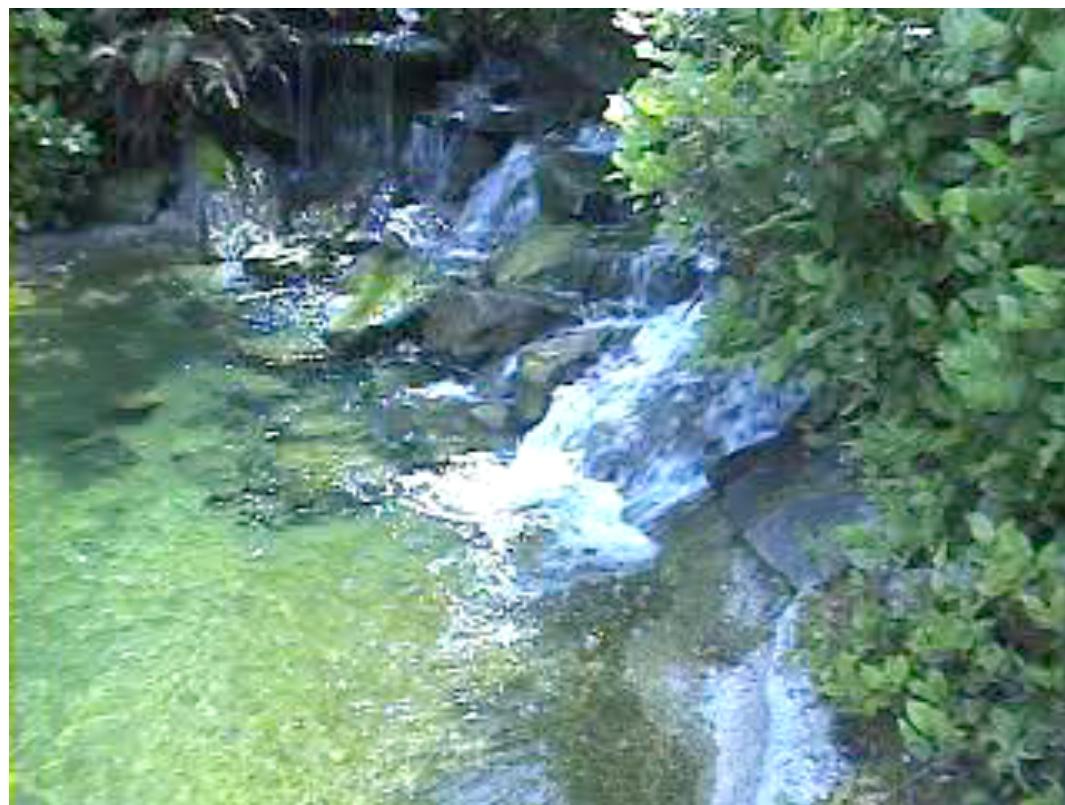
Cut

Fade

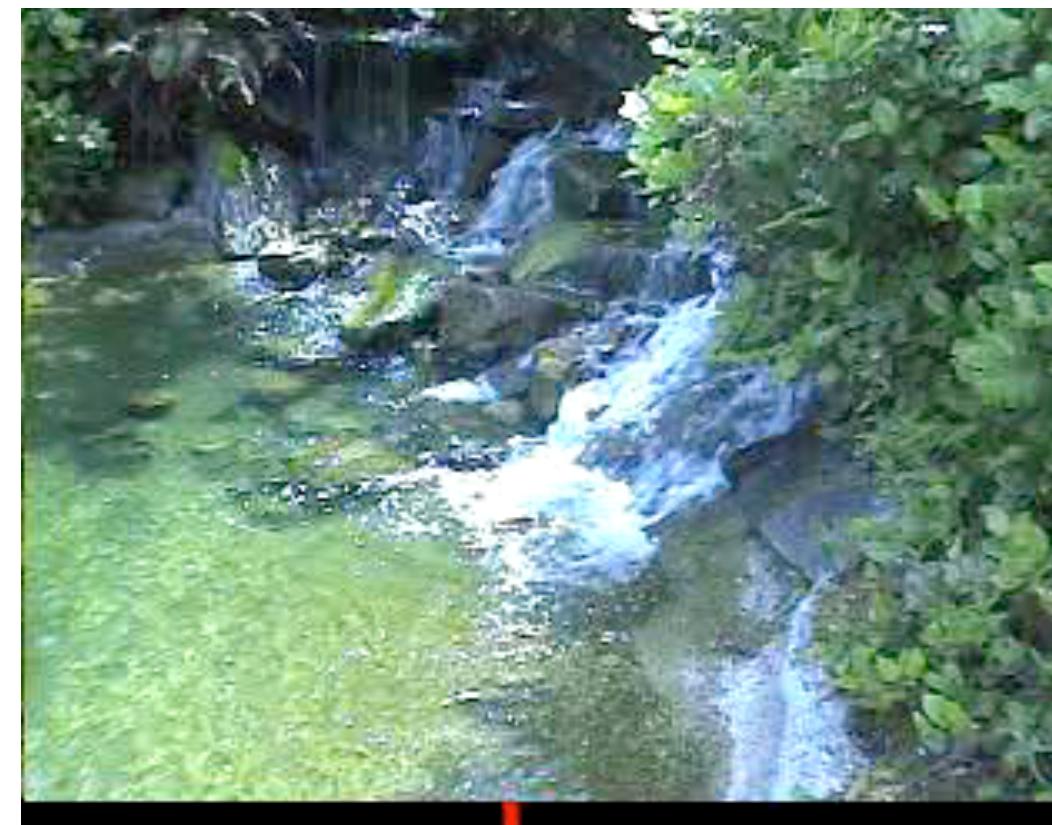
Morph/Feather



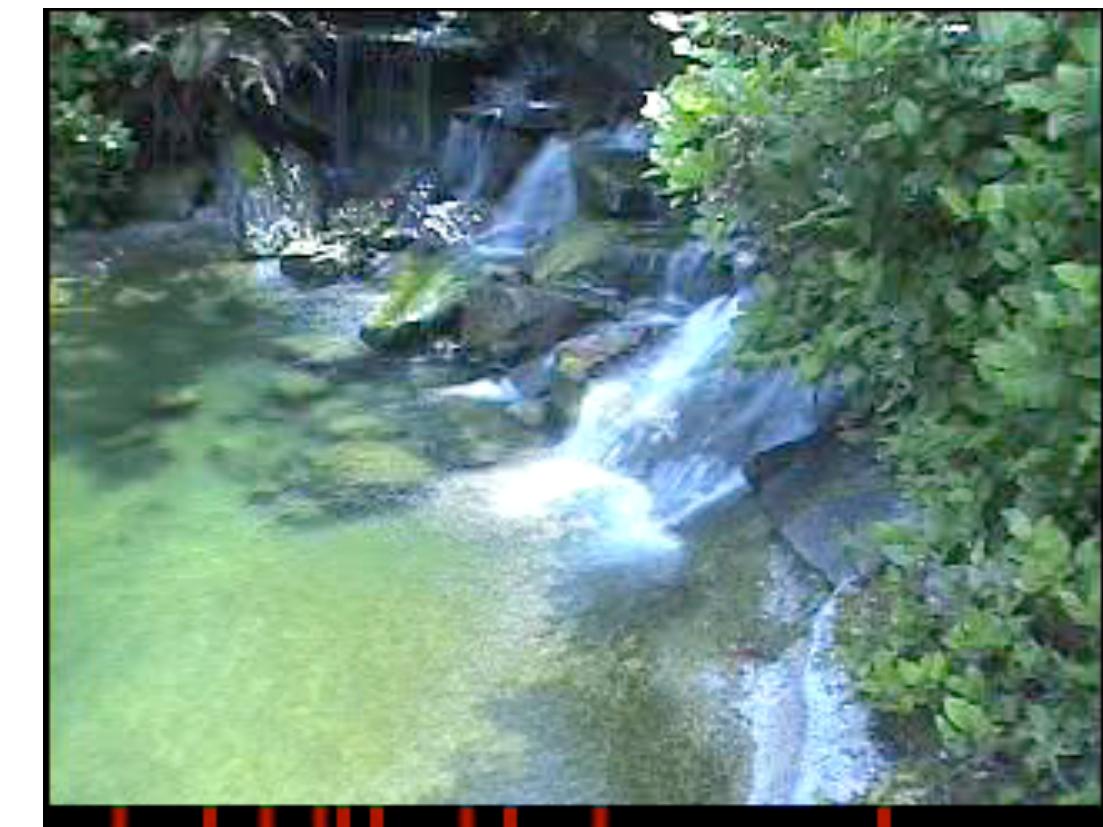
# Fading and Blending in Video



Original

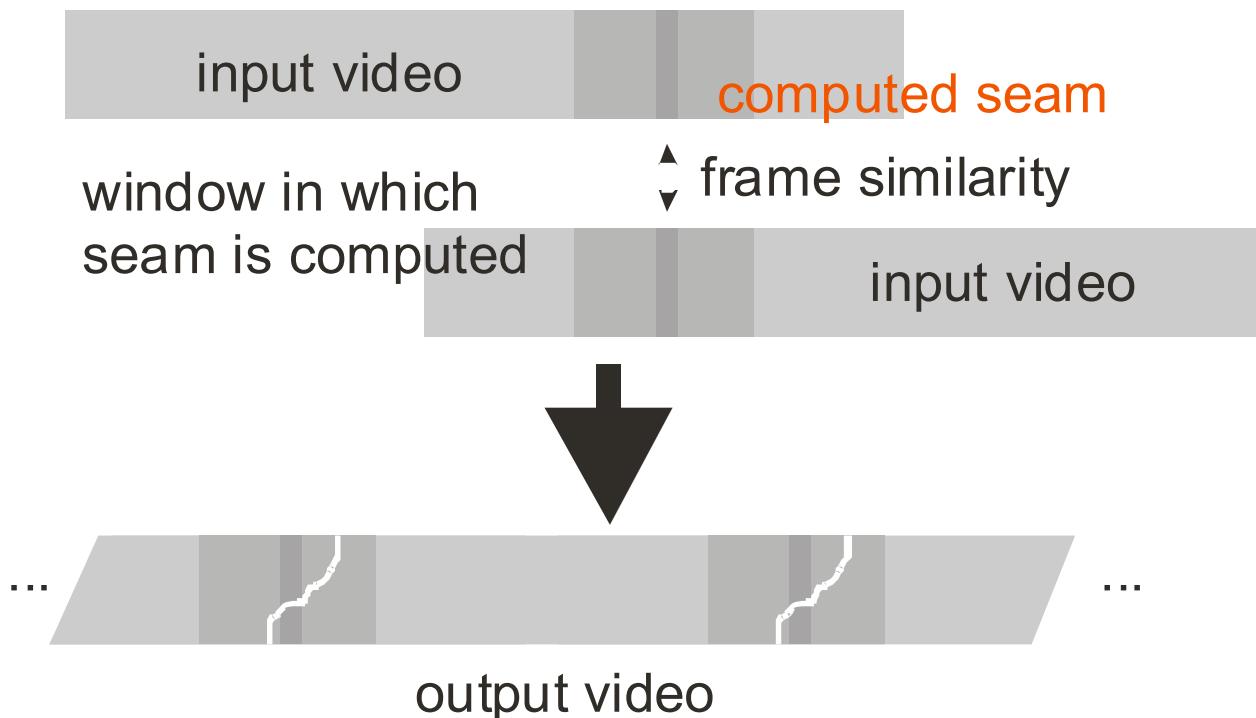


Single Fade



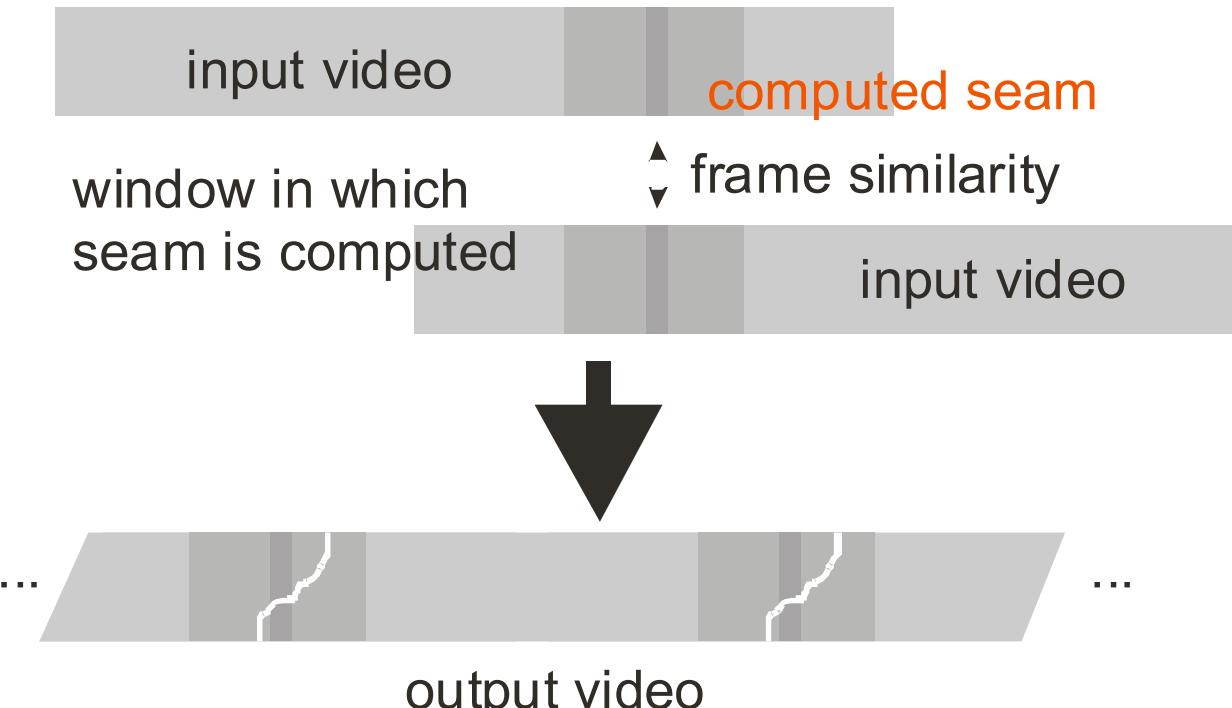
Multiple Fade/Blends

# Fading and Blending in Video



(Kwatra, Schödl, Essa 2003)

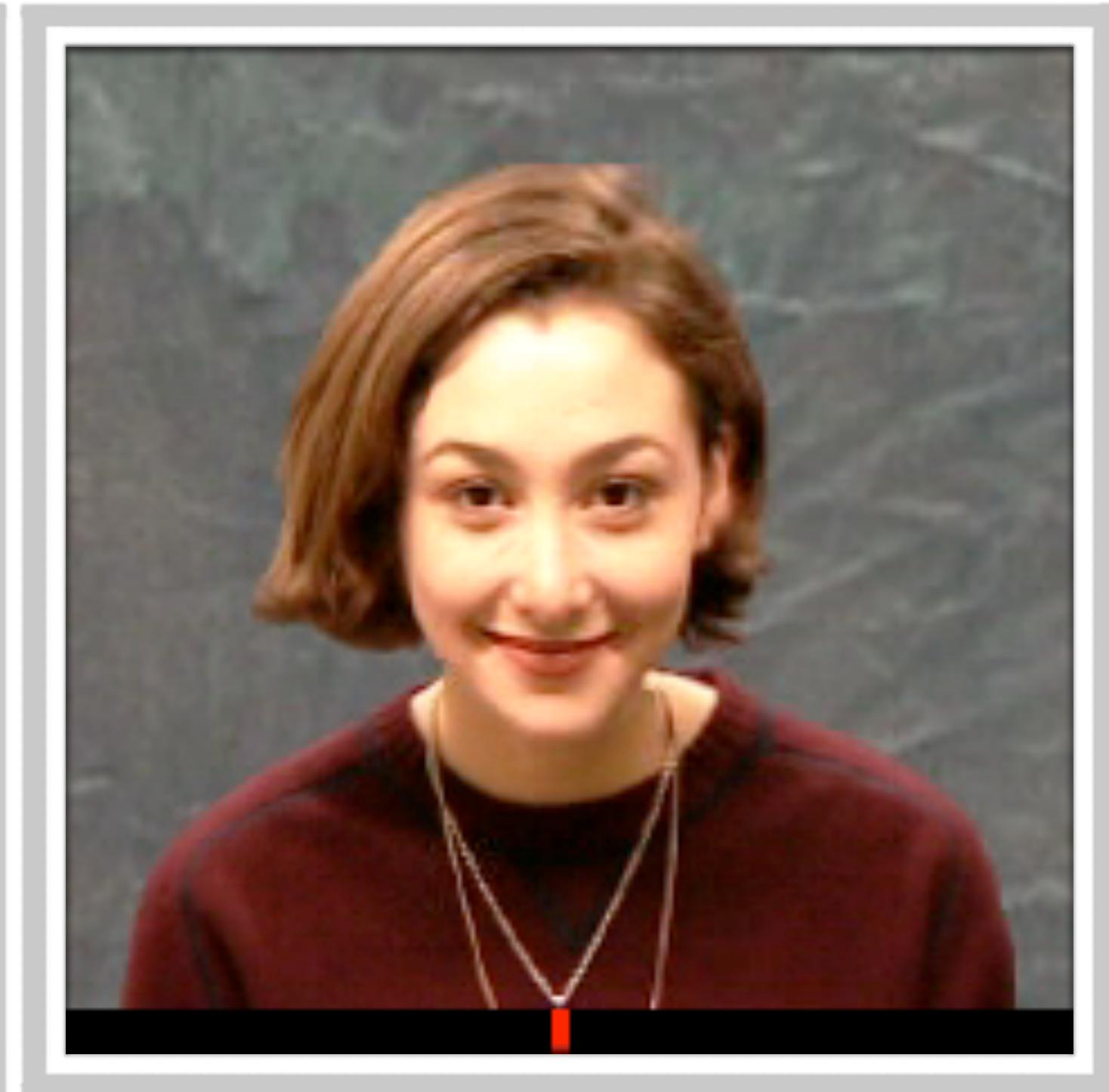
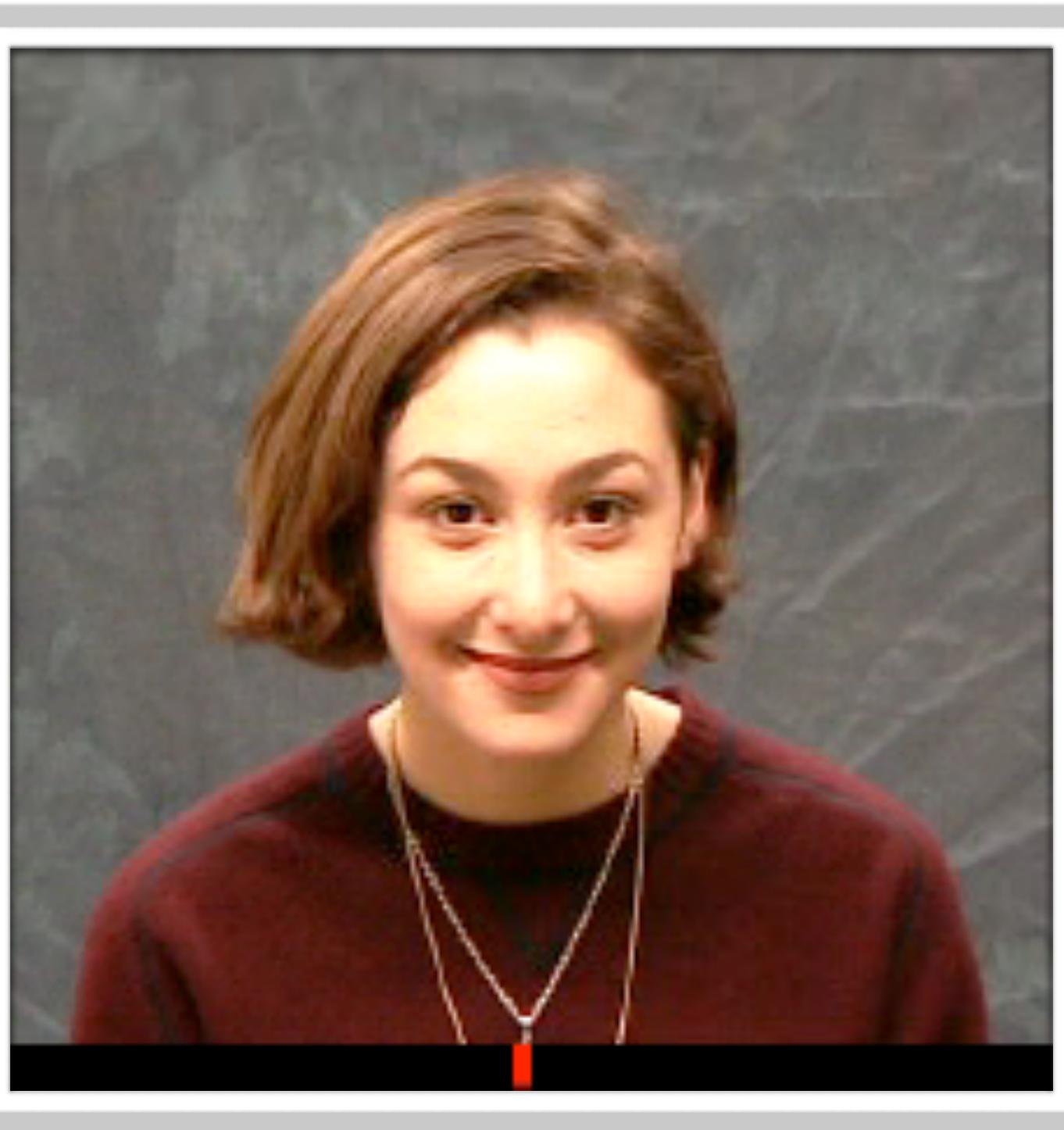
# Not just Fade/Blend, but Cut



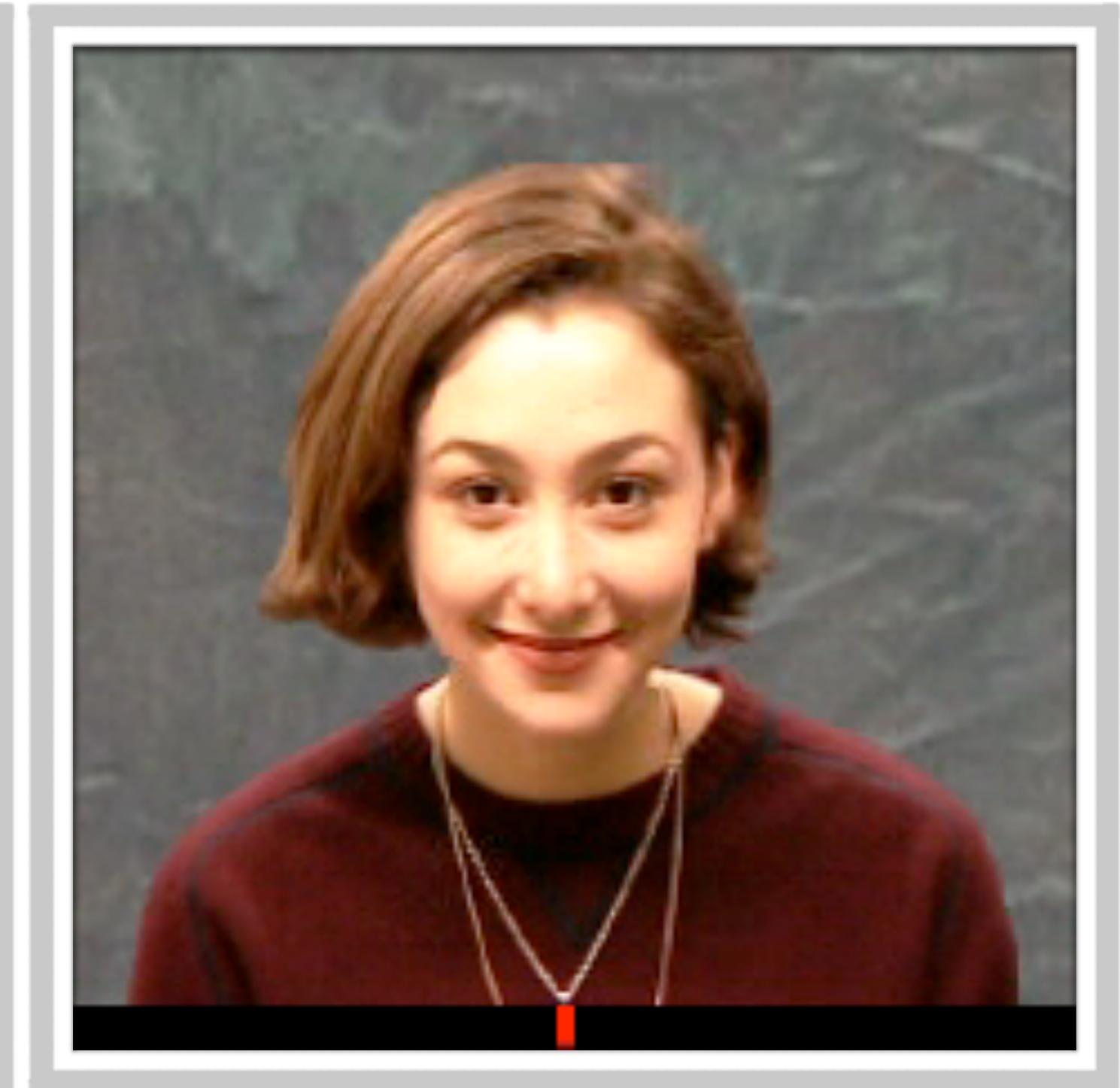
(Kwatra, Schödl, Essa 2003)

# Not just Fade/Blend, but Cut

# Video Portraits



## Video Portraits



## Video Portraits



Schödl and Essa (2002)

# Video Sprites

Henrik Sozzi, <http://www.youtube.com/watch?v=gkYL9weEDWE> using  
Microsoft Research Cliplets

Tom Freestone,  
[http://www.youtube.com/watch?v=u\\_scohnE9Wg](http://www.youtube.com/watch?v=u_scohnE9Wg)

Selecting and playing (animating) only parts of a Video

# Cliplets & Cinemagrams



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# Cliplets & Cinemagrams

# Summary (For Part 1 and 2).

- ★ Introduced the concept of a Video Texture.
- ★ Discussed the two (2) methods used to compute similarity between frames.
- ★ Showcased the use of similar frames to generate Video Textures.
- ★ Explained how blending, fading, and cuts are applied to generate Video Textures.
- ★ Described two (3) extensions of Video Textures.



<https://commons.wikimedia.org>

# Further Information

- ★ Schödl, Szeliski, Salesin, and Essa (2000), "Video textures," in SIGGRAPH 2000 [Website].
- ★ Kwatra, Schödl, Essa, Turk, Bobick (2003), "Graphcut textures: image and video synthesis using graph cuts" in SIGGRAPH 2003, (DOI|Paper|SIGGRAPH Video (160 MB, 50 MB) | Video Results 87 MB | Project Site)
- ★ Schödl and Essa (2002), "Controlled animation of video sprites" in ACM SIGGRAPH/Eurographics Symposium on Computer animation (DOI|PDF|WebSite).
- ★ Agarwala, Zheng, Pal, Agrawala, Cohen, Curless, Salesin, and Szeliski (2005) "Panoramic video textures." SIGGRAPH 2005 [PDF][DOI]
- ★ Bai, Agarwala, Agrawala, Ramamoorthi (2012), "Selectively De-animating Video," SIGGRAPH 2012.[PDF]
- ★ Microsoft Research Cliplets



[commons.wikimedia.org/](https://commons.wikimedia.org/)

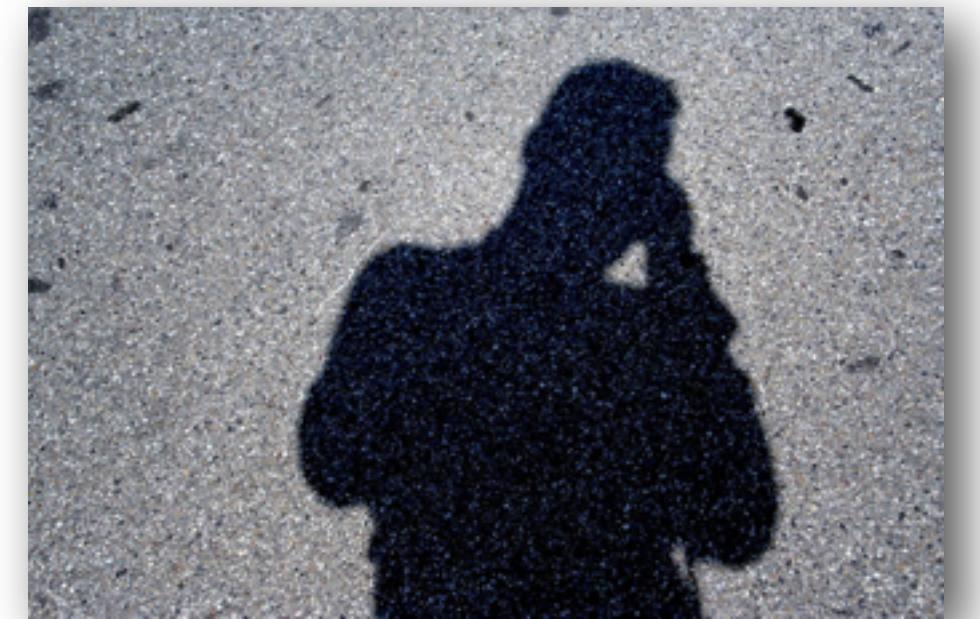
# Next Class

★ Light Fields and Plenoptic  
Cameras



# Credits

- ★ For more information, see
  - Richard Szeliski (2010) Computer Vision: Algorithms and Applications, Springer.
  
- ★ Some video retrieved from
  - <http://commons.wikimedia.org/>.
  - From Professors Essa's Lab.
  - List will be available on website.



[www.flickr.com/photos/neneonline/231886965/](http://www.flickr.com/photos/neneonline/231886965/)



# Computational Photography



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Professor

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Study the basics of computation and its impact on the entire workflow of photography, from capturing, manipulating and collaborating on, and sharing photographs.