

Alignment as a shortest path – details

- Core graph #nodes: $N_C \cdot N_S$ #edges: $N_C^2 \cdot (N_S - 1)$
- Local prior
 - initialize edge distances between all nodes
 - neighboring scenes are likely to stem from adjoining chapters

$$d_{(c,s) \rightarrow (c',s+1)} = \alpha + \frac{|c' - c|^2}{2 N_C}$$

- Global prior
 - multiplication factor for incoming edges to node (c, s)
 - larger distances to go to off-main diagonal nodes

$$g(c, s) = 2 - \exp\left(-\frac{(s - \mu_s)^2}{2 N_S^2}\right), \quad \mu_s = \lceil c \cdot N_S / N_C \rceil$$

- Modify incoming edge distances based on cues
 - high similarity between c and $s \Rightarrow$ low distance to reach it

$$d_{n' \rightarrow (c,s)} = d_{n' \rightarrow (c,s)} - \sum_M w_M \phi_{(c,s)}^M$$

- Scenes not in the book
 - additional layer of nodes allows scene to not be a part of book

$$d_{n' \rightarrow (\emptyset, s)} = d_{n' \rightarrow (\emptyset, s)} - \sum_M w_M \max(0, 1 - \sum_C \phi_{(c,s)}^M)$$

- Dijkstra's algorithm for shortest path



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Project page (data)

<http://cvhci.anthropomatik.kit.edu/projects/mma>

Chapter-Scene similarity scores – details

- # scenes: N_S | # chapters: N_C | # people (characters): N_P
- Difference between “histogram” for characters in scenes $Q_S \in \mathbb{R}^{N_S \times N_P}$, in chapters $Q_C \in \mathbb{R}^{N_C \times N_P}$
- Identity based similarity

$$\phi_{(c,s)}^I = \sqrt{2} - \|q_S(s) - q_C(c)\|_2$$

- Dialog similarity between a pair of dialogs (n, v)

$$\phi_{(n,v)}^D = \sum_{w \in \mathcal{S}_{n,v}} -(\log \psi^N(w) + \log \psi^V(w))/2$$

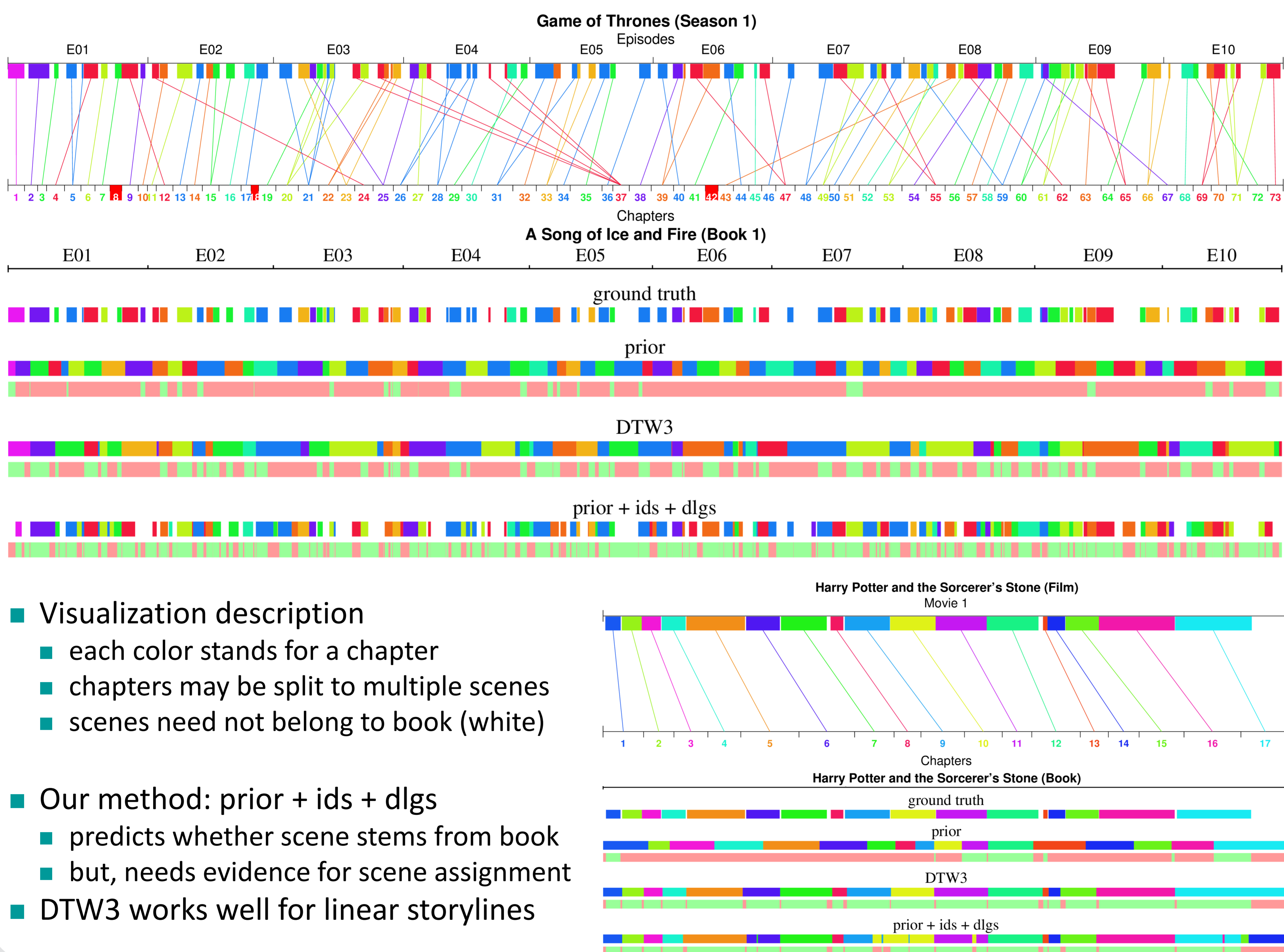
term frequency $\psi^N(w)$, set of matching words $\mathcal{S}_{n,v}$

- Dialog based similarity

- sum of similarities for all matching dialogs in chapter and scene

$$\phi_{(c,s)}^D = \sum_{n \in \mathcal{C}_D} \sum_{v \in \mathcal{S}_D} \phi_{(n,v)}^D$$

Qualitative alignment performance



Descriptions

Ch11, P47
E02 12m23s

Arya was in her room, packing a polished ironwood



chest that was bigger than she was. Nymeria was helping. Arya would only have to point, and the wolf would bound across the room, snatch up some wisp of silk in her jaws, and fetch it back.

Ch14, P66
M 1h40m30s

All at once there was a scraping noise



and the egg split open. The baby dragon flopped onto the table. It wasn't exactly pretty; Harry thought it looked like a crumpled, black umbrella. Its spiny wings were huge compared to its skinny jet body, it had a long snout with wide nostrils, the stubs of horns and bulging, orange eyes.

Ch28, P66
E04 29m45s

The master called over a tall lad about Robb's age, his arms and



chest corded with muscle. Thick hair, shaggy and unkempt and black as ink. The shadow of a new beard darkened his jaw. "This is Gendry. ..." Almost shyly, the boy led them to his bench, and a steel helm shaped like a bull's head, with two great curving horns.

Ch3, P8
E01 19m50s

At the center of the grove an ancient weirwood brooded over



a small pool where the waters were black and cold. "The heart tree," Ned called it. The weirwood's bark was white as bone, its leaves dark red, like a thousand bloodstained hands.

Ch3, P34
M 09m07s

Harry went back to the kitchen, still

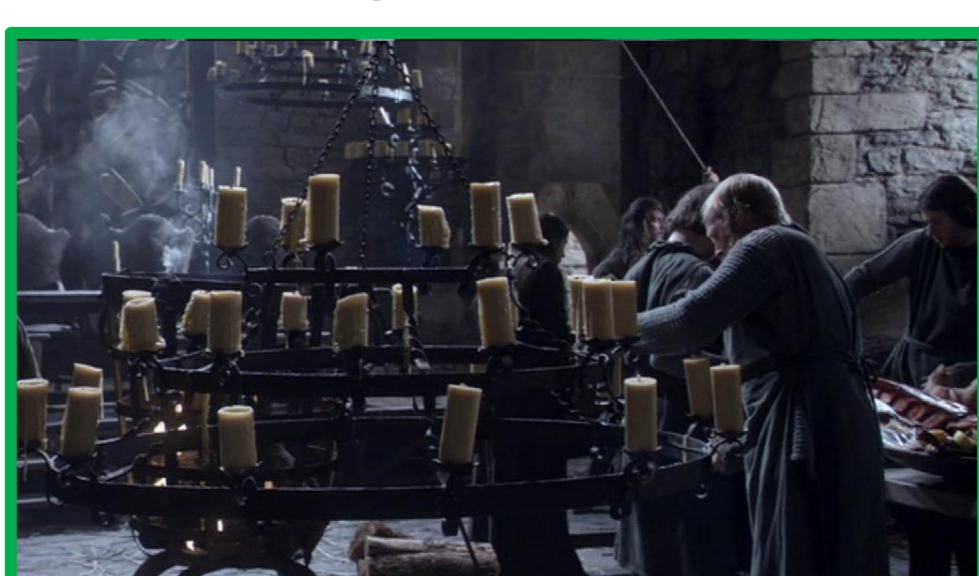


staring at his letter. He handed Uncle Vernon the bill and the postcard, sat down, and slowly began to open the yellow envelope.

Many more examples in the paper and supplementary material.

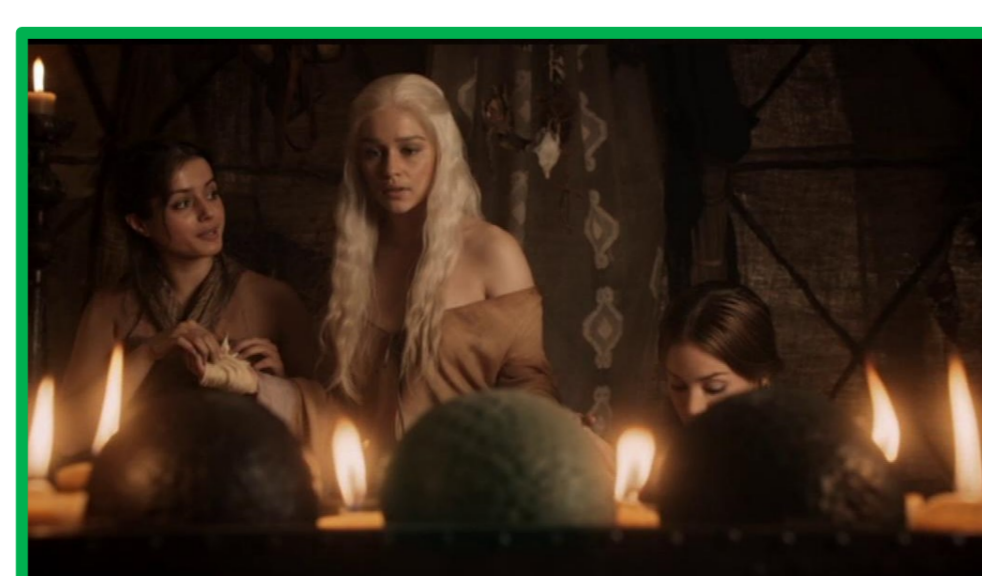
diff (Book, Video)

- Finding scene-level differences



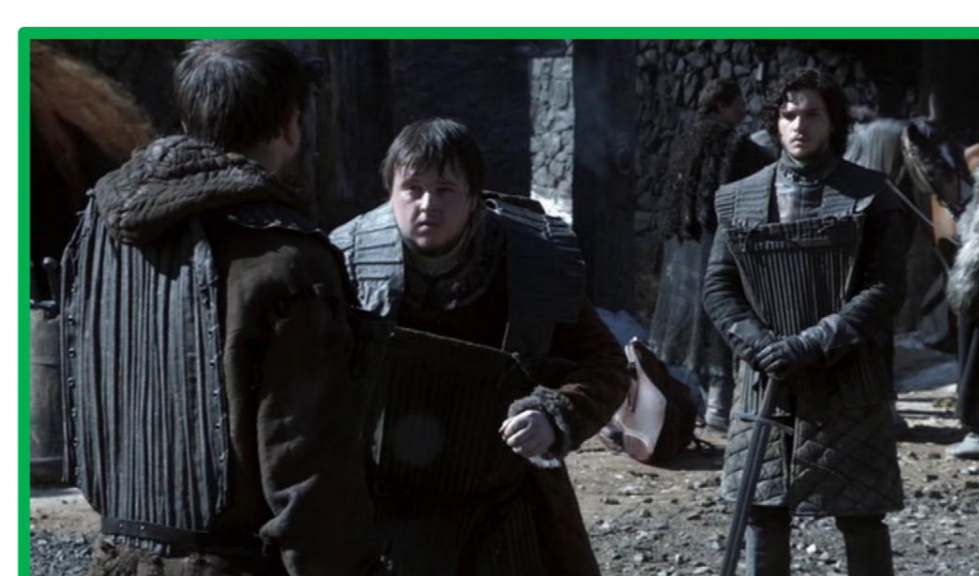
E01 ~21m

Scene involves preparation at Winterfell for the arrival of the King's party. This was not described in the book.



E02 ~31m

While admiring the eggs, Daenerys's servants tell her stories about the supposed origins of the dragons. This scene was not mentioned in the book.



E04 ~35m

Jon has threatened the other trainees to not harm Sam during practice. While this was mentioned in the book, the actual training scenes were never covered.



E08 ~4m

Arya is being protected by Syrio from Lannister swords. Due to the fighting and chaos in the scene this was wrongly predicted as not being in the book.