Computational Narrative

and what we can learn from narratology

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Columbia University

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Introduction

storytelling is a fundamental and universal form of communication

- ▶ how are narratives different from non-narratives?
- ▶ what do narratives tell us about authors and audiences?
- ▶ can we generate narratives automatically?

Outline

where did we come from?

- literary and linguistic studies of narrative

where are we now?

- the current state of computational narrative research

where are we going?

- how emotion detection can and should help us improve computational narrative

Narratology

Propp

Propp (1928)

- there is a limited set of functions that are the building blocks of a fairy tale
- the sequence of functions is always the same in every fairy tale

Vladimir Propp (1968). *Morphology of the Folktale.*

Narratology

Propp

Propp (1928)

- there is a limited set of functions that are the building blocks of a fairy tale
- the sequence of functions is always the same in every fairy tale

some functions are more specific than others

not all functions are equally important

Vladimir Propp (1968). *Morphology of the Folktale.*

Narratology

Propp
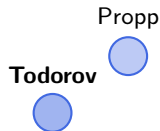
Todorov

Todorov (1969)

- the structural approach to narrative seeks an abstract theory of the structure of literary discourse such that all existing works are particular realized instances of that structure

- the minimal complete plot is a shift from one **equilibirum** state to another

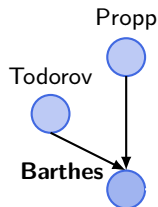T. Todorov (1969). Structural analysis of narrative.

Narratology
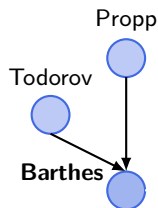
Barthes (1975)

- there must exist a common narrative structure, otherwise narratives are just random sequences of events
- we can reliably produce and recognize narratives, so they cannot be random

R. Barthes (1975). An introduction to the structural analysis of narrative.
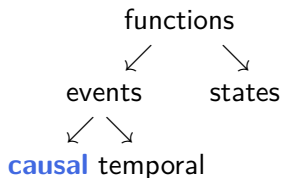
Narratology

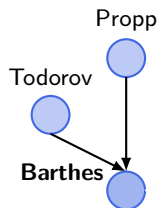## Barthes (1975)

three levels of analysis

- functions

```
        functions
         ↙      ↘
      events    states
       ↙  ↘
  causal  temporal
```

what are the decision points of a narrative?

R. Barthes (1975). An introduction to the structural analysis of narrative.

Narratology

Propp

Todorov

Barthes

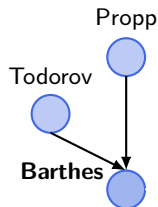## Barthes (1975)

three levels of analysis

- ► functions
- ► characters

characters are defined by actions

- ► have perspectives on sequences of actions
- ► participate in relationships
- ► form subject/object, giver/recipient, and assistant/opposer pairs

R. Barthes (1975). An introduction to the structural analysis of narrative.

Narratology

Barthes (1975)

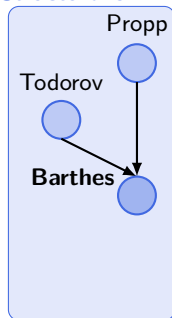three levels of analysis

- functions
- characters
- narration

the discourse of the narrative

- who is the narrator?
  - the author
  - an omniscient observer
  - a character
- who is the reader?

R. Barthes (1975). An introduction to the structural analysis of narrative.

Narratology

Structuralism

the story so far –

- ▶ narrative has two parts
  - ▶ surface form (narration/discourse)
  - ▶ deep structure (functions/characters)
- ▶ every existing narrative is a realization of a deep structure
  - ▶ eg. *Hamlet* and *The Lion King* are two realizations of the same deep structure

this is the **structuralist** position

Narratology

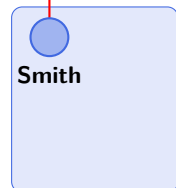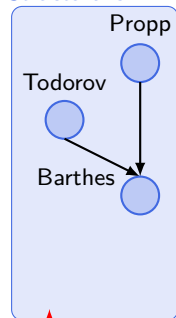Structuralism

Propp

Todorov

Barthes
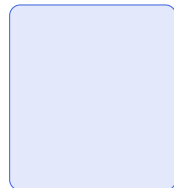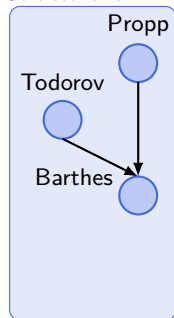
Contextualism

but wait –

- ▶ even if the deep structure is the same, the surface realization is very different
- ▶ even if the surface realization is the same, the reader's interpretation can be very different
  - ▶ L. Bohannan (1966). Shakespeare in the Bush.

this is the **contextualist** position

Narratology

Structuralism

Propp

Todorov

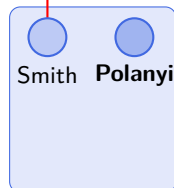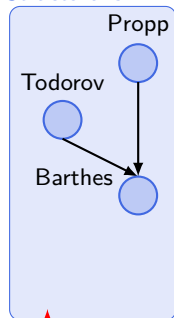Barthes

Smith

Contextualism

Smith (1980)

- ▶ narratives are not just structures, but also **acts**
- ▶ a narrative has a narrator and reader, both of whom must be interested in the narrative
  - ▶ what does the narrator want to convey?
  - ▶ what does the reader take away from the narrative?

B. H. Smith (1980). Narrative versions, narrative theories.

Narratology

Polanyi (1981)

- a narrative must be **tellable**
- the **durative-descriptive structure** shows the sociocultural context
- **evaluation devices** indicate important material that forms an **adequate paraphrase** of the story

Propp

Todorov

Barthes

Smith **Polanyi**

Contextualism

L. Polanyi (1981). What stories can tell us about their teller's world.

Narratology

Propp
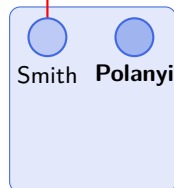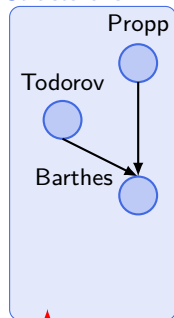
Todorov

Barthes

Smith **Polanyi**

Contextualism

Polanyi (1981)

- ▸ a narrative must be **tellable**
- ▸ the **durative-descriptive structure** shows the sociocultural context
- ▸ **evaluation devices** indicate important material that forms an **adequate paraphrase** of the story

the surface realization indicates the teller's intended deep structure

L. Polanyi (1981). What stories can tell us about their teller's world.
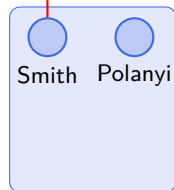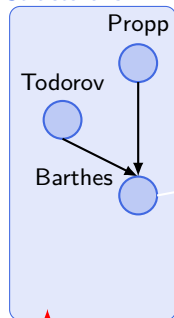
Narratology

the lay of the land –

Structuralism

- literature
- functions and actions

Contextualism

- personal narrative
- discourse and context

Narratology

Structuralism

Propp

Todorov

Barthes

Chatman

Contextualism

Smith   Polanyi
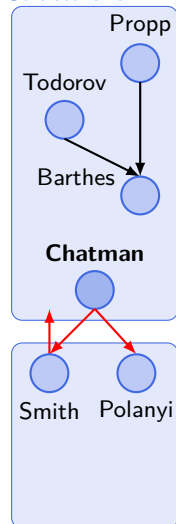
Chatman (1990)

- ▶ contextualists assume a real author/real audience relationship, which does not apply to literature

the theory might not apply to literature, but this does not make it less true in its intended domain

S. Chatman(1990). What can we learn from contextualist narratology?

Narratology
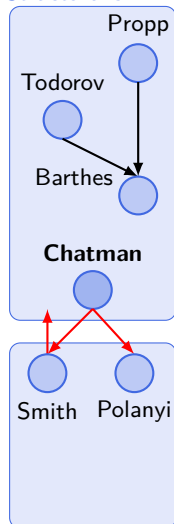
Chatman (1990)

- there is less variety and innovation of the form by amateur storytellers than by literary authors

this makes amateur stories more suitable for defining a general structure for narrative

S. Chatman(1990). What can we learn from contextualist narratology?

Narratology

Propp

Todorov

Barthes

Chatman

Smith Polanyi
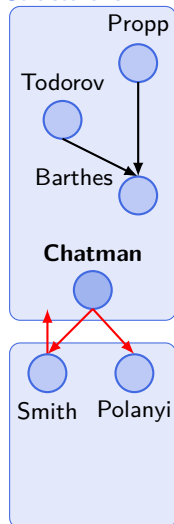
Chatman (1990)

▶ personal narratives do not
distinguish between the
surface realization and the
deep structure

this makes them perfect for
studying deep structure

S. Chatman(1990). What can we learn from contextualist narratology?

Narratology

Structuralism

Propp

Todorov

Barthes

Chatman

Smith   Polanyi

Labov

Contextualism

W. Labov (2013). The Language of Life and Death.
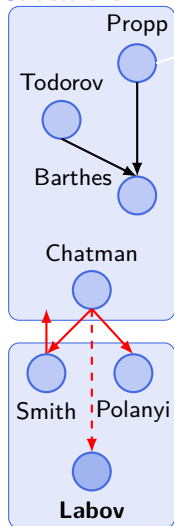
Labov (2013)

abstract

contextualist

orientation

structuralist

complicating action

structuralist

most reportable event

contextualist

evaluation

contextualist

resolution

structuralist

coda

contextualist

Outline

Structuralism

Propp

Todorov

Barthes

Chatman

Smith | Polanyi

Labov
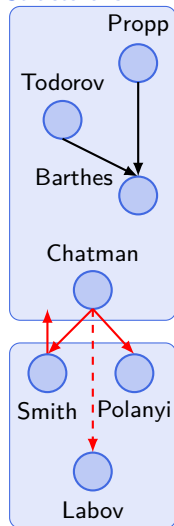
Contextualism

Narratology

- ▶ structuralism: literature, functions, character actions
- ▶ contextualism: personal narrative, discourse, context

Computational Narrative

- ▶ **coming up next**

Emotion Detection

- ▶ later

Computational Narrative
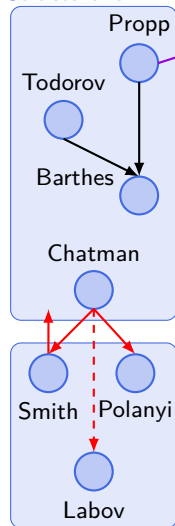
Structuralism

Propp — **Lehnert**

Todorov

Barthes

Chatman

Smith Polanyi

Labov

Contextualism

Lehnert (1981)

plot units

- vertices: affect states
- edges: causal links

$$-$$
$$\mathbf{m}$$
$$\mathbf{M}$$
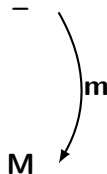
W. Lehnert (1981). Plot units and narrative summarization.

Computational Narrative
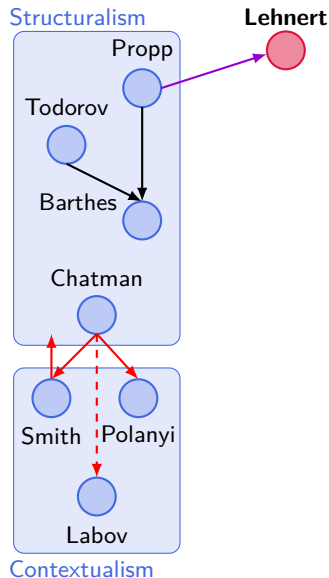
Lehnert (1981)

plot units

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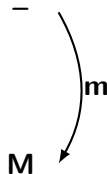
⇒ **Proppian functions**

W. Lehnert (1981). Plot units and narrative summarization.
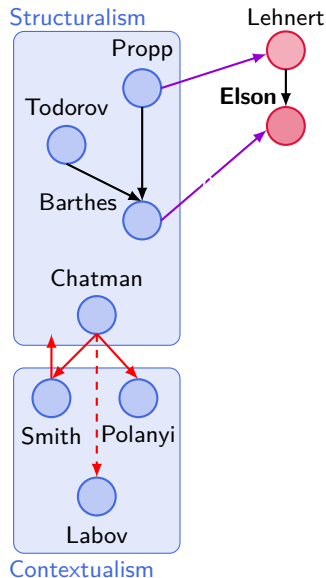
Computational Narrative

Elson (2012)

Story Intention Graph (SIG)

- three layers of annotation
    - **textual** ⇐ **narration**
    - **timeline** ⇐ **function**
    - **interpretive** ⇐ **character**

- annotators felt there were multiple interpretations for some narratives

D. Elson (2012). DramaBank: annotating agency in narrative discourse.

Computational Narrative

Elson (2012)

Story Intention Graph (SIG)

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  - **timeline $\Leftarrow$ function**
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- annotators felt there were multiple interpretations for some narratives

$\Rightarrow$ **Barthes's layers of analysis**
$\Rightarrow$ **Contextualism**

D. Elson (2012). DramaBank: annotating agency in narrative discourse.

Computational Narrative

Structuralism

Lehnert

Propp

Elson

Todorov

Barthes

Halpin

Chatman

Smith · Polanyi

Labov
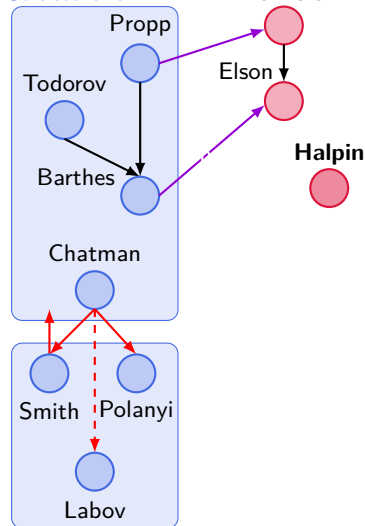
Contextualism

Halpin, Moore, and Robertson (2004)

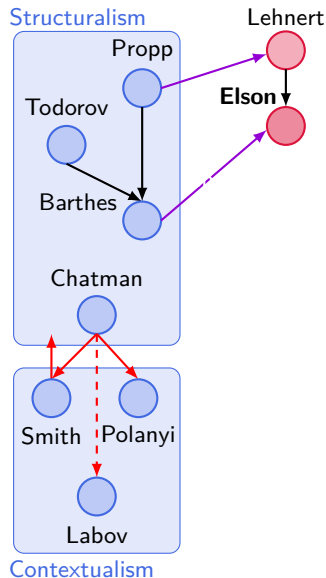- 103 stories rewritten by children
- does the pupil understand the point of the story and emphasize important links and details?
- extract and compare the events of the rewritten story with exemplar

H. Halpin, J. D. Moore, and J. Robertson (2004). Automatic analysis of plot for story rewriting.

Computational Narrative

Structuralism

Lehnert
Propp
Todorov
Elson
Barthes
Halpin
Chatman
Smith / Polanyi
Labov

Contextualism

Halpin, Moore, and Robertson (2004)

- 103 stories rewritten by children
- does the pupil understand the point of the story and emphasize important links and details? ⟸
- extract and compare the events of the rewritten story with exemplar

⟹ **contextualist question**

H. Halpin, J. D. Moore, and J. Robertson (2004). Automatic analysis of plot for story rewriting.

Computational Narrative

Structuralism

Lehnert

Propp

Todorov

Elson

Barthes

Halpin

Chatman

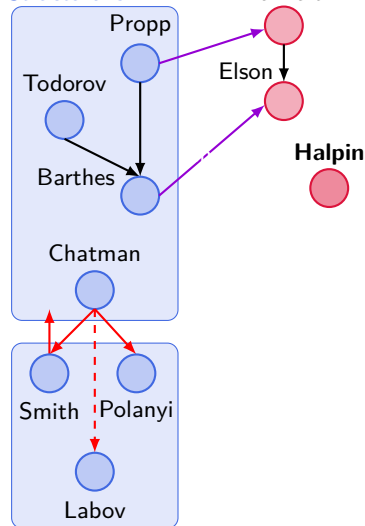Smith Polanyi

Labov

Contextualism

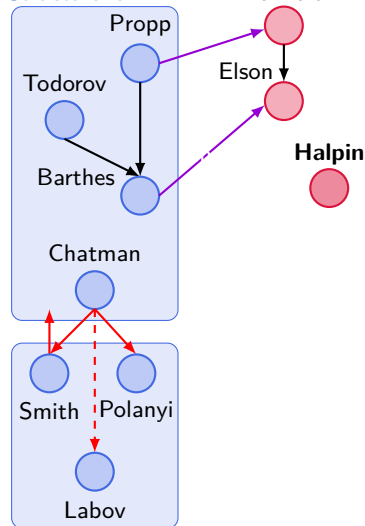Halpin, Moore, and Robertson (2004)

- ▶ 103 stories rewritten by children
- ▶ does the pupil understand the point of the story and emphasize important links and details? ⇐
- ▶ extract and compare the events of the rewritten story with exemplar ⇐

⇒ **contextualist question**
⇒ **structuralist answer**

H. Halpin, J. D. Moore, and J. Robertson (2004). Automatic analysis of plot for story rewriting.

Computational Narrative

Structuralism

Propp
Lehnert
Todorov
Elson
Barthes
Chambers Halpin
Chatman

Smith Polanyi
Labov
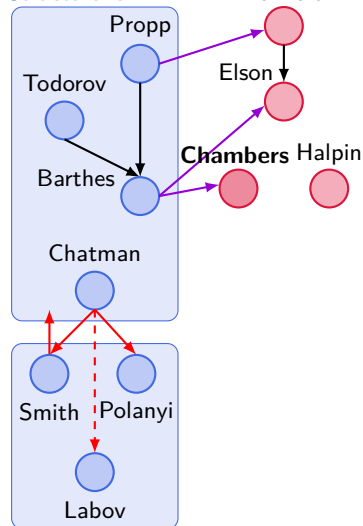
Contextualism

Chambers and Jurafsky (2008)

narrative chain

- partially ordered set of events with a common **protagonist**

⇒ **Barthes: characters are defined by their actions**

N. Chambers and D. Jurafsky (2008). Unsupervised learning of narrative event chains.

Computational Narrative

Structuralism

Lehnert
Propp
Todorov
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Smith Polanyi
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Contextualism

Chambers and Jurafsky (2008)

narrative chain

- ▶ partially ordered set of events with a common **protagonist**

⇒ **Barthes: characters are defined by their actions**

system	average rank
verb co-occurence	1826
protagonist	1160

but is this good performance?
how to interpret these numbers?
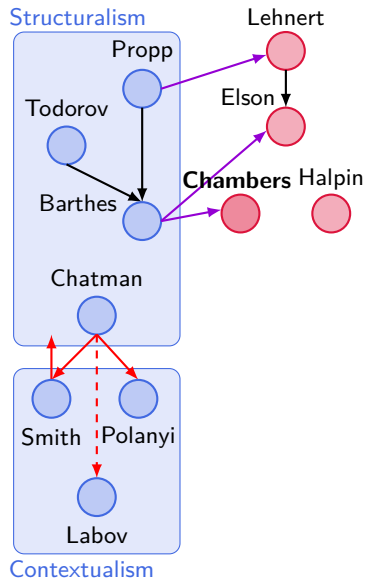
N. Chambers and D. Jurafsky (2008). Unsupervised learning of narrative event chains.

Computational Narrative

McIntyre and Lapata (2009)

- construct DAG from event chains (Chambers and Jurafsky)
- generate narratives by walking the DAG

N. McIntyre and M. Lapata (2009). Learning to tell tales: a data-driven approach to story generation.

Computational Narrative

Structuralism
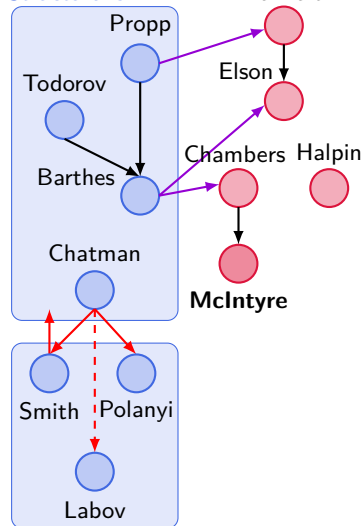
Contextualism
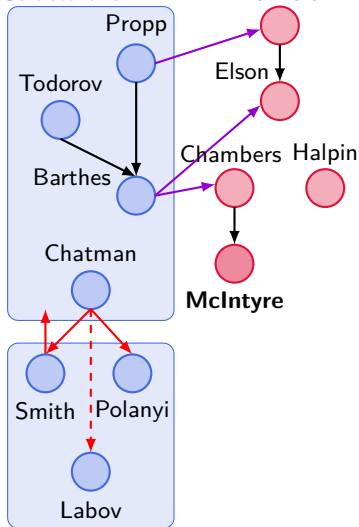
McIntyre and Lapata (2009)

- construct DAG from event chains (Chambers and Jurafsky)
- generate narratives by walking the DAG

The giant guards the child. The child rescues the son from the power. The child begs the son for a pardon. The giant cries that the son laughs the happiness out of death. The child hears if the happiness tells a story.

N. McIntyre and M. Lapata (2009). Learning to tell tales: a data-driven approach to story generation.

Computational Narrative

Structuralism

Lehnert
Propp
Todorov
Elson
Barthes
Chambers   Halpin
Chatman
Generation
McIntyre   **Reidl**
Smith   Polanyi
Labov
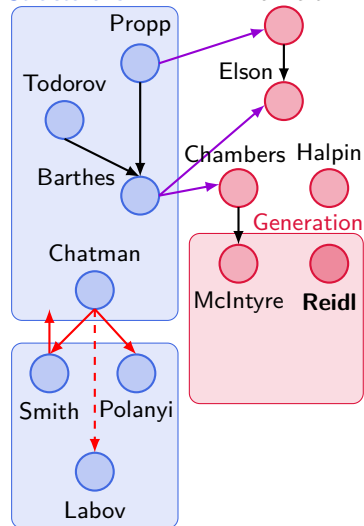
Contextualism

Reidl and Young (2010)

- **Intent-Driven Partial Order Causal Link** planning problem
- for a plan to be complete, it must not contain any character actions that are not part of a **frame of commitment**

M. Reidl and R. M. Young (2010). Narrative planning: balancing plot and character.

Computational Narrative

Reidl and Young (2010)

- **Intent-Driven Partial Order Causal Link** planning problem
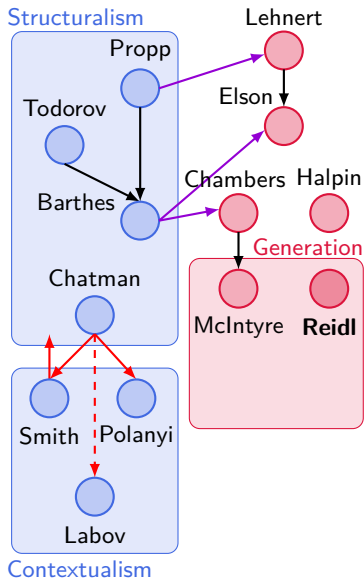- for a plan to be complete, it must not contain any character actions that are not part of a **frame of commitment**

The genie has a frightening appearance. The genie appears threatening to Aladdin. Aladdin wants the genie to die.

M. Reidl and R. M. Young (2010). Narrative planning: balancing plot and character.

Computational Narrative

the story so far –

work	data	task	approach
Lehnert	–	summarization	plot units
Elson	fables	annotation	SIG
Haplin	rewritten stories	grading	event similarity
Chambers	Gigaword	script extraction	event chain
McIntyre	fairy tales	generation	event chain
Reidl	–	generation	IPOCL

Computational Narrative

the story so far –

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structuralist ↗

Computational Narrative
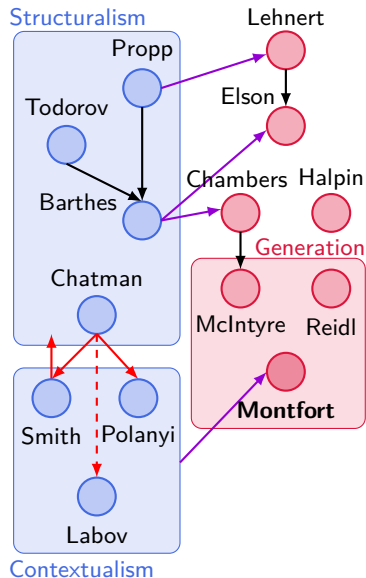
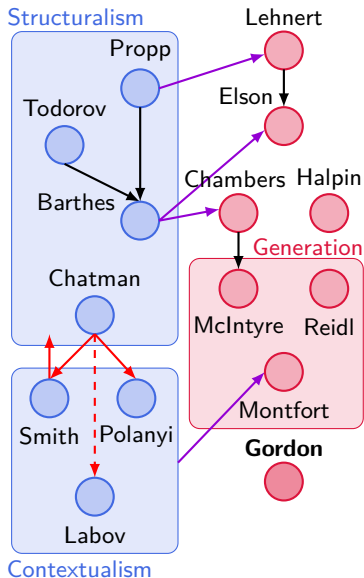## Montfort (2011)

- interactive fiction system that supports several models of narration
  - reverse chronological order
  - flashback and flashforward
- tense generated automatically based on an internal state time of narration and the time of the event

N. Montfort (2011). Curveship's automatic narrative style.

Computational Narrative

Gordon and Swanson (2009)

- ICWSM 2009 Spinn3r datset
- annotated 5002 posts
  - 240 stories (4.8%)
- simple unigrams normalized by frequency
  - POS tags and title text not statistically significant
- created dataset of 960,098 stories (precision = 0.75)

A. S. Gordon and R. Swanson (2009). Identifying personal stories in millions of weblog entries.
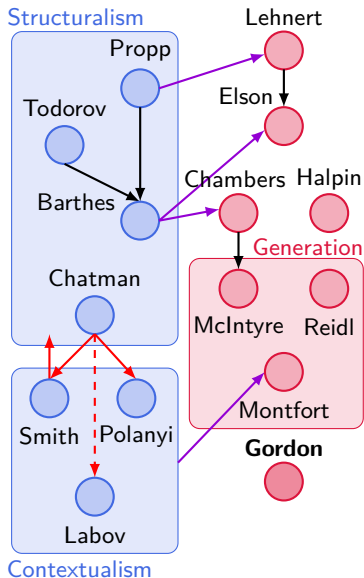
Computational Narrative

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⇒ **narratives of personal experience**

A. S. Gordon and R. Swanson (2009). Identifying personal stories in millions of weblog entries.

Computational Narrative
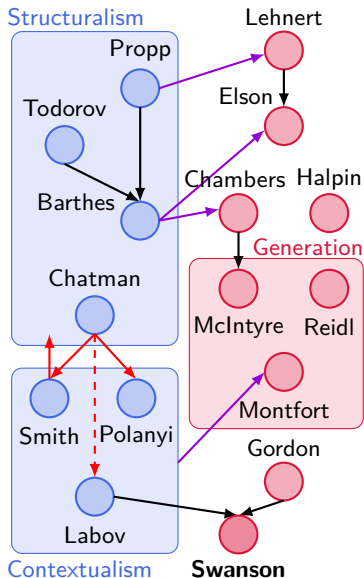
**Swanson et al (2014)**

- identify **orientation**, **complicating action**, and **evaluation**

- several rounds of annotation to achieve agreement
- problematic clause types
  - clauses containing of multiple elements
  - implied actions
  - stative descriptions resulting from local action
  - subjective language

R. Swanson et al (2014). Identifying narrative clause types in personal stories.

Computational Narrative
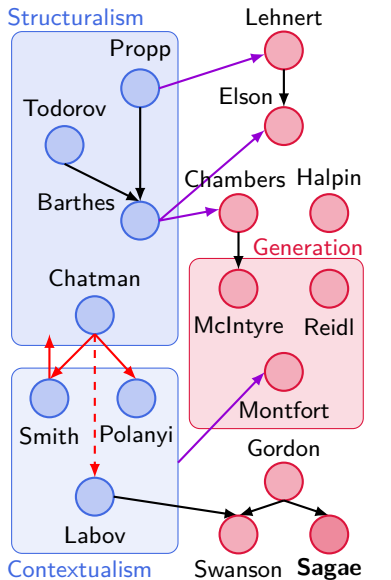
Sagae et al (2013)

- diegetic versus extradiegetic
- subjective versus objective

task	accuracy
six-way	58%
binary subjectivity	78%
binary diegetic	81%

K. Sagae et al (2013). A data-driven approach for classification of subjectivity in personal narrative.

Outline
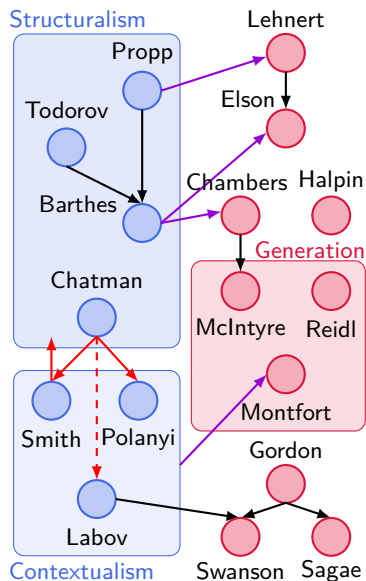
Narratology

- structuralism: literature, functions, character actions
- contextualism: personal narrative, discourse, context

Computational Narrative

- previous work has focused on structuralist approaches
- contextualist approaches are needed

Emotion Detection

- **coming up next**

Emotion Detection

Liu, Lieberman, and Selker (2003)

Liu

- six basic emotions: happy, sad, anger, fear, disgust, surprise
  - Ekman (1993)
- evaluation
  - email client that illustrates sentences with faces
  - faces generated by emotion system rated more interactive and intelligent than random faces

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H. Liu, H. Lieberman, and T. Selker (2003). A model of textual affect sensing using real-world knowledge.

Emotion Detection

Liu, Lieberman, and Selker (2003)

Liu

- six basic emotions: happy, sad, anger, fear, disgust, surprise
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  - faces generated by emotion system rated more interactive and intelligent than random faces

what was the rating scale?

H. Liu, H. Lieberman, and T. Selker (2003). A model of textual affect sensing using real-world knowledge.

Emotion Detection

Rubin

Liu

Rubin, Stanton, and Liddy (2004)

- ► Circumplex Theory of Affect
  (Watson and Tellegen 1985)
  - ► positive affect axis (active, elated
    v. drowsy, dull)
  - ► negative affect axis (distressed,
    fearful v. calm, placid)

unintuitive axes

too much overlap among labels in the
same octant

V. Rubin, J. Stanton, and E. Liddy (2004). Discerning emotions in texts.
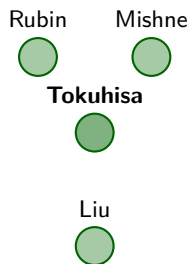
Emotion Detection

Rubin   **Mishne**

Liu

Mishne (2005)

- top 40 LiveJournal moods (eg. amused, excited, contemplative, sick, anxious, ecstatic)

too much subjectivity in self-reported moods

G. Mishne (2005). Experiments with mood classification in blog posts.

Emotion Detection

Rubin   Mishne

Tokuhisa

Liu

Tokuhisa, Inui, and Matsumoto (2008)

- ► happiness, pleasantness, relief, fear, sadness, disappointment, unpleasantness, loneliness, anxiety, anger

- ► fatal v. non-fatal errors

R. Tokuhisa, K. Inui, and Y. Matsumoto (2008). Emotion classification using massive examples extracted from the web.

Emotion Detection

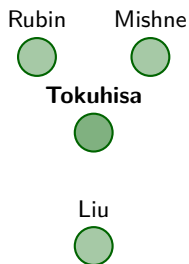Rubin   Mishne

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R. Tokuhisa, K. Inui, and Y. Matsumoto (2008). Emotion classification using massive examples extracted from the web.

Emotion Detection

Rubin   Mishne

Tokuhisa

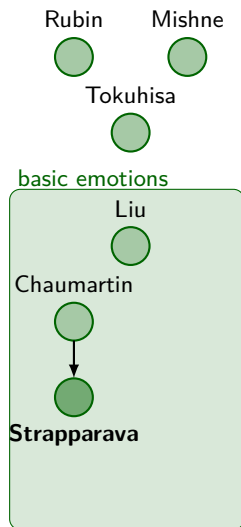basic emotions

Liu
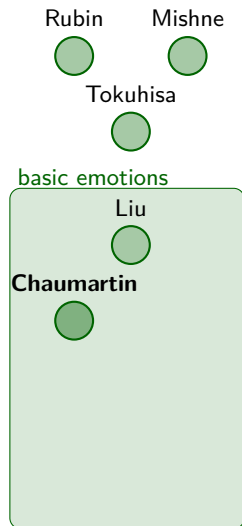
Chaumartin

Chaumartin (2007)

- ▶ fine- v. coarse-grain evaluation
- ▶ WordNet Affect and SentiWordNet scores weighted by syntactic role of word
- ▶ high accuracy, moderate precision, low recall

fine-grained control of emotion is possible

F.-R. Chaumartin (2007). UPAR7: a knowledge-based system for headline sentiment tagging.

Emotion Detection

Strapparava and Mihalcea (2008)

- ▶ LSA representation of WordNet Affect
    - ▶ outperformed by Chaumartin on fine-grained evaluation
    - ▶ performs best on coarse-grained evaluation
    - ▶ strict WN keyword has best precision (38.28)
    - ▶ synset augmented WN has best recall (90.22)

C. Strapparava and R. Mihalcea (2008). Learning to identify emotions in text.

Emotion Detection
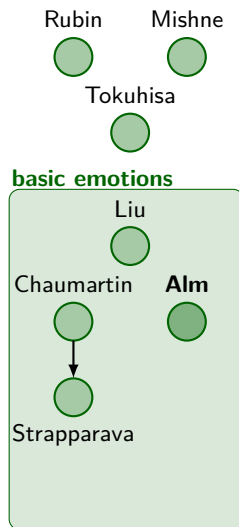
Rubin   Mishne

Tokuhisa

basic emotions

Liu

Chaumartin   **Alm**

Strapparava

Alm, Roth, and Sproat (2005)

- ▶ 185 children's stories
- ▶ emotions in adjacent sentences can affect the current sentence
- ▶ strongest feature group included thematic story type

C. Alm, D. Roth, and R. Sproat (2005). Emotions from text: machine learning for text-based emotion prediction.
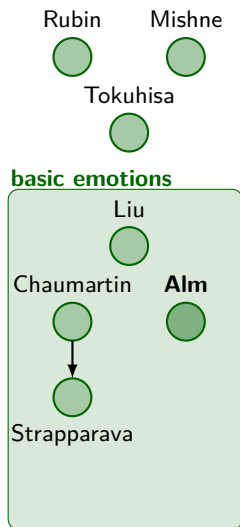
Emotion Detection

Alm, Roth, and Sproat (2005)

- ▶ 185 children's stories
- ▶ emotions in adjacent sentences can affect the current sentence
- ▶ strongest feature group included thematic story type ⟸

different types of stories should be told in different ways

C. Alm, D. Roth, and R. Sproat (2005). Emotions from text: machine learning for text-based emotion prediction.

Emotion Detection
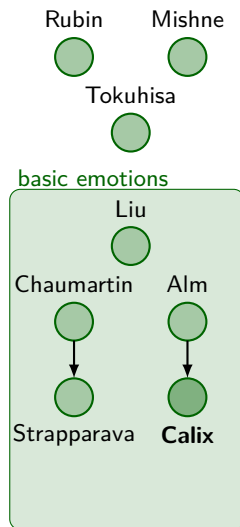
Calix et al (2010)

- ▶ mutual information between words and emotions
- ▶ learned list of words outperformed hand-crafted word lists
- ▶ performance varied by author

R. Calix, S. Mallepudi, B. Chen, and G. Knapp (2010). Emotion recognition in text for 3-d facial expression rendering.
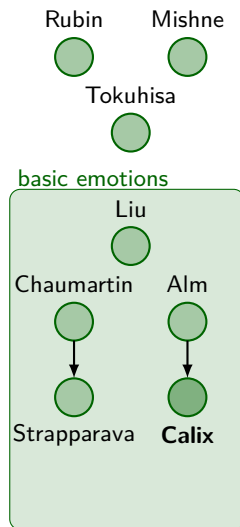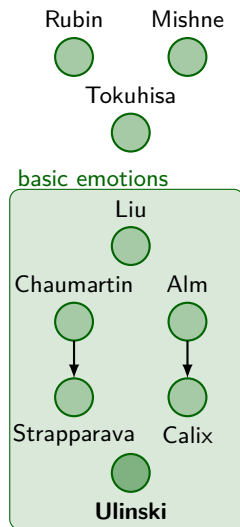
Emotion Detection

Calix et al (2010)

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- ▶ learned list of words outperformed hand-crafted word lists
- ▶ performance varied by author ⟸

authors express emotions in different ways

R. Calix, S. Mallepudi, B. Chen, and G. Knapp (2010). Emotion recognition in text for 3-d facial expression rendering.

Emotion Detection

Ulinski, Soto, and Hirschberg (2012)

- 4443 LiveJournal entries
- 660 annotated WordsEye images
    - literal description
    - basic emotion
    - explanation for why that emotion was chosen
- LIWC classes, tf-idf of (word n-gram, POS n-gram) pairs
- cross-domain classification

M. Ulinski, V. Soto, and J. Hirschberg (2012). Finding emotion in image descriptions.

Conclusion

structuralist narratology examines functions and character actions in literature; contextualist narratology examines discourse and context in personal narrative

most work in computational narrative has focused on structuralist approaches, but contextualist approaches should be explored, especially with the amount of online data now available

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questions?