

A Poststructuralist Perspective on Computer-Generated Literature



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Computer-Generated Literature

- Artificial Intelligence (AI)
- Natural Language Processing
- Natural Language Generation (NLG)

Classifications of Natural Language Generation (NLG) systems

Considering the degree of new, unpredicted information in the generated text

- Systems that can generate even long texts starting from an existing source
 - Machine translation,
 - Automatic summarization
 - Weather forecasts or sports reports
- Question-answering systems
- Writing narratives or poems - texts that are appreciated by humans as including original elements, a result of a creative process

Trăușan-Matu, S. (2019)
Computer-based Story
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Literature

Classifications of Natural Language Generation (NLG) systems (cont.)

Considering:

- The source of the machine-generated text
- The structuring of discourse
- The technological approach - AI
 - Symbolic
 - Grammars
 - Story schemata
 - Planning
 - Sub-symbolic
 - Machine/deep learning – Neural Networks

Theories of stories used in NLG

- Vladimir Propp - morphology of folk stories (1927)
 - a story is: “a description of the tale according to its component parts and the relationship of these components to each other and to the whole” (Propp, 1968)
- Rumelhart – story grammars
- Genette (1972), Jauss

Bailey classification of story generation systems (1999)

- Based on **character simulation** (“character-centric”): Tale-Spin (Meehan 1977a, 1977b, 1981) and Virtual Storyteller (Theune et al., 2003);
- **Focused on the author**: MEXICA (Perez, 1999; Perez and Sharples, 2001, 2004) - attempts to model the author’s thinking during the writing of a story;
- **Story-based systems**: Fabulist (Riedl and Young, 2006).

Another classification (Gervás et al., 2006)

- **Models of the author**, trying to model the process in which an author creates a story: MINSTREL (Turner, 1993) and MEXICA (Pérez, 1999; Pérez and Sharples, 2001).
- **Models of the story**, using an abstract representation of it, for example, a **grammar** of the story.
- **World models** - story generation is seen as building a world governed by **rules** and characters with individual goals. The story develops as a result of how the characters are trying to achieve their goals: Tale-Spin (Meehan, 1977a, 1977b, 1981); Story Generator

An example of a story generated by MEXICA (1999, 2001)

“Jaguar knight was an inhabitant of the Great Tenochtitlan. Princess was an inhabitant of the Great Tenochtitlan. Jaguar knight was walking when Ehecatl (god of the wind) blew and an old tree collapsed, injuring badly Jaguar knight. Princess went in search of some medical plants and cured Jaguar knight. As a result, Jaguar knight was very grateful to Princess. Jaguar knight rewarded Princess with some cacauatl (cacao beans) and quetzalli (quetzal) feathers.”
(Gervás, 2013)

Sub-symbolic NLG

- Deep Neural Networks
 - LSTM – Long Short-Term Memory
 - GRU – Gated Recurrent Units
 - Transformers (Bert, GPT-2, GPT-3, ...)
- Training with a corpus of literature
- Generating new texts in the “style” of the learned corpus

NLG with deep learning

- ▶ The man was an accountant. He had to be. He had to be the next president. I looked back over the top and saw that his wife was crying in the kitchen. I looked at the clock. It seemed to be coming slower, but I knew if I did it would not be long before I was in my own home. I wasn't sure. I had a hard time finding the right words to say. I was about to leave when he suddenly became angry and began talking to me. "Hello, sir, I'm John. What is your name?" "My name is Manuel and I'm a journalist." I said

Fan, Lewis, Dauphin, 2018 (Facebook AI Research)

NLG with deep learning

Word-LSTM

To me, fair, so you never be,
Each trifle, way, when bore your beauty when,
Such hence your can still,
O thou how much were your self the wrong chide

Char-LSTM

Give body an my mistress, trease,
Pert do I blind no contenden old?
In a mappess, can my mistress'd to brand
In a sovereign I canst turns more desire to cruent,

Gated LSTM

Thy youth 's time and face his form shall cover?
Now all fresh beauty, my love there
Will ever Time to greet, forget each, like ever decease,
But in a best at worship his glory die.

CNN-based LSTM

For that deep wound it gives I loved me not;
That I might see me, than now are thief;
That which it might me, and words old tell
That I are one with my friend?

Xie, Rastogi and Chang used MIT's "Complete Works of William Shakespeare," which contains all of his plays/writings and 154 sonnets and a LSTM Neural Network

*Shall I compare thee to a summer's day?
thou art more lovely and more temperate:
rough winds do shake the darling buds of May,
and summer's lease hath all too short a date*

And here's one written by Deep-speare, an artificial intelligence program that we trained to write sonnets:

*Yet in a circle pallid as it flow,
by this bright sun, that with his light display,
roll'd from the sands, and half the buds of snow,
and calmly on him shall infold away*

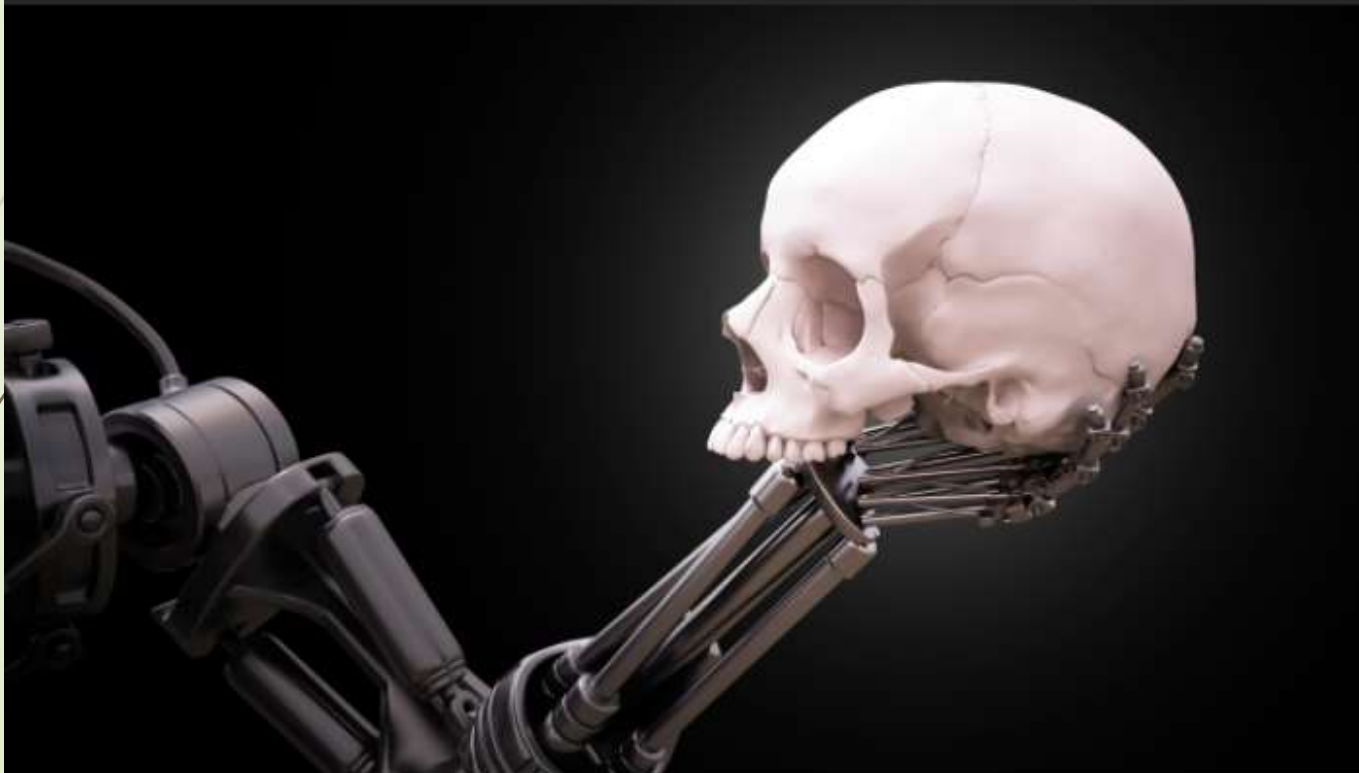
JEY HAN LAU, TREVOR COHN, TIMOTHY BALDWIN, ADAM HAMMOND, 2020

<https://spectrum.ieee.org/this-ai-poet-mastered-rhythm-rhyme-and-natural-language-to-write-like-shakespeare>

Kinky and absurd: The first AI-written play isn't Shakespeare—but it has its moments

Artificial intelligence generates a story about a robot trying to understand humanity

14 FEB 2021 • BY SOPHIA MOUTSAHO



<https://www.science.org/content/article/kinky-and-absurd-first-ai-written-play-isn-t-shakespeare-it-has-its-moments>

Artificial Intelligence

→ Computation
→ Philosophy

Philosophical ideas behind Symbolic Artificial Intelligence

➤ Raymundus Lullus (1232-1316)

Ars Combinatoria, Ars Magna

➤ Leibniz – *Characteristica Universalis* (1666)

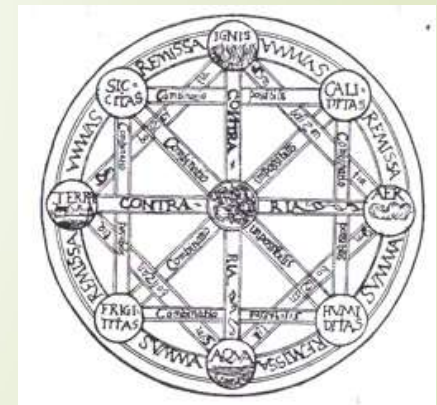
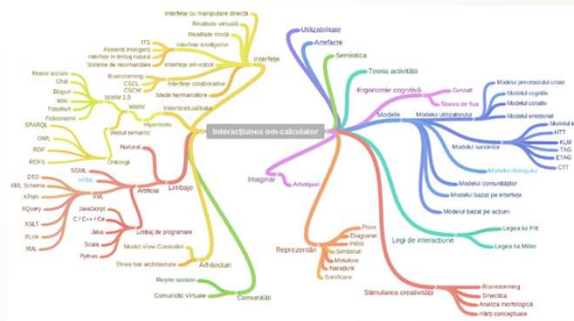
➤ Pozitivism

➤ Logicism

➤ Formalism

➤ Structuralism

➤ Neopozitivism (logical pozitivism)



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Formalism

➤ Positivism

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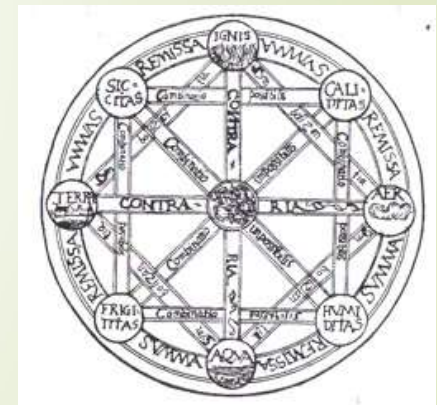
➤ Formalism

Symbolic AI

➤ Structuralism

➤ Neopositivism (logical positivism)

Stefan Trausan-Matu - H2PoC 2022, Zurich



Structuralism

- Ferdinand de Saussure
 - Semiotics
 - Meaning → signs differences, signified and signifier
 - Modern linguistics
- Logical positivism
- Claude Lévi-Strauss
- Noam Chomsky – formal grammars

Symbolic Artificial Intelligence – a knowledge-based approach

- Natural Language Processing
 - Grammars
 - Semantic networks
 - Logic
- Several problems, including high computational complexity

Sub-symbolic Artificial Intelligence

Is it also structuralist?

- Deep Learning → Neural Networks
- Deep Learning Natural Language Processing
 - Word Embeddings
 - Wittgenstein
 - Gastaldi (2020)- “The Structuralist Image of Language Behind Word Embeddings”

Computer-Generated Literature

- Artificial Intelligence (AI)
- Linguistics
- Literary Theory
- Discourse
- Narratology
- Poetics → effects on the reader
 - life experience
 - time-space (“chronotopes”)
 - metaphors
 - consciousness
 - dialogs

Problems of AI

- Context, being in the world (**Winograd Schemas**)
- Lack of **empathy**
- Lack of **creativity**
- Lack of **consciousness**
- Lack of **a real dialogue**

Winograd schemas – alternative to the AI Turing test

- The trophy doesn't fit in the brown suitcase because it is too big.
- What is too big?

- Jim comforted Kevin because he was so upset.
- Who was upset?

Winograd's critic

- ▶ artificial intelligence cannot go beyond a beaurocracy level, it has no empathy
- ▶ a computer, that “as a language machine, manipulates symbols without respect to their interpretation” cannot reach humans, which “create their world through language ... always interpreted in a tacitly understood background.” (Winograd, 1987)

Winograd proposal

- a **constructivist-hermeneutic** approach in the tradition of Heidegger and Habermas

Heidegger

- “For Heidegger, **language speaks** (*Sprache spricht*). It is not so much that people use words to express their ideas, but that *language speaks through us*. (...) What took place there happened largely through the power of language, the mechanisms of discourse. Utterances built on each other. **Words gathered richness of meaning through repetitive usage.**” (Stahl, 2006)

How to overcome AI problems?

- Lack of **creativity**
- Lack of **consciousness**
- Lack of **a real dialogue**
 - The existing structuralist approaches do not provide solutions
 - Is post-structuralism providing new ideas?

Poststructuralism

- Binary oppositions of structuralism is an immobile approach
- Texts have a particular logic, there is not a hierarchy of meanings, a center (Eagleton, 1983)
- Derrida, Barthes, ...
 - deconstruction
 - differance
- Mikhail Bakhtin (1895-1975) – “a poststructuralist *avant la lettre*”

Bakhtin - a poststructuralist *avant la lettre*

- A disputed assertion
 - some considers him a Russian formalist, a structuralist
 - Julia Kristeva refers him related to intertextuality
 - considered as the father of **Dialogism** - a socio-cultural paradigm with applications in Computer-Supported Collaborative Learning

Trausan-Matu S., Wegerif R., Major L. (2021) Dialogism. In: Cress U., Rosé C., Wise A.F., Oshima J. (eds.) *International Handbook of Computer-Supported Collaborative Learning*. Computer-Supported Collaborative Learning Series, vol 19. Springer, Cham, pp. 219-239.

- **Virulent critique of de Saussure semiotics (Voloshinov/Bakhtin, 1928)**

Bakhtin's dialogism

- "... Any true understanding is dialogic in nature" (Voloshinov-Bakhtin, 1973)
- Opposed to de Saussure ideas:
 - Real life dialog should be the focus, not written text
 - Words are not arbitrary
- Utterances (not sentences) should be the unit of analysis
- Speech genres
- Polyphony
- Ventrilogism
- Inter-animation of voices
- Chronotopes

Bakhtin's dialogism

- “word is a two-sided act. It is determined equally by whose word it is and for whom it is meant. As a word, it is precisely the product of the reciprocal relationship between speaker and listener, addresser and addressee” (Voloshinov/Bakhtin)
- Consciousness → Dialog
- It is a dialog among consciousnesses, a polyphony
- Dialogism vs. Hegel dialectics (Markova)

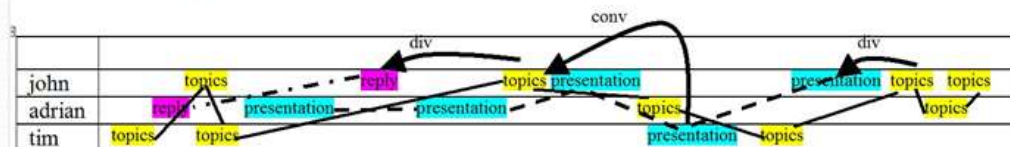
Polyphony and counterpoint

- ▶ Concept derived from classical music
 - ▶ “These are different voices singing variously on a single theme. This is indeed 'multivoicedness,' exposing the diversity of life and the great complexity of human experience “ (Bakhtin, 1984)
- ▶ Multiple voices – each utterance contains multiple voices
- ▶ Voices inter-animate in an unmerged way:
 - ▶ “a plurality of independent and unmerged voices and **consciousnesses**” (Bakhtin)

Polyphonic analysis

(Trausan-Matu & Stahl, 2007, <http://gerrystahl.net/vmtwiki/stefan.pdf>)

Nr	Ref	Time	User	Text
17		10.26.25	tim	You discussed about a topic separation
18	15	10.26.37	adrian	First of all, the topic method is cumbersome
19	17	10.26.50	john	yes, because we did not like the way the topics were presented in concert chat
20	18	10.26.56	john	yes !!
21	20	10.27.04	john	i hate double-clicking!
22	20	10.27.18	tim	and how can we find topics?
23	18	10.27.26	adrian	What bothers me is the linear presentation of the discussion
24	23	10.27.43	john	Yep
25	18	10.27.46	adrian	and double-clicking too
26		10.27.54	tim	You mean i want something like a chat forum? :D
27	24	10.27.58	john	and the reply-to facility is supposed to help you
28	18	10.28.15	adrian	i'd like a tree presentation more
29	18	10.28.38	adrian	or maybe multiple chat columns, for each chat sub-thread
30	27	10.28.58	john	but it is really difficult to use in real time, because there are so many topics discussed which intertwine each other
31	28	10.29.18	john	i subscribe to a tree-like presentation form
32	P 30	10.29.20	adrian	yes, that's why a clear separation of topics is needed
33	31	10.29.47	adrian	this is easy to implement, no problem here :)
34	30	10.29.49	tim	You need also a clever visual representation
35	30	10.30.05	tim	you'll need also a clever visual interface
36		10.30.22	tim	Who decides the topics?
37	33	10.30.33	john	i suppose you are referring to the visual representation, right?
38	37	10.30.45	john	What i would like is a clever way to separate the topics :)
39	38	10.30.59	john	not just doing it myself, manually
40	37	10.31.00	adrian	Yeah
41	39	10.31.44	adrian	When you start a new thread (a new message, non-related to other message), the app can assume a new topic
42	39	10.31.46	john	i would like the application to be able to detect w/ topic change all by itself
43	42	10.32.01	tim	That right



See also Trausan, 2020: <https://www.routledge.com/The-Routledge-International-Handbook-of-Research-on-Dialogic-Education/Mercer-Wegerif-Major/p/book/9781138338517>

Stefan Trausan-Matu - HaPOC 2022, Zürich



Apple CEO Tim Cook: "I'm not worried about artificial intelligence giving computers the ability to think like humans ... I'm more concerned about people thinking like computers"

Thank you!

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