Bags of Paragraphs Verses

VANISHING POINTS AND EXPLANATORY PATTERNS FOR STORY PROCESSING FROM COGNITIVE PSYCHOLOGY
“A WORK IN WHICH THERE ARE THEORIES IS LIKE AN OBJECT WHICH STILL HAS ITS PRICE TAG ON.”

- Proust
Questions for Context

Views expressed are mine alone, not my employer or professional associations with which I am associated.

- WHAT’S THE PURPOSE OF @KNOWLENGR’S DECK
- WHY DID THE REFEREE CALL INTERFERENCE?
- “IT ONLY WORKS ON 2.4GHZ.”
Why should she give her bounty to the dead?
What is divinity if it can come
Only in silent shadows and in dreams?
Shall she not find in comforts of the sun,
In pungent fruit and bright, green wings, or else
In any balm or beauty of the earth,
Things to be cherished like the thought of heaven?

From Wallace Stevens “Sunday Morning”

- Poem as story, essay as story
- Roles, Characters: author (Stevens, Allen), editor (Harriet Monroe), subsequent critics
- Bag of verses (paragraphs with internal & supraordinate structure)
- Events (publication of poem, publication of essay, Stevens history)
- Literary theory (domain ontology?)

“Monroe’s edits sacrifice many of the poem’s best effects in the name of concision and an orderly “flow.” In her version, for example, the reference to Palestine that closes the first stanza segues into the one that, in Stevens’s version, opens the final stanza; the two stanzas that end with the word wings occur in succession; and so on. This heavy-handed arrangement reduces Stevens’s delicate echoes and dialectical structure (silent questions answered by an unidentified, perhaps interior, voice) to a distorted muddle. To her credit, Monroe does not soften the poem’s religious skepticism. However, by cutting stanzas II, III, and VI, in which Stevens explores the contrast between earth and paradise—between our beautiful, “perishing” reality and the static fantasy land we struggle to imagine—she undermines much of the basis for that stance. . .”

Austin Allen for Poetry Foundation
Subjects can summarize facts from text lacking summaries, metadata tags, structural segmentation.

The representations ("memories") being drawn from are psychologically dissimilar in some respects to current software implementations of ontologies.

Parents co-evolve models of child cognition ("what she understands . . . ")

Musical instrument learners bridge musical ontologies when learning new instruments or music without explicit training in rules or frameworks.
“We then argue that the standard computational definition of the concept of evaluative language neglects the dynamic nature of evaluation, in which the interpretation of a given evaluation depends on linguistic and extra-linguistic contextual factors. We thus propose a dynamic definition that incorporates update functions. The update functions allow for different contextual aspects to be incorporated into the calculation of sentiment for evaluative words or expressions, and can be applied at all levels of discourse. We explore each level and highlight which linguistic aspects contribute to accurate extraction of sentiment. We end the review by outlining what we believe the future directions of sentiment analysis are, and the role that discourse and contextual information need to play.”
“This study examines young children’s ideas about natural science phenomena and explores possibilities in starting investigations in kindergarten from their ideas. Given the possibilities inherent in how young children make sense of their experiences, we believe it is critical to take children’s perspectives into consideration when designing any activities, and ideally, to design activities from their perspectives and understandings. Specifically, this research focuses on 5- and 6-year old children’s explanations of rainbows. . . “

“Children explain the rainbow: Using young children’s ideas to guide science curricula.”
Christina Siry, Isabelle Kremer
Journal of Science Education and Technology 20 (5), 643, 2011
Exhaustive Explanations as Psychologically “Incorrect”

Richland, Morrison U& Holyoak (2006) studied children’s development of scene reasoning. They concluded:

"The results suggest that changes in analogical reasoning with age depend on the interplay among increases in relational knowledge, the capacity to integrate multiple relations, and inhibitory control over featural distraction."


Context
- Story context: speaker

Event
- Some events must be interpreted in a story context (e.g., Who-Done-It’s)
- Explanations may need to “iterate” over event attributes
- Relative order of precedence

More! ***
Arguments and Agents

- Classic “rhetoric” includes variants of “stories”
- Old School: frames, scripts
- What’s new: agents, big data, streamed data
- Massively distributed agents (& frames?)
- Variation may have been under-represented
- Agents that discard rules, trees of ontologies, forget – or improve their filters?

Discourse inside Storytelling

- Speaker models
- Speaker intention, role
- Meetings have frames that orchestrate
- Developmentally evolving “schemata”
- “Narrative” voice: how is this learned, identified?
- Learning event representation (See previous Summits)

Real-world schemata and scene recognition in adults and children
Howard S Hock, Lorann Romanski, Anthony Galie, Cathy S Williams

Memory & Cognition 6 (4), 423-431, 1978
Domain-specific Narration

- Electronic Medical Records as Stories
  - For GP's
  - For specialists
  - Radiological reports
  - As ingested for interpretation by clinical decision support systems

- “A Node.JS and an Angular developer meet in a bar. They get into an argument and are interrupted by a LISP developer. . . “
The Automatic Toilet Non-Experiment

“Mommy, I can control it with my mind!”
“Why is the hood of the car hot?”
Because the engine is running
Because internal combustion engines involve burning of fuel.

“How did they locate the missing boy?”
Through his phone.
Through his phone’s GPS trilateration.

“They manipulated the 2016 election process.”


“Although explanations are necessarily incomplete—often dramatically so in laypeople—those gaps are difficult to discern. Despite such gaps and the failure to recognize them fully, people do have skeletal explanatory senses, often implicit, of the causal structure of the world. They further leverage those skeletal understandings by knowing how to access additional explanatory knowledge in other minds and by being particularly adept at using situational support to build explanations on the fly in real time. . . “
-- F.C. Kell (2006)
Non-ML Cognitive Frameworks

- Research in explanation should leverage more empirical work from human cognition
- If there such a thing as a “machine explanation,” that calls for a different research agenda

“Some psychologists argue that the specificity of face perception is an illusion and that human beings simply become expert recognizers of faces by using unspecialized visual capacities. The face-recognition system provides a good template for the features one can encounter in other examples of domain-specific systems. Research in the organization of human semantic knowledge should benefit from the combination of evolutionary, neural, and developmental evidence. Research in the field has too often proceeded in the following way: identify an ontological distinction; develop specific hypotheses and gather empirical evidence for domain-specific principles and developmental patterns that differ between ontological categories; and try to integrate neural structures into this picture, often with much more difficulty than was expected.”

Cognitive development to support theory formation predates ontologies

Attention, Motivation are important gating mechanisms

Lessons from Siri, Alexa, Google Home, Cortana

- Conversationally limited voice-activated agents are still useful
- Constrained context -> Utility
- Already must address multi-device, multi-user discourse use cases
- Context-by-context releases
  - Smart home, calendar, travel plans, shopping lists, sports scores, navigation
- Next gen products might . . .
  - Interactively configure skills (require device domain knowledge, with explanations)
  - Refine user dependencies (children, homebound)
  - Exploit enterprise interop (i.e., do what we envisioned in the 80’s)
Implicit Cognitive Models

- Models likely entail more than “Intention”
- Memory constraints may influence ontology processing, creation, forgetting
- “The Narrator” is a learned concept
- Story recursion (story-within-a-story) presumes boundaries, segmented forms


Sentiment Analysis ++

- 31,000+ Google Scholar citations for “sentiment analysis”
- What is “sentiment”?
- Where should it appear in an ontology? Could each new comment on a news story represent a different sentiment?
- Dell laptop launch use case to “explain” purchaser “sentiment”
- Sentiment in ML for amplifying social media impact by annexing related stories (e.g., deliberate misquotes)

Affective Dimensions for Explanation

- Competing explanations for experience of surprise: (1) events are low probability, or (2) the events are harder to explain.
- Research suggests ability to explain is the greater factor
- Affective impact may signal need for additional processing

2 Philosophical Foundations — What Is Explanation?
2.1 Definitions
2.1.1 Causality
2.1.2 Explanation
2.1.3 Explanation as a Product
2.1.4 Explanation as Abductive Reasoning
2.1.5 Interpretability and Justification
2.2 Why People Ask for Explanations
2.3 Contrastive Explanation
2.4 Types and Levels of Explanation
2.5 Structure of Explanation
2.6 Explanation and XAI
2.6.1 Causal Attribution is Not Causal Explanation
2.6.2 Contrastive Explanation
2.6.3 Explanatory Tasks and Levels of Explanation
2.6.4 Explanatory Model of Self
2.6.5 Structure of Explanation

3 Social Attribution — How Do People Explain Behaviour?
3.1 Definitions
3.2 Intentionality and Explanation
3.3 Beliefs, Desires, Intentions, and Traits
3.3.1 Maule’s Conceptual Model for Social Attribution
3.4 Individual vs. Group Behaviour
3.5 Norms and Morals
3.6 Social Attribution and XAI
3.6.1 Folk Psychology
3.6.2 Maule’s Models
3.6.3 Collective Intelligence
3.6.4 Norms and Morals

4 Cognitive Processes — How Do People Select and Evaluate Explanations?

4.1 Causal Connection, Explanation Selection, and Evaluation

4.2 Causal Connection: Abductive Reasoning

4.2.1 Abductive Reasoning and Causal Types

4.2.2 Background and Discounting

4.2.3 Explanatory Modes

4.2.4 Inherent and Extrinsic Features

4.3 Causal Connection: Counterfactuals and Mutability

4.3.1 Abnormality

4.3.2 Temporality

4.3.3 Controllability and Intent

4.3.4 Social Norms

4.4 Explanation Selection

4.4.1 Facts and Fools

4.4.2 Abnormality

4.4.3 Intentionality and Functionality

4.4.4 Necessity, Sufficiency and Robustness

4.4.5 Responsibility

4.4.6 Preconditions, Failure, and Intentions

4.5 Explanation Evaluation

4.5.1 Coherence, Simplicity, and Generality

4.5.2 Truth and Probability

4.5.3 Goals and Explanatory Mode

4.6 Cognitive Processes and XAI

4.6.1 Abductive Reasoning

4.6.2 Mutability and Computation

4.6.3 Abnormality

4.6.4 Intentionality and Functionality

4.6.5 Perspectives and Controllability

4.6.6 Evaluation of Explanations

5 Social Explanation — How Do People Communicate Explanations?

5.1 Explanation as Conversation

5.1.1 Logic and Conversation

5.1.2 Relation & Relevance in Explanation Selection

5.1.3 Argumentation and Explanation

5.1.4 Linguistic structure

5.2 Explanatory Dialogue

5.3 Social Explanation and XAI

5.3.1 Conversational Model

5.3.2 Dialogue

5.3.3 Theory of Mind

5.3.4 Implicature

5.3.5 Dilution

5.3.6 Social and Interactive Explanation
Multi-agent Simulation +

- Cooperative agents as collaborating cognitive systems
- Challenge of storytelling across radically diverse ontologies (i.e., weak reference to foundational ontologies)


“Multi-agent based simulation (MABS) model is based on a relationship between an individual and a computer program [sic] being possible to simulate an artificial world composed by computational interactive entities. . . “

Role Playing Games & Gamification

- Story drives game
- Representations must include:
  - Game world
  - Game player
  - Objects, events, other players
- Learner-, learning constraints
  - What player already “knows”
  - Theory of the game
  - Rules vs. explanations

“The platform is used to assess and monitor the children’ progress and performance in meeting preset learning objectives without any manual intervention. The learning games are used to improve the children’s learning outcomes and keep them motivated. The platform monitoring features allow the teachers to focus on the children’ achievement of every learning objective and empower also the parents’ engagement in their children’s learning experience. . . A new ontology is proposed to map the programs curriculums and learning objectives with the flow-driven game worlds’ elements. The children’ performance is evaluated through the ontology using information extraction with an automated reasoning mechanism that is guided by a set of inference rules. . . .These games can query and update the ontology in real time through a web service by invoking data management, reasoning, monitoring and reporting operations using Apache Jena Ontology API. The platform can be used to dynamically generate the content of the games based on the children’ preferences and acquired knowledge.”

ontologies for RPG’s

“... We introduce a new, comprehensive ontology specially designed for modeling Role-Playing Games semantics. We build on top of a foundational ontology approach, namely Unified Foundational Ontology, to cover elements from Interactive Storytelling and aspects from a game’s narrative. Experimental results using two well-known, representative titles from the electronic and the analog supports, respectively, shows promising flexibility and effectiveness in terms of competency questions.”

”. Bakhtin’s notion of a chronotope serves as a metaphor focusing on the environment of knowledge creation, as opposed to the individual. A chronotope structures time and space to optimize a technology-mediated knowledge outcome. To extend this previously appropriated concept, we will propose the term “gamiform” as a way of distinguishing serious game chronotopes, that is, chronotopes that are games.”

Collective Narration

- Collective intelligence
- Multi-agent fusion
  - Machine to machine
  - Machine to intermediate forms
  - Machine to natural language
- Use cases
  - 10,000 drones
  - Multiple, concurrent human narrators
Early development of causal reasoning also informs explanation

- “weak” explanations may be powerful cognitive groundwork
- A technology-driven society must operate on partially represented, sometimes mis-represented, simplified “ontologies

See Wellman and related papers here

Theory of Mind (Wikipedia)

Katharine and Edith were gay women who wrote under the pseudonym “Michael Field” in the Victorian era.

Their representations in ontologies have been problematic.

“... we might be thinking of ourselves and of other people in terms of two selves. There is an experiencing self, who lives in the present and knows the present. It's capable of reliving the past but basically it has only the present. And then there is a remembering self, and the remembering self is the one that keeps score and maintains the story of our life, and it's the one that the doctor approaches in asking the question, how have you been feeling lately? Or how was your trip to Albania? ... Now, the remembering self is a storyteller and that really starts with a basic response of our memory. It starts immediately. We don't only tell stories when we set out to tell stories; our memory tells us stories. That is, what we get to keep from our experiences is a story.”

-- Daniel Kahneman, TED Radio Hour 2013-05-25
Rhetorical Structure Theory


RST Trees

- RST graphs depict text as rhetorical relations between text segments
- No direct relation to ontologies, though some have tried*
- Related: Speech acts, discourse “logic”
- RST generally not viewed through a developmental psycholinguistics lens
  - Machine-aided open text mining

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ABSTRACT This paper surveys ontological modeling of rhetorical concepts, developed for use in argument mining and other applications of computational rhetoric, projecting their future directions. We include ontological models of argument schemes applying Rhetorical Structure Theory (RST); the RhetFig proposal for modeling; the related RetFig Ontology of Rhetorical Figures for Serbian (developed by two of the authors); and the Lassoing Rhetoric project (developed by another of the authors). The Lassoing Rhetoric venture is interesting for its multifaceted approach to linguistic devices, prominently including rhetorical figures, but also RST relations and stylistic models, like the use of historic present. This application takes a natural language text input and uses syntactic parsing tools to produce a knowledge base of linguistic entities using references to an OWL ontological framework, locating these devices using Semantic Web Rule Language (SWRL) logic rules.

Coherence & Argument Scheme and Rhetorical Blocks

Possible (Not Just) RST Applications

- author recognition and discovery
- plagiarism detection
- comparing authors and speech-writers
- political discourse analysis
- argument/intent analysis, e.g., hate speech detection

Can we build ontologies with useful vanishing points?

“There’s no single vanishing point to get sucked into but rather a plane to linger over with different perspectives and focal points.”

- Alexander Gorlizki

At right: Art by Alexander Gorlizki
### D. Kunze on Vanishing Point in Narration

<table>
<thead>
<tr>
<th>vanishing point position</th>
<th>point of view inside frame</th>
<th>point of view in special margin</th>
<th>point of view outside frame</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>VP inside frame</strong></td>
<td>First Person narrator effect&lt;br&gt;Device in work that ‘vanishes’ to other scene; ‘4th dimensional travel’. HOT detective. Representations of representation.&lt;br&gt;Alice in Wonderland (Carroll, 1865)&lt;br&gt;The Eye (Nabokov, 1930)&lt;br&gt;Pale Fire (Nabokov, 1962)&lt;br&gt;Vertigo (Hitchcock, 1958)</td>
<td>Subject represented in special margin inside the frame; device inside work that ‘vanishes’ to other scene; ‘4th dimensional travel’. Ventrioloquist, Dead of Night (Cavalcanti)&lt;br&gt;Rear Window, all but conclusion (Hitchcock, 1954)</td>
<td>SYNECODCHE&lt;br&gt;Subject narrates but does not appear inside the frame; device inside work that ‘vanishes’ to other scene; ‘4th dimensional travel’.</td>
</tr>
<tr>
<td><strong>VP in special margin</strong></td>
<td>Subject represented, attention focused on object outside frame.</td>
<td>Rear Window, conclusion (Hitchcock, 1954)&lt;br&gt;‘Desmoiselles d’Avignon’ (Picasso, 1907)</td>
<td>NARRATION (FEMININE)</td>
</tr>
<tr>
<td><strong>VP outside frame</strong></td>
<td>METONYMY&lt;br&gt;‘Mystery and Melancholy of a Street’ (di Chirico, 1914)&lt;br&gt;‘Nighthawks’, ‘Morning in a City’ (Hopper)</td>
<td>Olimpla (‘The Sandman’, Hoffman)&lt;br&gt;HAL, 2001 Space Odyssey (Kubric) computers as projections of consciousness (Turing)</td>
<td>HYSTERICAL INVERSION OF SPACE&lt;br&gt;‘Ambassadors’ (Holbein, 1533)&lt;br&gt;North by Northwest (Hitchcock)</td>
</tr>
</tbody>
</table>

Permission pending: [http://art3idea.psu.edu/locus/](http://art3idea.psu.edu/locus/)
FAMILIAR THINGS HAPPEN AND MANKIND DOES NOT BOTHER ABOUT THEM. IT REQUIRES A VERY UNUSUAL MIND TO UNDERTAKE THE ANALYSIS OF THE OBVIOUS.

-WHITEHEAD


Contact & Version History

- 1.2 2019-02-04 Add Kahneman remarks. RST.
- 1.1 2019-01-29 Win10 theme discrepancies
- 0.1 2019-01-25 Initial draft

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