Bringing Coherence to Cognition: Flexible Semantics, Deep Reasoning, and Explanations

Benjamin Grosof

CTO, CEO, and Co-Founder,

Coherent Knowledge Systems*

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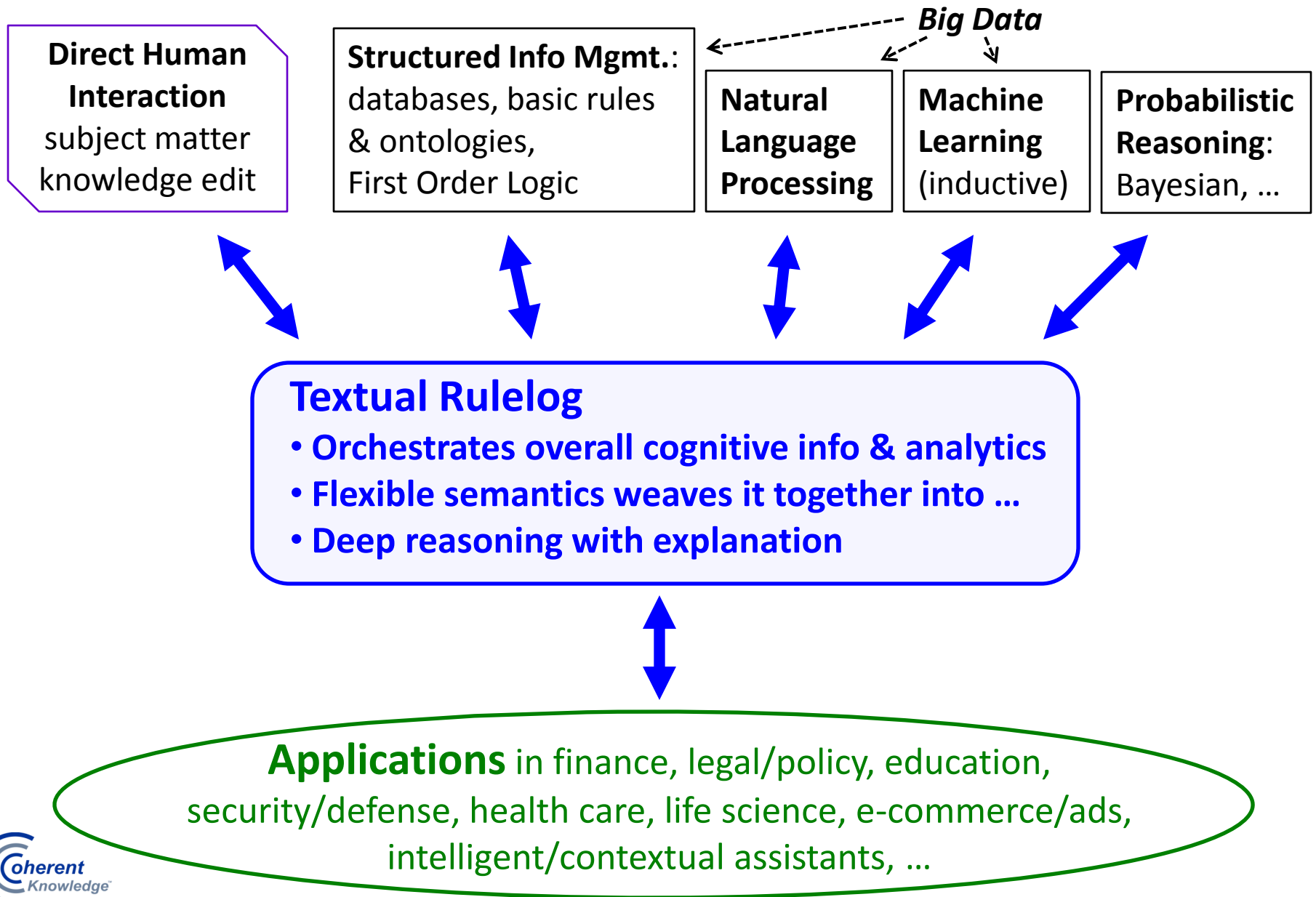
* Web: http://coherentknowledge.com

Email: *firstname.lastname*@coherentknowledge.com

** Web: http://www.cognitivecomputingforum.com

Presentation also authored by Janine Bloomfield of Coherent Knowledge Systems.

Approach & Vision for Coherent Integration

Direct Human Interaction
subject matter knowledge edit

Structured Info Mgmt.:
databases, basic rules & ontologies,
First Order Logic

Natural Language Processing

Machine Learning
(inductive)

Probabilistic Reasoning:
Bayesian, ...

Big Data

Textual Rulelog
- **Orchestrates overall cognitive info & analytics**
- **Flexible semantics weaves it together into ...**
- **Deep reasoning with explanation**

Applications in finance, legal/policy, education, security/defense, health care, life science, e-commerce/ads, intelligent/contextual assistants, ...

Coherent Knowledge™

Next Generation Logic Methods

- **Rulelog** – based on major research advances
  - The logic itself is new, in addition to the innovative reasoning techniques
  - Very high expressiveness/reasoning power: higher-order, exceptions, probabilistic
  - Scalable computationally: bounded rationality ("restraint"), spirit of database logic
  - Orchestrates well: external queries & actions, standardization, high expressiveness
  - Open, adaptive, modular

- **Textual** Rulelog: combines closely with Natural Language Processing
  - Logic-based mappings between logic and English
    - English into logic for: assertions, queries
    - Logic into English for: answers, explanations
  - Very flexible in what one can say, and easy to change. Strong meta expressiveness.
  - Much easier to understand knowledge & reasoning: explanations, provenance

App: Decision Automation for Policy Compliance

Knowledge integrated via Textual Rulelog from: relational DB of transactions, OWL/RDF financial domain ontology, text of financial regulations/policies, human direct editing, natural language processing.

Why is this contemplated transaction a "<u>covered transaction</u>"?
(under Federal Reserve Regulation W). User drills down into explanation tree.

Screenshot of Coherent's Episto™ from work done as part of collaboration: Enterprise Data Management Council (financial industry consortium) application pilot on regulatory/policy compliance: by Coherent, Wells Fargo, SRI International, and GRCTC (Ireland).

Conclusions

- The time has come for combining modern logical methods with ML and NLP
  - Integration methodology is needed to reap full benefits of machine-learned knowledge
  - The logical dimension of semantics will accelerate natural language processing
  - Watson and most current ML methods lack detailed understandable explanations
  - Textual Rulelog can provide provable reliable accuracy to a level beyond inductive ML

- Textual Rulelog is ready for commercial use now
  - Coherent Knowledge Systems was founded by lead developers of Textual Rulelog
  - Our product Episto™ has advanced Textual Rulelog capabilities

- For Textual Rulelog case studies, incl. automated tutoring and policy compliance – with benefits of lower cost, greater agility, and more effectiveness:
  See at SemTechBiz on Thu. 8/21: 10:30-11am Grosof et al; 12-12:45pm Denker et al
- For more info and to schedule a live demo, see our website coherentknowledge.com