

Stanford·CS520 | Knowledge Graphs (2021)

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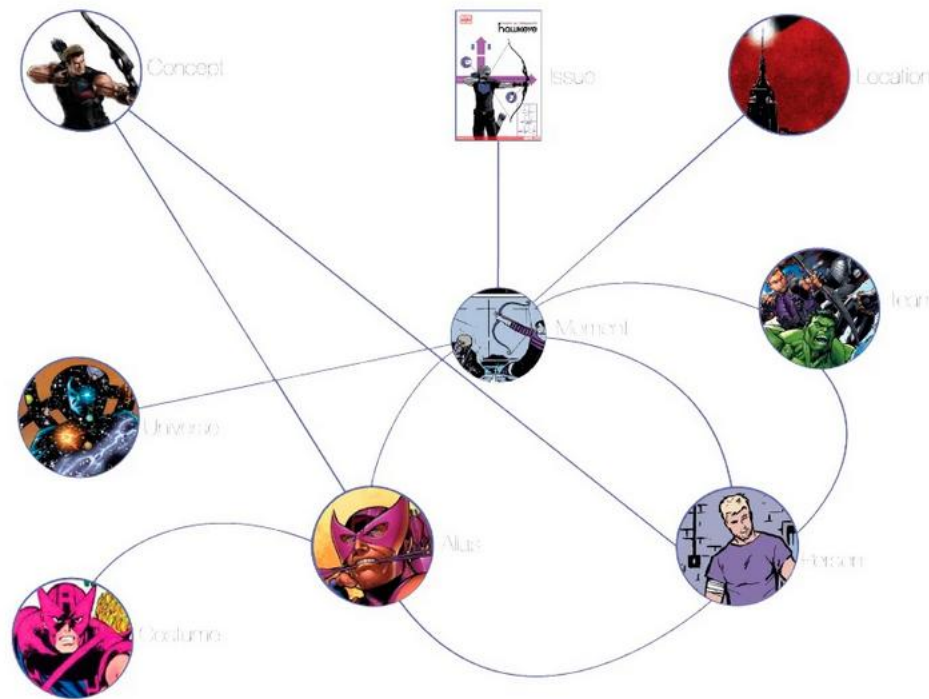
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What are some High Value Use
Cases of Knowledge Graphs?



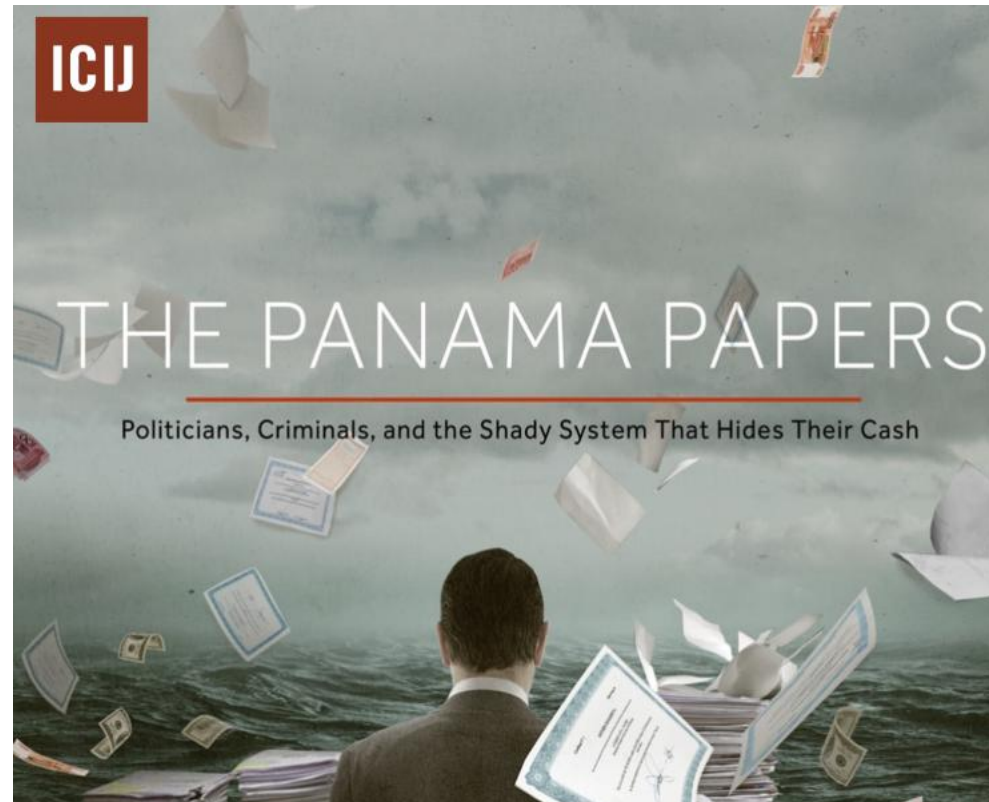
Applications of Knowledge Graphs

Entertainment: Knowledge Graph of Marvel's Cinematic Universe



Applications of Knowledge Graphs

Investigative Journalism



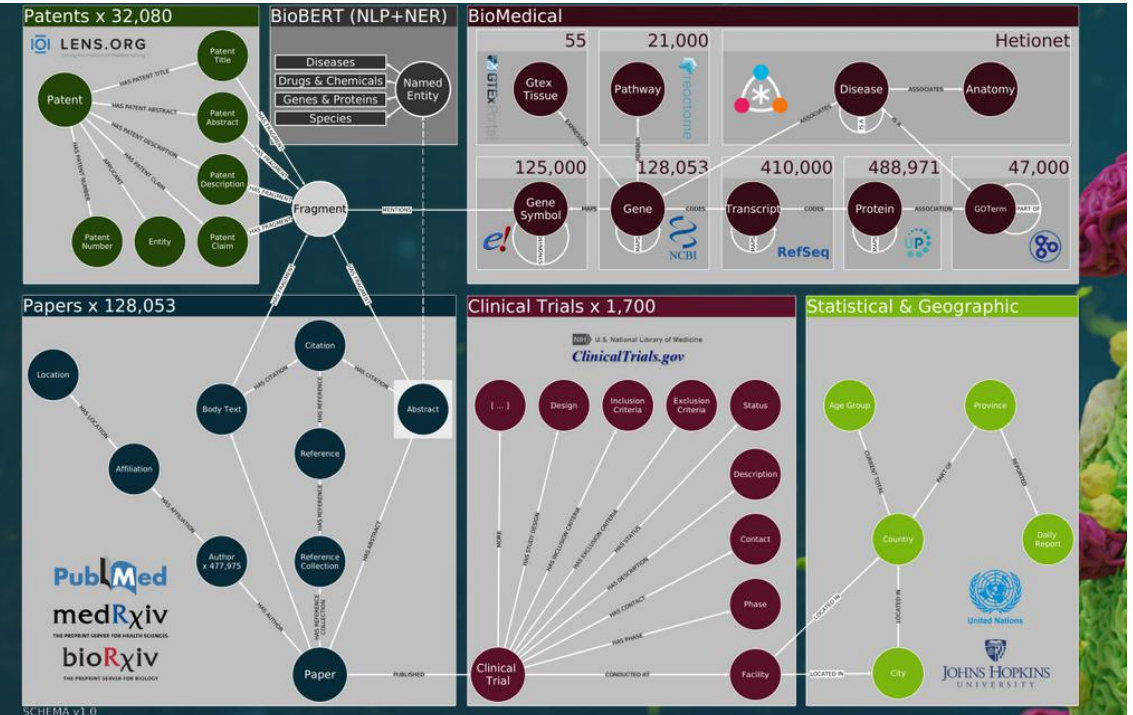
Applications of Knowledge Graphs

Biomedicine

COVID-19 Knowledge Graph

CovidGraph is a non-profit collaboration of researchers, software developers, data scientists and medical professionals.

We have built a research and communication platform that encompasses over 40,000 publications, case statistics, genes and functions, molecular data and much more.



Outline

- Knowledge Graphs in Finance
 - Financial Analytics
 - Financial Calculations
 - Financial Reporting



Knowledge Graphs for Financial Analytics

- Example business questions
 - Which of our clients are suppliers of company X that is in financial trouble?
 - In a supply chain network, is there a single company that connects a group of companies?
 - Which startups have attracted most influential investors?
 - Which group of investors tend to coinvest?
 - Which companies are most similar to a given company?
 - Which company might be a good future client for us?



Knowledge Graphs for Financial Analytics

- Which of our clients are suppliers of company X that is in financial trouble?

Who supplies to who?

FACTSET



Who are my customers?

INTERNAL
COMPANY
DATA

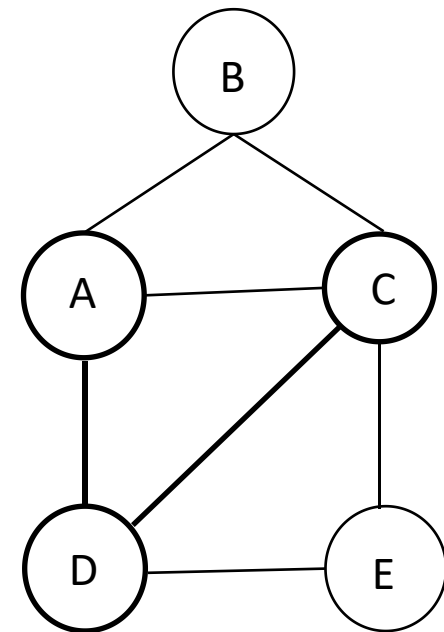


Knowledge Graphs for Financial Analytics

- Which of our clients are suppliers of company X that is in financial trouble?

- Answered using path finding

Who supplies to who?



FACTSET



Who are my customers?

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Knowledge Graphs for Financial Analytics

- In a supply chain network, is there a single company that connects a group of companies?

Who supplies to who?

FACTSET



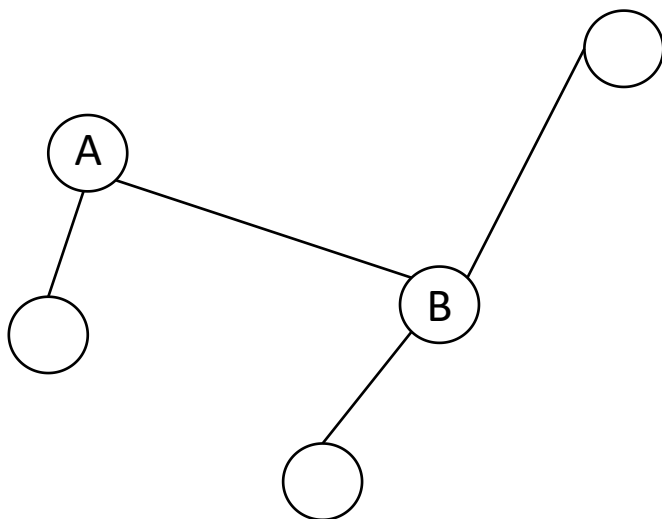
Who are my customers?

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Knowledge Graphs for Financial Analytics

- In a supply chain network, is there a single company that connects a group of companies?
 - Answered using between-ness centrality



Who supplies to who?

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Knowledge Graphs for Financial Analytics

- Which startups have attracted most influential investors?

Who is funding who?



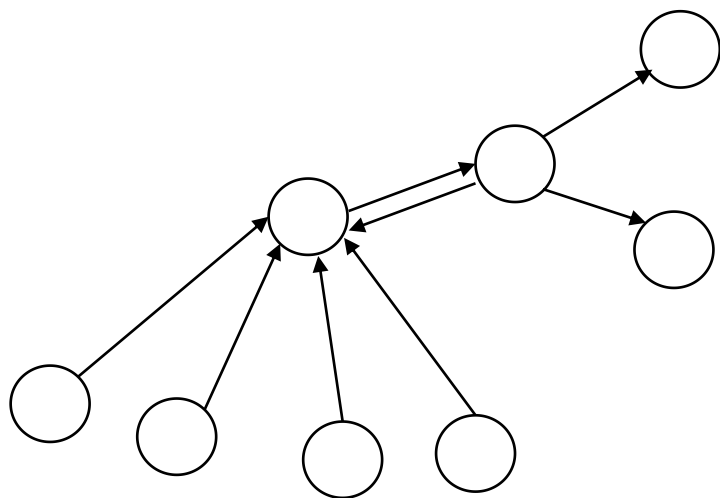
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Knowledge Graphs for Financial Analytics

- Which startups have attracted most influential investors?
 - Answered using page rank



Who is funding who?

 PitchBook®



Who are my customers?

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Knowledge Graphs for Financial Analytics

- Which group of investors tend to coinvest?



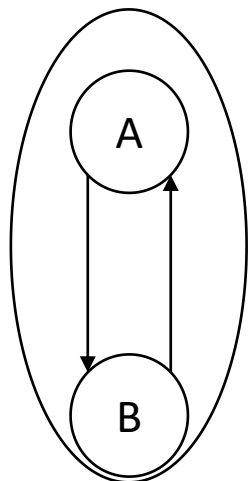
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Knowledge Graphs for Financial Analytics

- Which group of investors tend to coinvest?
 - Answered using community detection algorithms



Who is funding who?



Who are my customers?

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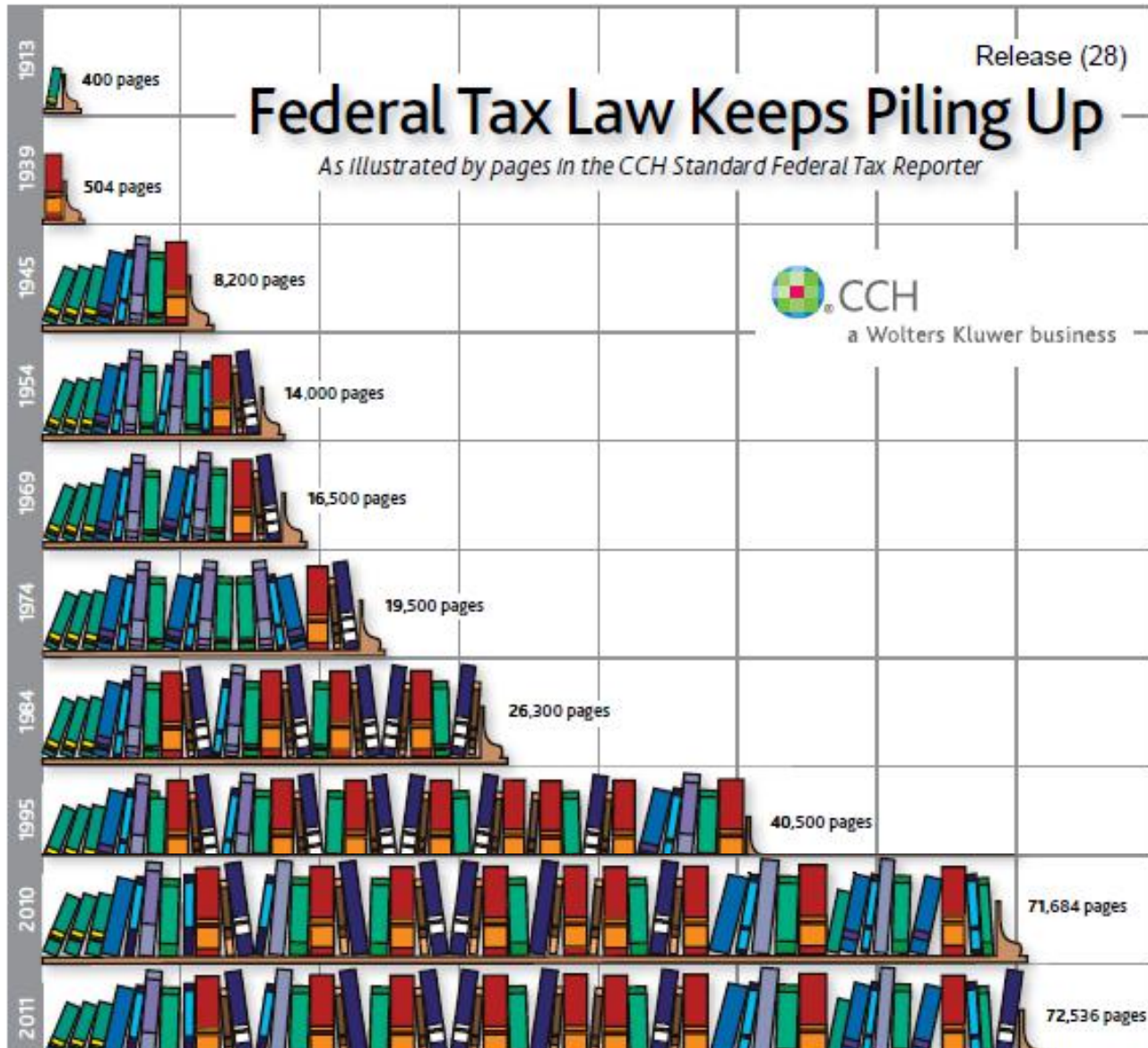
Knowledge Graphs for Financial Analytics

- Example business questions
 - Which companies are most like a given company?
 - Use graph embeddings to calculate similarity
 - Which company might be a good future client for us?
 - Use link prediction to identify future customers



Knowledge Graphs for Financial Calculations

- Federal Tax Law
 - 72,000 pages
 - 1000s forms
 - Changing every year



Knowledge Graphs for Financial Calculations

- Model the tax law using a set of rules
- Leverage the graph structure in the rules to
 - Generate user interviews/dialogs
 - Apply the rules for tax calculations



Knowledge Graphs for Financial Calculations

- A person is qualified for a tax benefit if:
 - the person is a resident of California, and
 - the age of the person is greater than 18 years



Knowledge Graphs for Financial Calculations

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 - the person is a resident of California, and
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`qualified_for_tax_benefit(P) :- resident_of(P,CA) & age(P,N) & min(N,18,18)`

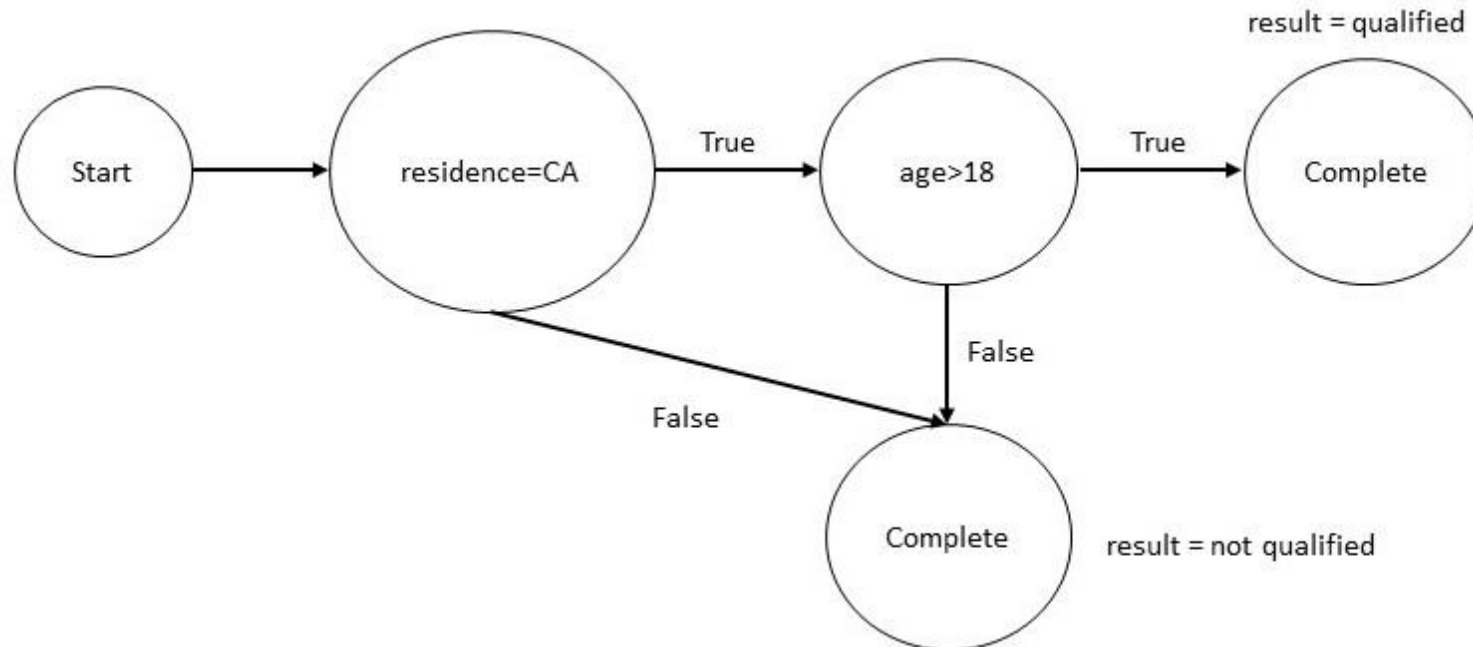


Knowledge Graphs for Financial Calculations

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$\text{qualified_for_tax_benefit}(P) :- \text{resident_of}(P, \text{CA}) \ \& \ \text{age}(P, N) \ \& \ \text{min}(N, 18, 18)$



Knowledge Graphs for Financial Calculations

- Intuit has developed a tax knowledge engine to capture tax law
- The graph structure of the rules drives TurboTax® line of products



Knowledge Graphs for Financial Reporting

- Financial Reporting Requirements
 - Derivative contracts
 - Interest rate and commodity swaps
 - Options
 - Futures
 - Forwards
 - Asset back securities



Knowledge Graphs for Financial Reporting

- Financial Reporting Requirements
 - Consumer of the reports
 - Internal compliance teams
 - Brokers and dealers
 - Regulators



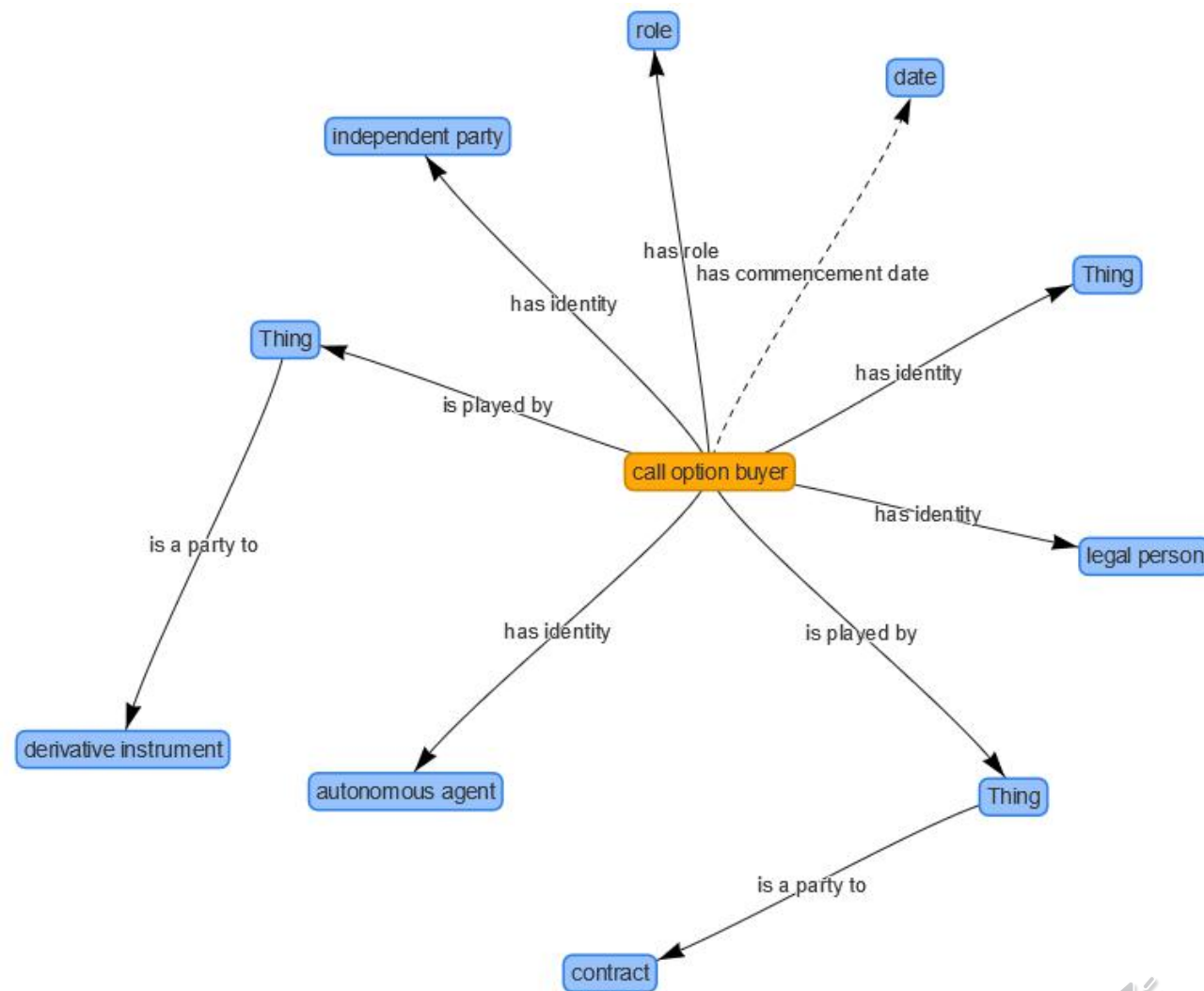
Knowledge Graphs for Financial Reporting

- Financial Reporting Requirements
 - Standardize the reports using FIBO
 - FIBO – Financial Industry Business Ontology
 - Defined in Web Ontology Language
 - Developed by multiple stakeholders
 - Provide semantics to the data in the reports



Knowledge Graphs for Financial Reporting

- Financial Reporting Requirements
 - Standardize the reports using FIBO



Knowledge Graphs for Financial Reporting

- Financial Reporting Requirements
 - Standardize the reports using FIBO
 - FIBO has many other use cases
 - Counter party exposure
 - Index analysis for ETF Development
 - Exchange instrument data offering



Summary

- Knowledge Graphs in Finance
 - Financial Analytics
 - Financial Calculations
 - Financial Reporting



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