AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

DAT202

Real-world use cases with graph databases

Mark Myslin
Principal Data Scientist
LexisNexis

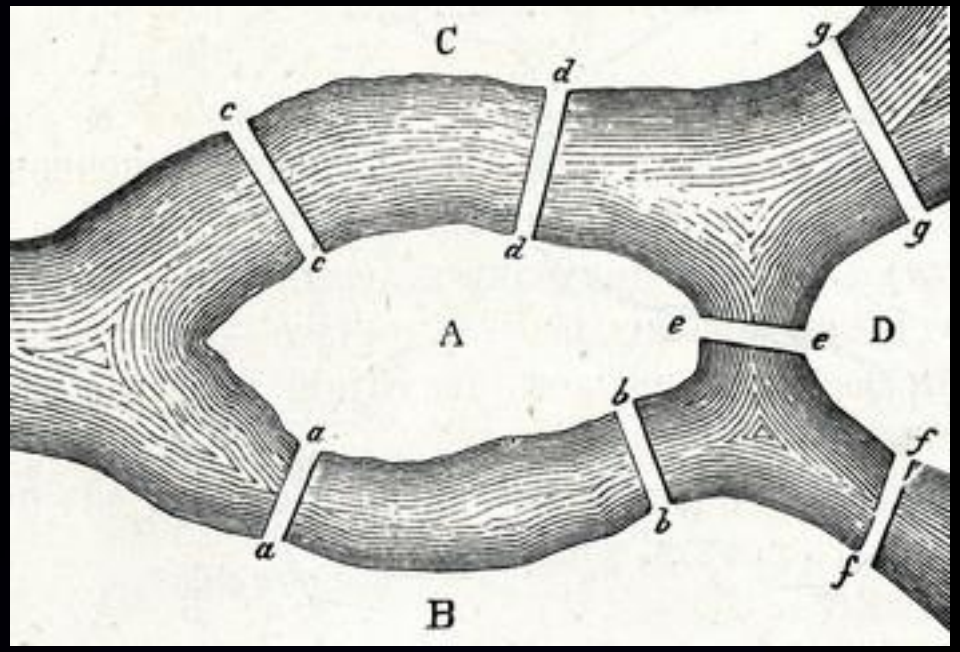
Kyle Patrick
Senior Architect
LexisNexis

Joy Wang
Senior Product Manager
AWS

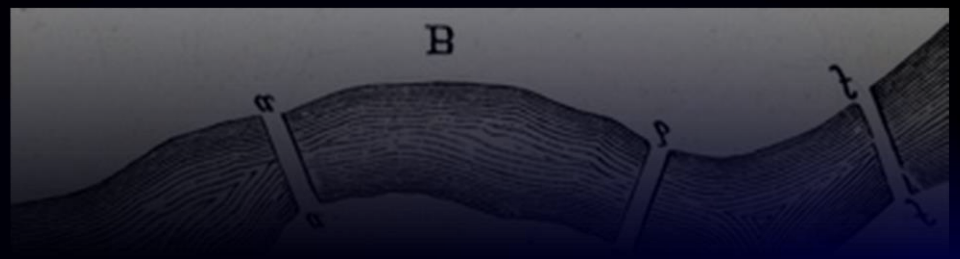
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Bridges of Königsberg



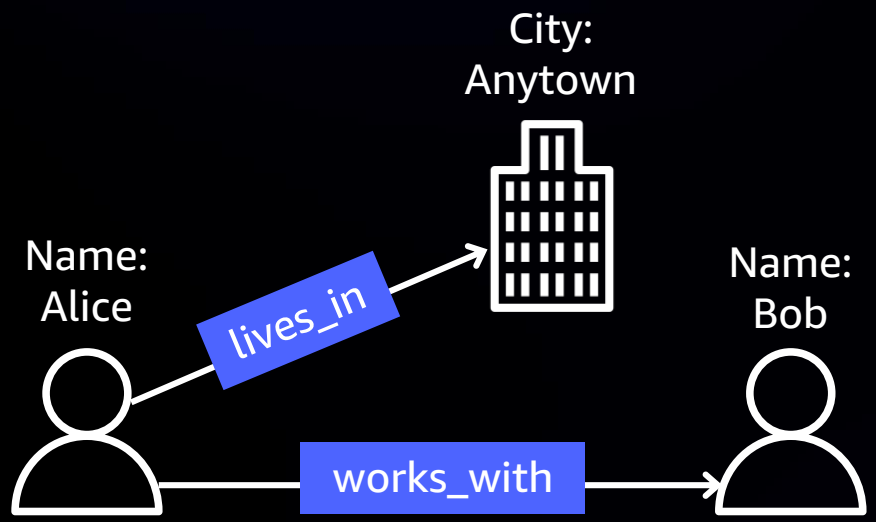






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Modern graphs



Graphs model data based on **relationships**

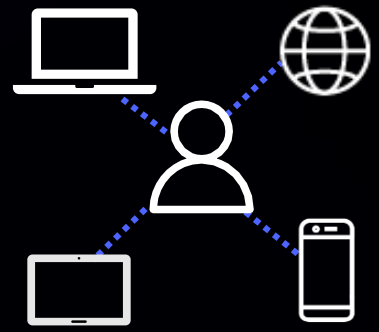
Graphs explore relationships and patterns in **connected data**

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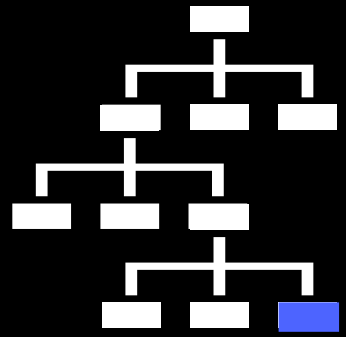
Problems solved by graph databases



Fraud detection



Identity resolution



Knowledge organization
(knowledge graph)

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Amazon Neptune

Open



Fast & scalable



Secure & reliable



Easy

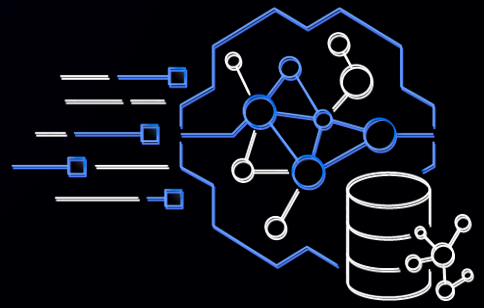


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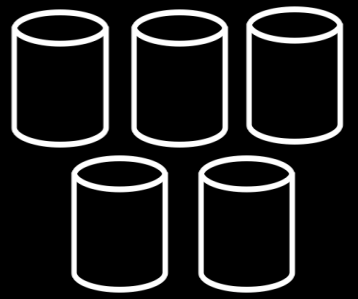
Recent innovations



Caching



Machine learning



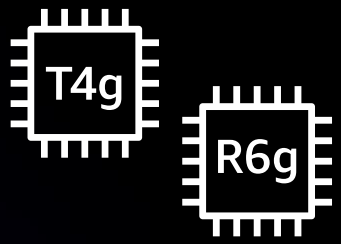
Auto scaling



openCypher &
query improvements



Graph visualization
enhancements



AWS Graviton2
instances

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AWS Recognized as a **Leader in first Forrester Wave** for Graph Data Platforms

The Forrester Wave: Graph Data Platforms, Q4 2020

https://aws.amazon.com/resources/analyst-reports/forrester-wave-graph-data-platforms-2020/?trk=slide

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Some of our customers



Amazon Neptune

Customers across different verticals and use cases use Amazon Neptune in production today

THOMSON REUTERS | FINRA | SIEMENS | AstraZeneca | LIFEOMIC | freshworks

amazon alexa | LexisNexis | FACTSET | SAMSUNG | Blackfynn | Rappi

Uber ATG | HUUUGE | NBCUniversal | NETFLIX | asurion | COX AUTOMOTIVE

PaySense | intuit | Pearson | MARINUS ANALYTICS | noonum | audible FOR BUSINESS

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Scaling machine learning value with Amazon Neptune

Mark Myslin
Principal Data Scientist
LexisNexis

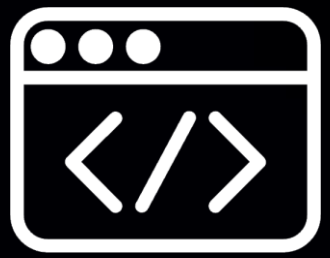
Kyle Patrick
Senior Architect
LexisNexis

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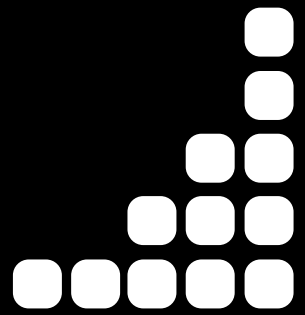
Today’s talk



Building a graph-based recommendation engine



Sharing the graph across the business via API

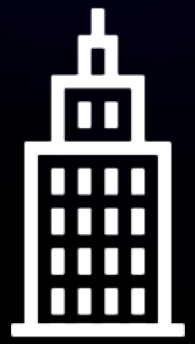


Multiplying value with new contributors and consumers

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Disconnected data



Law firm



40 million



Court



250 million



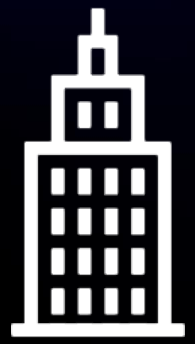
Vendor



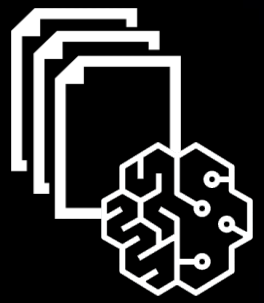
1.5 billion

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Disconnected data

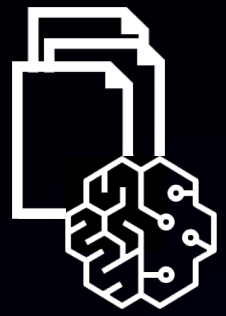


Law firm



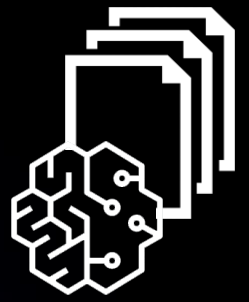


Court



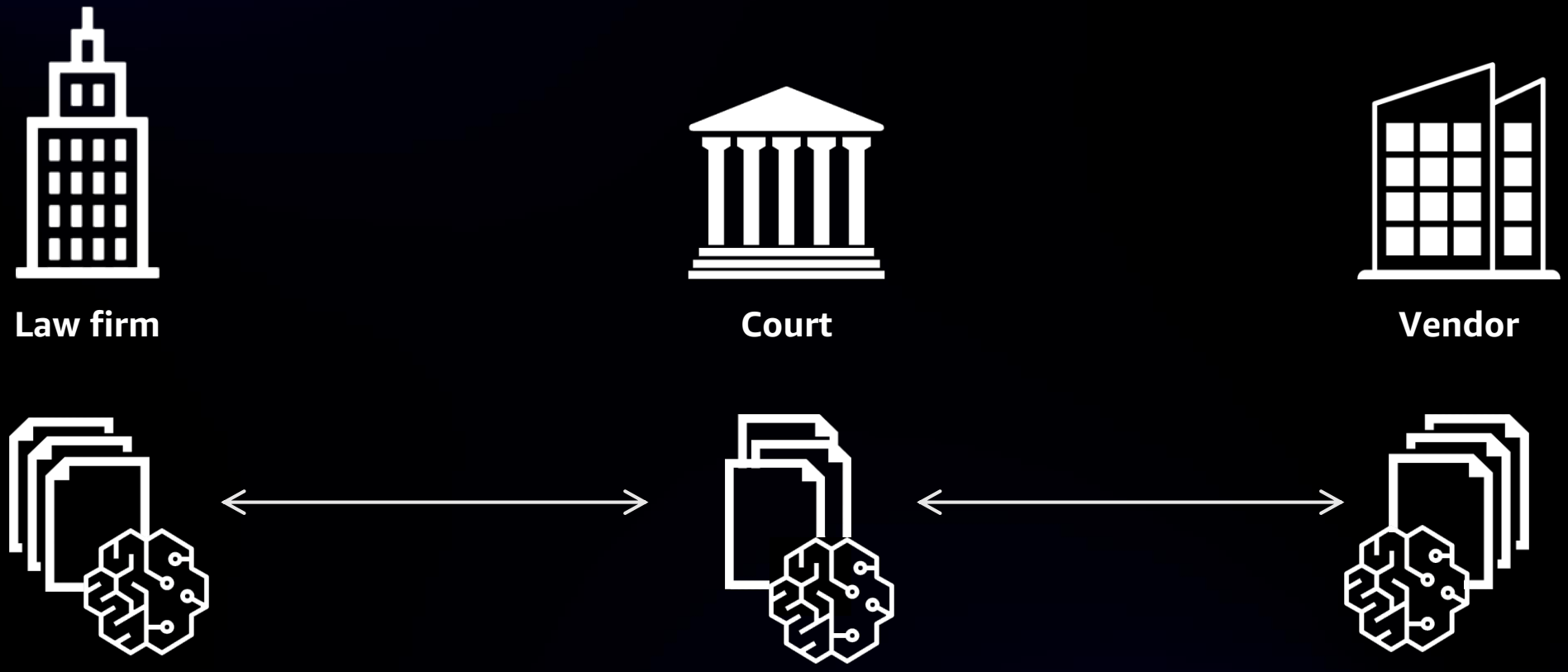


Vendor



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Let’s connect and search our data automatically for our users

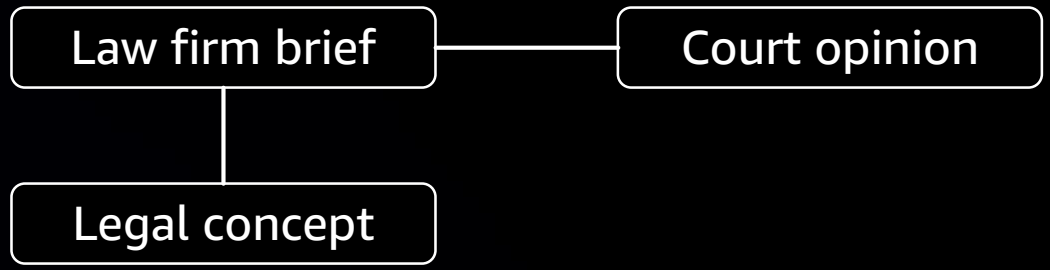


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Brief Analysis on Lexis+



User uploads their own brief



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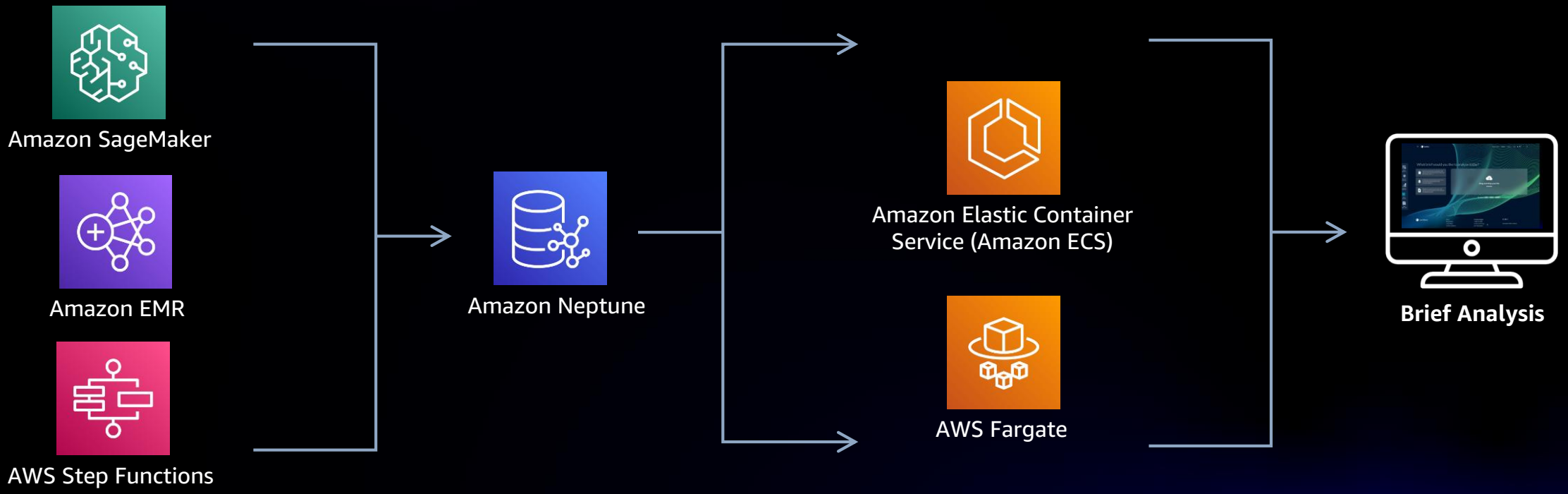
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Building our knowledge graph

Extract legal concepts and citations from millions of Lexis briefs

Represent concept and citation relationships in a knowledge graph

When a user uploads their own brief, query the graph for briefs with similar connections

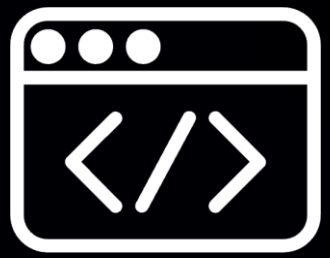


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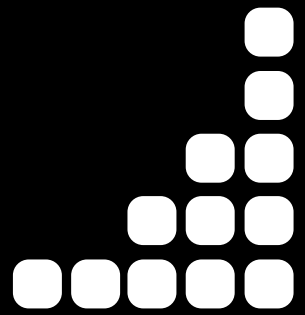
Today’s talk



Building a graph-based recommendation engine



Sharing the graph across the business via API

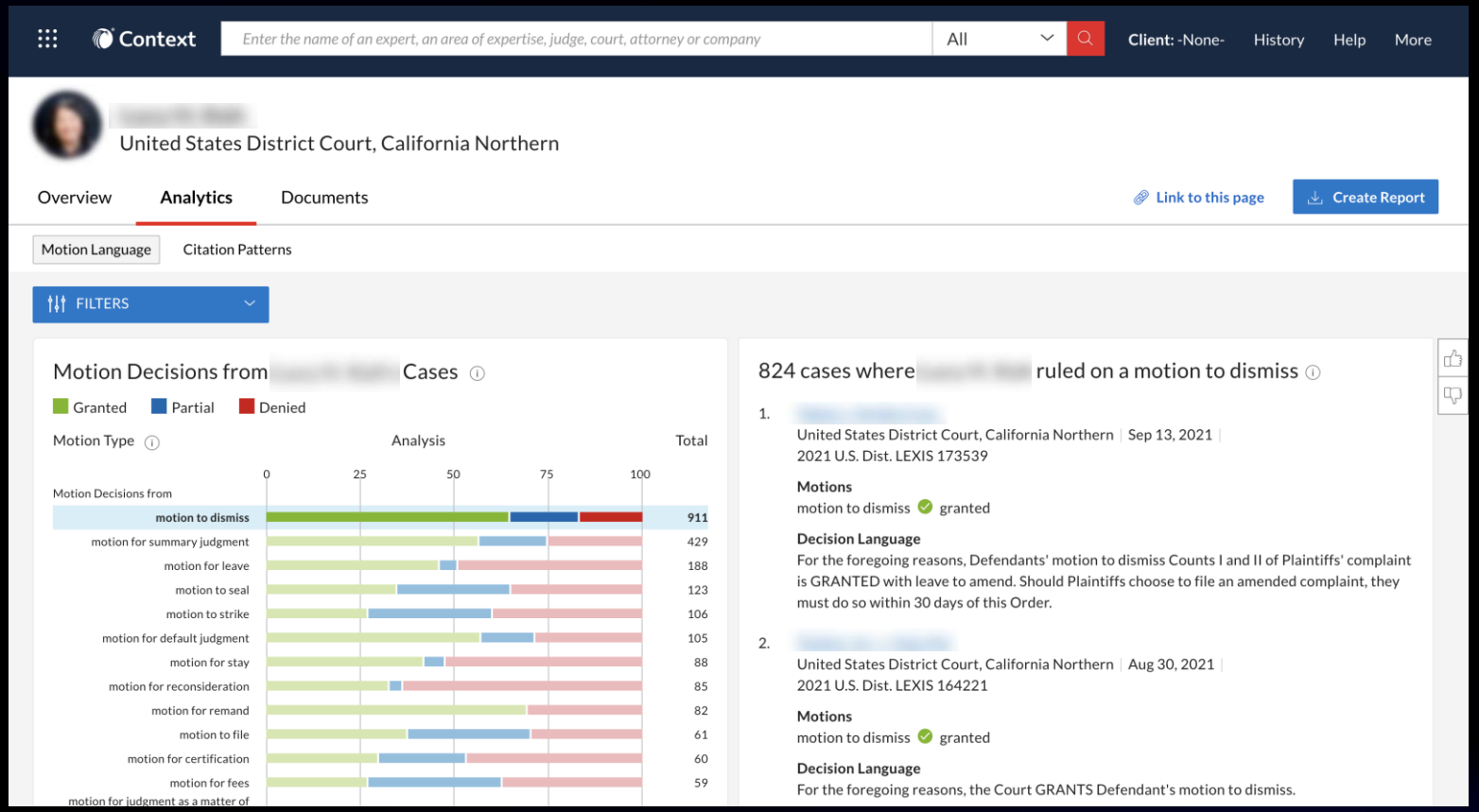


Multiplying value with new contributors and consumers

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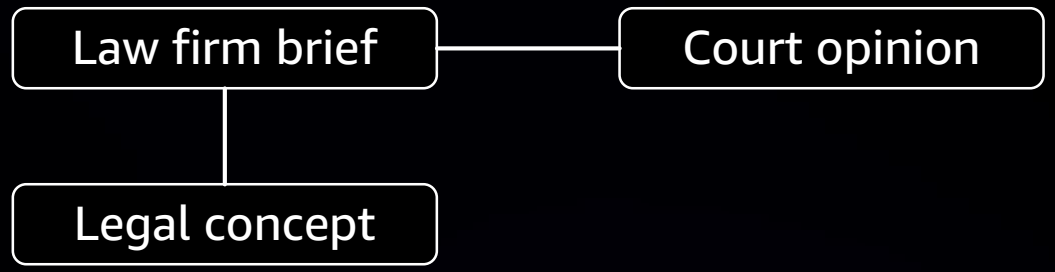
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Opportunity: Connect attorney arguments to their outcomes



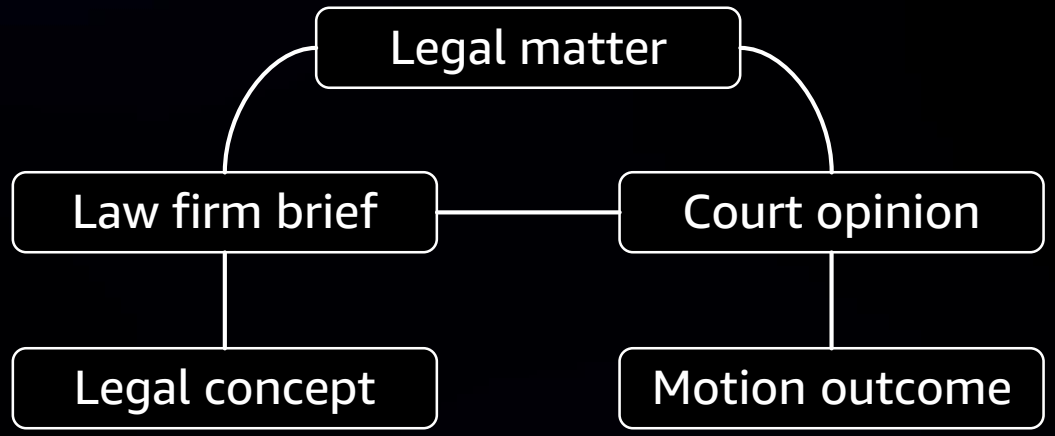
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Adding Context



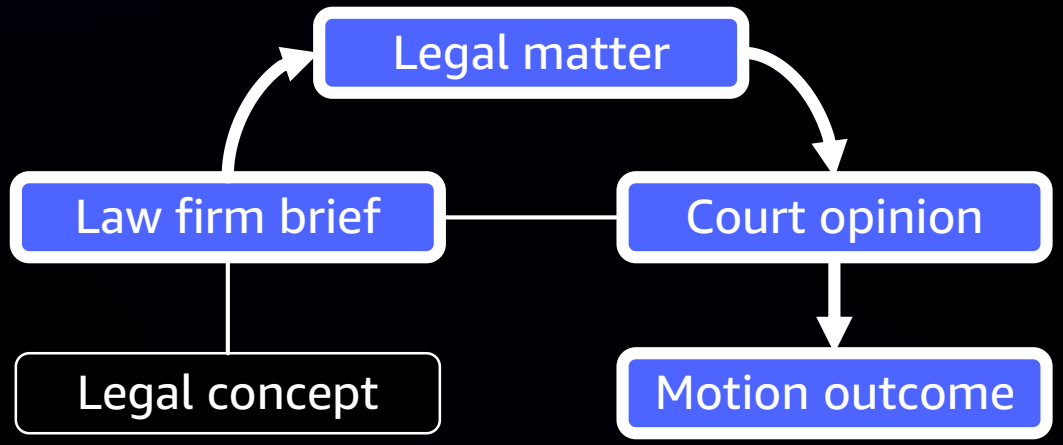
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Adding Context

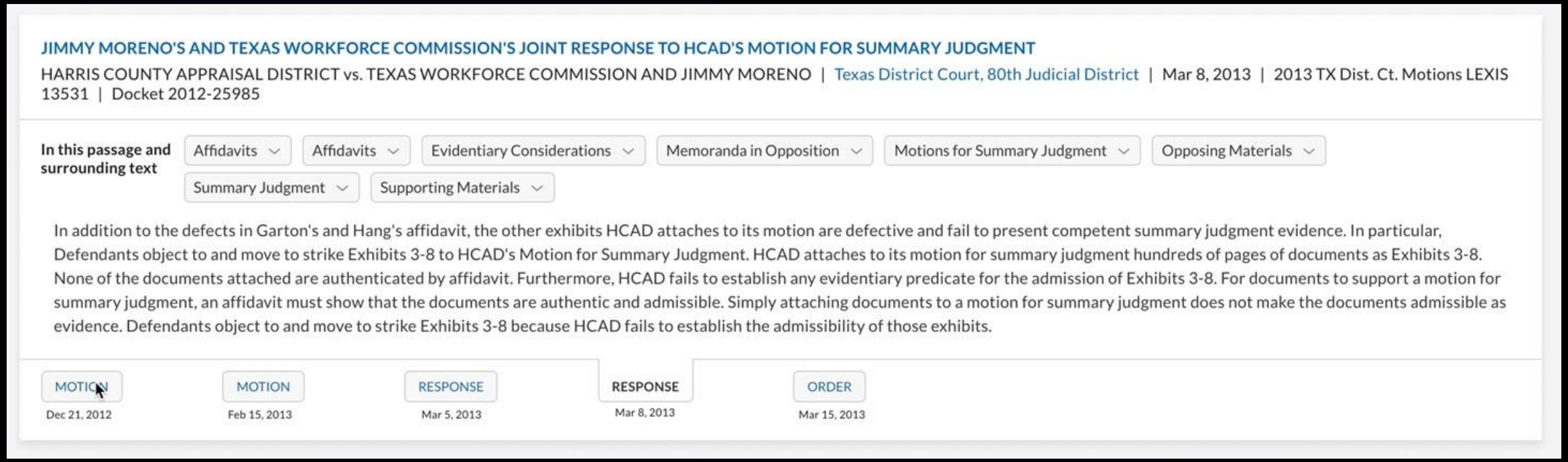


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Adding Context

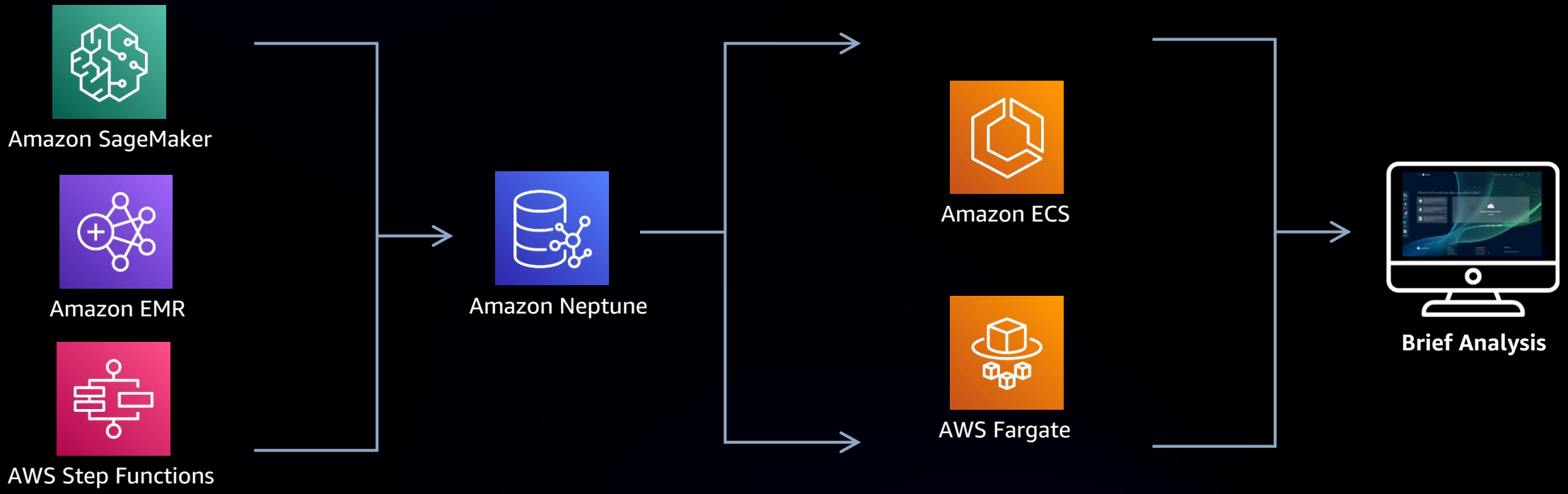


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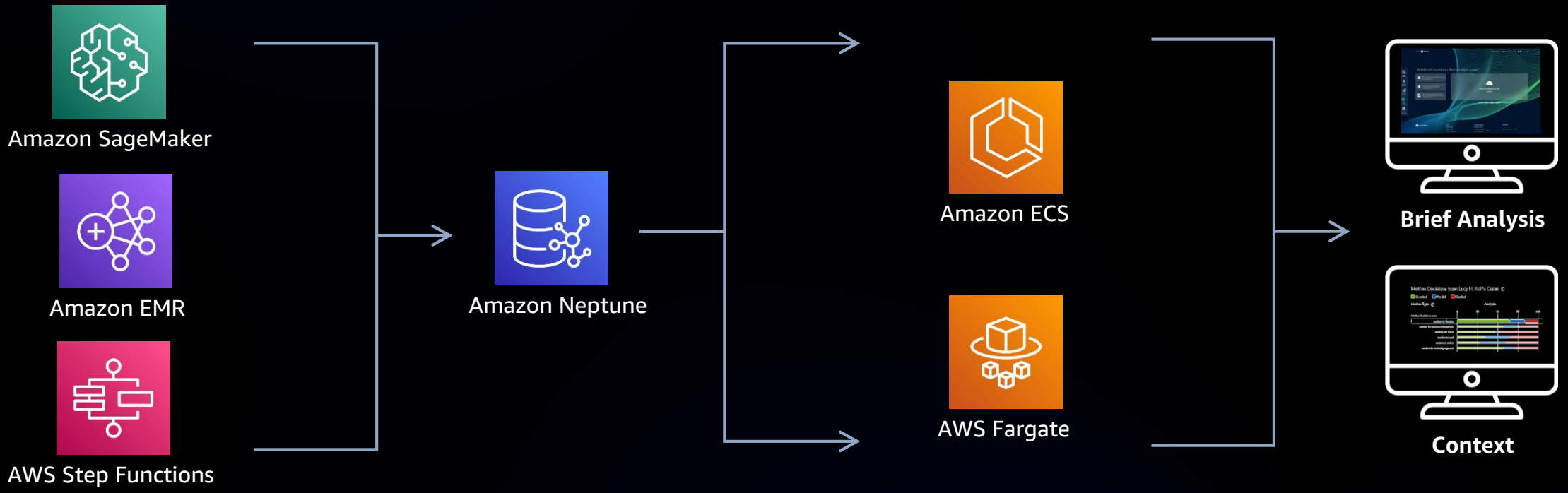
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Adding knowledge graph consumers



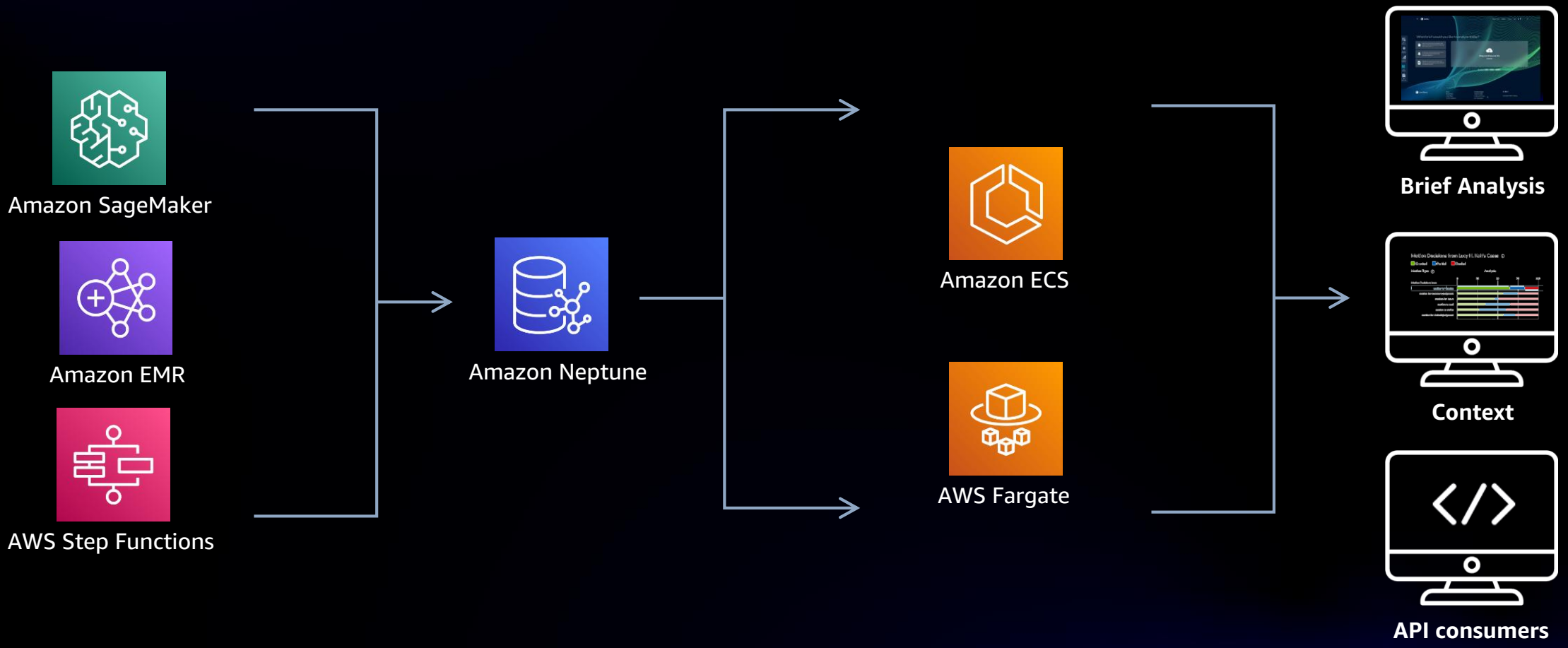
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Adding knowledge graph consumers



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Adding knowledge graph consumers

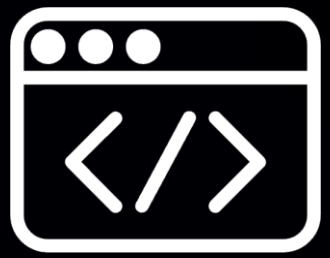


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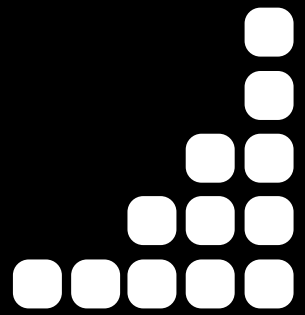
Today’s talk



Building a graph-based recommendation engine



Sharing the graph across the business via API



Multiplying value with new contributors and consumers

aws

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Our API is spurring new graph use cases

Machine learning		ML powers the graph, and the graph powers ML
Entity deduping		The graph helps us detect **too much** similarity
Train/test separation		The graph helps us **avoid** connected data
Network analytics		The graph itself can become a product → *Shepard's* Citation Services

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Shepard's citation graph on Amazon Neptune

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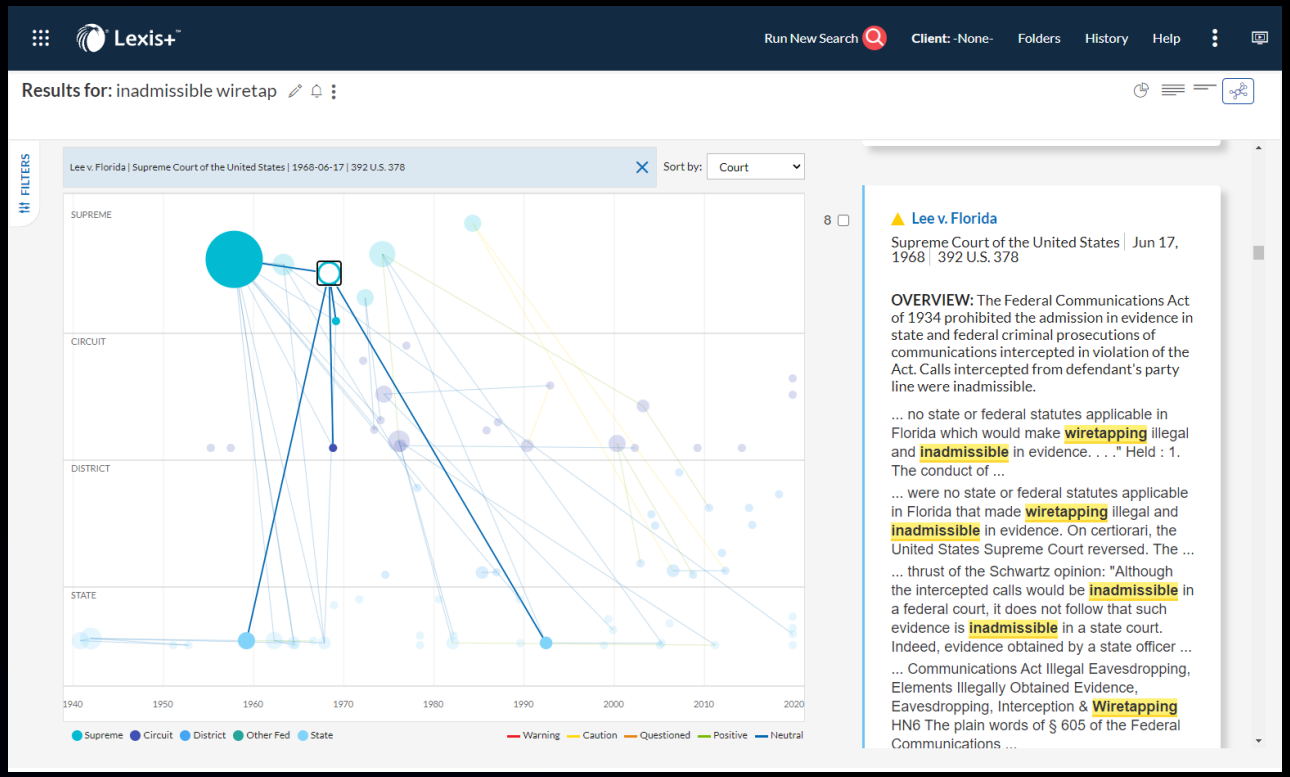
Shepard's Citation Services

Surfaces citation connections between case law, statutes, legislation, and regulatory materials

Combines editorial and network analysis to establish the current and historical sentiment toward law

Used to differentiate overruled points of law from those that are positively treated

A core part of legal research for 140 years and central to the LexisNexis platform



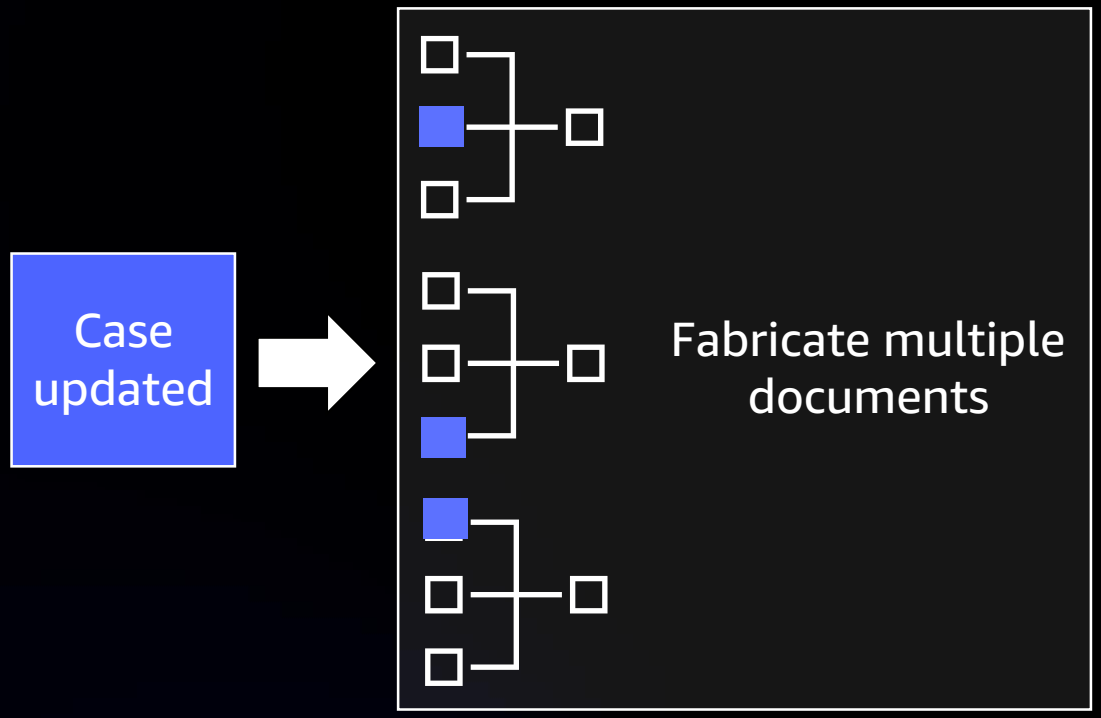
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Shepard's on document-based NoSQL

Denormalizes all citation information into report documents for each case or statute

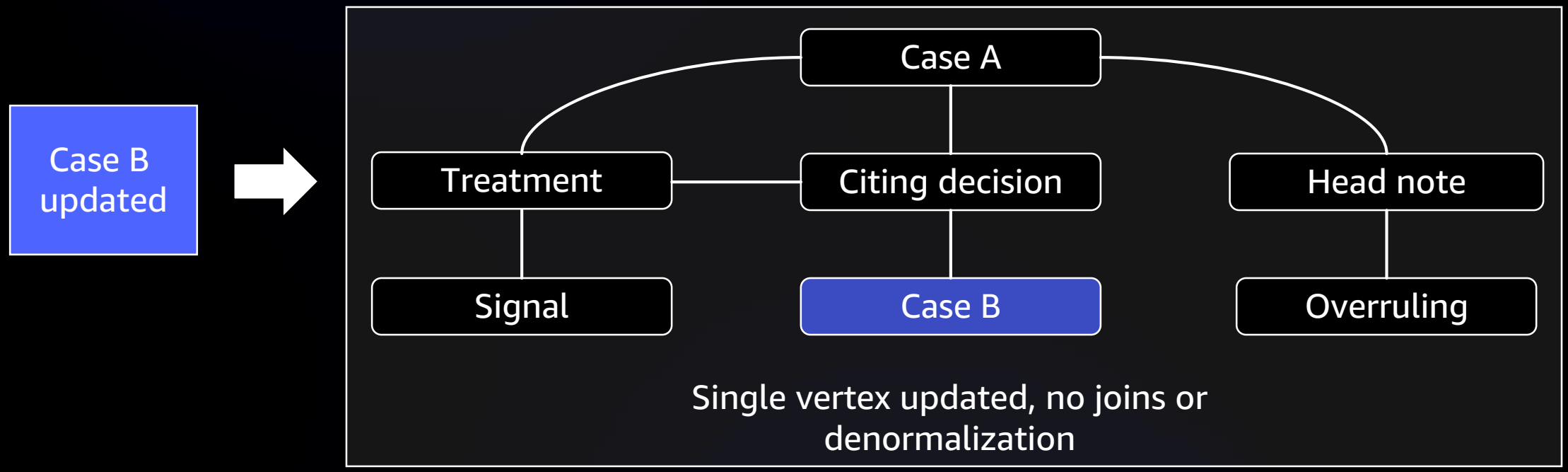
Documents with many citing decisions can be **large and expensive** to fabricate

Case updates can **force republish** of all cited documents to maintain synchronization



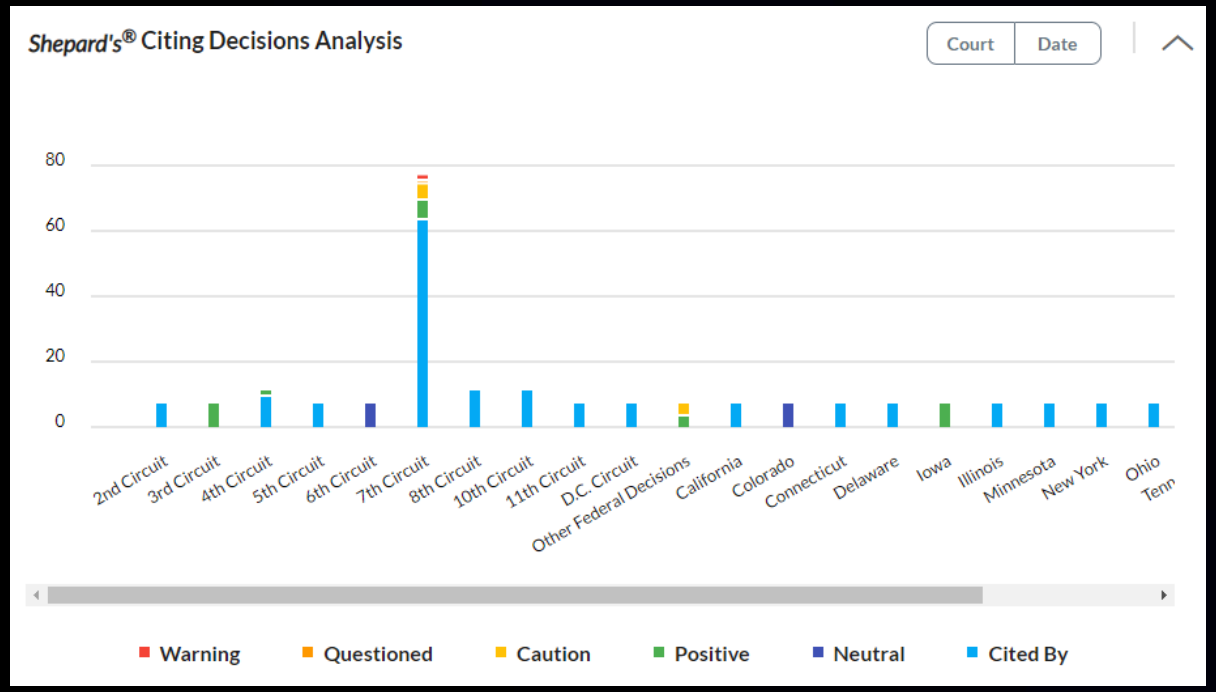
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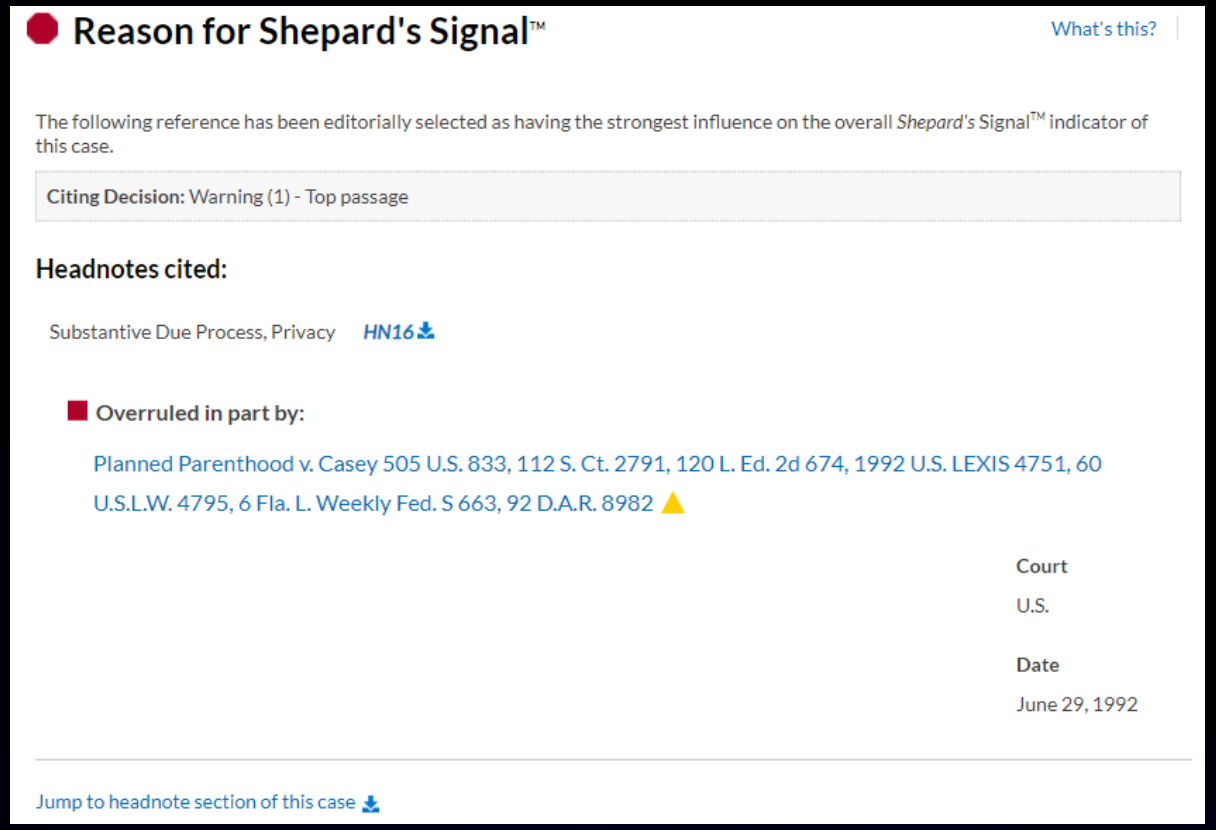
Shepard's on Amazon Neptune



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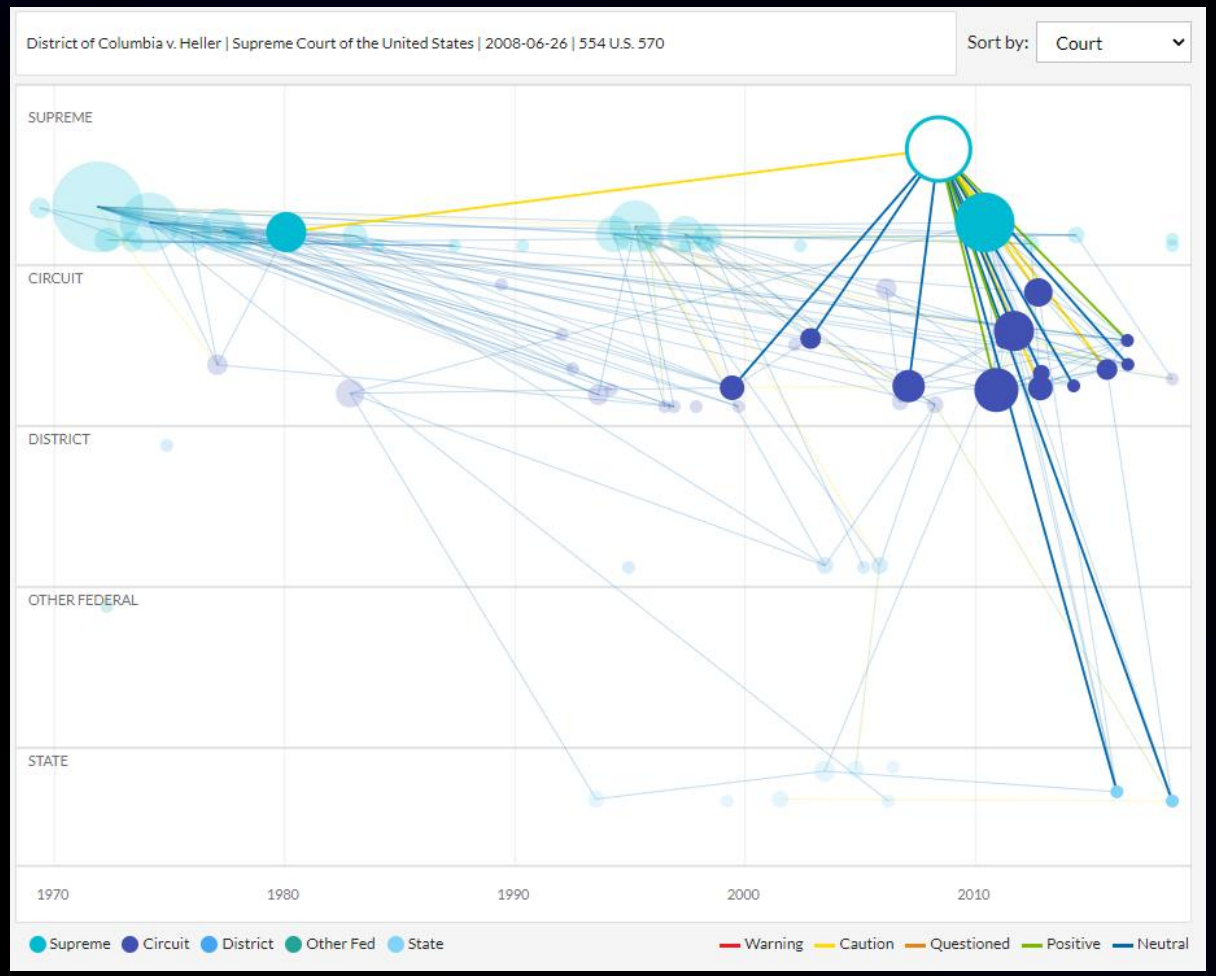
One *Shepard's* graph, many features

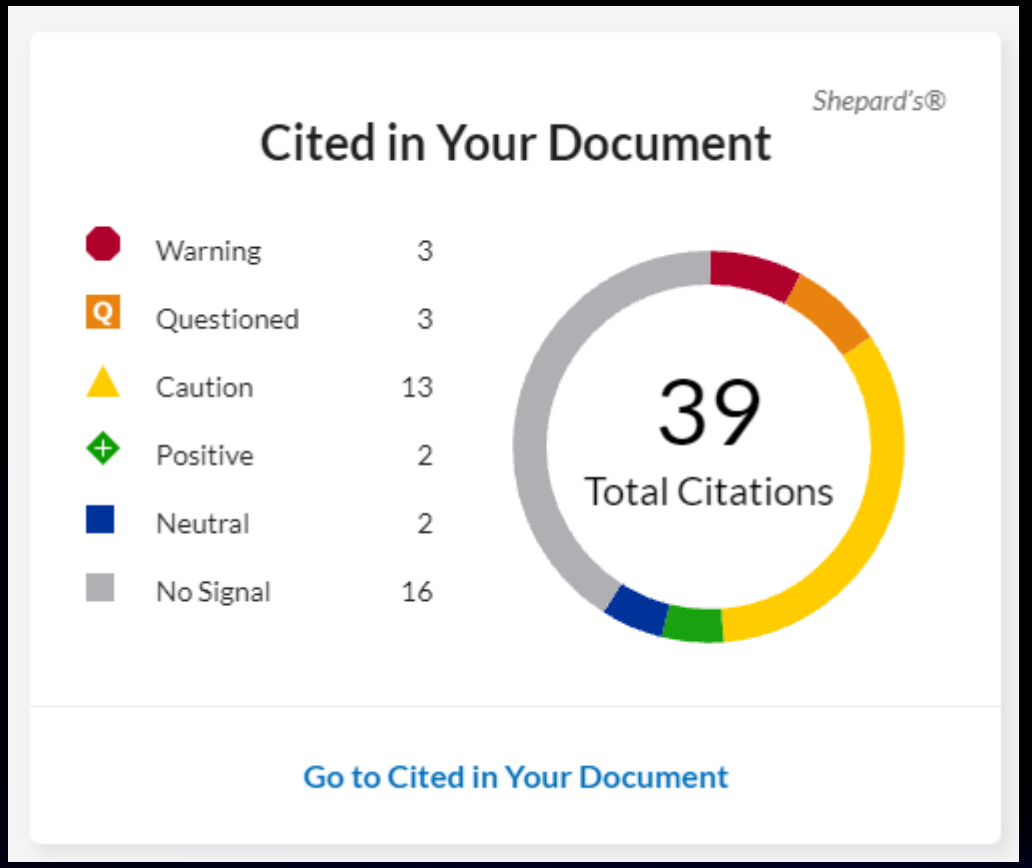




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One *Shepard's* graph, many features





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Bulk loading of incremental citation changes

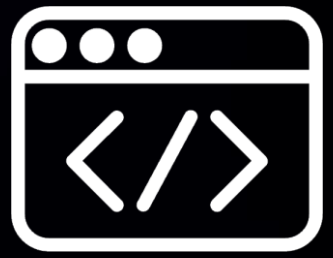


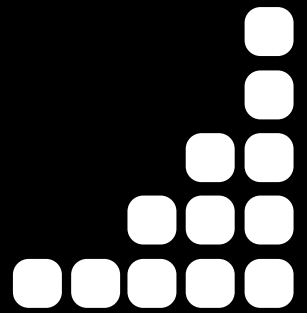
Supporting ~100 million graph updates per day

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Today’s talk







- Our graph let us reuse and multiply value of data science inference
- It’s easy to make additions, and they compound in value
- Simple APIs attract new consumers and new use cases
- Modeling existing solutions as graphs can bring efficiency

aws

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Acknowledgments

Abhisha Bhattacharyya
Avni Gulati
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Mark Koussa
Pius Sundarjith Vasanth Francis
Presley Rosen
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Nathaniel Harris
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DAT 322
Get more information from graphs using Amazon Neptune ML

DAT 323
Using key-value and graph databases for highly connected data apps

DAT 332
Amazon Neptune: Build and run graph applications

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Thank you!

Mark Myslin
mark@ravellaw.com

Kyle Patrick
kyle.patrick@lexisnexis.com

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