

Product Knowledge Graph _Via Named-entity Recognition

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What should you buy next?

Purchased

Upholstered Reversible
Sectional Sofa in Gray.

A hint of retro styling provides a clean and classic look for your contemporary home in the Collection . Gray fabric with contrast pillows furthers the look and versatility for placement within a number of home decors

A

Metropolitan Living
Rustic Modern
Console Table in
Brown.

Add a dash of character to your living room or entryway with this modern console table . Crafted from solid mango wood it showcases...

B

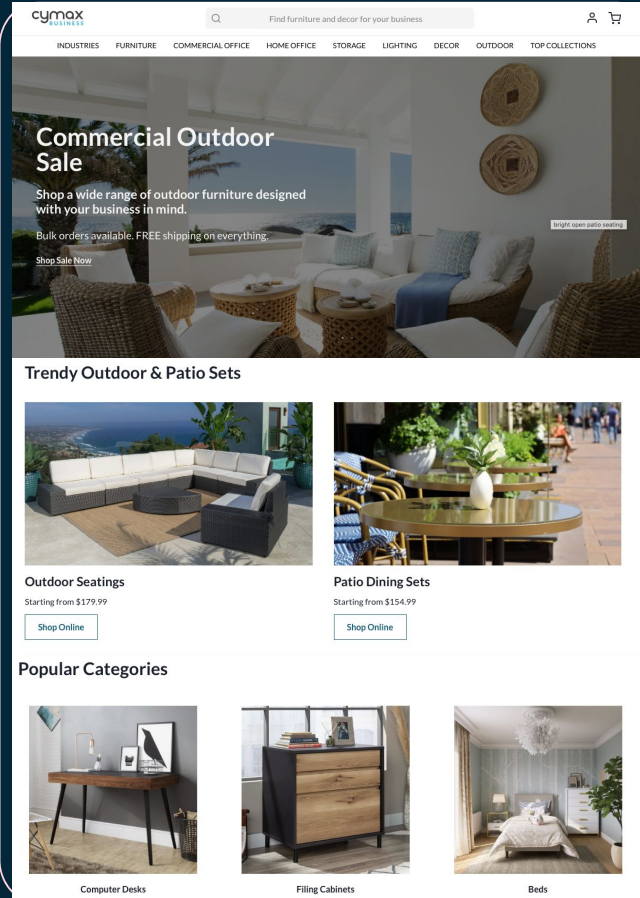
Mid Century TV
Console in Gray.

This 56 " TV Console is a modern take on a retro style . The console 's mid-century modern design and functionality make it the perfect fit for all entertainment spaces...

Introduction – Cymax

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An eCommerce and shipping platform provider for clients selling furniture. Manages lifecycle of 600K products.



Data from Cymax

Product ID ← Item: 1991289

Title → Bush Furniture Somerset 72W Sit Stand L Shaped Desk in Storm Gray

★★★★★ 0 Reviews

[Write a review](#)

Price ← \$688.99 ~~\$1,400.00~~ → **OnPromo details**

Finish: **Storm Gray**

Primary Material ↑
Material
Engineered Wood

Weight & Dimensions

Height	Width	Depth
29.15" H	71.02" W	71.75" D

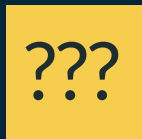
Product Weight → 200.45" lbs **Weight**

Upgrade your personal workspace with the ergonomic Bush Furniture Somerset 72W 3 Position Sit to Stand L Shaped Desk. As a quality alternative to desktop risers, the innovative 42W x 24D Sit to Stand Return offers all the health benefits of a standing desk with the versatility of more expensive electric height adjustable options. The built-in mechanical Lift-n-Lock system allows the desktop to lock into place at standing heights of 35, 38, and 41 inches and easily returns to a seated position. The 72W x 24D Office Desk includes a file drawer that opens on full-extension ball bearing slides for easy access to legal and letter size documents in addition to a box drawer for supplies and utensils. Fixed surfaces are tested to meet ANSI/SOHO standards for safety and performance while the mechanical lift is rigorously tested to Bush Furniture quality standards. Backed by a 6 Year Warranty.

Business Use Cases for Text Data

Title: White L-shaped Sofa.

Description: Fill your living room with this modern style white sofa!
This sofa is ...



Complementary Products



Special features



warranty?

Enhanced Search

Product Recommendations

Out of stock

Notify me when item is back in stock.

Notify me

Our Solution

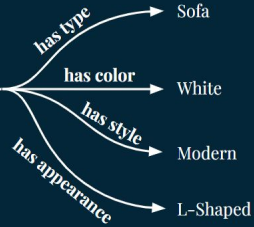
Step 1

Named-Entity Recognition



Title: White L-shaped Sofa.

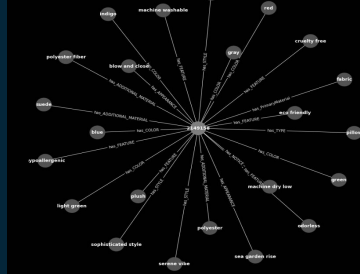
Description: Fill your living room with this modern style white sofa! This sofa is ...



Similarity Search



Product Knowledge Graph



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NER Task: step 1 manual tagging

Long texts

Gavic GVC-2308 51 x 71 "Rectangle Fabric Rug in Medium Gray Light Beige

Description : The simplistic yet compelling rugs from the Gavic collection effortlessly serve as the exemplar representation of modern decor . The meticulously woven construction of these pieces boasts durability and will provide natural charm into your decor space . Made with polyester polypropylene in Turkey, and has high pile Spot clean only. Features Materials: Fabric {55 % polyester ,45 % polypropylene Finish :Cream light beige light gray medium gray charcoal Shape: Rectangle Style: Modern Construction : Machine woven Outdoor safety: No Has fringe : No Machine washable: No Backing : No backing Pile type: High pile Specifications : Product Dimensions: 0.59 " H x 51 " W x 71 " D Product Weight: 13.5 Is Product Dimensions : (Thickness) 0.79 " ; (Pile Height) 0.59 " Warranty: One year limited warranty

NER
guideline

NER
manual
tagging

Color

Type

Additional Material

Appearance

Style

Feature

Notice

NER tagging example

Gavic GVC-2308 51 x 71 " Rectangle APPEARANCE Fabric ADDITIONAL_MATERIAL Rug TYPE in Medium Gray COLOR Light Beige COLOR

Description : The simplistic STYLE yet compelling rugs TYPE from the Gavic collection effortlessly serve as the exemplar representation of modern STYLE decor . The meticulously woven construction of these pieces boasts durability and will provide natural charm into your decor space . Made with polyester ADDITIONAL_MATERIAL , polypropylene ADDITIONAL_MATERIAL in Turkey , and has high pile APPEARANCE . Spot clean only NOTICE . Features :


Materials : Fabric ADDITIONAL_MATERIAL (55 % polyester ADDITIONAL_MATERIAL , 45 % polypropylene ADDITIONAL_MATERIAL) Finish : Cream COLOR , light beige COLOR , light gray COLOR , medium gray COLOR , charcoal COLOR Shape : Rectangle APPEARANCE Style : Modern STYLE

Construction : Machine woven FEATURE Outdoor safety : No Has fringe : No Machine washable : No Backing : No backing Pile type : High pile APPEARANCE

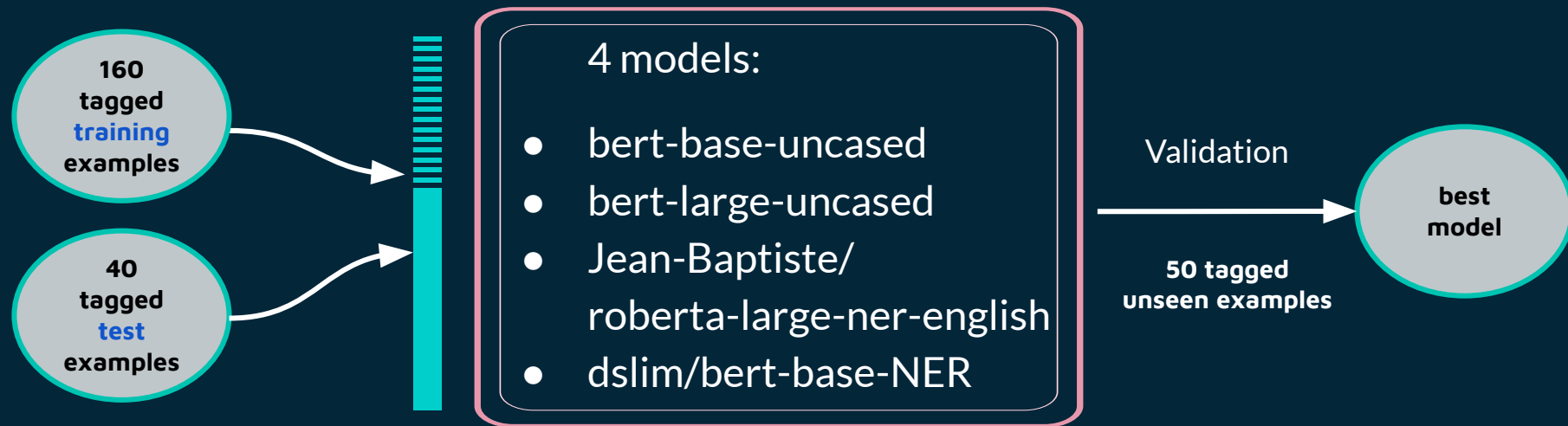
Specifications : Product Dimensions : 0.59 " H x 51 " W x 71 " D Product Weight : 13.5 lbs Product Dimensions : (Thickness) 0.79 " ; (Pile Height) 0.59 " Warranty : One year limited warranty NOTICE

Q: How do we measure the variability of NER tagging?

A: Inter-annotator Agreement

- 7 multi tags
- 2 annotators tag the same 50 new product texts independently.
- multi_cohen_kappa_score is 0.855
- General agreements reached 

NER Task: step 2 fine-tune models



Q: How do we measure the performance of fine-tuned models?

A: F1 score

Our F1 score is based on **EXACT** match for the tagging results.

For example:

Actual manual labeling: This rug is **light yellow**.

Model labeling: This rug is **light yellow**.



Model labeling: This rug is **light yellow**.



Fine-tuned Models Results

models	runtime	test f1 score	validation f1 score (unseen)
bert-base-uncased	28 min	0.76	0.8
bert-large-uncased	72 min	0.77	0.79
Jean-Baptiste/roberta-large-ner-english	40 min	0.76	0.77
dslim/bert-base-NER	35 min	0.74	0.76

- best fine-tuned model is **bert-base-uncased**
- test F1 score is 0.76
- unseen validation F1 score is 0.80

Model Labeling Result Example – appealing

Manual Labeling

Tube Elipse 1-Light APPEARANCE Metal ADDITIONAL_MATERIAL Cluster APPEARANCE Pendant TYPE in Mosaic Purple COLOR . Description :
The Tube collection uses mosaic APPEARANCE or opal COLOR cylindrical APPEARANCE glass ADDITIONAL_MATERIAL in a variety arrangements that
can decorate any room in fine elegance . The optional glasses ADDITIONAL_MATERIAL shine a reverent aura to the space below . Features : Material : Metal
ADDITIONAL_MATERIAL steel ADDITIONAL_MATERIAL , glass ADDITIONAL_MATERIAL Finish : Satin nickel COLOR , mosaic purple COLOR This
pendant TYPE hangs beautiful mosaic APPEARANCE cylindrical APPEARANCE glass ADDITIONAL_MATERIAL above , creating an elegant environment
. Choose from different configurations Mosaic glass ADDITIONAL_MATERIAL Bulb (s) not included Location rating : UL dry Sloped ceiling APPEARANCE Yes
Specifications : Product Dimensions : 16 " H x 4 " W x 4 " D Product Weight : 4 lbs Product Dimensions : (Glass ADDITIONAL_MATERIAL) 4 " D x 9 " H Wattage :
60 Voltage : 120 Bulb Type : Candelabra Number of Lights : 1

Model Labeling

Tube Elipse 1-Light APPEARANCE Metal ADDITIONAL_MATERIAL Cluster APPEARANCE Pendant TYPE in Mosaic Purple COLOR . Description :
The Tube collection uses mosaic APPEARANCE or opal COLOR cylindrical APPEARANCE glass ADDITIONAL_MATERIAL in a variety arrangements that
can decorate any room in fine elegance . The optional glasses TYPE shine a reverent aura to the space below . Features : Material : Metal
ADDITIONAL_MATERIAL steel ADDITIONAL_MATERIAL , glass ADDITIONAL_MATERIAL Finish : Satin nickel COLOR , mosaic purple COLOR This
pendant TYPE hangs beautiful mosaic APPEARANCE cylindrical APPEARANCE glass ADDITIONAL_MATERIAL above , creating an elegant environment
. Choose from different configurations Mosaic APPEARANCE glass ADDITIONAL_MATERIAL Bulb (s) not included NOTICE Location rating : UL dry
Sloped ceiling FEATURE : Yes Specifications : Product Dimensions : 16 " H x 4 " W x 4 " D Product Weight : 4 lbs Product Dimensions : (Glass
ADDITIONAL_MATERIAL) 4 " D x 9 " H Wattage : 60 Voltage : 120 Bulb Type : Candelabra Number of Lights : 1

Project Plan

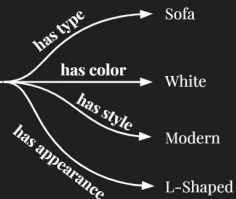
Step 2

Named-Entity Recognition



Title: White L-shaped Sofa.

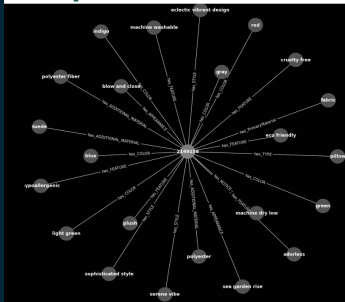
Description: Fill your living room with this modern style white sofa! This sofa is ...



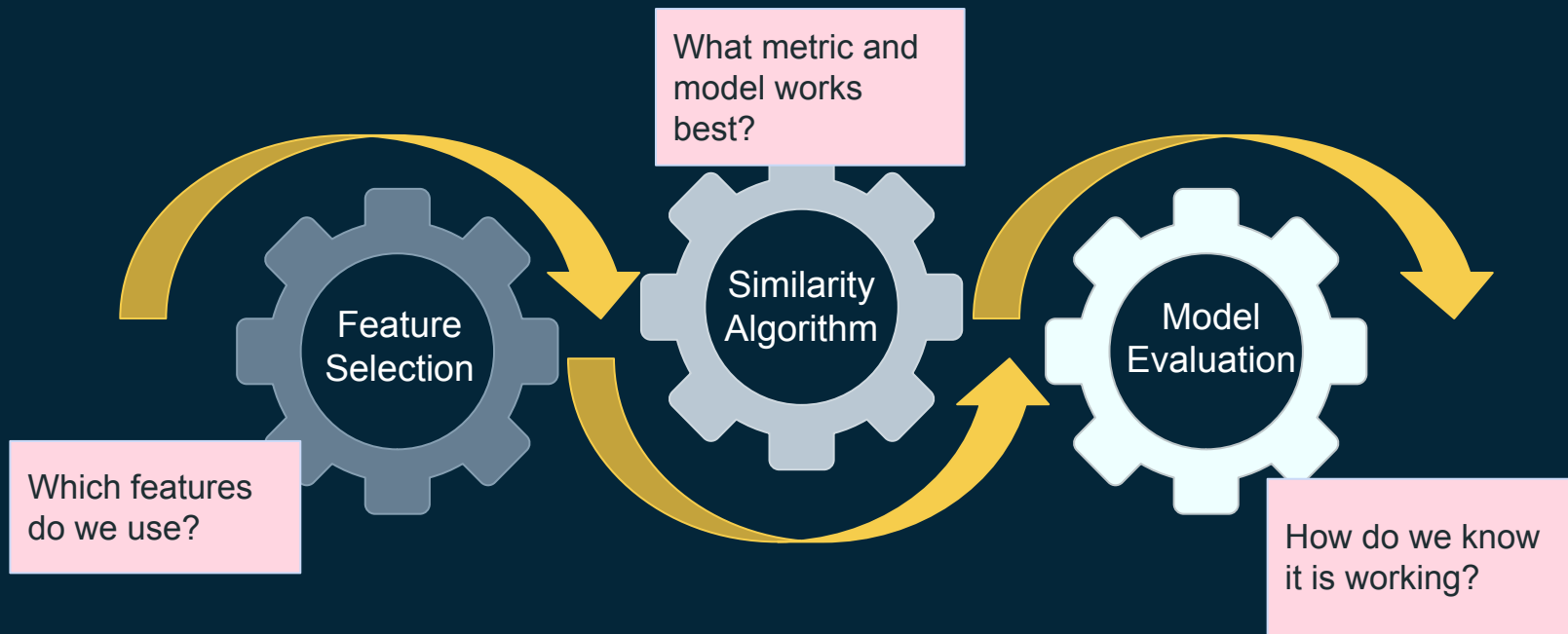
Similarity Search



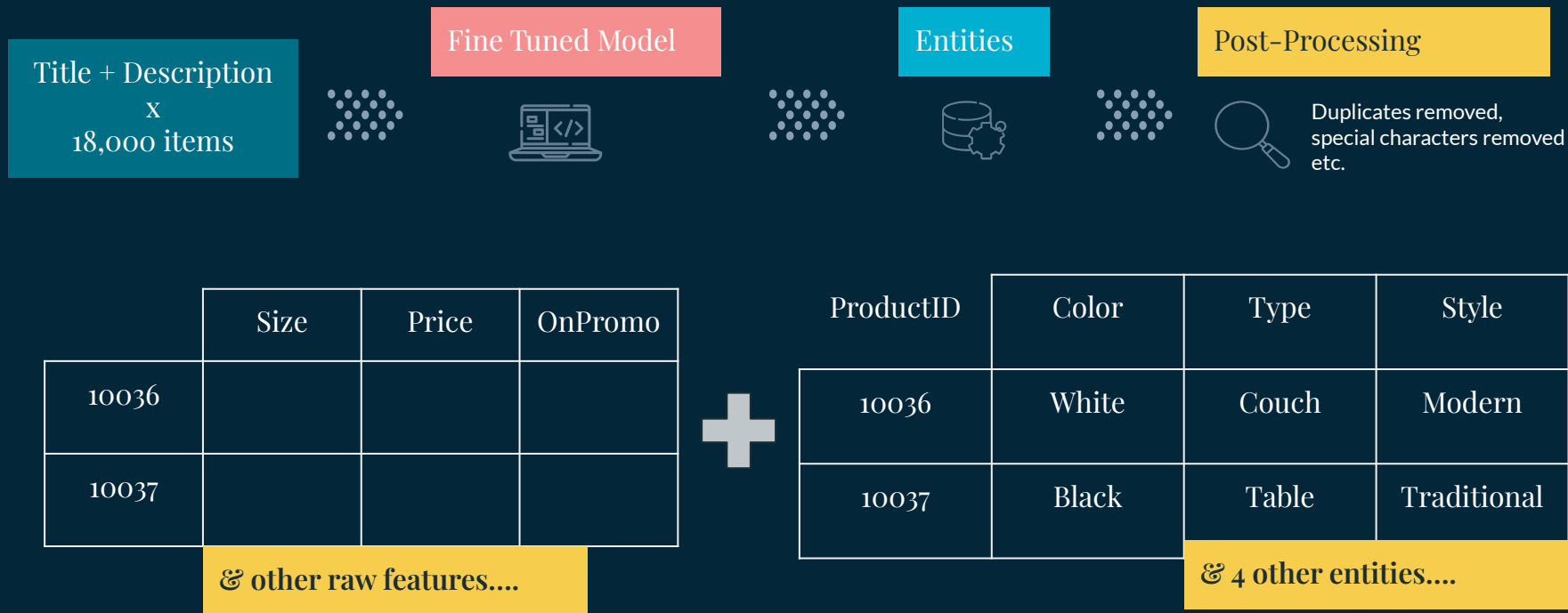
Product Knowledge Graph



Similarity Search Experimentation



Feature Selection and Post Processing



Similarity Algorithm & Testing

	OnPromo	Color	Type
10036			
10037			

& other selected features....



Model and Metric



Testing



Similar items



Dissimilar items

Testing Output on Known Similar Products

Item_1_Title	Item_2_Title	Baseline Model - All features without NER	Model 1 Score with all Features	Model 2 Score with only NER Features
Bristow 30 inch Antique Metal Barstool Antique White Finish 2 Pack	Bristow 30 inch Antique Metal Barstool Antique White Finish 2 Pack	1.000	1.000	1.000
16x47 Bold Anemones Panel III By Silvia Vassileva - on Canvas Fabric Multi-Color	13x39 Bold Anemones Panel III By Silvia Vassileva - on Canvas Fabric Multi-Color	0.854	0.986	1.000
30" X-Sided Plant Stand	24" X-Sided Plant Stand	0.853	0.991	1.000
39" x 20" Castanets by Silvia Vassileva - Print on Canvas Fabric Multi-Color	34" x 17" Castanets by Silvia Vassileva - Print on Canvas Fabric Multi-Color	0.849	0.987	1.000
Oceanside 9' Black Market Umbrella in Canvas	Oceanside 9' Black Market Umbrella in Yellow	0.838	0.991	1.000

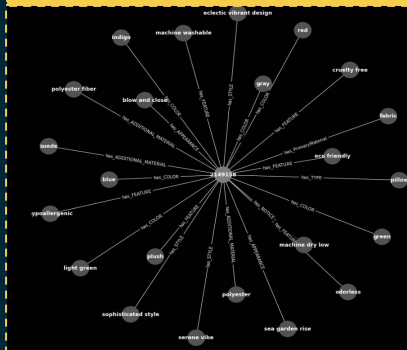
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```

graph LR
    A((Image of White L-shaped Sofa)) -- "has type" --> B[Sofa]
    A -- "has color" --> C[White]
    A -- "has style" --> D[Modern]
    A -- "has appearance" --> E[L-Shaped]
  
```

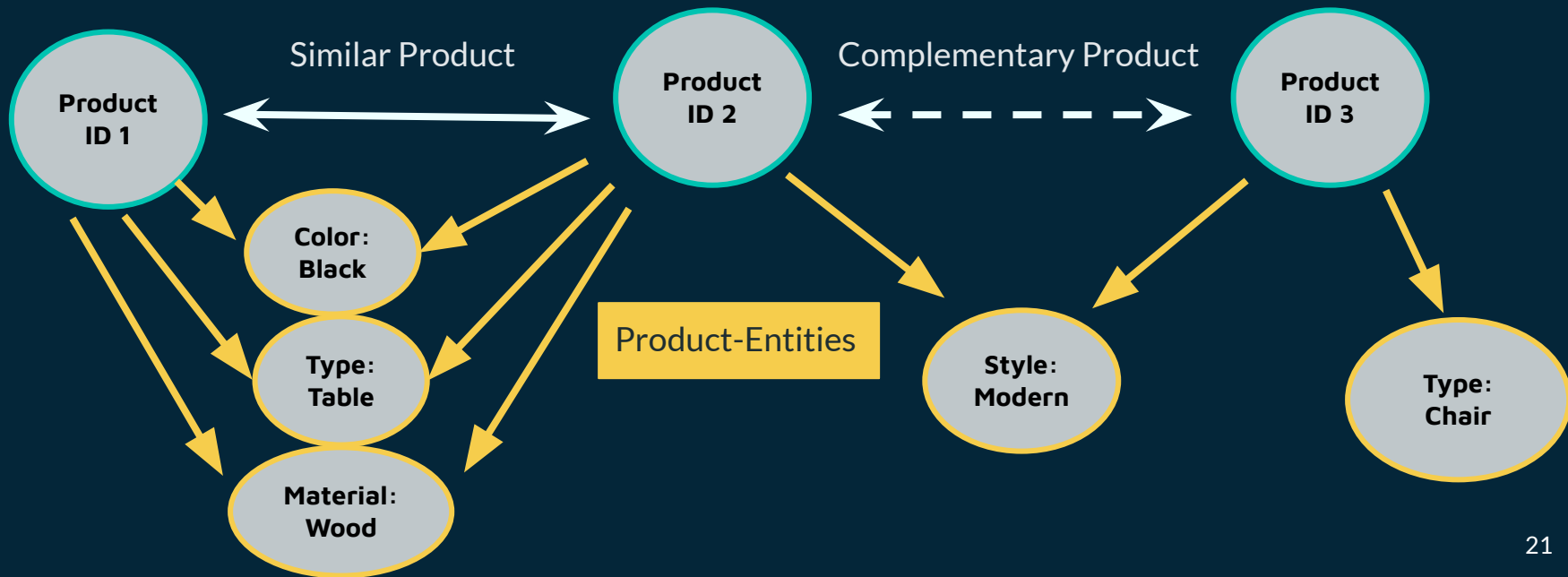
Title: White L-shaped Sofa.

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Why a Product Knowledge Graph?

Used to visualize and uncover relationships



Conclusion

- We extracted product attributes using fine-tuned large language models
- We used the extracted entities to find similarities between products
- We visualized the similarity search using a knowledge graph

Project Dashboard

Demo

Limitations and Future Work for Cymax

- Transform into an efficient product knowledge graph database for scalability
- Leverage the product knowledge graph for recommender system development
- Increase diversity of the training data with more manual annotations

Acknowledgement

We'd like to share thanks to

Varada Kolhatkar, *mentor and Professor*

Prateek Jain, *Cymax Group Technologies*

Gittu George, *Professor*

Thank you for your attention!

cymax group

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