

# Multimodal Dialogs (MMD): Towards Building Large Scale Multimodal Domain-Aware Conversation Systems

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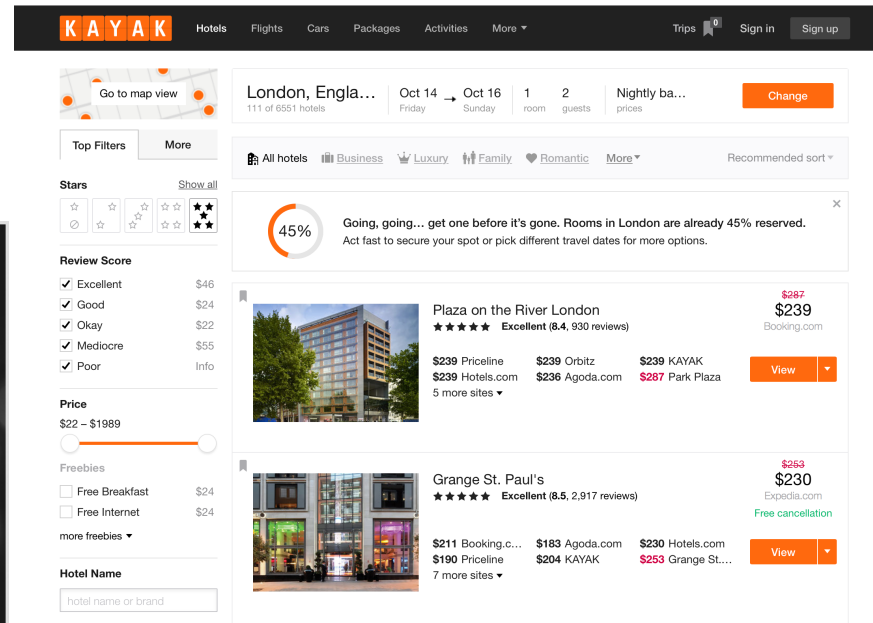
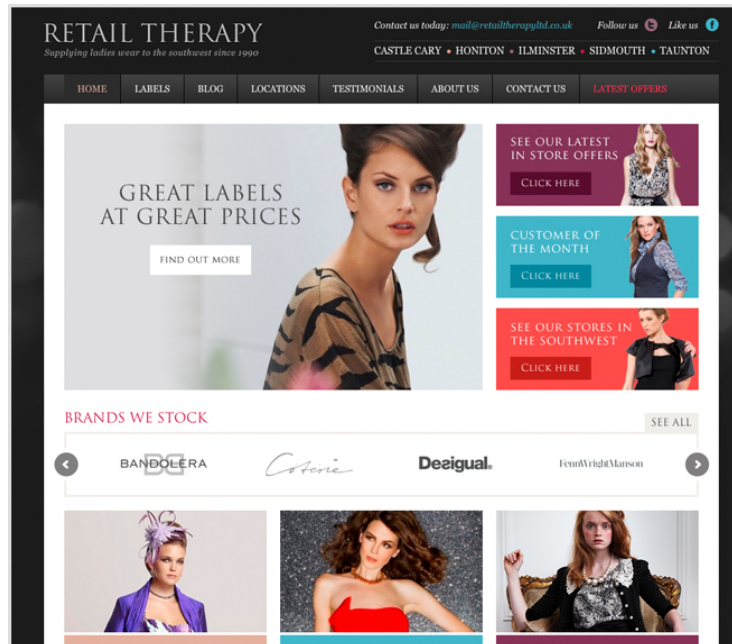
[kartsank@in.ibm.com](mailto:kartsank@in.ibm.com)

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# Need for multimodal conversation

## Fashion / Retail



## Travel

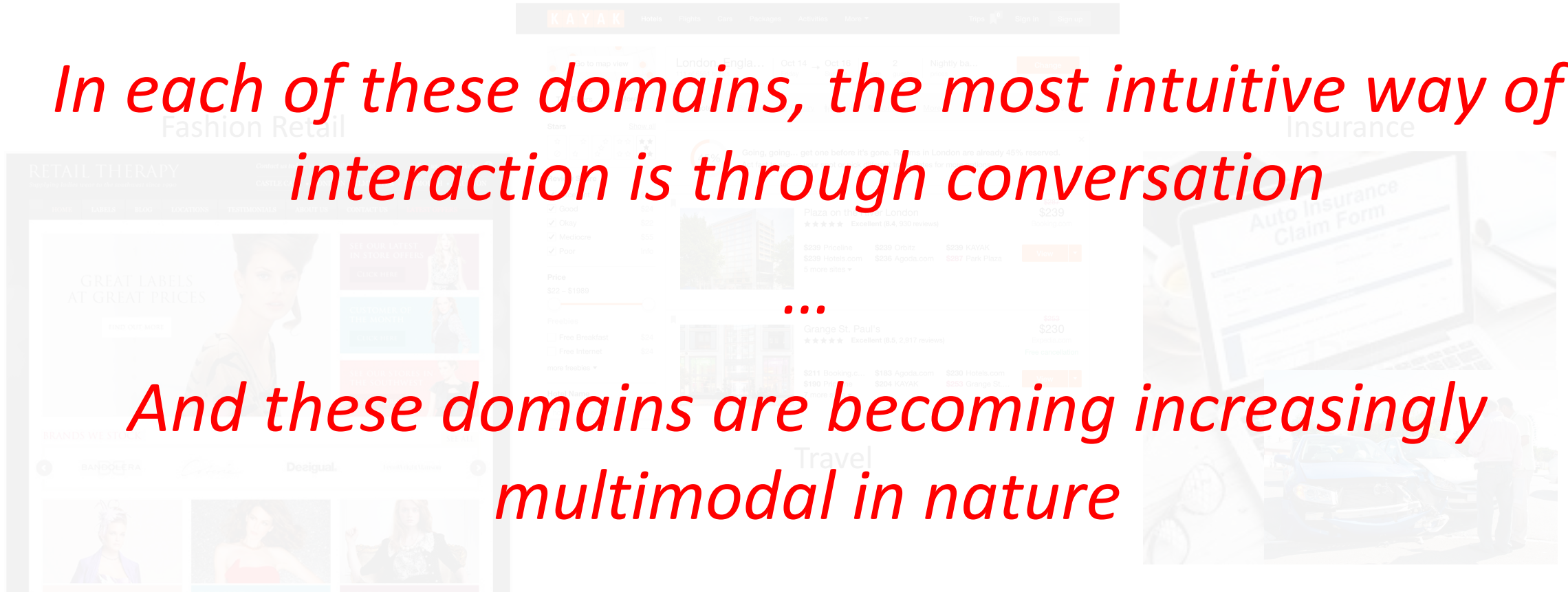
## Insurance



# Need for multimodal conversation

*In each of these domains, the most intuitive way of interaction is through conversation*

*And these domains are becoming increasingly multimodal in nature*



# Multimodal Conversation Datasets



Visual Context

Textual Context	I checked out the protest yesterday.
Question	Do you think America can ever overcome its racial divide?
Response	I can only hope so.

Turn 4 Was the protest peaceful?

Turn 5 Yes, it was, thankfully.

Turn 6 I hope the voices of minorities will be heard, and lead to changes in policing.

VQG Question	Where was the protest?
--------------	------------------------



#168019

Is it a person?	No
Is it an item being worn or held?	Yes
Is it a snowboard?	Yes
Is it the red one?	No



#203974

Is it a cow?	Yes
Is it the big cow in the middle?	No
Is the cow on the left?	No
On the right ?	Yes

**GuessWhat?! Visual object discovery through multi-modal dialogue (CVPR 2017)**

**Image-Grounded Conversations: Multimodal Context for Natural Question and Response Generation (2017)**



**Visual dialog. (2016)**



# Multimodal Conversation Datasets

Visual Context	
Textual Context	I checked out the protest yesterday.
Question	Do you think America can ever overcome racial divide?
Response	I think so.
Turn 4	Was the protest peaceful?
Turn 5	Yes, it was, thankfully.
Turn 6	I hope so. More voices of minorities will be heard, and lead to changes in policing.
VQG Question	Where was the protest?

*Image-Grounded Conversations: Multimodal Context for Natural Question and Response Generation (2017)*



Is it a person? **No**  
Is it an item being worn or held? **Yes**  
Is it a person's body? **Yes**  
Is it a head of a person? **No**



Is it a cow? **Yes**  
Is it the big cow in the middle? **No**  
Is it a cow on the left? **No**  
Is it a cow on the right? **No**

*GuessWhat?! Visual object discovery through multi-modal dialogue (CVPR 2017)*

**Not truly multimodal in nature**

**Open-domain conversation**



*Visual dialog. (2016)*

# WishList for a domain-aware multimodal conversation dataset

- Dialog context is truly multimodal in nature, with multiple text + image utterances
- Response generated should be multimodal
- Response generation needs to leverage external domain knowledge as well as the unstructured dialog context

# WishList for a domain-aware multimodal conversation dataset

- Dialog context, with multiple text + image utterances
- Response generation, with multiple text + image
- Response generation needs to leverage external domain knowledge as the unstructured dialog context



*.... In our new dataset on Domain Aware Multimodal Conversation (MMD)*

# Highlights of the MMD Dataset

- Crawled a multimodal catalog of 1 million items of over 700 fashion categories from various fashion sites
- Curated a large scale domain knowledge from the catalog data
- Further, with domain experts, we designed an automata over 17 types of dialog states, for a “fashion shopping” use-case
- By instantiating such an automata, we created a dataset of 150K dialogs having around 3 million question-answers

# Link to Download Dataset

<https://amritasaha1812.github.io/MMD/>

[Home](#) [People](#) [Dataset](#) [Download](#) [Examples](#)

### Abstract

While multimodal conversation agents are gaining importance in several domains such as retail, travel etc., deep learning research in this area has been limited primarily due to the lack of availability of large-scale, open chatlogs. To overcome this bottleneck, in this paper we introduce the task of multimodal, domain-aware conversations, and propose the MMD benchmark dataset. This dataset was gathered by working in close coordination with large number of domain experts in the retail domain. These experts suggested various conversations flows and dialog states which are typically seen in multimodal conversations in the fashion domain. Keeping these flows and states in mind, we created a dataset consisting of over 150K conversation sessions between shoppers and sales agents, with the help of in-house annotators using a semi-automated manually intense iterative process. With this dataset, we propose 5 new sub-tasks for multimodal conversations along with their evaluation methodology. We also propose two multimodal neural models in the encode-attend-decode paradigm and demonstrate their performance on two of the sub-tasks, namely text response generation and best image response selection. These experiments serve to establish baseline performance and open new research directions for each of these sub-tasks. Further, for each of the sub-tasks, we present a 'per-state evaluation' of 9 most significant dialog states, which would enable more focused research into understanding the challenges and complexities involved in each of these states.

### CODE

To be made available soon!

### PAPER

Please download the paper here [paper link](#)

Updated version of the paper and results are in <https://arxiv.org/abs/1704.00200>



Challenges in such a Dataset

# Shopping Assistant ChatLog

**SHOPPER:** show me some espadrilles in beige/blue within \$200.

**AGENT:** Sure. let me just quickly browse through my catalogue



**AGENT:** What you can see in the fifth item, michael michael kors brings you a weekend look with the wrapped espadrille heel and crisscross styling of these dana flats.

**SHOPPER:** List more in the upper material as in the 5th image and style as the 3rd and 5th



**SHOPPER:** Can you list images of the 1st result from all orientations?



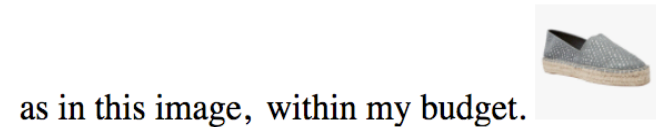
**AGENT:** Image from the front,right and back orientations respectively

**SHOPPER:** And the 3rd one?



**AGENT:** Image from the front,right,back and left orientations respectively

**SHOPPER:** I like the 4th image. Show me something like it but in style



**SHOPPER:** Will these espadrilles suit office style?

**AGENT:** Yes

# Shopping Assistant ChatLog

**SHOPPER:** show me some espadrilles in beige/blue within \$200.

**AGENT:** Sure. let me just quickly browse through my catalogue

*Parse the question using domain semantics in order to retrieve relevant images*

**AGENT:**

**AGENT:** What you can see in the fifth item, michael michael kors brings you a weekend look with the wrapped espadrille heel and crisscross styling of these dana flats.

**SHOPPER:** List more in the upper material as in the 5th image and style as the 3rd and 5th



**AGENT:**

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**T:** Image from the front, right, back and left orientations respectively

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as in this image, within my budget.



**AGENT:**

**SHOPPER:** Will these espadrilles suit office style?

**AGENT:** Yes

# Shopping Assistant ChatLog

**SHOPPER:** show me some espadrilles in beige/blue within \$200.

**AGENT:** Sure. let me just quickly browse through my catalogue

*Provide a short description of the displayed items in a persuasive language*

**AGENT:**

**AGENT:** What you can see in the fifth item, michael michael kors brings you a weekend look with the wrapped espadrille heel and crisscross styling of these dana flats.

**SHOPPER:** List more in the upper material as in the 5th image and style as the 3rd and 5th



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*Counting based quantitative reasoning*

*Inference over aggregate of images*

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# Shopping Assistant ChatLog

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SHOPPER: And the 3rd one?

**AGENT:** Sure. let me just quickly browse through my catalogue



**AGENT:**

*Ellipsis resolution for incomplete questions*

*Also visual co-reference resolution to understand 3rd one is w.r.t. the 2<sup>nd</sup> row of results*

**AGENT:** What you can see in the fifth item, michael michael kors weekend look with the wrapped espadrille heel and crisscross styling of these dana hats.

as in this image, within my budget.

**SHOPPER:** List more in the upper material as in the 5th image and style as the 3rd and 5th



**AGENT:**



**AGENT:**

**SHOPPER:** Will these espadrilles suit office style?

**AGENT:** Yes

**SHOPPER:** Can you list images of the 1st result from all orientations?



**AGENT:** Image from the front, right and back orientations respectively

# Shopping Assistant ChatLog

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**AGENT:**

**AGENT:** What you can see in the fifth item, michael michael kors weekend look with the wrapped espadrille heel and crisscross styling of these dana flats.

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**AGENT:**

**SHOPPER:** Can you list images of the 1st result from all orientations?



**AGENT:** Image from the front, right and back orientations respectively

**SHOPPER:** And the 3rd one?



*Ellipsis resolution for incomplete questions*

*Also visual co-reference resolution to understand 3rd one is w.r.t. the 2<sup>nd</sup> row of results*

**AGENT:**



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as in this image, within my budget.



**Logical inferencing (along with sentiment analysis)**

**A long term context to know the user's budget**

**Quantitative inference for filtering**



# Shopping Assistant ChatLog

**SHOPPER:** show me some espadrilles in beige/blue within \$200.

**AGENT:** Sure. let me just quickly browse through my catalogue



**AGENT:** What you can see in the fifth item, michael michael kors brings you an weekend look with the wrapped espadrille heel and crisscross styling of these dana flats.

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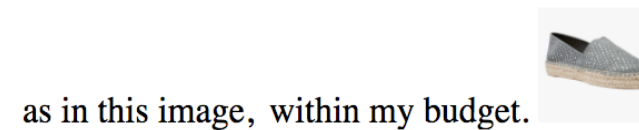
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**AGENT:** Image from the front,right,back and left orientations respectively

**SHOPPER:** I like the 4th image. Show me something like it but in style



**SHOPPER:** Will these espadrilles suit office style?

**AGENT:** Yes

**Inference using domain knowledge and multimodal context**

Evaluating State-of-the-art  
models on some of the tasks



## Sub-Tasks evaluated in the current work

- Text Response Generation Task
- Image Response Task simplified to Best Image Selection, given a small subset of  $m$  images

# Results

Model (domain knowledge agnostic)	Text Response Generation	Select Best Image Response								
		m=5			m=50			m=100		
		Re@1	Re@2	Re@3	Re@1	Re@2	Re@3	Re@1	Re@2	Re@3
Text Only HRED*	14.58	0.46	0.64	0.75	-	-	-	-	-	-
Multimodal HRED**	19.58	0.79	0.88	0.93	0.23	0.37	0.48	0.13	0.22	0.3

\*Text Only HRED is the Hierarchical Encoder Decoder (HRED) model used for building end-to-end dialog systems (Serban et. al 2016)

\*\* Multimodal HRED is a multimodal extension of the above HRED model

# Results

Model (domain knowledge agnostic)	Text Response Generation	Select Best Image Response								
		m=5			m=50			m=100		
		Re@1	Re@2	Re@3	Re@1	Re@2	Re@3	Re@1	Re@2	Re@3
Text Only HRED	14.58	0.46	0.64	0.75	-	-	-	-	-	-
Multimodal HRED	19.58	0.79	0.88	0.93	0.23	0.37	0.48	0.13	0.22	0.3

Poor performance because of the domain  
agnostic nature of the model

# Results

Model (domain knowledge agnostic)	Text Response Generation	Select Best Image Response								
		m=5			m=50			m=100		
		Re@1	Re@2	Re@3	Re@1	Re@2	Re@3	Re@1	Re@2	Re@3
Text Only HRED	14.58	0.46	0.64	0.75	-	-	-	-	-	-
Multimodal HRED	19.58	0.79	0.88	0.93	0.23	0.37	0.48	0.13	0.22	0.3

Poor performance in image response selection itself, then  
what about image retrieval from a million sized catalog ?

# Conclusion

- Introduced a dataset of 150K multimodal conversation sessions consisting of around 3 Million QA pairs between a user and a shopping agent, covering 17 types of dialog states
- Showcased the limitations of state-of-the-art conversation systems in handling multimodal domain-specific applications
- With this, we hope to encourage research into modeling domain-aware multimodal conversation systems



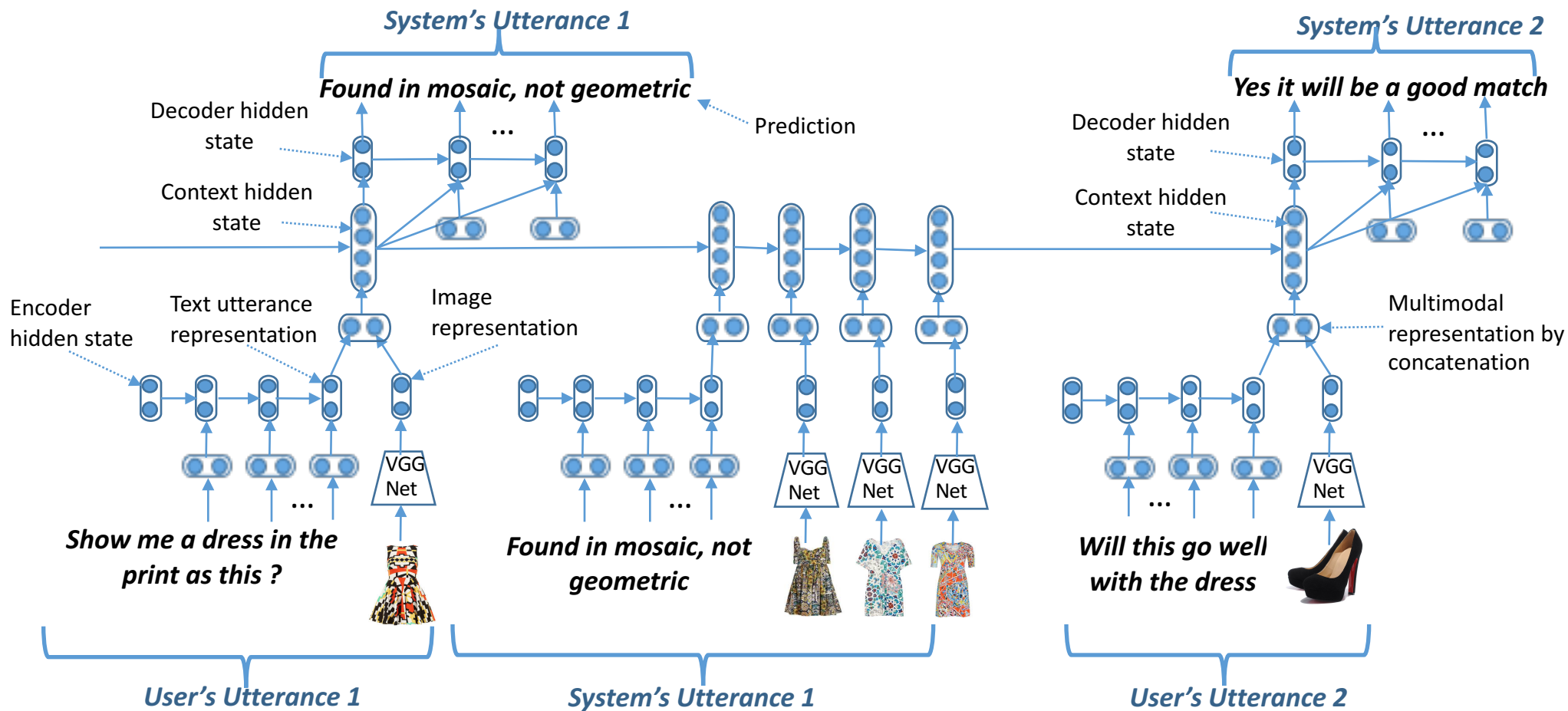
THANK YOU

Backup Slides

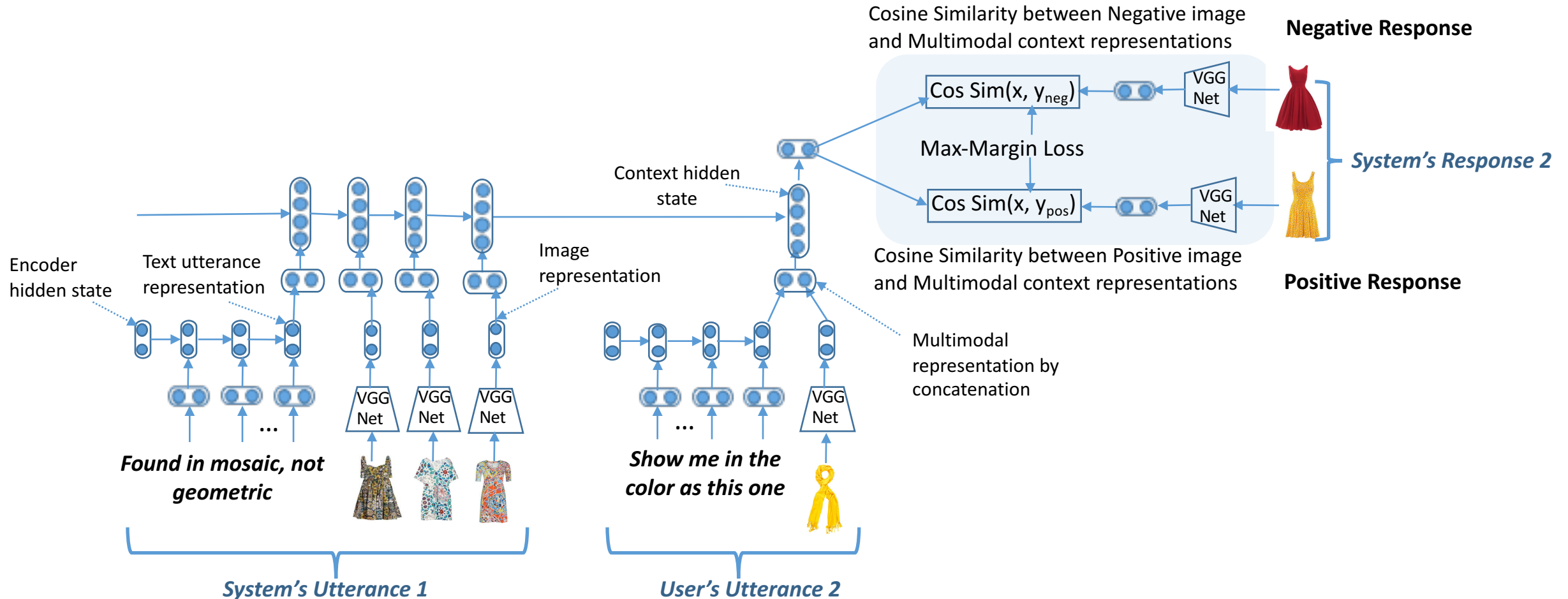
# Data Collection Methodology

- Curation and representation of a large-scale domain knowledge
- Developing a large collection of multimodal conversations, each consisting of a series of interactions employing this knowledge

# Multimodal HRED Model: Text Task




# Multimodal HRED Model: Image Task (Train)



# Domain Knowledge Curation

- Crawling over 1 Million fashion items




Rebecca Taylor  
Rebecca Taylor Women's Ls Tulip Clip Top  
[Be the first to review this item](#)

Price: **\$325.00** & **FREE Returns**

**Size:**  
Select [Size Chart](#)

**Color:** Ballet Combo

- Shell Fabric: 100% Cotton; Combo Fabric: 99% Cotton, 1% Spandex
- Imported
- Dry Clean Only
- Floral chiffon blouse
- Open neckline



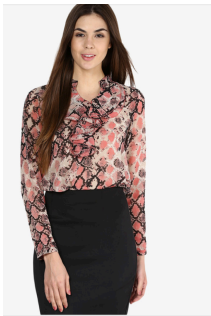
People Women's Body Blouse Top  
★★★★☆ [4 customer reviews](#)

Suggested price: ₹-699.00  
**Sale: ₹ 558.00** [Details](#)  
You Save: ₹ 141.00 (20%)  
Inclusive of all taxes

**Fit:** [As expected \(66%\)](#)

**Size:**  
Select [Size Chart](#)

- 100% Polyester front, 70% cotton and 30% Polyester
- Body blouse
- Sleeveless
- Floral



Keep your look lively wearing this pink coloured top by La Zoire. Fashioned using georgette, this top will keep you at comfort all day long. Pair this top with black denims to get endless compliments.

Neck	Mandarin Collar
Fit	Regular
Wash Care	Handwash with like colors Dry in shade Do not wrin
Color	Pink
Fabric Details	Georgette
Style	Printed
SKU	LA313WA44OBJINDFAS

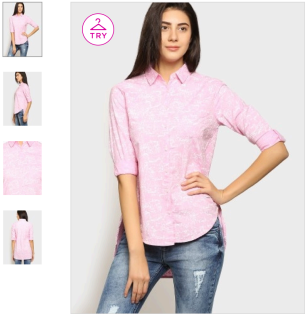
Pepe Women Pink Printed Regular Fit Shirt

₹1,799 **₹900 50%**

Select Color:

Select Size: S M [Size Guide](#)

Save For Later



**Style Tip**  
“ Style this shirt with a pair of jeans and pumps. Add on a pair of sunglasses and sling on a handbag for a modish look. ”

**Info & Care**

**Details**  
Pink printed shirt, has a spread collar, full button placket, long sleeves with button cuffs, patch pocket on the front, curved hemline, extended back hem, button closures on either side of the hems

**Size & Fit**  
The model (height 5'8" and chest 35") is wearing a size S

**Material and Care**  
100% cotton; Machine-wash

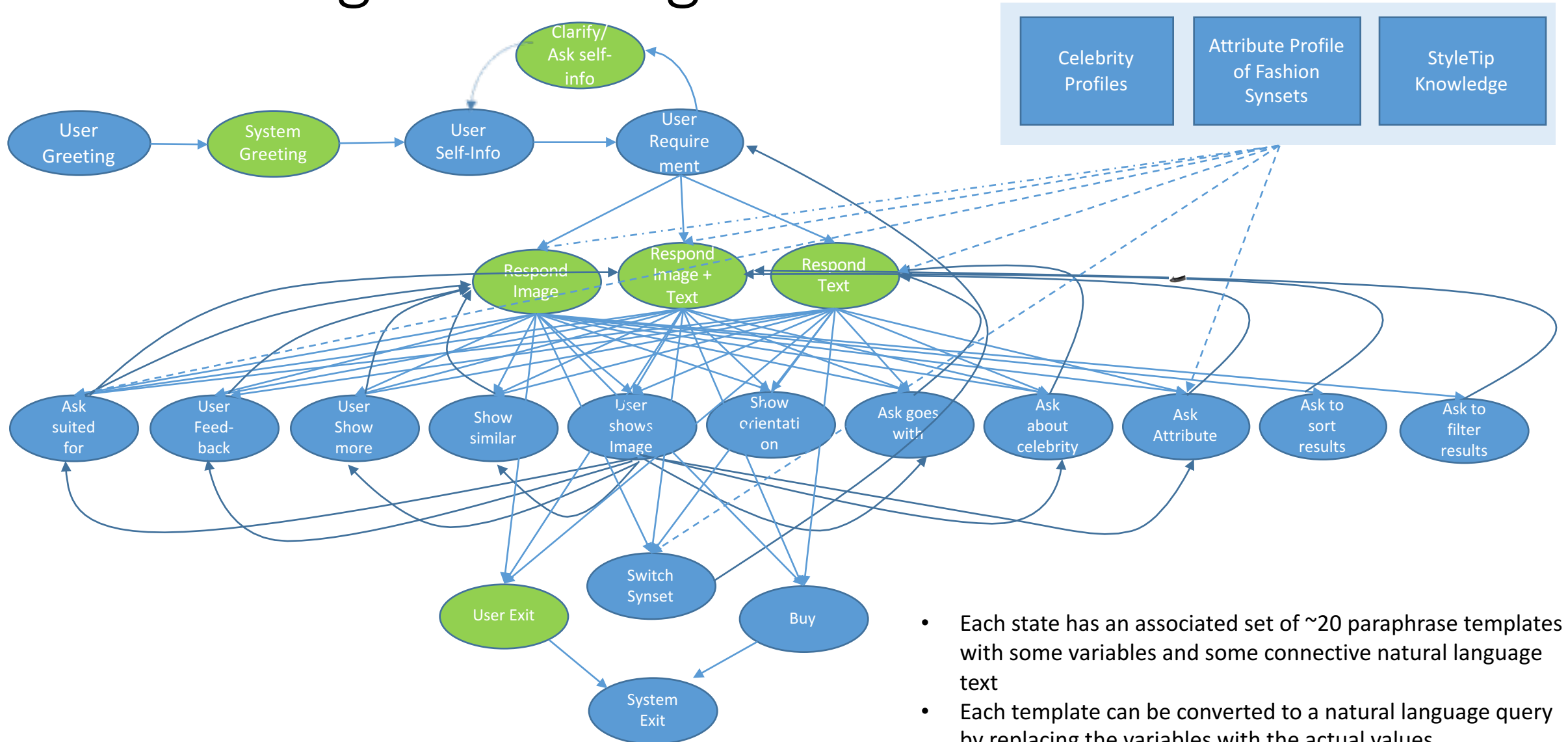
**More Info**  
Stylecode: PEPEA16AWWWSH9164922

# Simulating the Dialog Automata



- Each state has an associated set of ~20 paraphrase templates with some variables and some connective natural language text
- Each template can be converted to a natural language query by replacing the variables with the actual values


# Simulating the Dialog Automata





# Domain Knowledge Curation

- Parsing the catalog to create a structured




Rebecca Taylor  
Rebecca Taylor Women's Ls Tulip Clip Top  
Be the first to review this item

Price: \$325.00 & FREE Returns

Size: Select [Size Chart](#)

Color: Ballet Combo

- Shell Fabric: 100% Cotton; Combo Fabric: 99% Cotton, 1% Spandex
- Imported
- Dry Clean Only
- Floral chiffon blouse
- Open neckline



People Women's Body Blouse Top  
★★★★☆ 4 customer reviews

Suggested price: ₹-699.00  
Sale: ₹ 558.00 Details  
You Save: ₹ 141.00 (20%)  
Inclusive of all taxes

Fit: As expected (66%)

Size: Select [Size Chart](#)

100% Polyester front, 70% cotton and 30% Polyester

- Body blouse
- Sleeveless
- Floral



Keep your look lively wearing this pink coloured top by La Zoire. Fashioned using georgette, this top will keep you at comfort all day long. Pair this top with black denims to get endless compliments.

Neck	Mandarin Collar
Fit	Regular
Wash Care	Handwash with like colors Dry in shade Do not wrin
Color	Pink
Fabric Details	Georgette
Style	Printed
SKU	LA313WA44OBJINDFAS


Pepe Women Pink Printed Regular Fit Shirt

₹1,799 ₹900 50%

Select Color:

Select Size: S M [Size Guide](#)

Save For Later



**Style Tip**

“ Style this shirt with a pair of jeans and pumps. Add on a pair of sunglasses and sling on a handbag for a modish look. ”

**Info & Care**

**Details**  
Pink printed shirt, has a spread collar, full button placket, long sleeves with button cuffs, patch pocket on the front, curved hemline, extended back hem, button closures on either side of the hems

**Size & Fit**  
The model (height 5'8" and chest 35") is wearing a size S

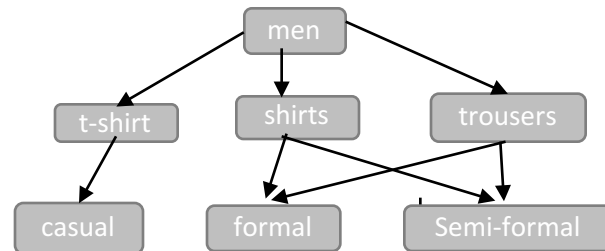
**Material and Care**  
100% cotton; Machine-wash

**More Info**  
Stylecode: PEPEA16AWWWSH9164922

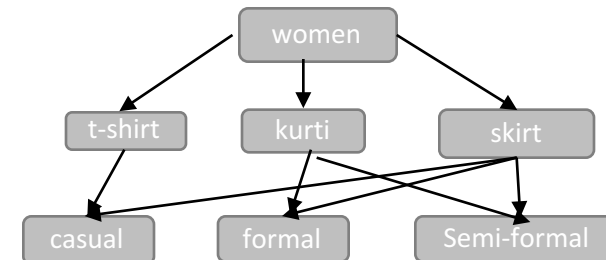
# Domain Knowledge Curation

- Creating a hand-crafted taxonomy of the different types of fashion items.

```
man>apparel>layer_3_upper_body>sweater>turtleneck,turtle neck
man>apparel>layer_3_upper_body>jacket>quilted jacket
man > apparel > layer-2-lower-body>trouser>formal-trousers, dressed pants
man>apparel>layer_2_lower_body>joggers,jogger
man>apparel>layer_2_lower_body>shorts,half-pants
man>apparel>layer_2_upper_body>knit shirt
man>apparel>layer_3_upper_body>jacket>tuxedo
man>footwear>shoes>formal shoes>spectators,spectator tip
man>apparel>layer_1_lower_body>socks>dress socks
man>footwear>shoes>casual shoes>high tops
man>footwear>shoes>casual shoes>boots>harness boots,harness boot
```



```
woman>apparel>layer_2_upper_body>top>crop top,midriff top
woman>apparel>layer_2_upper_body>blouse>pullover blouse
woman>apparel>layer_2_upper_body>woven shirt>casual shirt
woman>apparel>layer_2_lower_body>skirt>full skirt
woman>apparel>layer_2_lower_body>trousers>yoked pants
woman>apparel>layer_3_upper_body>sweater>argyle sweater
woman>apparel>layer_2_lower_body>trousers>peplum pants
woman>apparel>layer_2_whole_body>dress>wrapover dress
woman>footwear>flats>clog,clogs
woman>footwear>heels>platform,platform heels
woman>footwear>boots>tanker boots,tanker boot
```



# Domain Knowledge Curation

- Identifying attributes for different fashion items

**Apparel** Collar, Color, Cuff, Cut, Material, Fit, Button, Shape, Type, Style, Size, Length, Jeans style, Pleats, Pocket, Print, Neck, Sleeves, Weave

**Shoes** Sole Material, Upper Material, Toe, Tip, Closure, Heel, Fit

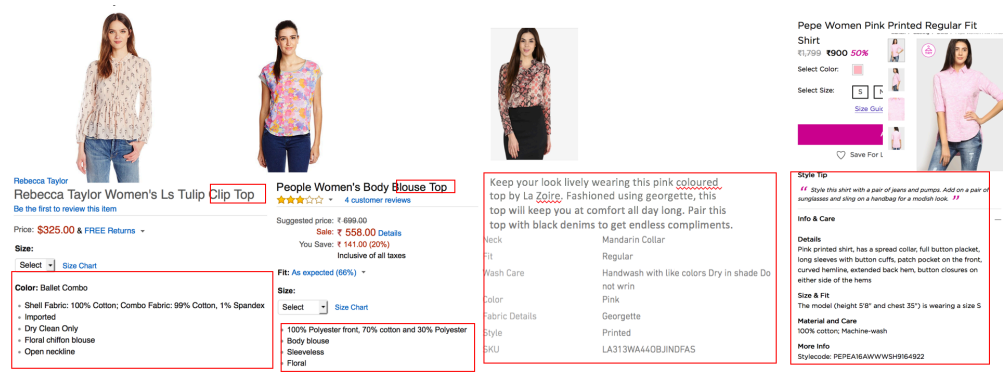
**Spectacles** Lens material, Frame material, Rim, Color, Frame color

**Watch** Movement Type, Band color, Band material, Water Resistance, Warranty, Dial color, Dial glass material

**Bag/Wallet** Material, Card slots, Pocket, Dimension, Color

# Domain Knowledge Curation

- Constructing a distribution of attributes and their values for each of the fashion synsets, from the structured catalog data



man>apparel>layer\_3\_upper\_body>sweater>turtleneck,turtle neck  
man>apparel>layer\_3\_upper\_body>jacket>quilted jacket  
man>apparel>layer\_2\_lower\_body>joggers,jogger  
...  
man>apparel>layer\_1\_lower\_body>socks>dress socks  
man>footwear>shoes>casual shoes>high tops  
man>footwear>shoes>casual shoes>boots>harness

woman>apparel>layer\_2\_upper\_body>top>crop top  
woman>apparel>layer\_2\_upper\_body>blouse>pullover blouse  
woman>apparel>layer\_2\_upper\_body>woven shirt>casual shirt  
...  
woman>apparel>layer\_2\_whole\_body>dress>wrapover dress  
woman>footwear>flats>clog,clogs  
woman>footwear>boots>tanker boots,tanker boot

**Apparel** Collar, Color, Cuff, Cut, Material, Fit, Button, Shape, Type, Style, Size, Length, Jeans style, Pleats, Pocket, Print, Neck, Sleeves, Weave  
**Shoes** Sole Material, Upper Material, Toe, Tip, Closure, Heel, Fit  
**Spectacles** Lens material, Frame material, Rim, Color, Frame color  
**Watch** Movement Type, Band color, Band material, Water Resistance, Warranty, Dial color, Dial glass material  
**Bag/Wallet** Material, Card slots, Pocket, Dimension, Color

## Crop top:

*style: casual:0.3, 90s:0.3, stylish:0.3, ...*  
*material: Cotton:0.5, silk:0.5*

## Tanker boot:

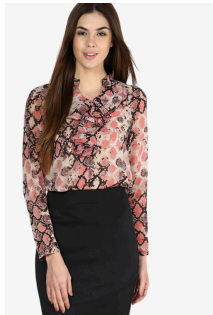
*sole material: Rubber:0.5, Leather:0.5*  
*upper material: Leather:0.5, PU:0.5*

## Aviator Spects:

*frame material: Plastic:0.5, Carbon:0.5*  
*rim type: angular:0.5, aviator:0.5, funky:0.3*

# Domain Knowledge Curation

- From the unstructured product description in the catalog, spotting and extracting style-tip information (e.g. black trousers go well with white shirt)



Keep your look lively wearing this pink coloured top by La Zoire. Fashioned using georgette, this top will keep you at comfort all day long. Pair this top with black denims to get endless compliments.

Neck	Mandarin Collar
Fit	Regular
Wash Care	Handwash with like colors Dry in shade Do not wrin
Color	Pink
Fabric Details	Georgette
Style	Printed
SKU	LA313WA440BJINDFAS

## Pink Top & Black Denims



Pepe Women Pink Printed Regular Fit Shirt

₹1,799 ₹900 50%

Select Color:



Select Size:

S

M

L

XL

[Size Guide](#)

Add to Bag

Save For Later

Share

### Style Tip

“ Style this shirt with a pair of jeans and pumps. Add on a pair of sunglasses and sling on a handbag for a modish look. ”

### Info & Care

#### Details

Pink printed shirt, has a spread collar, full button placket, long sleeves with button cuffs, patch pocket on the front, curved hemline, extended back hem, button closures on either side of the hems

#### Size & Fit

The model (height 5'8" and chest 35") is wearing a size S

#### Material and Care

100% cotton; Machine-wash

#### More Info

Stylecode: PEPEA16AWWWSH9164922

**Pink Shirt & Jeans**  
**Pink Shirt & Pumps**  
**Pink Shirt & Sunglasses**  
**Pink Shirt & Handbag**

# Domain Knowledge Curation

- Creating fashion profiles for celebrities based on the type of clothes and accessories worn or endorsed by them.
  - simulating a distribution of fashion synsets that each of these celebrities endorse
  - distribution of fashion attributes preferred by these celebrities for each of the fashion synsets.

## **Celebrity#1 Fashion Profile:**

Shoes:

Material: Vegan Leather:0.3, PU:0.3, Plastic:0.3

Jacket:

Material: Pseudo Leather: 0.3, Wool:0.3, PU:0.3

## **Celebrity#2 Fashion Profile:**

Lehenga:

Color: Earthy: 0.3, Dark: 0.3, Pastel: 0.3...

Saree:

Print: Monochrome:0.5, Contrast Dual: 0.5

Blouse:

Color: Contrast: 0.5, Shiny: 0.5

Sandal:

Color: Silver:0.3, Gold: 0.3

Material: Glossy

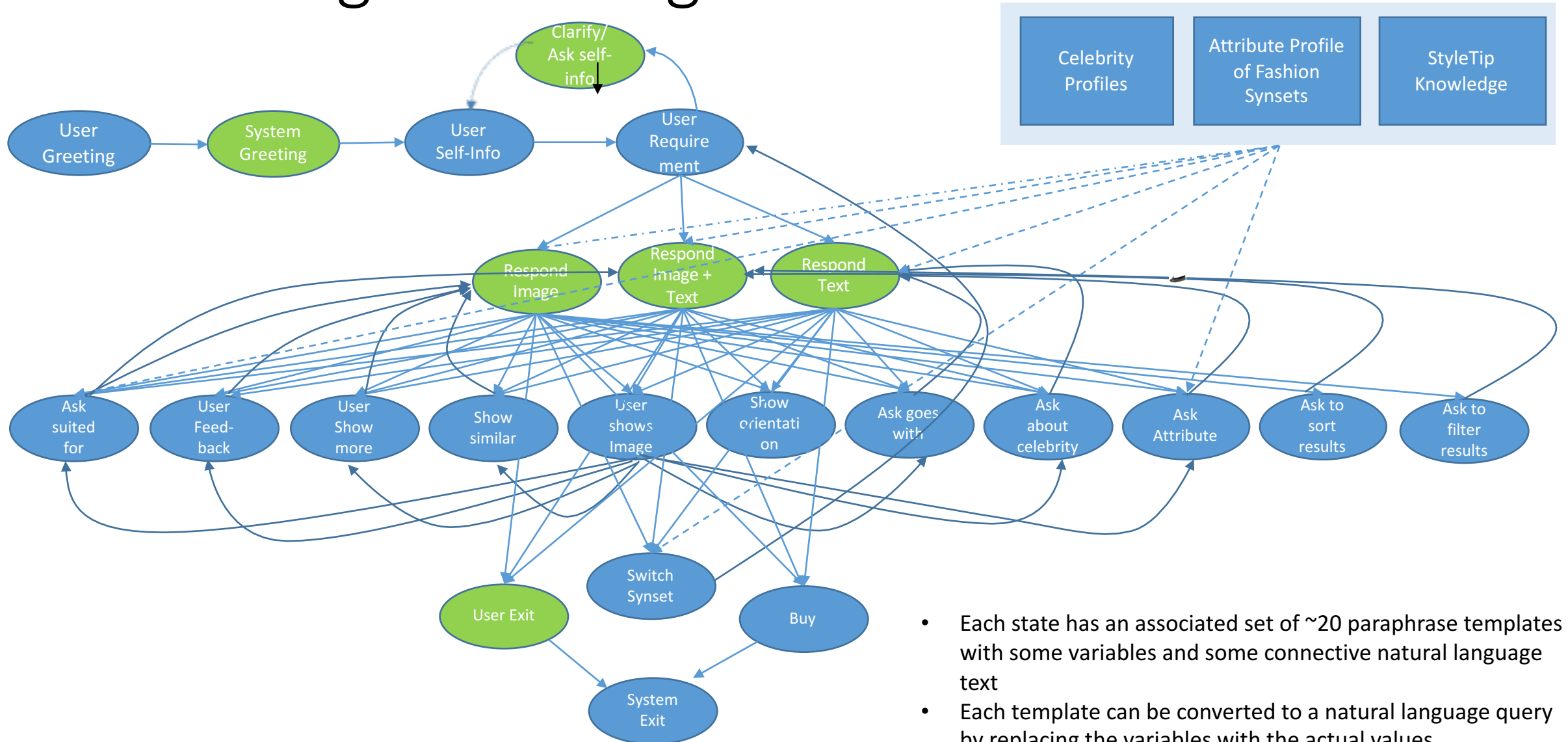


# Domain Knowledge Statistics

Knowledge Base Statistics		Examples
#Items Crawled	1.05M	-
Avg. #Images per item	4	-
#Fashion Synsets	716	shirt, trouser, tuxedo, loafer, stilletoes, sunglasses, handbag, earring
#Fashion Attributes	52	color, pattern, material, brand, style, dial material, band color, lens material, price, wash-care,
#Visual Fashion Attributes	45	color, pattern, material, style, neck, sleeves, length, sole type, closure
#Meta-Info Attributes	8	price, wash-care, product ranking, brand, size, suitable occasions
Avg. #Fashion Attribute per Synset	16	-
Avg. #values per attribute	4200	-
#Coarse-Grained StyleTips (Synset, Synset association)	8871	shirt & trouser, tshirt & sneakers, tuxedo & cufflinks, suit & formal shoes, kurta & jeans
#Fine-Grained StyleTips (Attribute Synset, Attribute Synset association)	350K	white shirt & black trousers, light t-shirt & dark jacket, black gown and silver stilletoes
#Celebrity profiles	411	Celeb1 likes vegan-leather shoes, monochrome pastel shaded t-shirts and polyester jackets
Avg. #Fashion Synsets endorsed by a celebrity	4	Celeb1 endorses lehenga, saree, blouse, kurti, sandals and stilettos.
Avg. #Celebrities endorsing a fashion synset	15	-
#Fashion Synsets endorsed by celebrities	252	-

## Statistics of the Domain Specific Knowledge Graph

# Simulating the Dialog Automata



# Details of Automata States

<b>Automata State</b>	<b>State Description</b>
<b>greeting</b>	Shopper greets
<b>self-info</b>	Shopper gives information about him/herself
<b>give-requirement</b>	Shopper describes his requirements
<b>give-feedback, show-more</b>	Shopper expresses preference towards one or more results in the context and possibly modifies his requirements and wants to see more
<b>give-feedback, show-image, show-more</b>	Shopper expresses preference towards one or more results shown currently or previously, and shows a new image to possibly modify his requirements and wants to see more
<b>show-orientation</b>	Shopper wants to see an item from different orientations
<b>show-similar</b>	Shopper wants to see similar to a particular item
<b>goes-with</b>	Shopper asks for style-tip
<b>ask-attribute</b>	Shopper asks about the attributes of the items shown
<b>suited-for</b>	Shopper asks for other types of meta-info about the items shown
<b>sort-results</b>	Shopper wants to sort the result set by some attribute
<b>filter-results</b>	Shopper wants to filter the results based on some attribute
<b>celebrity</b>	Shopper asks questions relating to some celebrities and his fashion items of interest
<b>switch-synset</b>	Shopper wants to switch back to the type of fashion synset he had seen previously
<b>buy</b>	Shopper wants to buy one or more items
<b>exit</b>	Shopper wants to exit

## Details of Automata States

# Complexities in the Dataset

Type of Complexity	Description	Example
<b>Long-Term Context</b>	At the beginning of the session the user mentions his budget or size preference and after a few utterances, asks the agent to show something under his budget or size	<i>I like the 4th image. Show me something like it but in style as in this image. I want to see only within my budget.</i>
<b>Quantitative Inference (Counting)</b>	User points to the $n$ th item displayed and asks a question about it	<i>Can you list images of the 1st result from all orientations?</i>
<b>Quantitative Inference (Sorting / Filtering)</b>	User asks to sort or filter from a list of items based on a numerical field, e.g. price or product rating	<i>I want to see only within my budget.</i>
<b>Logical Inference</b>	User likes one fashion attribute of the $n$ th image displayed but does not like another attribute of the same	<i>I am keen on seeing something similar to the 1st image but in a different sole material</i>
<b>Visual Inference</b>	User asks a question or expresses a preference towards a fashion attribute in an image	<i>List more in the upper material of the 5th image and style as the 3rd and the 5th</i>
<b>Inference over aggregate of Images</b>	User's question can have multiple aspects, drawn from multiple images displayed in the current or past context	<i>List more in the upper material of the 5th image and style as the 3rd and the 5th</i>
<b>Multimodal Inference</b>	User gives partial information in form of images and text in the context	<i>See the first espadrille. I wish to see more like it but in a silver colored type</i>
<b>Inference using domain knowledge and context</b>	Sometimes inferences for the user's questions go beyond the dialog context to understanding the domain	<i>Are the products in the 2nd and 3rd image suited for softer washing?</i>
<b>Coreference Resolution / Incomplete Question</b>	Temporal continuity between successive questions from the user may cause some of them to be incomplete or to refer to items or aspects previously talked about	<i>Can you list images of the 1st result from all orientations? ... And the 3rd one?</i>

**Anecdotal examples of different aspects of complexity in the MMD Dataset**

# Dataset Statistics

<b>Dataset Statistics</b>	<b>Train</b>	<b>Valid</b>	<b>Test</b>
#Dialogs(chat sessions)	105,439	22,595	22,595
Proportion in terms of dialogs	70%	15%	15%
Avg. #Utterances per dialog	40	40	40
#Utterances with shopper's questions	2080,115	446,610	445,472
#Utterances ending in agent's image response	904,233	194,645	193,446
#Utterances ending in agent's text response	1544,183	331,536	330,379
Avg. #Positive images in agent's image response	4	4	4
Avg. #Negative images in agent's image response	4	4	4
Avg. #Words in shopper's Question	12	12	12
Avg. #Words in agent's text Response	8	8	8
Avg. #Automata states per dialog	15	15	15
Avg. #Dialogs having a particular automata state	20,246	4,346	4,335
Avg. #Automata state-types per dialog	12	12	12
Avg. #dialogs having a particular state-type	59,638	12,806	12,764
#Automata states	83	83	83
#Automata state types	21	21	21
Vocabulary Size (threshold frequency <sub>i</sub> =2)	7328	-	-

**Multimodal Dialog Dataset Statistics**

# Dataset Quality Survey

- **Participants:** 16 domain experts
- **Task:** Asked to evaluate both whether the text portions of the dialog are natural sounding and meaningful and whether the images in the dialog are appropriate.
- **Rating:** 1 – 5
- **Types of Errors Recorded:**
  - minor errors i.e. conversational mistakes
  - severe error being logical mistakes

<b>% of Surveyed 760 Chat Sessions</b>	<b>Rating</b>	<b>Rating Chart</b>
42.0%	5	dialog is realistic with no errors
30.0%	4	$\leq 2$ Conversational Errors
19.2%	3	$\leq 2$ Conversational $\leq 2$ Logical Errors
6.8%	2	$\leq 2$ Conversational $\leq 4$ Logical Errors
2.0%	1	$> 2$ Conversational and $> 4$ Logical Errors

**Expert Ratings obtained in Qualitative Survey**



# Proposed Sub-Tasks for Multimodal Dialog

- **Text Response:** Given the context, generate the next text response.
- **Image Response:** Given the context, output the most relevant image(s).
  - **Image Retrieval:** Further given an image database, retrieve and rank n images based on their relevance
  - **Image Generation:** Generate an image most relevant to the context
- **Employing Domain-knowledge:** Performing the above tasks using both the unstructured dialog context along with the structured domain knowledge.
- **Modeling the User:** Different users have different shopping behavior; buying preferences, speed of decision making.

## • **Ideal Multimodal Conversation System**

- utilizing the context, decide the modality of the response, *i.e.*, text or an image
- generate a text/ image/multimodal response as required
- rank all the images in the catalog based on their contextual relevance

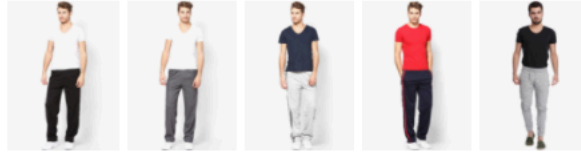
Model Prediction (Text Task)

**SHOPPER:** And what about celebrity cel\_334 for the 5th one?

**AGENT:** No.



**SHOPPER:** I dont like the 1st image . Show me something in material as in this image



**AGENT:**

**SHOPPER:** How about the trackpants in the 4th image? What will go well with it?

**AGENT:** It can go well with casual style, cotton fabrics t-shirt

**SHOPPER:** And what about with the 4th one?

**AGENT:** It can go well with lifestyle, silver colouring footwear and with sports style, white coloring, casual-sports type t-shirt

**PREDICTED:** it can go well with casual style

**AGENT:** Hello, is there anything i can help you with?

**SHOPPER:** I am looking for my uncle. his age is 40 years.

**AGENT:** Thanks for the information

**SHOPPER:** I am very much interested in going through your collection of training shoes within the range USD between 120.0 and 620.0 that i can gift him .

**AGENT:** Good!ill just take a quick scan through my catalog



**AGENT:**

**SHOPPER:** Does celebrity cel\_230 wear the kind of training shoes in the 4th image?

**AGENT:** Yes.

**PREDICTED:** Yes.

**SHOPPER:** I like the 4th image . Show me something like it but in brand as in this image . Can you please show within my budget



**AGENT:**



**SHOPPER:** Are the products in the 3rd and 5th images suited for casual style?

**AGENT:** Yes

**SHOPPER:** And what about the ones in the 2nd, 1st and 4th images?

**AGENT:** Yes

**PREDICTED:** Yes

**SHOPPER:** I like the 2nd sandals. Show me something similar to it but in suede soled type



**AGENT:**

**SHOPPER:** I dont like the 4th image . Show me something in material as in this image



**AGENT:**

**SHOPPER:** What is the 2nd images material ?

**AGENT:** The material in 2nd image is mesh

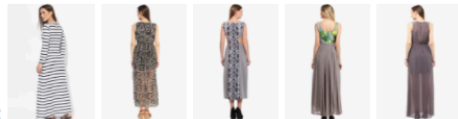
**PREDICTED:** The material in 2nd image is synthetic

**SHOPPER:** Show me items similar to the 3rd image



**AGENT:** The similar looking ones are

**SHOPPER:** I like these. Show me more in the color as in the 3rd image from what you had previously shown me in maxi dress



**AGENT:**

**SHOPPER:** What is the fit, collar and color in the 5th result?

**AGENT:** the maxi dress in the 5th image has grey color regular collar regular fit

**SHOPPER:** And what about weave and color in the 3rd one?

**AGENT:** the maxi dress in the 3rd image has grey color georgette weave

**PREDICTED:** the maxi dress in the 3rd image has black color georgette weave

Model Prediction (Image Task)

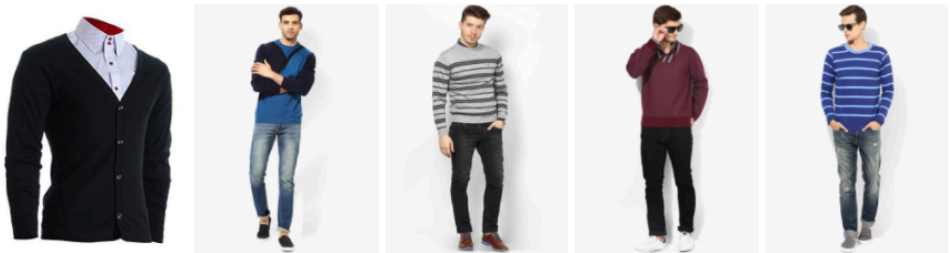


**AGENT:** The cardigan in the 4th image has basic style

**SHOPPER:** And in the 5th image?

**AGENT:** The cardigan in the 5th image has casual style

**SHOPPER:** No i dont like the 1st cardigan. Show me something in thats somewhat round in type



**AGENT:**



**SHOPPER:** Will the product in the 4th result go with the one in this image?

**AGENT:** No

**SHOPPER:** I dont like the 1st result . Show me something in print as in the 3rd image

**AGENT:**

Target  
Images



Cosine  
Similarity

0.95 0.92 0.89 0.83 0.2 0.18 -0.1 -0.19 -0.3 -0.39

**AGENT:** Great!



**AGENT:**

**SHOPPER:** What is the color and print in the 3rd result?

**AGENT:** the coat in the 3rd image has black color lace print

**SHOPPER:** And fit and color in the 1st one?

**AGENT:** the coat in the 1st image has blue color slim fit

**SHOPPER:** I like the 2nd image . Show me something like it but in material as in this image



**AGENT:**

Target  
Images

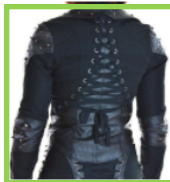
Cosine  
Similarity



0.87



0.52



0.41



-0.61



-0.78



-0.84

**SHOPPER:** Hello

**AGENT:** Hi, How can i help you today?

**SHOPPER:** I am buying for my buddy. she is 33-yr old.

**AGENT:** Great!

**SHOPPER:** I am interested in going through hand bag within INR 1400.0 that i can buy for her .

**AGENT:** Good!Got it. Just showing you in a minute

**AGENT:**

Target  
Images



0.92



0.63



0.75



0.74



0.63



0.6



0.58



-0.56

Cosine  
Similarity

# Example Simulated Dialogs

# Shopping Assistant ChatLog

**SHOPPER:** Good Morning

**AGENT:** Hello, please tell me what i can help you with?

**SHOPPER:** I want to buy some v-neck shaped casual-jacket in a regular fit that i can buy for my buddy .

**AGENT:** May i please ask the gender

**SHOPPER:** female

**SHOPPER:** she is 45 years of age.

**AGENT:** Great!

**AGENT:** Ill just take a few seconds to quickly browse through my catalog

**AGENT:** Sorry I cant find anything in v-neck but i can show you some in



different neck

**AGENT:** What you see in the 1st item, only women 100%cotton solid full sleeves casual jacket. About the third one, only women's 100%cotton 100%cotton egret jacquard regular fit long sleeves round neck casual jacket. And to describe the fourth item, people women's polyester outerwear.

**SHOPPER:** Can you show me something in thats like long in type. I dont like the 5th casual jacket.



**AGENT:**

**AGENT:** The first item, sport this cobalt sheer jacket with your basics.

**SHOPPER:** And how about the 3rd result complement? Will it go well with a blue colored jeans?

**AGENT:** Yes

**SHOPPER:** And sandals that looks brown coloured?

**AGENT:** Yes

**SHOPPER:** Which of the celebrities usually wear casual jacket similar looking to the one in the 4th image?

**AGENT:** celebrities cel\_1627 and cel\_2243 and cel\_3205 endorse this kind of casual jacket

**SHOPPER:** I am here to look for faux leather type sole material contained in sandal that i can gift her .



**AGENT:**

**AGENT:** To describe the 3rd item, day-to-night style just got easier. these wedge sandals give any look a lift with a strappy vamp and stud details.

**SHOPPER:** I like the kind of sandals usually worn by celebrity cel\_2036. Can you show more like those?



**AGENT:**

**AGENT:** In the 1st image, just imagine wearing these shoes showing your moves for everyone to see. And about the 5th item, leave an impression with strappy, gold heels!

**SHOPPER:** Does celebrity cel\_2036 endorse the kind of sandals in the 4th image?

**AGENT:** Yes.

**SHOPPER:** Can I have 2nd results images from some possible orientations

**AGENT:** Image from the front,right,back and left views respectively



**SHOPPER:** No i think ditch the sandals I want to go back and look at the casual jacket you had shown before

**SHOPPER:** Do you think is it style military in the 2nd image?

**AGENT:** No. The style in the 2nd image is casual

**SHOPPER:** And for the 3rd product as well?

**AGENT:** Yes.

**SHOPPER:** Will the product in the 3rd result justify the skirt constituted of



suede material in this image?

**AGENT:** Yes

**SHOPPER:** And how about pu leather type sole material contained in



mocassins in this image??

**AGENT:** No

**SHOPPER:** And, how about the style in the 4th image?

**AGENT:** The casual jacket in the 4th image has elegant and casual style

**SHOPPER:** What about this color ?

**AGENT:** The casual jacket in the 4th image has blue color

**SHOPPER:** I would like to see wrap-around with rise as mid that she would like .



**AGENT:**

**AGENT:** For the 1st item, this skirt features a buttoned front and flaunts an a-line silhouette.

**SHOPPER:** Does celebrity cel\_3187 usually wear the kind of skirt in the 1st image?

**AGENT:** No.

**SHOPPER:** Can you show me something in having material made in cotton. I dont like the 1st skirt.



**AGENT:**

**SHOPPER:** I want to buy the 1st one

**AGENT:** Sure. Thats a great choice



# Shopping Assistant ChatLog

**SHOPPER:** Good Morning

**AGENT:** Hello please tell me, anything i can help you with today?

**SHOPPER:** I am keen on looking at some of your best hand-bag that would suit me .

**AGENT:** It would help to also know your gender

**SHOPPER:** female

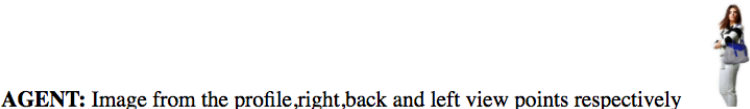
**AGENT:** Great!Showing you, just a minute



**AGENT:**

**AGENT:** Regarding the 2nd image, the mighty purse 2tone clutch is made of high-quality 100% genuine leather that is both fashionable and functional. And the fourth item, a gold pu material hand bag to accessorize your look in style.

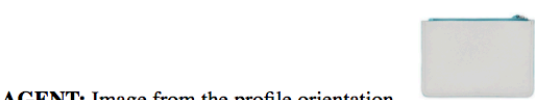
**SHOPPER:** Suggest me images of the 3rd result from all different directions



**AGENT:** Image from the profile,right,back and left view points respectively



**SHOPPER:** And how about for the 2nd image?



**AGENT:** Image from the profile orientation

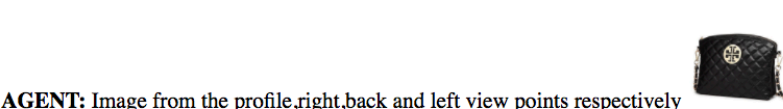
**SHOPPER:** Which of the celebrities wear similar looking hand bag as in the 2nd image?

**AGENT:** celebrity cel\_1627 endorses this kind of hand bag

**SHOPPER:** And as in the 3rd one?

**AGENT:** celebrities cel\_2555 and cel\_66 and cel\_860 endorse this kind of hand bag

**SHOPPER:** Can I have 1st results images from all possible orientations



**AGENT:** Image from the profile,right,back and left view points respectively



**SHOPPER:** And how about for the 5th product?

**AGENT:** Image from the profile,right,back and left view points respectively



**SHOPPER:** I dont like the 2nd result . Show me something in material as in the 3rd image



**AGENT:**

**AGENT:** About the first one, be it your intense winter look or a cheerful summer appearance, this black coloured handbag from lino perros will certainly do justice to both. And in the 2nd one, timeless designs, classic fashion, elegant looks are the hallmarks of heels & handles.

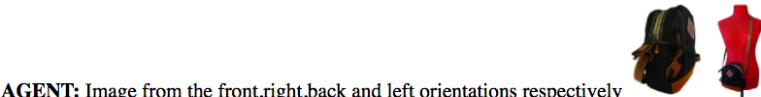
**SHOPPER:** I want to see more in the material similar to the 2nd image



**AGENT:**

**AGENT:** The 2nd item, carry your essentials in style with this red coloured handbag from the house of puma.

**SHOPPER:** Can you list images of the 1st result from all orientations?



**AGENT:** Image from the front,right,back and left orientations respectively



**SHOPPER:** What will pair well along with the 4th image?

**AGENT:** It can go well with aviator and cat-eye rimmed sunglasses and with black or silver coloring stilettos and with canvas sole, canvas and rubber material footwear

**SHOPPER:** And with the 4th one?

**AGENT:** It can go well with oxford and synthetic fabrics bag

**SHOPPER:** I would like to look for a few of your best ethnic styled bag .



**AGENT:**

**AGENT:** What you can see in the first item, this hobo bag is made of cotton.

**SHOPPER:** I like the kind of bag usually worn by celebrity cel\_1991. Can you show more like those?



**AGENT:**

**AGENT:** To describe the 5th one, it has many categories of functions pockets, can meet all your daily needs.

**SHOPPER:** How about a few more options in the material as in the 5th image?



**AGENT:**

**AGENT:** Regarding the third item, good and convenient for storing travel accessories or daily life or study gadgets. The fifth image, fill these totes with books or work out clothes or whatever you want, and become one of the many people using these stylish drawstring bags! And to describe the second item, 1 front pocket 2 side pockets. 2 handles on top for carry.

**SHOPPER:** I would like to look at your collection of velcro type closure shoe containing soles made out of suede of about INR 3200.0 for myself .

**AGENT:** Sorry I cant find anything in suede but would you like something in lace



**AGENT:** The first one, the lucky brand, rezdah platform wedge is incredibly lightweight and chic. The 3rd item, this fashionable synthetic leather high top lace up sneakers velcro strap comfortable high hidden heel and round toe wedge trainers in luxuriously. And what you see in the fourth image, the dr. comfort victory is and athletic shoe that has extra lightweight mesh and leather trainer with arch stabilizer for enhanced support.

**SHOPPER:** I like the sole material in the 4th product but not the fit. Please show me some more



**AGENT:**



**AGENT:** What you can see in the second image, padded collar and tongue offer additional support and comfort. And the fifth image, lightweight, man-made leather upper. all rubber traction spikes.

**SHOPPER:** I think i want to buy the 3rd one

**AGENT:** Absolutely, thats a great footwear

# Shopping Assistant ChatLog

**SHOPPER:** Hi

**AGENT:** Hi, anything i can help you with?

**SHOPPER:** I am very much keen on looking at a few of your best regular styled casual jacket in the range INR of 3700.0 - 4200.0 that i can buy for my son .

**SHOPPER:** he is 12 years of age.

**AGENT:** Great! Now ill be able to help you better

**AGENT:** Got it. Showing in a minute



**AGENT:**

**AGENT:** About the first one, exuding elegance and class, this black jacket by quiksilver will lend you a sophisticated look in no time.

**SHOPPER:** Show me images of the 4th result from all possible directions

**AGENT:** Image from the profile,right,back and left viewpoints respectively



**SHOPPER:** Can you show something similar to the 2nd image?



**AGENT:** The similar looking ones are



**SHOPPER:** Can you show me some more. I dont like the collar in the 5th image.



**AGENT:**

**AGENT:** In the 1st image, jordan boys slim fit polyester solid casual jacket.

**SHOPPER:** How about something similar to the 4th image?



**AGENT:** The similar looking ones are

**SHOPPER:** Does celebrity cel\_1635 usually wear the kind of casual jacket in the 1st image?

**AGENT:** Yes.

**SHOPPER:** What pocket would be suited for casual jacket in 1st and 2nd images ?

**AGENT:** The casual jacket in the 1st and 2nd images will suit well for multicoloured pocket

**SHOPPER:** What other apparels and accessories are usually endorsed by celebrity cel\_1001?

**AGENT:** navy coloring, embroidered patch neck, fibre/fabric or ceramics peacoat mostly

**SHOPPER:** And what about celebrity cel\_7685?

**AGENT:** celebrity cel\_7685 usually wears bomber fit crewneck

**SHOPPER:** How about something similar to the 2nd image?



**AGENT:** The similar looking ones are

**SHOPPER:** I liked the 1st casual jacket. Can I see something like it but in hooded type

**AGENT:** Sorry i dont think i have anything in 100% polyester but i can show



you in poly cotton

**AGENT:** About the first one, your style score will certainly deck up as you wear this grey coloured sweatshirt from the house of burton.

**SHOPPER:** Can I have images of the 1st result from all orientations?

**AGENT:** Image from the front,right,back and left view-points respectively



**SHOPPER:** This casual jacket will be suited by what style?

**AGENT:** It will suit well for fashionable and solid and military style

**SHOPPER:** Do you think that regular style be suited by casual jacket in the 1st image?

**AGENT:** Yes

**SHOPPER:** Will sports shoes go well with any of these?

**AGENT:** Yes

**SHOPPER:** Which of the celebrities usually wear similar looking casual jacket as in the 1st image?

**AGENT:** celebrity cel\_356 endorses this kind of casual jacket



**AGENT:**

**AGENT:** About the first one, a pair of round toed cockpit sport shoes for men, has central lace up and low top styling . The second one, modi brothers is a well-known firm for selling all type of brands in footwear which includes sports shoes, slippers, floaters & sandals for both men & women. And what you see in the 4th one, this is a high performance pair of shoes meant for everyday use in running , walking , gymming.

**SHOPPER:** Id like to see something similar to the 1st image but in a different style



**AGENT:** The similar looking ones are

**SHOPPER:** Thanks all this was very helpful

**AGENT:** Absolutely



# Shopping Assistant ChatLog

**SHOPPER:** Hi

**AGENT:** Hi, please tell me, anything i can help you with?

**SHOPPER:** I am looking to buy for my brother who is 26 years of age.

**AGENT:** Thanks for the information

**SHOPPER:** I am keen on going through your collection of casual jacket holding mid rise for him .

**AGENT:** Absolutely. Ill just take a few seconds to quickly browse through my catalog of items



**AGENT:**

**AGENT:** Regarding the second item, gain some edge with this brown coloured casual jacket from the house of locomotive.

**SHOPPER:** Can you show something similar to the 2nd image?



**AGENT:** The similar looking ones are



**SHOPPER:** The 1st casual jacket looks catchy. Can I have something like it but that is somewhat khaki in color



**AGENT:**

**AGENT:** Regarding the second image, upgrade your layered look with this casual jacket from the house of duke.

**SHOPPER:** Did you check the collar in the 1st image? What is it?

**AGENT:** The casual jacket in the 1st image has regular collar

**SHOPPER:** Does celebrity cel\_356 wear the kind of casual jacket in the 1st image?

**AGENT:** Yes.

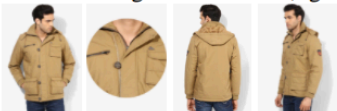
**SHOPPER:** From all orientations, show me few images of the 1st result

**AGENT:** Image from the front,right,back and left directions respectively

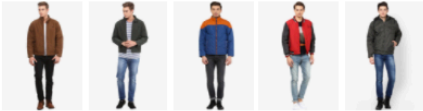


**SHOPPER:** And for the image 2nd?

**AGENT:** Image from the front,right,back and left orientations respectively



**SHOPPER:** Can you show me something in regular styled type. I dont like the 1st casual jacket.



**AGENT:**

**AGENT:** To describe the 1st image, add a touch of definition to an otherwise solid look with this coffee coloured casual jacket from the house of okane. And for the 4th image, score a dapper look in a snap with this red coloured casual jacket from the house of okane.

**SHOPPER:** I dont like the 3rd image . Show me something in material as in



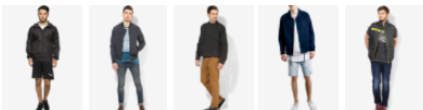
this image



**AGENT:**

**AGENT:** For the first one, add a touch of definition to an otherwise solid look with black casual jacket from locomotive.

**SHOPPER:** Can you show similar to what celebrity cel\_529 usually wears?



**AGENT:**

**AGENT:** What you can see in the 4th image, give your casual look a varsity inspired update with this navy blue nylon coach jacket completed with traditional collar, hem and elasticated cuff detailing. The first item, stack up your style against the rest with this black coloured casual jacket from the house of puma. And the 3rd image, look stylish and trendy wearing this dark grey coloured winter jacket for men from breakbounce.

**SHOPPER:** Which of the celebrities usually wear similar looking casual jacket as in the 5th image?

**AGENT:** celebrities cel\_1592 and cel\_1635 endorse this kind of casual jacket

**SHOPPER:** Will casual jacket be fitting for regular clean?

**AGENT:** Yes

**SHOPPER:** And for delicate hand?

**AGENT:** No

**SHOPPER:** How is the 2nd image?. Does it have the material polyester?

**AGENT:** Yes.

**SHOPPER:** This casual jacket would be suited for what?

**AGENT:** It can go well with classic and slim fit, classic graphic type, round and polo neck t-shirt

**SHOPPER:** Does celebrity cel\_3554 endorse the kind of casual jacket in the 2nd image?

**AGENT:** No.

**SHOPPER:** Will the slim fitting casual jacket in the 2nd result support the cotton or chino material trousers?

**AGENT:** Yes

**SHOPPER:** And the solid patterned casual jacket in this image with leather boots?

**AGENT:** Yes

**SHOPPER:** What style would be suited for casual jacket in 4th, 2nd and 3rd images ?

**AGENT:** The casual jacket in the 2nd and 4th and 3rd images will suit well for solid style

**SHOPPER:** Can you list images of the 4th result from all orientations?



**AGENT:** Image from the front and back viewpoints respectively



**SHOPPER:** By the way, how about the material in the 5th image?

**AGENT:** The casual jacket in the 5th image has solid material

**SHOPPER:** Thank you for showing me all this, i guess i will leave

**AGENT:** Do provide us a feedback on your experience. Bye



# Shopping Assistant ChatLog

**SHOPPER:** Hello

**AGENT:** Hello, please tell me what can i help you with today?

**SHOPPER:** I would love to look for a few cotton material voberry branded sports shoes fabricated with leather upper material .

**AGENT:** Absolutely. Showing you in just a minute

**AGENT:** Sorry i dont have any in voberry but would you like something in



**AGENT:** In the 1st image, great for playtime, school...whenever. And what you can see in the fifth one, men's lace up sneaker.

**SHOPPER:** Can you show something similar to the 5th image?



**SHOPPER:** Which of the celebrities wear similar looking sports shoes as in the 5th image?

**AGENT:** celebrities cel\_69 and cel\_2644 endorse this kind of sports shoes

**SHOPPER:** Suggest me images of the 2nd result from few different directions

**AGENT:** Sorry i couldnt find any other orientations for this image

**SHOPPER:** And for the product in the 4th result?

**AGENT:** Image from the profile,right,back and left point of views



respectively

**SHOPPER:** I am keen on seeing something similar to the 3rd image but in a different material



**AGENT:** The similar looking ones are

**SHOPPER:** Show me images of the 2nd result from few possible orientations

**AGENT:** Image from the profile,right,back and left orientations respectively



**SHOPPER:** What about the image in 1st?

**AGENT:** Image from the profile,right,back and left view points respectively



**SHOPPER:** So, do you think that a rucksack made in standard size go with any of these

**AGENT:** No none of the products here will go well with it

**SHOPPER:** And what do you think about running shoes containing the suede type soles?

**AGENT:** No none of the products here will go well with it

**SHOPPER:** And do you think that the sports shoes having casual style in the 1st result pair well with pink pocket in bottoms?

**AGENT:** Yes

**SHOPPER:** And the sneaker styled sports shoes in this image with mid jeans?

**AGENT:** Yes

**SHOPPER:** Will a classic fitting slip ons go with atleast one of these

**AGENT:** No none of the products here will go well with it

**SHOPPER:** What other apparels and accessories are usually worn by celebrity cel\_69?

**AGENT:** artificial silk or mesh pu fabrics casual shoes usually

**SHOPPER:** And what about celebrity cel\_2644?

**AGENT:** regular size-fit, denim canvas upper material, chic-eclectic style slippers mostly

**SHOPPER:** I want to buy chappals of delebao brand for myself .

**AGENT:** Sorry I cant find anything in delebao but would you like to see



**AGENT:** To describe the third image, the company offers several distinct shoe collections with more than 300 four-season footwear styles. And for the fourth image, looking for a basic flip? check out the chawaii.

**SHOPPER:** Which of the celebrities endorse similar looking slippers as in the 4th image?

**AGENT:** celebrities cel\_486 and cel\_2644 endorse this kind of slippers

**SHOPPER:** What material is it in the 1st image?

**AGENT:** The material in 1st image is rubber

**SHOPPER:** And in the 2nd image?

**AGENT:** The material in 2nd image is rubber

**SHOPPER:** I like the 1st one. I think ill buy that one

**AGENT:** Absolutely. I think thats a fabulous choice

# Shopping Assistant ChatLog

**SHOPPER:** Hello

**AGENT:** Hi, please tell me what i can help you with today?

**SHOPPER:** show me few of your top large sized rubber type upper material clogs that is mostly light pink in colored that i would like .

**AGENT:** Of course. Just wait a few seconds while i browse through my catalog

**AGENT:** Sorry i dont have any in pink but would you like to see some in



other color

**SHOPPER:** Please show me something similar to the 1st image but in a different upper material



**AGENT:** The similar looking ones are

**SHOPPER:** I like the 4th result . Show me something like it but in material as in the 1st image from what you had previously shown me in clogs



**AGENT:**



**AGENT:** About the 1st one, they have an optional back strap that can be worn either forwards over the foot or back at the heel. And in the 4th image, the clarks colony clog is perfect for those casual days when comfort is key.

**SHOPPER:** I dont like the 4th image . Show me something in style as in this



image

**AGENT:**



**AGENT:** About the second one, a beautiful pair of classic swedish wooden clogs in thick wax tan leather.

**SHOPPER:** Show me items similar to the 4th image



**AGENT:** The similar looking ones are

**SHOPPER:** See the 2nd clogs. Can I have more like it but in white colored type



**AGENT:**

**AGENT:** To describe the first one, happy feet and a stylish you is the promise that crocs makes with these 'classic clogs' in white.

**SHOPPER:** Id like to see something similar to the 1st image but in a different sole material

**AGENT:** The similar looking ones are



**SHOPPER:** What style would be suited for clogs in 3rd and 5th images ?

**AGENT:** The clogs in the 3rd and 5th images will suit well for classic style

**SHOPPER:** Will clogs be ideal for gorgeous style?

**AGENT:** Yes

**SHOPPER:** What do you feel about the silver coloured clogs in the 5th image? Will it go with footwear?

**AGENT:** Yes

**SHOPPER:** And how about with knitwear?

**AGENT:** No

**SHOPPER:** I like the style in the 2nd product but not the material. Please show me some more



**AGENT:**



**AGENT:** About the third one, we've updated a favorite with a new look, but kept the same crocs comfort inside.

**SHOPPER:** Can you show me shoe having outsole type tip that i might like .



**AGENT:**



**AGENT:** About the fourth image, expertly crafted from canvas and leather, these veranda a-line espadrilles from tory burch are the perfect refresher for your shoe collection. And the 2nd image, the air jordan 12 retro big kids' shoe is a hardwood original with radiant style.

**SHOPPER:** What is the color, upper material and sole material in the 4th result?

**AGENT:** the footwear in the 4th image has ivory color canvas upper material rubber sole material

**SHOPPER:** Which of the celebrities usually wear similar looking footwear as in the 4th image?

**AGENT:** celebrities cel\_1491 and cel\_2036 and cel\_2715 endorse this kind of footwear

**SHOPPER:** And how about as in 5th?

**AGENT:** celebrity cel\_2728 endorses this kind of footwear

**SHOPPER:** I think ill buy the 5th one

**AGENT:** Great. I think thats a great choice



# Shopping Assistant ChatLog

**SHOPPER:** Good Morning

**AGENT:** Hi, tell me how i can help you?

**SHOPPER:** Can you show me acrylic material benie designed with hand type patterns .

**SHOPPER:** I am a female, 24 years old

**AGENT:** Oh. Good

**AGENT:** Ill just take a few seconds to search quickly through my catalog

**AGENT:** Sorry i dont think i have anything in hand but would you like



something in chain

**SHOPPER:** Show me images of the 1st result from all possible directions

**AGENT:** Sorry i couldnt find any other orientations for this image

**SHOPPER:** What print is it in the result 1st?

**AGENT:** The beanies in the 1st image has chain print

**SHOPPER:** Can you show me something similar to the 1st image but in a different fit



**AGENT:** The similar looking ones are



**SHOPPER:** I did not find it much interesting.Show me more.



**AGENT:**

**SHOPPER:** These look awesome. How about few more in the material as in the 3rd image?

**AGENT:** Sorry i dont think i have any 100% acrylic but i can show you in



knit

**SHOPPER:** Show me something similar to the 4th image but with the material different



**AGENT:** The similar looking ones are



**SHOPPER:** I like the material in the 3rd one but not the color. I want to see a few more which match that criteria



**AGENT:**

**SHOPPER:** I like the 1st image . Show me something like it but in style as in



this image

**AGENT:** Sorry i dont think i have anything in trendy but would you be



interested in seeing some in punk

**SHOPPER:** can you sort these by best seller ranking



**AGENT:**

**SHOPPER:** Show me something similar to the 1st image but with the style different



**AGENT:** The similar looking ones are



**SHOPPER:** Does celebrity cel\_2715 usually wear the kind of beanies in the 3rd image?

**AGENT:** No.

**SHOPPER:** And what about celebrity cel\_1558 for the 2nd one?

**AGENT:** No.

**SHOPPER:** Does celebrity cel\_103 usually wear the kind of beanies in the 1st image?

**AGENT:** No. But Celebrities cel\_11 and cel\_45 endorse this type of beanies

**SHOPPER:** And what about celebrity cel\_1104 for the 4th?

**AGENT:** Yes.

**SHOPPER:** This was great, i guess i am done

**AGENT:** Sure. Bye

# Shopping Assistant ChatLog

**SHOPPER:** Good Morning

**AGENT:** Hello, what i can help you with today?

**SHOPPER:** I want to look at a few of your best black coloured denim jacket above USD 200.0 .

**AGENT:** It would help to also know your gender

**SHOPPER:** male

**SHOPPER:** I am 28 years of age.

**AGENT:** Thanks, this helpful

**AGENT:** Sorry i dont think i have anything in black but would you like



something in light blue

**AGENT:** See the third one, zshow men's denim bomber jacket aims to provide good fashion product to every customer.

**SHOPPER:** I dont like the 2nd image . Show me something in fit as in this



image



**AGENT:**

**AGENT:** In the fifth item, score a dapper look in a snap with this navy blue coloured denim jacket from the house of ripfly. And to describe the fourth one, look cool and trendy by wearing this denim jacket for men from pepe jeans.

**SHOPPER:** These results will be matched by what all items?

**AGENT:** It can go well with printed fabrics, blue burgundy coloured t-shirt and with black coloured, slim jeans

**SHOPPER:** Show me something like the one in 1st image



**AGENT:** The similar looking ones are



**SHOPPER:** What is the fit in the 6th and 5th images?

**AGENT:** The fit of the denim jacket is regular in the 5th and 6th image

**SHOPPER:** Which of the celebrities usually wear denim jacket similar looking to the one in the 7th image?

**AGENT:** celebrities cel\_777 and cel\_6 endorse this kind of denim jacket

**SHOPPER:** Show me something similar to the 8th image



**AGENT:** The similar looking ones are



**SHOPPER:** I would like to see a few of your best coverage patterned tee that is mostly vivid orange in colored .

**AGENT:** Sorry I couldnt find anything in coverage but would you be



interested in seeing some in hand

**AGENT:** The 1st one, fall in love with the soft texture adorning this orange coloured t-shirt from the house of invincible.

**SHOPPER:** These doesnt seem interesting. Show me more with rise as mid



**AGENT:**

**AGENT:** The 3rd item, 5500 chouinard adult ring-spun mid-weight tee choose your dyed-to-perfection style.

**SHOPPER:** What do you think about the 4th result? Is it suited for unique design style?

**AGENT:** No

**SHOPPER:** how about for regular wash cleaning?

**AGENT:** Yes

**SHOPPER:** What is the print and material in the 3rd result?

**AGENT:** the t-shirt in the 3rd image has ribbed print 100% cotton material

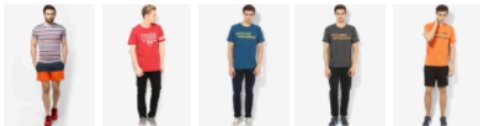
**SHOPPER:** And what about neck and type in the 1st one?

**AGENT:** the t-shirt in the 1st image has round type round neck

**SHOPPER:** What other apparels and accessories are usually endorsed by celebrity cel\_777?

**AGENT:** pink blue-dreamy colors henley

**SHOPPER:** I like the 2nd t-shirt. Show me something like it but in blended material type. Can you please show within my budget



**AGENT:**

**AGENT:** In the 3rd item, puma offers this blue coloured t-shirt that will be a stylish pick for urban men.

**SHOPPER:** I think i want to buy the 3rd one

**AGENT:** Absolutely. I think thats a fabulous choice Thank you for shopping with us

# Shopping Assistant ChatLog

**SHOPPER:** Good Morning

**AGENT:** Hi, please tell me, anything i can help you with today?

**SHOPPER:** I need to look for some of your best regular fit anarkali that i can gift my ma .

**SHOPPER:** she is 44 years of age.

**AGENT:** Ok. This helpful

**AGENT:** ill just quickly search through my catalog of fashion items



**AGENT:**

**AGENT:** The third item, hand block printed anarkali kurti. What you see in the fourth item, trishaa by pantaloons womens casual churidar kurta dupatta. And in the second one, mustard coloured suit set. tailored from polyester, this set comprises a flared kurta with a band collar and 3/4th sleeves.

**SHOPPER:** What is the fit in the 2nd image?

**AGENT:** The fit in 2nd image is regular fit

**SHOPPER:** And how about the material?

**AGENT:** The material in 2nd image is polyester

**SHOPPER:** Which of the celebrities usually wear similar looking kurta as in the 4th image?

**AGENT:** celebrities cel\_22 and cel\_41 endorse this kind of kurta

**SHOPPER:** Show me more images of the 1st product in some different orientations

**AGENT:** Image from the right and back directions respectively



**SHOPPER:** And for the result in the 4th image?

**AGENT:** Image from the profile,back and left viewpoints respectively



**SHOPPER:** I like the material in the 2nd image but i dont like the fit. Can you show me some more



**AGENT:**

**AGENT:** About the 1st item, sparkle this festive season by wearing this suit set for women from biba. To describe the 3rd item, lime green coloured suit set. tailored from polyester, this set comprises a sleeveless kurta with a band collar and button placket. And what you see in the 4th image, gorgeously mesmerising is what you will look at the next social function as you wear this suit set from the house of juniper.

**SHOPPER:** Can you show something similar to the 1st image?

**AGENT:** The similar looking ones are



**SHOPPER:** These doesnt match my taste. Please show me more thats somewhat hip length



**AGENT:**

**AGENT:** For the 2nd item, pull together a chic look by wearing kurta salwar set by soup. And about the 5th image, be the cynosure of all eyes when you wear this red coloured suit set by faireno.

**SHOPPER:** please show sorted by review rating

**AGENT:** Sorry i do not have the review rating information for these

**SHOPPER:** This was great, i guess i am done

**AGENT:** Glad to know it was helpful



# Shopping Assistant ChatLog

**SHOPPER:** Hi

**AGENT:** Hi, is there anything i can help you with?

**SHOPPER:** I would like to look at a few of your best mid rise churidar with a comfort fit .

**AGENT:** Of course. Just wait a few seconds while i take a quick scan through my catalog

**AGENT:** Sorry i dont seem to have anything in comfort fit but i can show



you some in other fit

**AGENT:** See the 5th image, keep everyday glamour handy with this ecru pin tuck kurti that can astutely wander from being classy work wear to understated party wear when paired rightly.

**SHOPPER:** I dont like the 3rd result . Show me something in rise as in the 4th image



**AGENT:**

**AGENT:** What you see in the 2nd item, keep everyday glamour handy with this fuchsia pin tuck kurti that can astutely wander from being classy work wear to understated party wear when paired rightly. And the 3rd image, the soulful hues of beige and pink coupled with a stylish layered silhouette weave a magic of elegance and poise.

**SHOPPER:** I like the material in the 4th one but not the rise. I want to see a few more which match that criteria



**AGENT:**

**AGENT:** To describe the 1st item, multi colour georgette & velvet salwar kameez with anarkali style and amazing embroidery work on kameez.

**SHOPPER:** What is the style and weave in the 3rd result?

**AGENT:** the kurti in the 3rd image has party style chiffon weave

**SHOPPER:** From all orientations, show me few images of the 1st result

**AGENT:** Sorry i couldnt find any other orientations for this image

**SHOPPER:** And for the result 3rd?



**AGENT:** Image from the front direction

**SHOPPER:** Will kurti in the 4th image go with multicoloured pocket?

**AGENT:** Yes

**SHOPPER:** And how about for cargo?

**AGENT:** No

**SHOPPER:** Do you this it weave georgette in the 2nd image?

**AGENT:** Yes.

**SHOPPER:** And material georgette ?

**AGENT:** Yes.

**SHOPPER:** I dont like the 2nd result . Show me something in weave as in the 3rd image



**AGENT:**

**AGENT:** What you can see in the first item, gorgeously mesmerising is what you will look at the next social function as you wear this suit set from the house of juniper.

**SHOPPER:** I do not like these. Show me more



**AGENT:**

**AGENT:** What you see in the third one, unstitched long anarkali party ethnic anarkali style pakistani suit indian salwar? kameez for all party needs.

**SHOPPER:** Can you list images of the 5th result from all orientations?

**AGENT:** Sorry i couldnt find any other orientations for this image

**SHOPPER:** What is the material in the 3rd and 1st images?

**AGENT:** The material of the kurti is net in the 1st image; georgette in the 3rd image

**SHOPPER:** And what care?

**AGENT:** The kurti in the 5th and 4th images will suit well for machine and normal and regular care

**SHOPPER:** Do you think that the product in the 3rd image pair well with jeans?

**AGENT:** Yes

**SHOPPER:** And what about with sandals?

**AGENT:** Yes

**SHOPPER:** I like the 3rd one. I think ill buy that one

**AGENT:** Absolutely! Thank you for shopping with us

# Shopping Assistant ChatLog

**SHOPPER:** Good Morning

**AGENT:** Hello, is there anything i can help you with?

**SHOPPER:** I am very much interested in shopping for xl sized culotes that would suit me .

**AGENT:** Absolutely. Just give me a few seconds to browse through my catalog



**AGENT:**

**AGENT:** What you can see in the 1st item, mocking bird multi coloured pants made from polyester. About the fifth item, be a trendsetter among your friends by flaunt these black culottes by miaminx. And what you see in the 4th one, shun the shackles of bygone fashion wearing grey coloured culotte by yepme.

**SHOPPER:** What style would be suited for dungaree in 2nd, 3rd and 4th images ?

**AGENT:** The dungaree in the 2nd and 3rd and 4th images will suit well for these style

**SHOPPER:** What is the material and print in the 5th result?

**AGENT:** the dungaree in the 5th image has hand print 100% polyester material

**SHOPPER:** I am keen on seeing something similar to the 4th image but in a different print



**AGENT:** The similar looking ones are



**SHOPPER:** Will dungaree be complementary for soft cleaning?

**AGENT:** No

**SHOPPER:** what about urban life style?

**AGENT:** No

**SHOPPER:** Show me more images of the 2nd product in some different orientations

**AGENT:** Sorry i couldnt find any other orientations for this image

**SHOPPER:** And what about the 1st result?

**AGENT:** Image from the profile,back and left point of views respectively



**SHOPPER:** I like the fit in the 5th one but not the material. I want to see a few more which match that criteria



**AGENT:**

**AGENT:** In the fifth item, funky and cool, these monochrome culottes come from missguided. For the second image, take a more relaxed approach towards fashion as you wear this trousers from the house of liebemode. And what you can see in the third one, make a new fashion statement by wearing these black coloured culottes for women from missguided.

**SHOPPER:** Show me more in the type as in the 2nd image from what you had previously shown me in dungaree

**AGENT:** Sorry i dont seem to have anything in regular but would you like to see some in others

**SHOPPER:** Which of these are in my size?

**AGENT:** Sorry none of the products satisfy your constraints from the old set

**AGENT:** Here are some new results.



**AGENT:**

**AGENT:** For the second item, mocking bird multi coloured pants made from polyester. What you can see in the 3rd item, the culotte has become a vince. customer staple for its chic combination of ease and polish. And about the fourth image, upgrade your staple look as you wear these capris, in black coloured, from the house of faballey.

**SHOPPER:** Can you give the color in the 4th image?

**AGENT:** The dungaree in the 4th image has solid and black color

**SHOPPER:** Which of the celebrities usually wear similar looking dungaree as in the 5th image?

**AGENT:** celebrities cel\_100 and cel\_2126 endorse this kind of dungaree

**SHOPPER:** Will dungaree be complementary for unquie style?

**AGENT:** No

**SHOPPER:** Does celebrity cel\_68 endorse the kind of dungaree in the 1st image?

**AGENT:** Yes.

**SHOPPER:** I want to buy the 1st one

**AGENT:** Sure. Thats a great dungaree Thanks for shopping with us.



# Shopping Assistant ChatLog

**SHOPPER:** Hi there

**AGENT:** Hello, what i can help you with?

**SHOPPER:** Hi, Can you show me some party styled muffler that would suit me .

**AGENT:** May i please ask your gender

**SHOPPER:** female

**SHOPPER:** I am a woman 25 years of age

**AGENT:** Ok great! this helpful

**AGENT:** let me just quickly scan through my catalogue

**AGENT:**



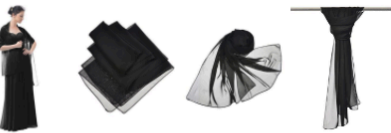
**SHOPPER:** Can I have 3rd results images from all possible orientations

**AGENT:** Image from the profile,back and left orientations respectively



**SHOPPER:** And for the result in the 2nd image?

**AGENT:** Image from the profile,right,back and left orientations respectively



**SHOPPER:** Will scarf in the 3rd image complement outdoor style?

**AGENT:** Yes

**SHOPPER:** What style would be suited for scarf in 5th, 4th and 2nd images ?

**AGENT:** The scarf in the 4th and 5th and 2nd images will suit well for chic and ethnic and vibrant style

**SHOPPER:** I dont quite like the style in the 3rd one. Can you show me some more

**AGENT:**



**SHOPPER:** I want to see something similar to the 5th image but in a different material

**AGENT:** The similar looking ones are



**SHOPPER:** can you show these sorted by best seller ranking

**AGENT:**



**SHOPPER:** Will the product in the 3rd result agree with the black colored thermal in this image?



**AGENT:** No

**SHOPPER:** And with the classic fit footwear in this image?



**AGENT:** No

**SHOPPER:** Show me items similar to the 1st image

**AGENT:** The similar looking ones are



**SHOPPER:** Show some more in the style as in the result 4th?

**AGENT:**



**SHOPPER:** Im interested in buying the 5th one

**AGENT:** Great choice Hope you had a great shopping experience

# Shopping Assistant ChatLog

**SHOPPER:** Hi there

**AGENT:** Hi, anything i can help you with today?

**SHOPPER:** I am here to shop for tapered type casual trousers that my brother would like .

**SHOPPER:** he is 26 years of age.

**AGENT:** Oh. Good

**AGENT:** let me just make a quick search through my catalogue

**AGENT:**



**SHOPPER:** Are the products in the 5th, 1st and 2nd images suited for multicoloured pocketed?

**AGENT:** Yes

**SHOPPER:** And for melange?

**AGENT:** No

**SHOPPER:** Show me more images of the 3rd product in some different directions

**AGENT:** Sorry i couldnt find any other orientations for this image

**SHOPPER:** I dont like the 4th image . Show me something in fit as in this image



**AGENT:**



**SHOPPER:** I like the 4th image . Show me something like it but in material as in this image



**AGENT:**



**SHOPPER:** Does celebrity cel\_4362 wear the kind of casual trousers in the 5th image?

**AGENT:** Yes. Celebrity cel\_529 also endorses this type of casual trousers

**SHOPPER:** And what about celebrity cel\_646 for the 5th?

**AGENT:** Yes.

**SHOPPER:** Show me images of the 3rd result from all possible directions

**AGENT:** Sorry i couldnt find any other orientations for this image

**SHOPPER:** Show me something similar to the 2nd image but with the style different

**AGENT:** The similar looking ones are



**SHOPPER:** Does celebrity cel\_1241 endorse the kind of casual trousers in the 1st image?

**AGENT:** No. But Celebrities cel\_1916 and cel\_1216 endorse this type of casual trousers

**SHOPPER:** I dont like the 3rd result . Show me something in fit as in the 2nd image

**AGENT:**



**SHOPPER:** No i dont like the 4th casual trousers. Show me something in chino material type

**AGENT:**



**SHOPPER:** please sort these by price

**AGENT:**



**SHOPPER:** Thanks for showing me, bye

**AGENT:** You are most welcome