

## Extracting information by analyzing multi-thread conversations

### Background and Motivation:

The use case is to process multi-threaded conversations and extract information, specific to a domain and intended business task. The task at hand to assess multiple contexts in the conversation, understand the dialogue flow and utilize that in extracting information from the conversations.

### Context:

In a business setting, there are multiple conversational interactions within the company as well as with customers. For example, dialogue between a sales representative and a potential buyer, customer and customer support executive. These dialogues have information which can be extracted for further actioning, and can also be used to automate tasks and perform analytics for business decisions.

Since we are targeting free flow dialogue, to understand and maintain different context flow in a multi-threaded conversation is a crucial task. The attempt is to build a solution that can connect these contexts and is reflected in the extracted information, taking care of things like negotiations.

The possible data set used to build the model can include conversations from a business setting.

### References:

- <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.226.1734&rep=rep1&type=pdf>
- <https://onlinelibrary.wiley.com/doi/abs/10.1111/ijcs.12021>
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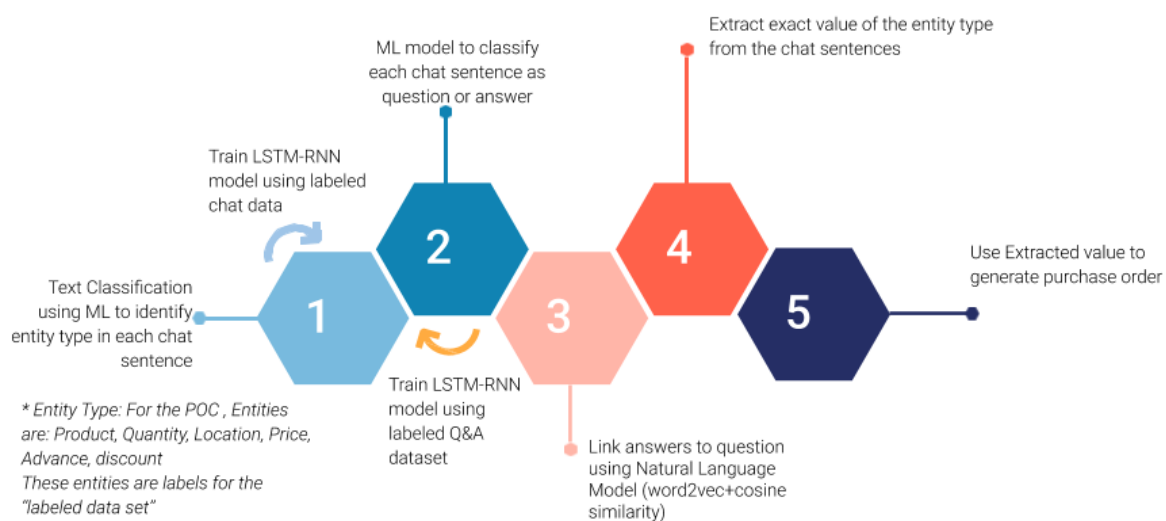
## Basic Model design for reference:

For a given domain and a given task

- Entity classification module: this aims at classifying sentences of the conversation into one of the entities that are key to a given task and a given domain.
  - Language classifiers based on seq2seq modelling can be used here. This is inclusive of state of art models like BERT.
- Question/ enquiry identification: a language classifier, to identify the queries in the conversation
  - Similar to the previous steps
- Language embedding analysis to link response to identified query
- Morphological analysis to extract exact information.

The output from each step is used to finally aggregate the desired information extraction. a sample output is shown in the image below. The context is a buyer-seller conversation for a possible purchase. The task is to generate a purchase order at the end of the conversation.

### Approach



## Data Sample

This Sample conversation is for a specific setting, to take an example use case. The conversation is between a buyer and a seller intending a purchase, and the processing engine can extract information for a given task.

This is a sample for both Problem statement(PS) 1&2. Similar conversions are needed to be generated for problem statement 2 and then can be utilized for training models in PS 1.

### Chat Samples: single thread- single product

start

Hi, I am looking for Iphone X charger

Sure, what is the quantity and location

I need 100 pieces delivered to Bangalore

Yes, we have this product

Can you give me a quotation

It will cost 1800

I think price is on higher side, can you make it 1500

Sorry, this price offer does not work out

end

=====END=====

=====START=====

start

Hey Xyz Electronics Manufacturer, do you supply Iphone X charger

How many pieces are you looking for? and where?

I need 100 pieces delivered to Bangalore

Sure, I can supply.

Can you give me a quotation

It will cost 1800

We will have a deal if the price is 1500

Sorry, your offer not acceptable

end

=====END=====

=====START=====

start

Hey Xyz Electronics Manufacturer, do you supply Iphone X charger

Sure, what is the quantity and location

I need 100 pieces delivered to Bangalore

Sure, I can supply.

What is the cost

Our price would be 1800

Great, Lets finalize on this

end

=====END=====

=====START=====

start

Hi, I am looking to buy Iphone X charger

Sure, what is the quantity and location

Can you deliver 100 to Bangalore

Sorry, product is out of stock

end

=====END=====

=====START=====

start

Hi, I am looking to buy Iphone X charger

Sure, what is the quantity and location

I need 100 pieces delivered to Bangalore

Sorry, I don't sell this product anymore

end

=====END=====

=====START=====

start

Hi, I am looking to buy Iphone X charger

How many pieces are you looking for? and where?

I need 100 pieces delivered to Bangalore

Sure, I can supply.

What is the cost

Our price would be 1800

We will have a deal if the price is 1500

Ok, we have a deal

end

=====END=====

=====START=====

start

Hi, I am looking to buy Iphone X charger

Sure, what is the quantity and location

Can you deliver 100 to Bangalore

Sorry, product is out of stock

end

=====END=====

=====START=====

start

Hey Xyz Electronics Manufacturer, do you supply Iphone X charger

Sure, what is the quantity and location

I need 100 pieces delivered to Bangalore

Sorry, I don't sell this product anymore

end

=====END=====

=====START=====

start

Hi, I am looking to buy Iphone X charger

How many pieces are you looking for? and where?

Can you deliver 100 to Bangalore

Sorry, I don't sell this product anymore

end

=====END=====

=====START=====

start

Hi, I am looking for Iphone X charger

How many pieces are you looking for? and where?

I need 100 pieces delivered to Bangalore

Sure, I can supply.

Can you give me a quotation

It will cost 1800

Is that your final price?, I expect some discount

My final price would be 1700

I don't think this price point works for me , thanks for your time

end

=====END=====

=====START=====

start

Hey Xyz Electronics Manufacturer, do you supply Iphone X charger

How many pieces are you looking for? and where?

Can you deliver 100 to Bangalore

Sorry, product is out of stock

end

=====END=====

## Chat Sample : multi thread- multi product

=====START=====

Hi I am Looking for Iphone X and its headphone

Okay, How many you need

I would need 100 iPhones and 40 headphones

I want it delivered at koromangla bangaluru

Sure

It will cost you 30k each for iPhones and 1500 for headphones

Headphones are costly.

Give it to me for 1000 each

1200 is the last price i can give you.

Okay , but at-least give me some overall discount

Of you take 30 more headphones i can offer a 10 % off overall

10 is less , at-least give 15

Okay, but only if you order 70

Okay i will order additional headphones.

fine, i will send the package after 10 % advance payment

okay

=====END=====

=====START=====

I want to buy 200 cotton shirts and 5000 white buttons

Okay.

But I only have 150 shirts in stock at the moment.

Okay , will work for now.

What is their cost

150 per shirt and 5 rupees per pair buttons

I will easily get it at 100 per shirt. Can you lower your price.

No.

At max, I can give you some overall discount.

How much  
10%  
Make it 12  
Okay.  
What is your location  
Marathalli, bengaluru.  
Fine. Will send the items.  
=====END=====

=====START=====

Hi, do you sell office tables.  
Yes, how many are you looking for  
100.  
I need chairs also  
Okay  
What is the price  
2K for chairs, 3K for tables  
I will also need an advance.  
Your price is too high  
This is my last quote. At max I can give a 5 % overall discount if you buy 150 each.  
No that will not work.  
I need 100. You tell me your last rate.  
I will offer a 3% then, if its okay then fine , otherwise we can't have a deal.  
Okay, then let it be  
=====END=====

=====START=====

Hi I want tv units and sofa beds  
How many do you need  
I want 50 tv units and 30 sofa beds  
5K for tv units , small and 14000 for sofa bed  
I take 30% in advance and rest after delivery  
What about discount.  
I can give 10 % overall.  
Give separate rates, sofa beds are costly.  
Okay , will give 12 % on sofa beds  
Okay . Send it to indranagar , bengaluru.  
=====END=====