The Conversational Enterprise

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Agenda

The Conversational Enterprise

1. Conversational user intent across industries
2. Service Conversations Archetypes
3. NLP and ML Systems in Customer Service
4. Deep Dive - A Simple conversational model (CM)
5. Leveraging CM to build an Response Recommender for Service Agents

Enterprise Conversations - Scale

16 M
Conversations
Per Day

83 M
Knowledge
Article Views
Per Day

salesforce

Analyzing Service Interactions

/Conversational Intent by Industry

Bennett, Nasr, & Giang (2019)

Industries

From all the industries Salesforce operates in we selected 5 industries. These represent a wide diversity in vocabulary coupled with a high volume of conversation:

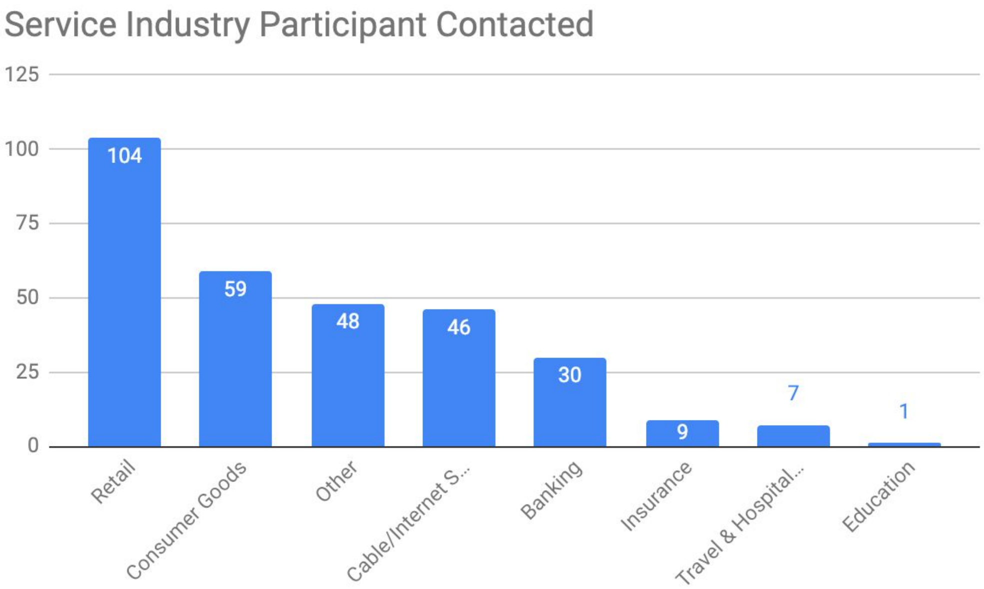
1. Retail
2. Banking
3. Consumer Goods
4. Insurance
5. Cable and ISP

Service industry contacted

Participants selected from 5 industries:

1. Retail
2. Banking
3. Consumer Goods
4. Insurance
5. Cable and ISP

The most common industry for which participants engaged customer support via chat was **retail**, indicating the value of conversational AI in this space.



N = 304

What We Found
(in order of frequency)

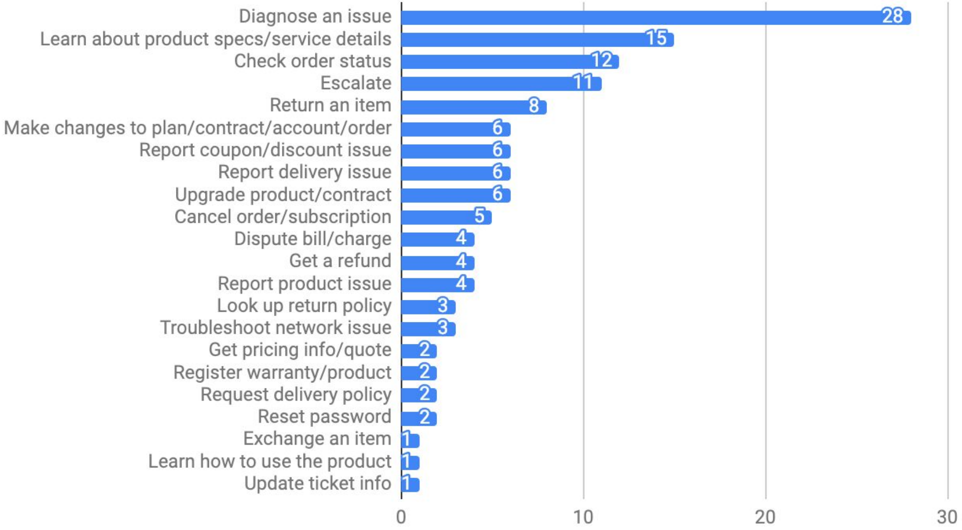
Retail

1. Learn about product specs/service details (34)
2. Check order status (25)
3. Return an item (23)

N = 103
Total Mentions = 191

Consumer Goods

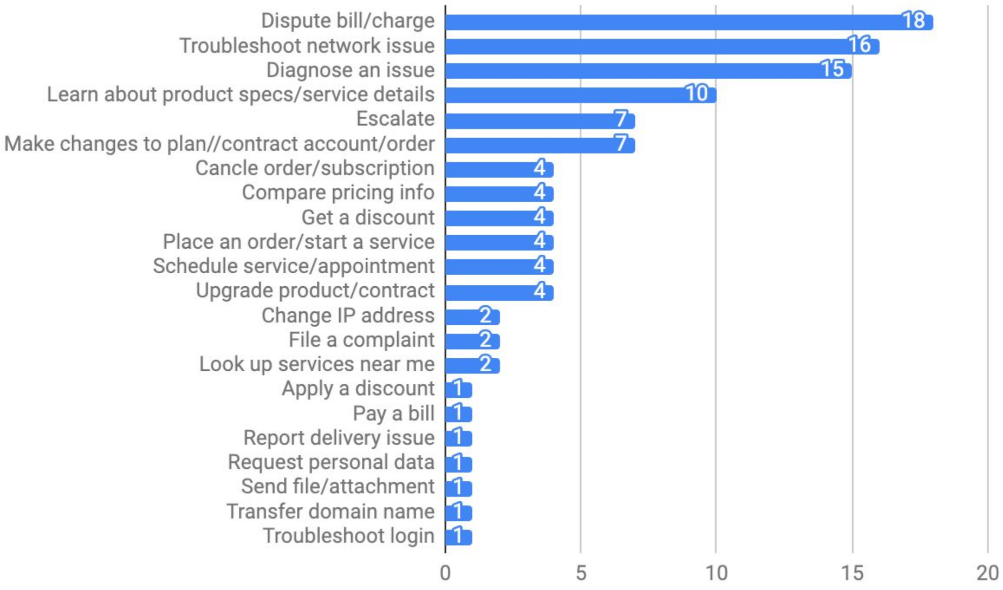
1. Diagnose an issue (28)*
2. Learn about product specs/service details (15)
3. Check order status (12)



N = 60
Total Mentions = 130

Cable & ISP

1. Dispute bill/charge (18)
2. Troubleshoot network issue (16)*
3. Diagnose an issue (15)

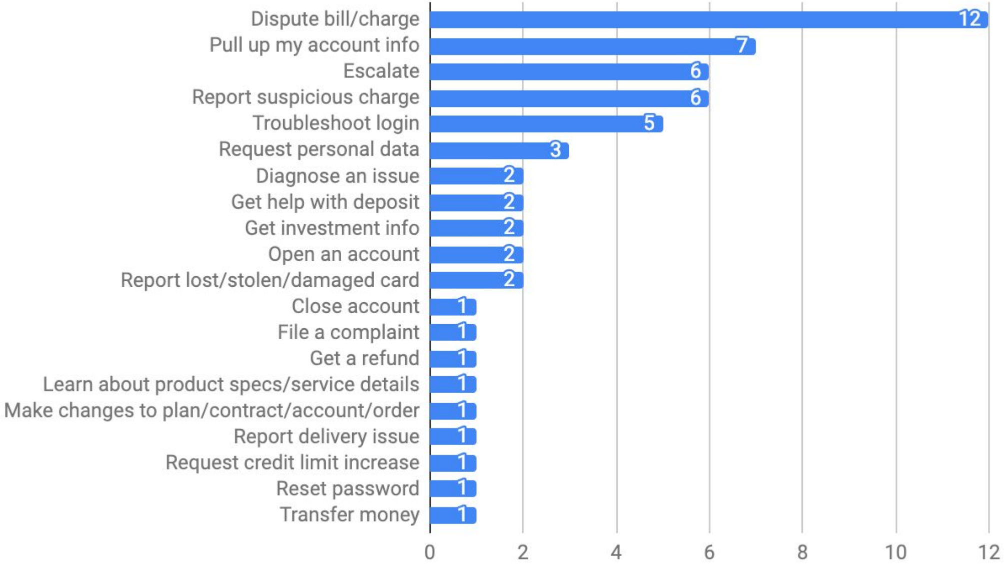


N = 47

Total Mentions = 110

Banking

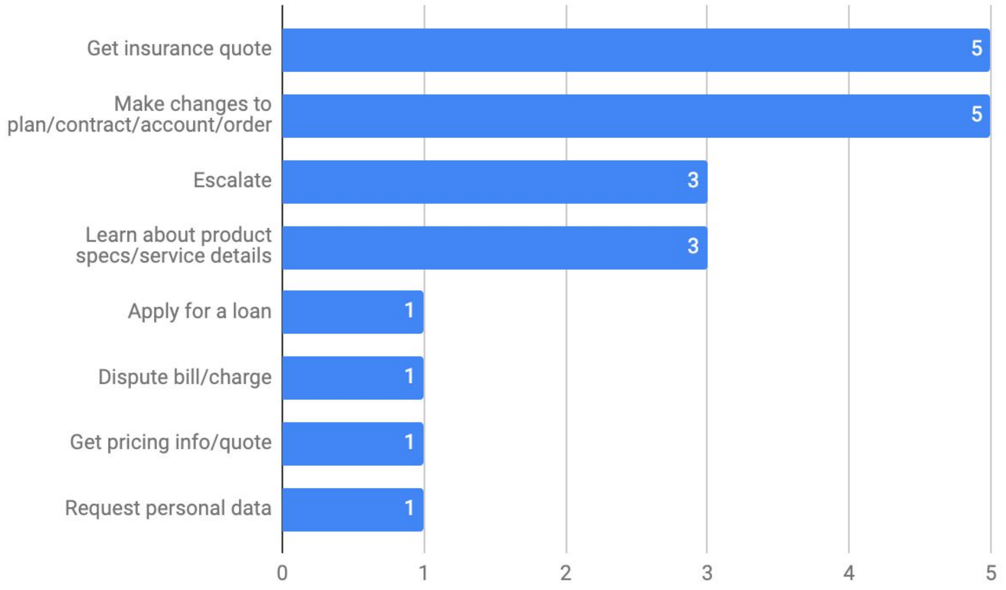
1. Dispute charge (12)
2. Pull up my account info (7)
3. Escalate (6)
   Report suspicious charge (6)



N = 30
Total Mentions = 58

Insurance

1. Get insurance quote (5)
2. Make changes to plan/contract/account/order (5)
3. Escalate (3), Learn about product specs/service details (3)



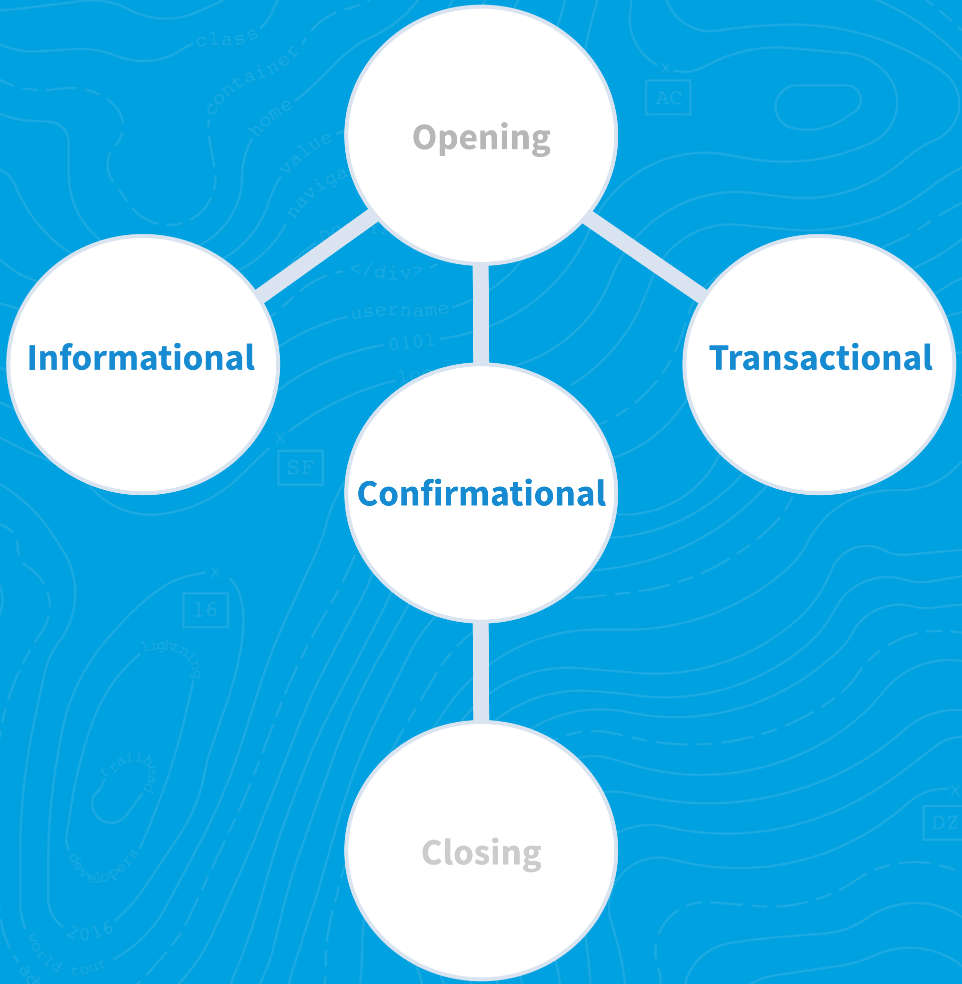
N = 9
Total Mentions = 20

Service Conversation Archetypes

/We discovered types of customer requests

Bennett, Nasr, & Giang (2019)

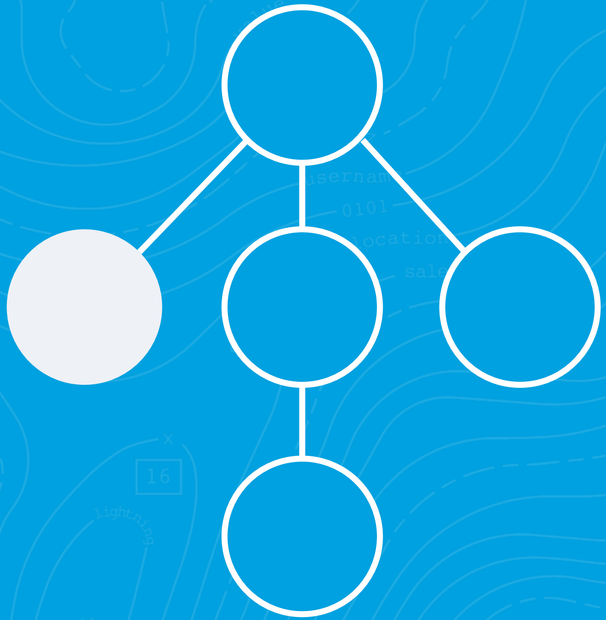
CUSTOMER REQUEST ARCHETYPES



Conversation begins

Customer makes a request (this is the **Intent**)

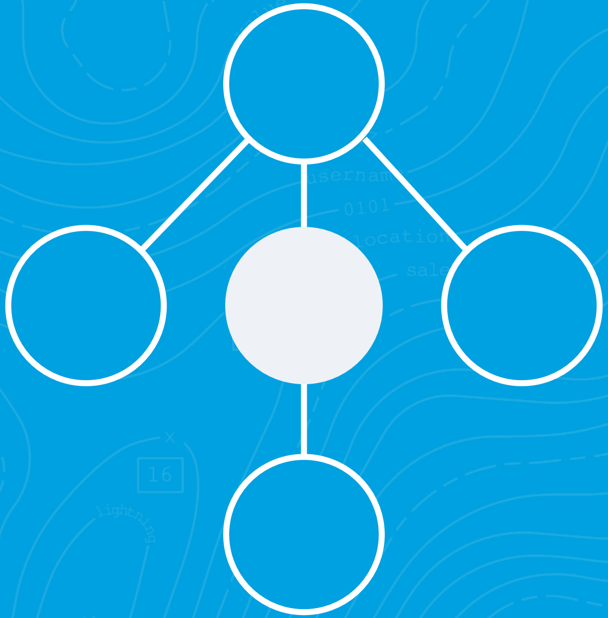
Conversation ends



1. Informational

Customer wants to learn or obtain new information.

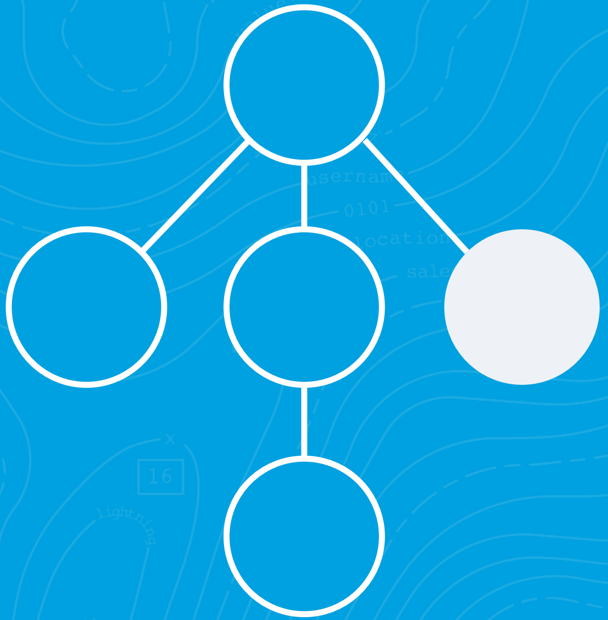
“What is the baggage limit on SFO- DEN flights ?”
“What is the return policy on my purchases ?”
“How much warranty do I have left on my device?”



2. Confirmational

Customer has some info and wants to confirm its validity.

"Am I eligible for an upgrade?"
"I'd like to confirm my flight booking for Denver to LA."
"Has my order already been shipped?"

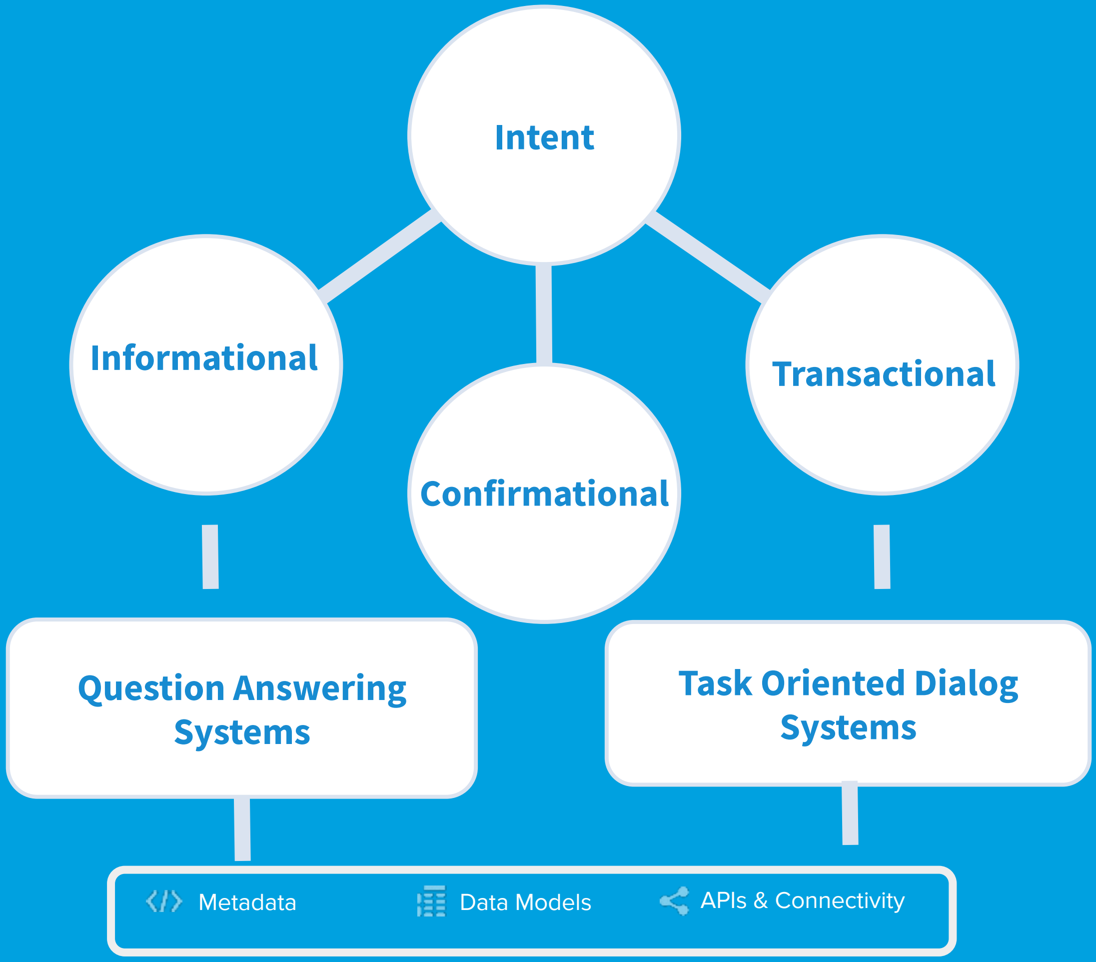


3. Transactional

Customer requests action be taken.

"The shirt I received is too big."
"I'm trying to return the speakers I ordered."
"I just moved apartments. Can you change my billing address?"

SYSTEMS



Intent Disambiguation

Conversational Dialog Management

NLP ML Backend

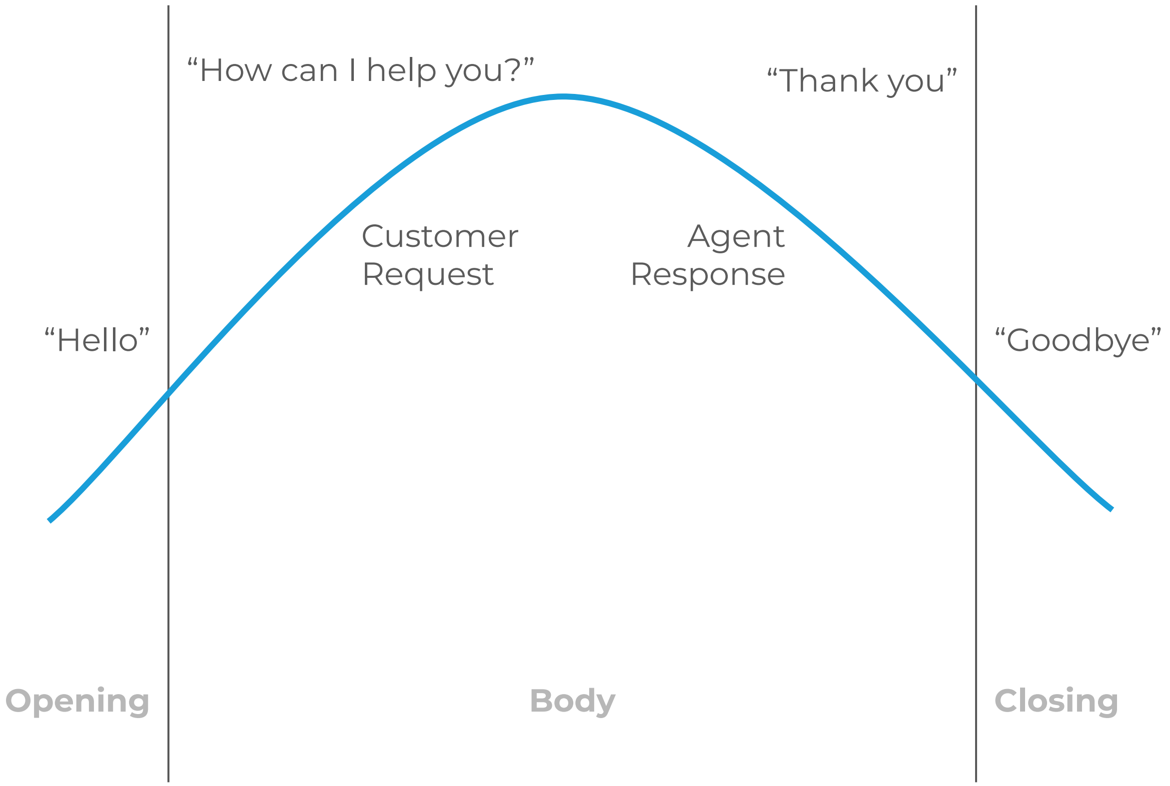
Data and APIs Execution

NLP and ML in Customer Service

Agent-Assist

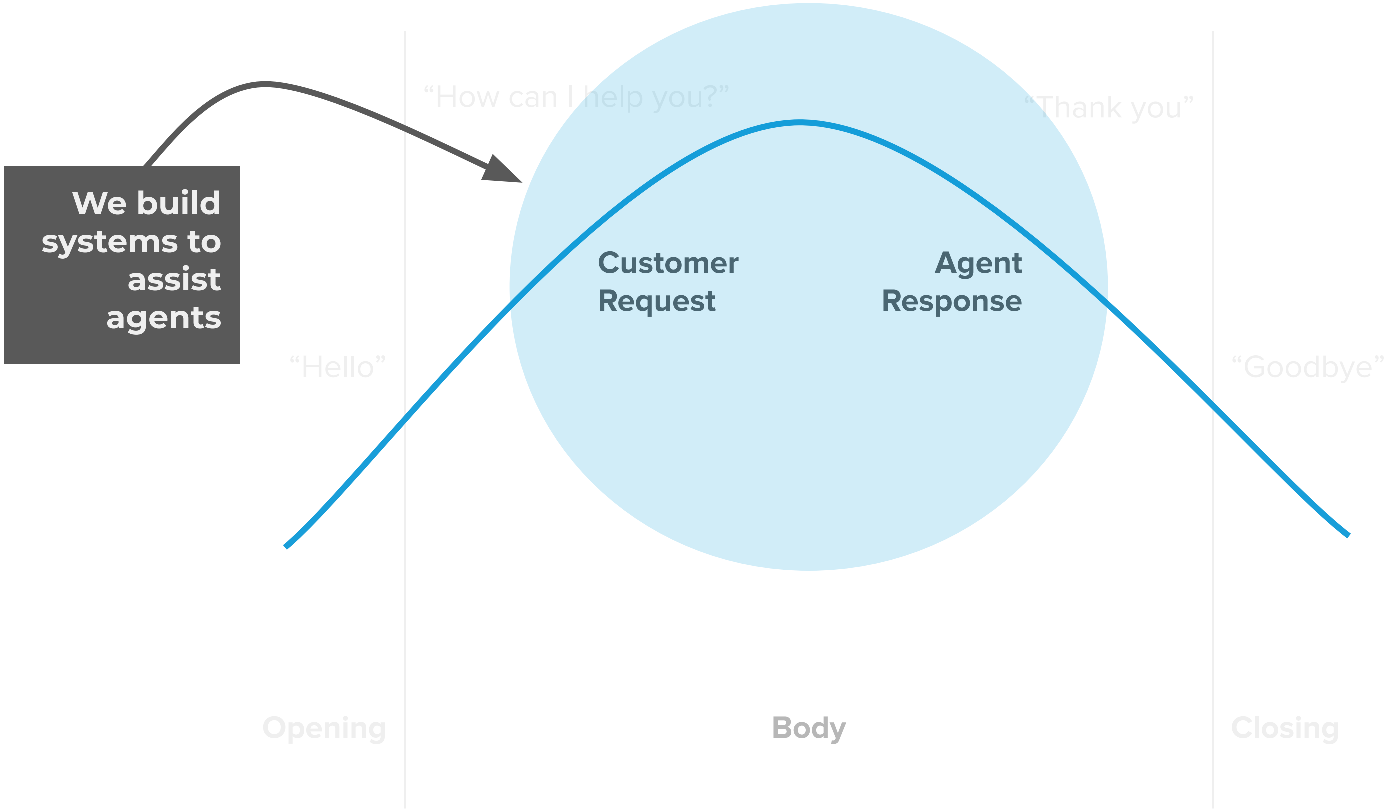
Bennett, Nasr, & Giang (2019)

CANONICAL STRUCTURE OF A CUSTOMER <> SERVICE AGENT CONVERSATION



adapted from Szymanski & Moore (2018)

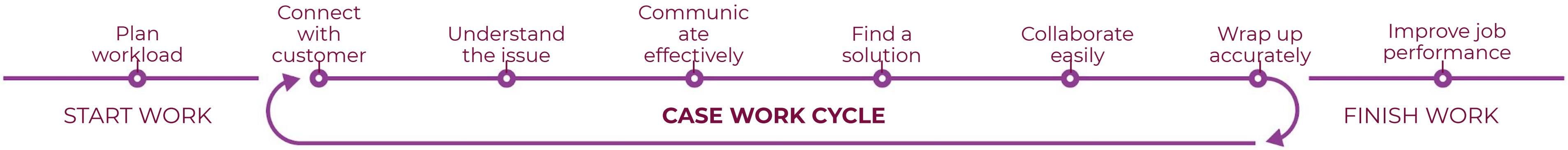
CANONICAL STRUCTURE OF A CUSTOMER SERVICE CONVERSATION



adapted from [Szymanski & Moore (2018)]

ASSIST AGENTS' WORKFLOW

Orchestrate Compose Collaborate



ASSIST AGENTS' WORKFLOW

AUTO-TRIAGE AND ROUTING | **CASE CLASSIFICATION** | **REPLY RECOMMENDATIONS** | **Q & A Knowledge** | **CASE WRAP UP SUMMARIZATION**

Plan workload
Connect with customer
Understand the issue
Communicate effectively
Find a solution
Collaborate easily
Wrap up accurately
Improve job performance

START WORK

CASE WORK CYCLE

FINISH WORK

ASSIST AGENTS’ WORKFLOW

AUTO-TRIAGE AND ROUTING

CASE CLASSIFICATION

REPLY RECOMMENDATIONS

ARTICLE RECOMMENDATIONS

CASE WRAP UP

Plan workload

Connect with customer

Understand the issue

Communicate effectively

Find a solution

Collaborate easily

Wrap up accurately

Improve job performance

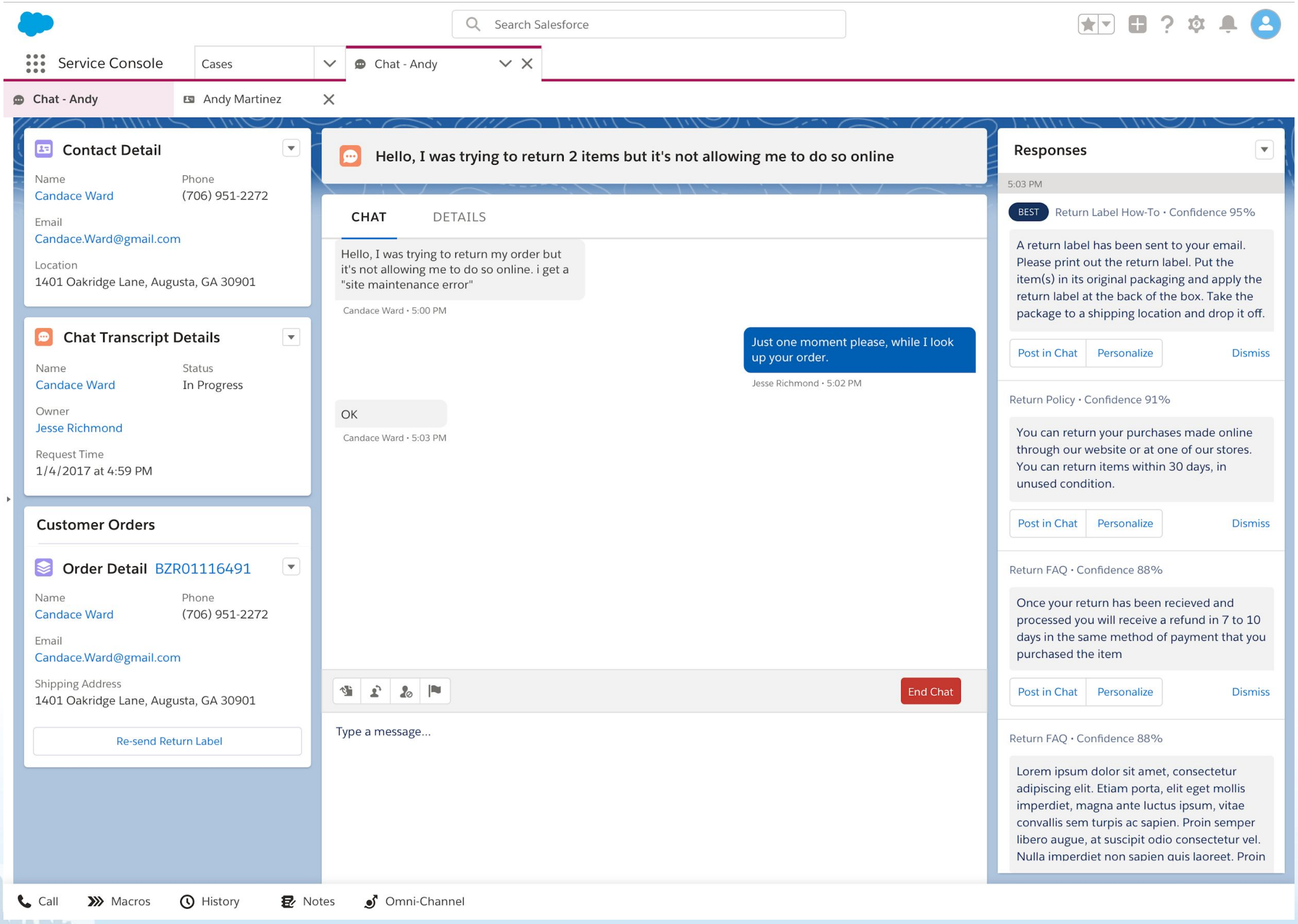
START WORK

CASE WORK CYCLE

FINISH WORK

Reply Recommendations

- Agent *assist* (as opposed to automate)
- In the context of chat conversations, suggest common responses for the agent to enter directly into the chat.
- Save the agent from having to type the same “return policy” response over and over again….


Search Salesforce
Service Console
Cases
Chat - Andy
Chat - Andy
Andy Martinez
Contact Detail
Name
Candace Ward
Phone
(706) 951-2272
Email
Candace.Ward@gmail.com
Location
1401 Oakridge Lane, Augusta, GA 30901
Chat Transcript Details
Name
Candace Ward
Status
In Progress
Owner
Jesse Richmond
Request Time
1/4/2017 at 4:59 PM
Customer Orders
Order Detail BZR01116491
Name
Candace Ward
Phone
(706) 951-2272
Email
Candace.Ward@gmail.com
Shipping Address
1401 Oakridge Lane, Augusta, GA 30901
Re-send Return Label
Hello, I was trying to return 2 items but it's not allowing me to do so online
CHAT
DETAILS
Hello, I was trying to return my order but it's not allowing me to do so online. i get a "site maintenance error"
Candace Ward • 5:00 PM
Just one moment please, while I look up your order.
Jesse Richmond • 5:02 PM
OK
Candace Ward • 5:03 PM
End Chat
Type a message...
Responses
5:03 PM
BEST
Return Label How-To • Confidence 95%
A return label has been sent to your email. Please print out the return label. Put the item(s) in its original packaging and apply the return label at the back of the box. Take the package to a shipping location and drop it off.
Post in Chat
Personalize
Dismiss
Return Policy • Confidence 91%
You can return your purchases made online through our website or at one of our stores. You can return items within 30 days, in unused condition.
Post in Chat
Personalize
Dismiss
Return FAQ • Confidence 88%
Once your return has been recieved and processed you will receive a refund in 7 to 10 days in the same method of payment that you purchased the item
Post in Chat
Personalize
Dismiss
Return FAQ • Confidence 88%
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Etiam porta, elit eget mollis imperdiet, magna ante luctus ipsum, vitae convallis sem turpis ac sapien. Proin semper libero augue, at suscipit odio consectetur vel. Nulla imperdiet non sapien quis laoreet. Proin
Call
Macros
History
Notes
Omni-Channel

Product Considerations

- **Must be applicable across all archetypes**
  - Informational, Confirmational, Transactional
- **Minimal risk**
  - Responses should be retrieved rather than generated.
- **Dynamic and Personalizable.**
  - Agents prefer to speak in their own voice.
  - Each agent should be able to personalize their predefined response list.
  - Agents should be able to edit their lists whenever they want.
- **Easy setup**
  - Ideally, customers should be able to ‘just turn it on'

Reply Recommendations Flow

1. Customer turns on the feature
   a. Build a model using historical chat transcripts.
2. (Optional) Admin Setup
   a. Admin manually creates a list of ‘good’ canned responses. These are global responses, available to all agents.
3. Each agent curates their own list
   a. Right-click “add to list” after typing a response.
   b. Model suggests responses in real time that should be added to the list. (After the agent has already typed the response)
4. Model recommends responses from the canned response lists.

Training Data

Agent: Hi, I'm <name> and I will be assisting you today!
Customer: Hello I was just wondering when my <items> would be shipped
Customer: Do you need my order number?
Agent: I apologize for the inconvenience regarding your delivery. I'd be more than happy to provide you with an order status.
Agent: Yes can you provide me with you Reference number
Customer: <PII>
Agent: And also can you verify your full name and email address for me?
Customer: <PII>
Customer: <PII>
Agent: Thanks! Your order was relaesed for warehousing today. All of our orders must go through a processing period which takes up to 1-3 business days.
Customer: So it's being shipped today?
Agent: Yes, since you placed your order on the <date>, your order will be shipped by the end of the day today and you will be receiving a tracking number by today or tomorrow.
Customer: Okay thank you
Agent: Your welcome! Can I help yo with anything else?

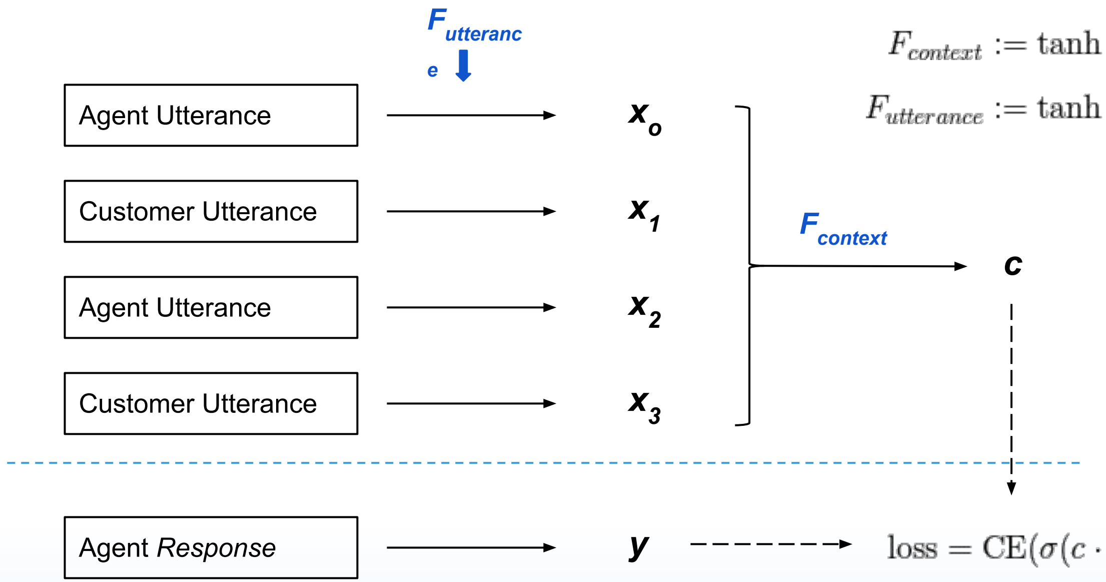
Training data consists of 10s of thousands of such chats (filtered for length, language, etc.)

Model

Hierarchical Siamese GRU

$$F_{context} := \tanh \circ FC_{context} \circ GRU_{context}$$

$$F_{utterance} := \tanh \circ FC_{utterance} \circ biGRU_{utterance} \circ X_{emb}$$

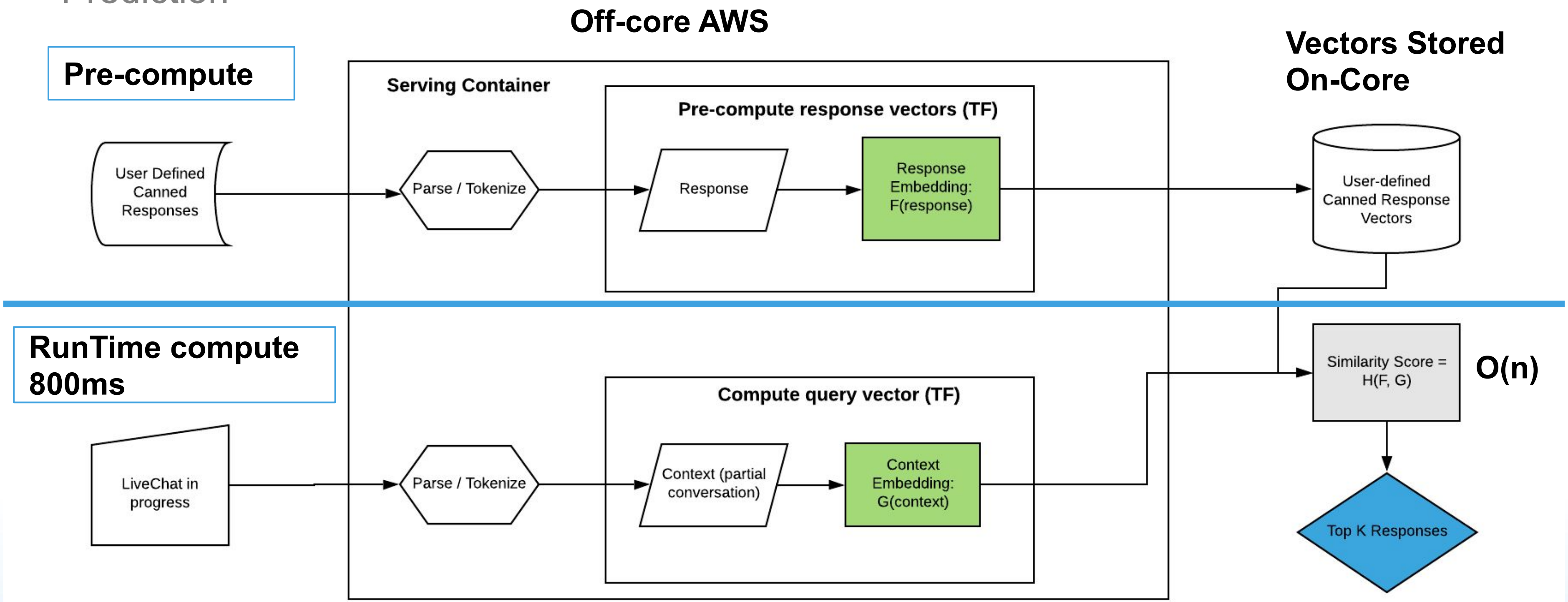


$$\text{loss} = \text{CE}(\sigma(c \cdot y), \hat{y})$$

One training example consists of one partial conversation and either the true agent's response, or a randomly sampled agent response.

Model Serving

Prediction



Evaluation

- Performance on the training task
  - AUC
  - Acuity
- Performance in production
  - Precision / Recall
- Offline heuristics
  - Does the model appear to work well on historical chats?

Training Performance

Customer 1 - 10 epochs

- AUC: 0.986
- Acuity: 0.979

Customer 2-30 epochs

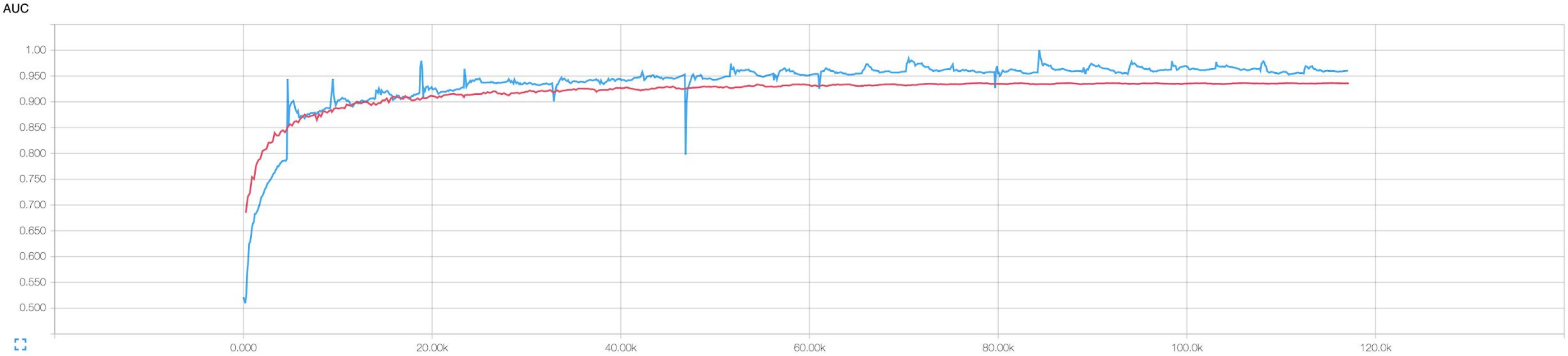
- AUC: 0.966
- Acuity: 0.966

Green light!

Rough calculation of human-level performance on the training task is on the order of 95% accuracy

*Acuity := P(score of true response > score of random response)

Training Curve



Recap

The Conversational Enterprise

1. Customer conversations topically diverse across industries

2. 3 Conversational Archetypes in Customer Service

3. Sophisticated systems that blend Q&A, Goal oriented dialog system and Conversational Models are needed to enable AI in customer service

4. Human in the loop Agent Assistive applications are a good starting point

Thank you.

We are Hiring !