

OpinionConv: Conversational Product Search with Grounded Opinions



MOTIVATION

- When searching for products, subjective experiences of others play a crucial role in making informed decisions. This is also true in sales conversation.

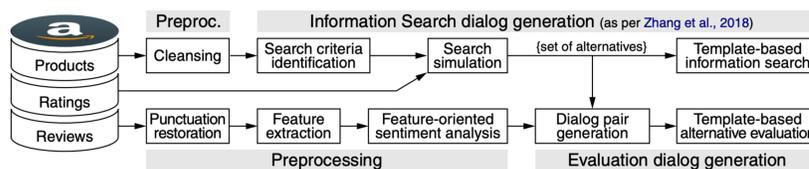


- We addressed this problem by leveraging product reviews as a rich source of product opinions to ground conversational AI in true subjective narratives.

- We used a five-stage process that encapsulates customer decision making: [6]

- (1) Recognize a need
- (2) Search for information about potential products
- (3) Evaluate and compare these alternatives
- (4) Proceed to make a purchase decision
- (5) Exhibit post-decision behaviors.

GROUNDING PRODUCT OPINION GENERATION



- **Data Source:** Amazon Product Data including their reviews

- **Pre-processing:**

- Punctuation Model [2]
- Aspect Extraction Model [3]
- Aspect-based Sentiment Analysis [4]

- **Information Search Dialog Generation:** [1]

- Narrow down the set of alternatives by asking for preferences on product features

Evaluation Dialog Generation:

- For lack of public corpora of in-store conversations, we resort to a template-based approach

- The templates are derived from common conversational negotiation strategies



Review 1
[...] Internet connections are much faster than on my BlackBerry, which my work has supplied me. **The battery is another item that people tend to give bad reviews on.** That may be why Verizon is currently offering a 60 dollar battery for 19 dollars. [...]

Review 2
[...] He constantly has Rhapsody or Pandora running on T-Mobile 4G with no lag at all. It does great on wi-fi at home as well. **The battery life is impressive as well, you can charge it when you go to bed, but I'm sure you never see it die throughout the day even with heavy use.** All in all a great phone!

Partial dialog
C: I heard that **the battery is another item that people tend to give bad reviews on.**
S: Well, I can tell that **the battery life is impressive as well, you can charge it when you go to bed, but I'm sure you never see it die throughout the day even with heavy use.**

Customer C voices negative opinion on a product feature, sales assistant S counters with a positive one.

Example of a basic opinionated dialog pair generation step

Pair	Principle	Action	Example
Deny-Switch Product	Insist on position Invent options for mutual gain	Express negative sentiment Recommend a new product	B: What I know about its battery is that the battery keeps draining because the phone is constantly looking for network signal. S: If the battery is important for you, we can offer this product: Axon 7 is the same price as OnePlus 3, but it has slightly bigger battery.
Request- Inform	Focus on interests Build trust	Look for more information Express positive sentiment	B: What do you think about its speakers? S: It has dual front-facing speakers with good quality.
Search- Agreement	Focus on interests Build trust	Search for alternatives Confirm consumer's preference	B: I heard about this phone: Galaxy S4 that has a super-fast processor and a good battery life. S: Yes, that's true. This phone is also a good choice with the one premium hardware, great software and a reasonable price.

Example of the combination of dialog pairs in a conversation template

GROUNDING OPINIONATED CONVERSATION GENERATED BY OPINIONCONV

- We adapted the "CraigslistBargain" setting [5] and devise 14 conversation templates with different combinations of the 7 generated question-answer and opinion-opinion pairs.

- Product category: **Cell Phones and Accessories**

- Total number of conversations generated by OpinionConv: **195,614**

Deny-Disagreement

Opinion: P-1, F-A, negative
Opinion: P-1, F-A, positive

Request- Inform

Question: P-1, F-A, neutral
Answer: P-1, F-A, positive

Deny-Switch Product

Opinion: P-1, F-A, negative
Opinion: P-2, F-A, positive

Deny-Switch Feature

Opinion: P-1, F-A, negative
Opinion: P-1, F-B, positive

Search-Agreement

Opinion: P-1, F-A, positive
Opinion: P-1, F-A, positive

Search-Switch Feature

Opinion: P-1, F-A, positive
Opinion: P-1, F-B, positive

Search-Warning

Opinion: P-1, F-A, positive
Opinion: P-1, F-B, negative

Negotiation tactics used in dialog pair templates (P=product, F=feature)

Customer decision process (Kotler and Keller, 2015)



Generated opinionated conversation for product search (S = sales assistant, C = customer)

(not relevant for conversation generation)

S: How may I help you? C: Can you find me a mobile phone?
S: Sure, what **operating system** do you prefer? C: I want an Android.
S: OK, and any preference on **screen size**? C: Larger than 5 inches.
S: Do you have requirements on **storage capacity**? C: I want at least 64 GB.
S: And any preference on **phone color**? C: Not particularly.

S: What about the Samsung Galaxy S6? It's available for \$228.89.
C: I like its design, but it costs too much. Do you have any cheaper ones?
S: Yes! I have this one for you. The Sony Xperia X. It's cheaper; \$117.13.
C: Sounds good!
C: How does its **operating system** handle?
S: The Sony Xperia X is an excellent phone, good **connectivity**, **operating system** easy to handle, it takes high-quality **pictures**, but its **battery life** lacks a little.
C: What about the Oneplus 2? I don't know how they did it, but they managed to create a phone with **robust life** and **low battery drain**.
S: Yes, I agree. This phone might also be a good choice, but you hear some criticism from tech "critics" on the web about its **camera** and the **pixel density**, etc.
C: I see. The **camera** quality is important to me.
C: Given the **price** of the Sone Xperia X, I would have expected **capacitive buttons**.
S: For a sim-free **price** under \$200 it's one of the most affordable options out there and a good smartphone.
C: Alright, I'll buy the Sony Xperia X.

Negotiation strategy (Conversation template ID: 4)



HUMAN EVALUATION

Study 1: Importance of Product Opinions

- We showed participants two variants of generated sales conversation:
- Variant 1 is focused on the customer's preferences and requirements.
- Variant 2 starts similarly, but then continues with an opinionated discussion.

Q: Which of the two variants would you as a customer hold with the sales assistant while searching for a smartphone?"

- **83%** of the participants of study 1 preferred variant 2 over the variant 1.

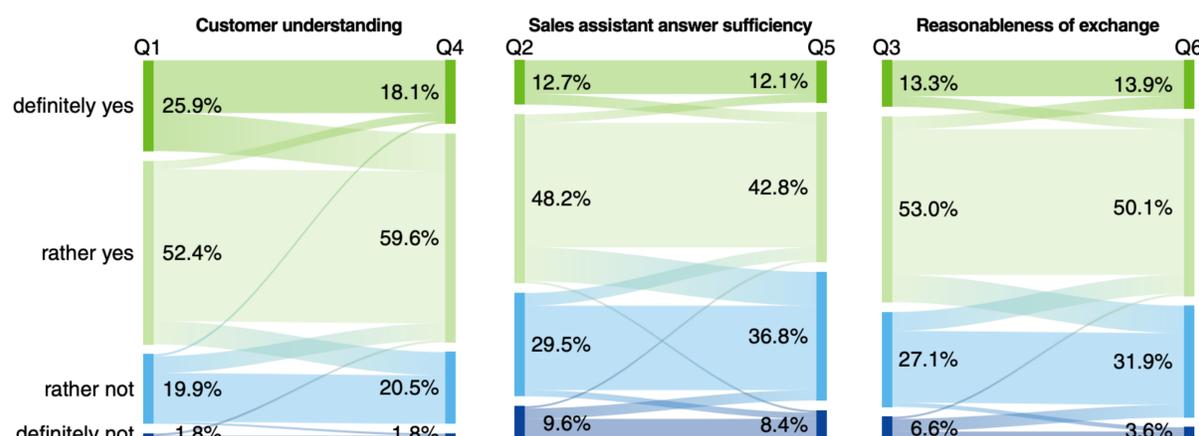
Measure	Characteristics	Study 1 (N=100)	Study 2 (N=420)
Gender	Males	41.0%	31.0%
	Females	58.0%	69.0%
	Non-binary	1.0%	0.0%
Age	25 to 34 years	35.0%	38.0%
	35 to 44 years	28.0%	30.1%
	18 to 24 years	21.0%	15.7%
	55 to 64 years	6.0%	13.3%
	45 to 54 years	5.0%	1.8%
	65 years or older	5.0%	1.2%

Demographics of study participants

Study 2: Perceptions of Dialog Realism

- For each of 14 conversation templates: 10 examples
- For each example 3 participants were asked

- First, we inform participants, they are reading a transcript of a real conversation. → Q1, Q2, Q3
- Then, we reveal the truth and declare that the conversation they just read, was not a real but an automatically generated one.
→ Q4, Q5, Q6



CONCLUSION & FUTURE WORK

- We introduced **OpinionConv**, a new conversation generation pipeline that generates opinionated multi-turn conversations for product search.

- **OpinionConv** was mainly designed to **incorporate** subjective narratives into conversational product search and to **control** both the dialog coherence and the information to be mentioned in the utterances.

- We also observed three key concerns raised in the human evaluation:

- (1) **Some features are of no interest to be discussed:**
e.g., "Why would the person asks the sales assistant about colours? That seems out of the ordinary."
- (2) **Some participants judge the conversations based on their personal experience with real sales assistants:**
e.g., "As always in marketing strategies, he [the sales assistant] was just trying to sell a phone not what he [the customer] wanted."
- (3) **A stronger argumentation is expected by some participants**
e.g., "stating that it's 'bright and good quality' would not be convincing enough for me to buy the product."

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