

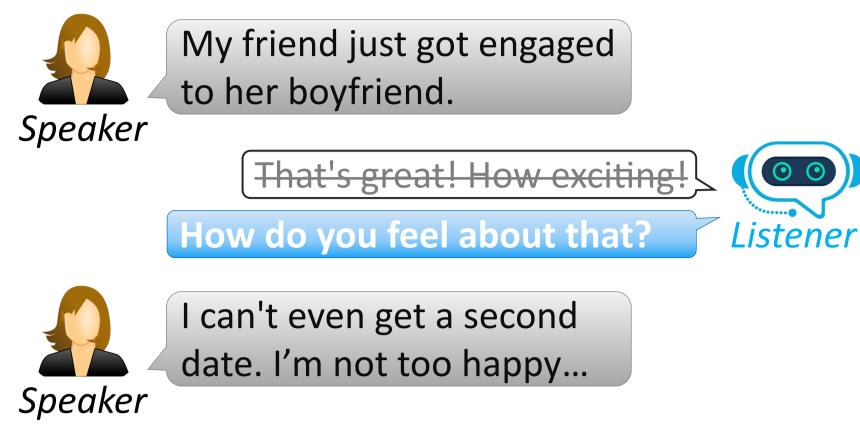
# A Taxonomy of Empathetic Questions in Social Dialogs

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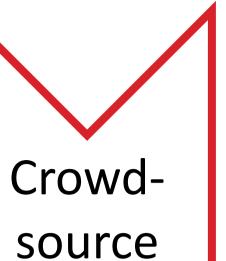
# MOTIVATION

#### Questions play important social function in empathetic dialogs

- Generating meaningful questions is a central objective of open-domain chatbots
- > This is challenging, especially due to the lack of modeling resources



# ANNOTATION



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## Mturk Setup

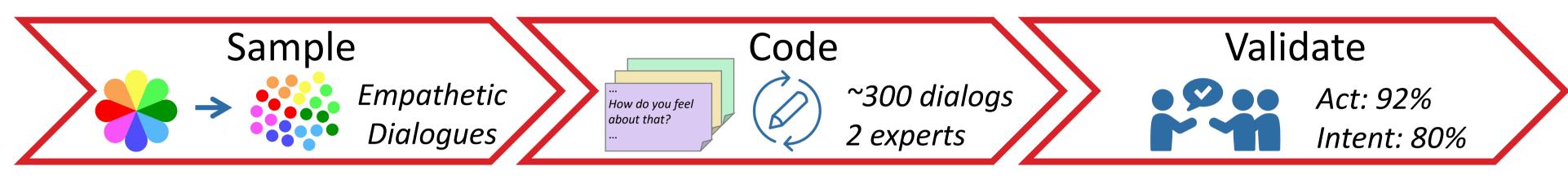
- 40% of ED dialogs
- 25 dialogs per HIT
- 3 workers per HIT  $\Rightarrow$  majority voting

### Mturk Results

- 5,826 annotated intents (71.6% agr)
- 6,433 annotated acts (68.0% agr)

#### **Data Augmentation**

# **TAXONOMY DEVELOPMENT**



• •

today

Sympathize

Intent:

### **12 question intents:**

- Express interest (57.1%)
- Express concern (20.3%)
- Offer relief (4.8%)
- Sympathize (3.9%)
- Support (2.6%)
- Amplify pride (2.6%)
- Amplify excitement (1.9%)
- Amplify joy (1.6%)
- De-escalate (1.6%)
- Pass judgement (1.6%)
- Motivate (1.0%)

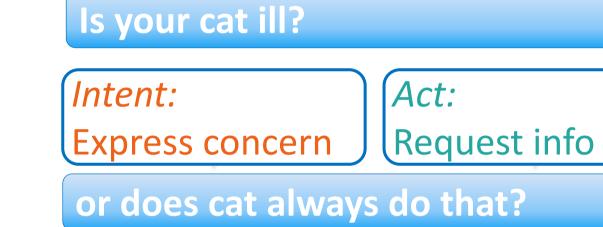
Positive

Neutral

Moralize speaker (1.0%)

### 9 question acts:

- Request information (38.7%)
- Ask about consequence (21.0%)
- Ask about antecedent (17.1%)
- Suggest a solution (8.7%)
- Ask for confirmation (5.8%)
- Suggest a reason (5.2%)
- Irony (1.3%) \_\_\_\_
  - Negative rhetoric (1.3%)
  - Positive rhetoric (1.0%)



My cat vomited on my shoes

Act:

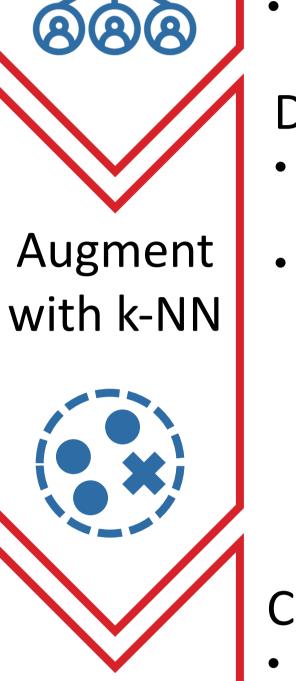
Suggest a reason

Positive

Neutral

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Classify

- Sentence-BERT framework to encode questions with contexts
- k-NN majority vote on cos similarity  $\circ$  0.825 cos similarity with k=3

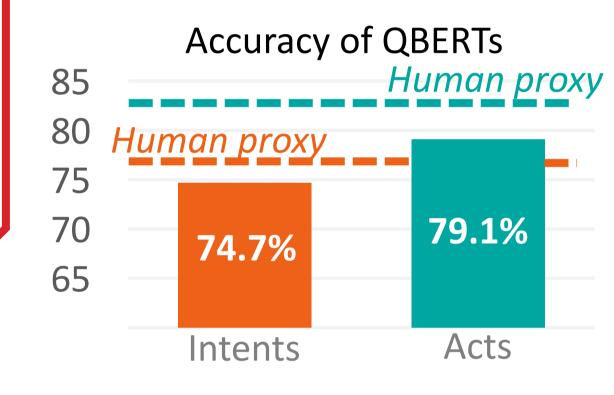
 $\circ$  ~76% CV accuracy

	Train	Val	Test
Intents	4,969	1,243	1,500
Acts	5 <i>,</i> 475	1,369	1,500

### Classification

• 2 QBERT classifiers

• Trained separately for acts & intents

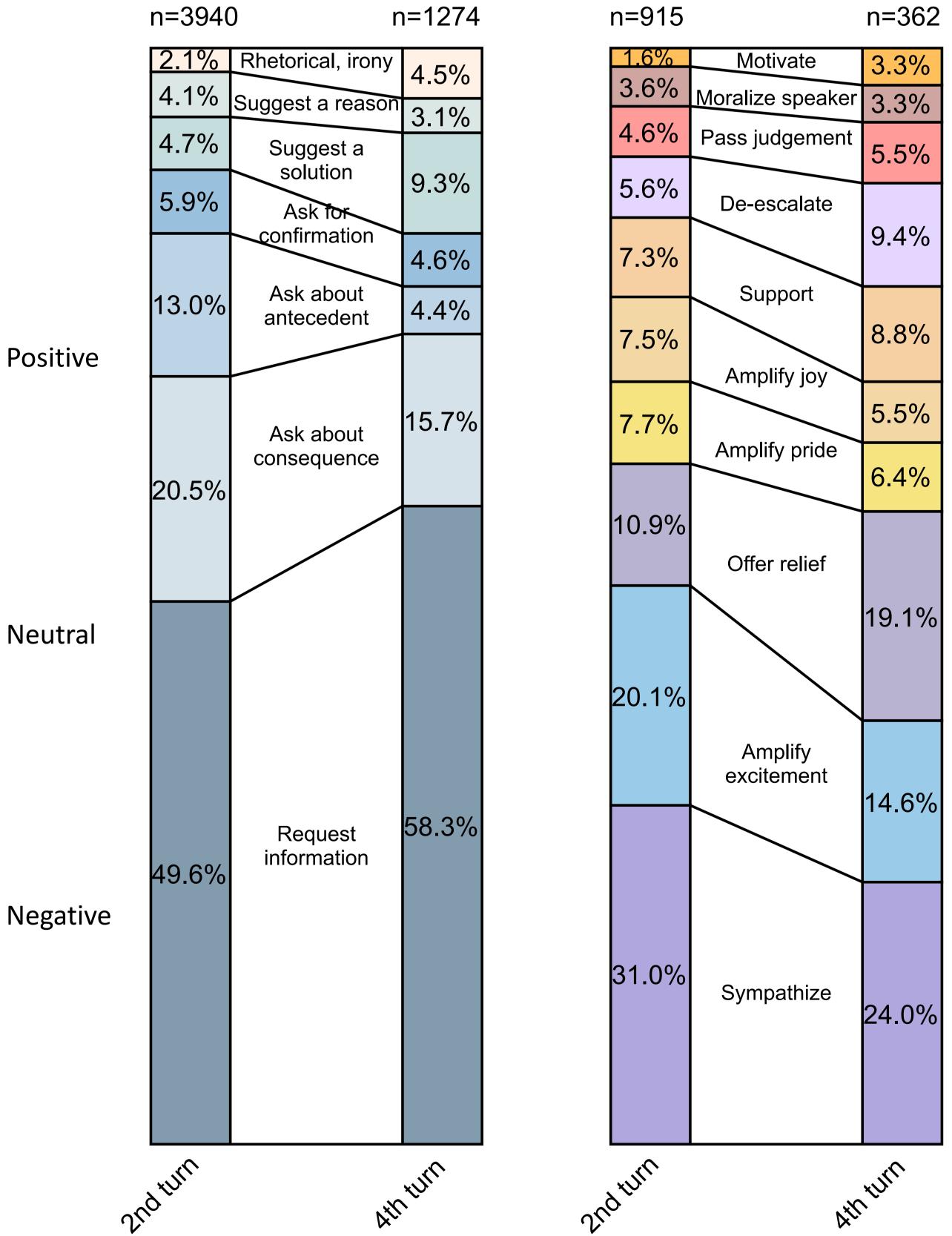


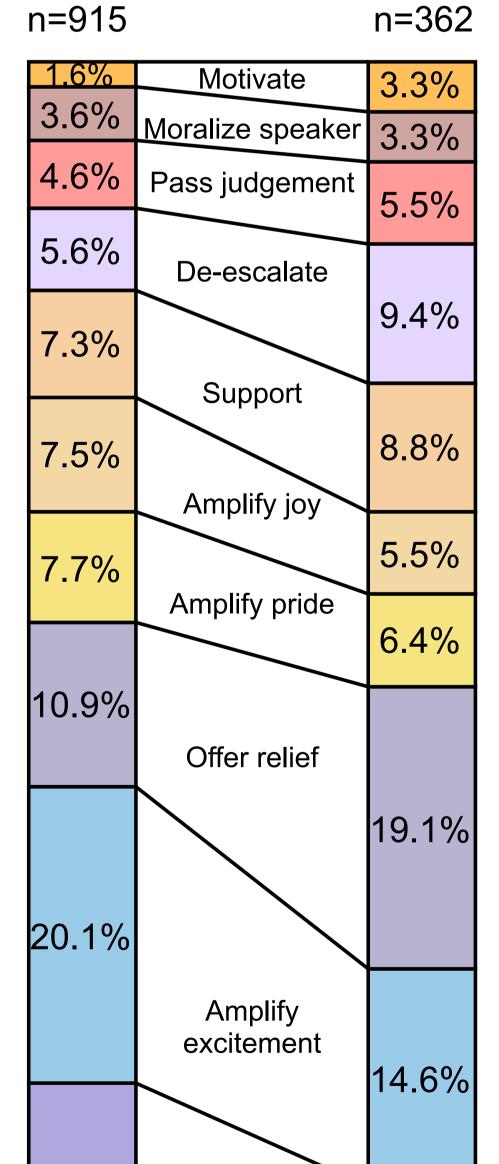
# **ANALYSIS OF QUESTIONING STRATEGIES**

Amplify excitement, Request info Amplify excitement, Ask about consequence Amplify pride, Request info Amplify joy, Request info

Express interest, Request info

Express interest, Ask for confirmation Express interest, Ask about antecedent Express interest, Ask about consequence Express interest, Suggest a reason Express concern, Request info Express concern, Ask for confirmation







Express concern, Ask about antecedent

Express concern, Ask about consequence

Express concern, Suggest a reason Sympathize, Request info Sympathize, Ask about antecedent Sympathize, Ask about consequence Offer relief, Suggest a solution De-escalate, Suggest a solution

- General Express interest + Request info dominate, no influence on emotions
- For positive (>60% preserved): Amplify emotion + Request info/Ask about consequence
- For negative (>50% alleviated): Express concern + Ask about ant./cons., Sympathize + Ask about ant./cons, Offer relief / De-escalate + Suggest a solution
- # questions drops with dialog depth Reaction to **positive** contexts is immediate, while **negative** contexts require extra clarifications