



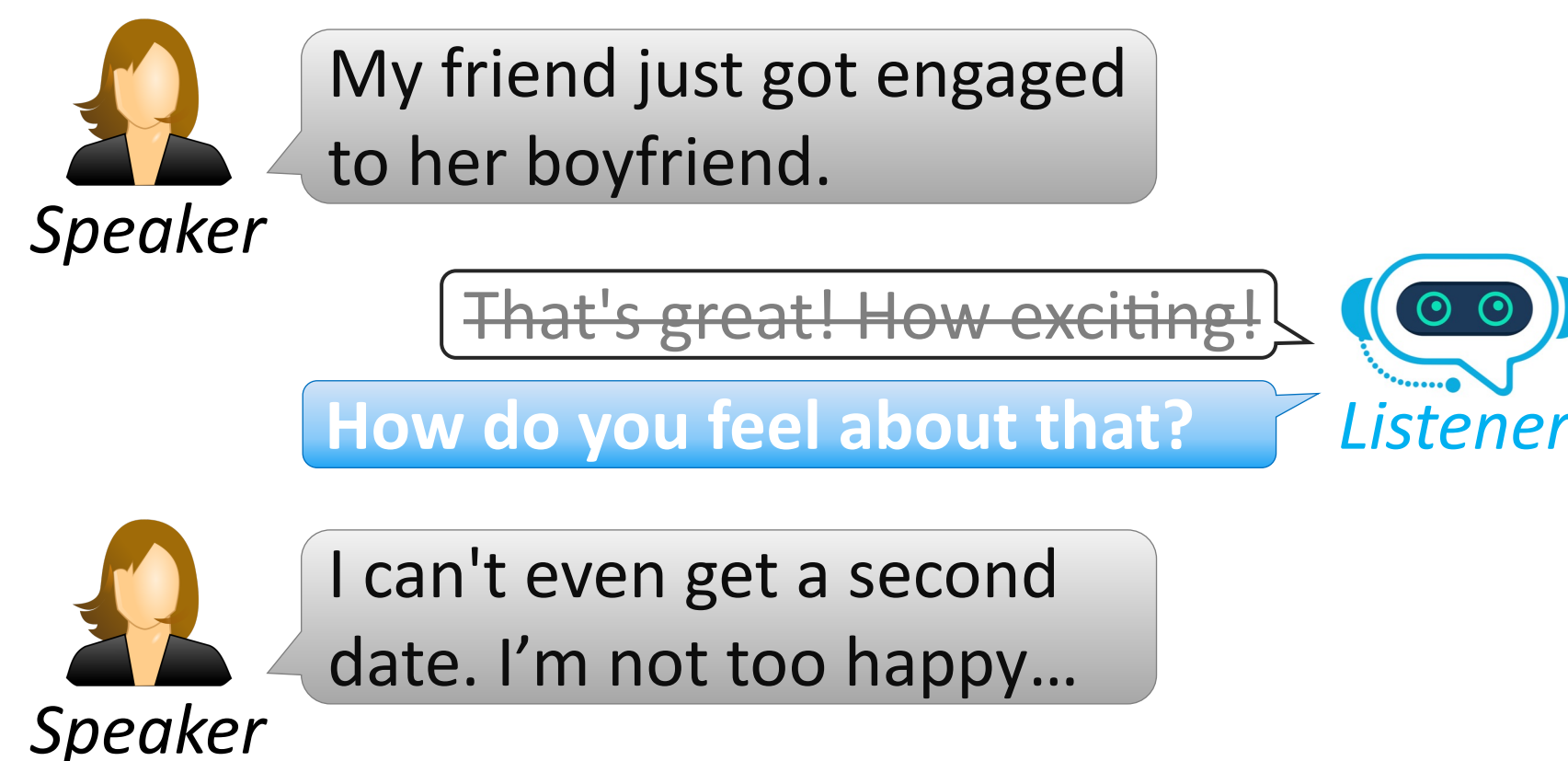
A Taxonomy of Empathetic Questions in Social Dialogs



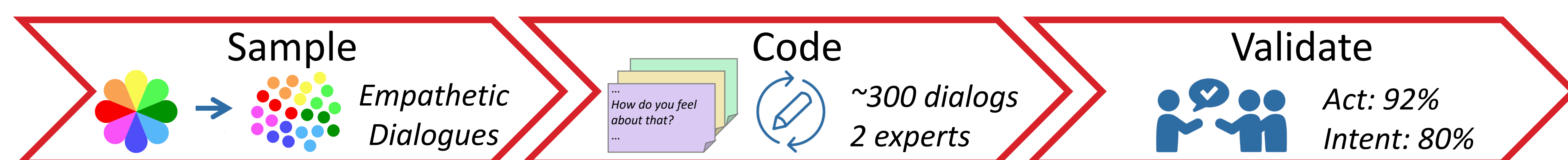
Ekaterina Svikhnushina, Iuliana Voinea, Anuradha Welivita and Pearl Pu

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



TAXONOMY DEVELOPMENT

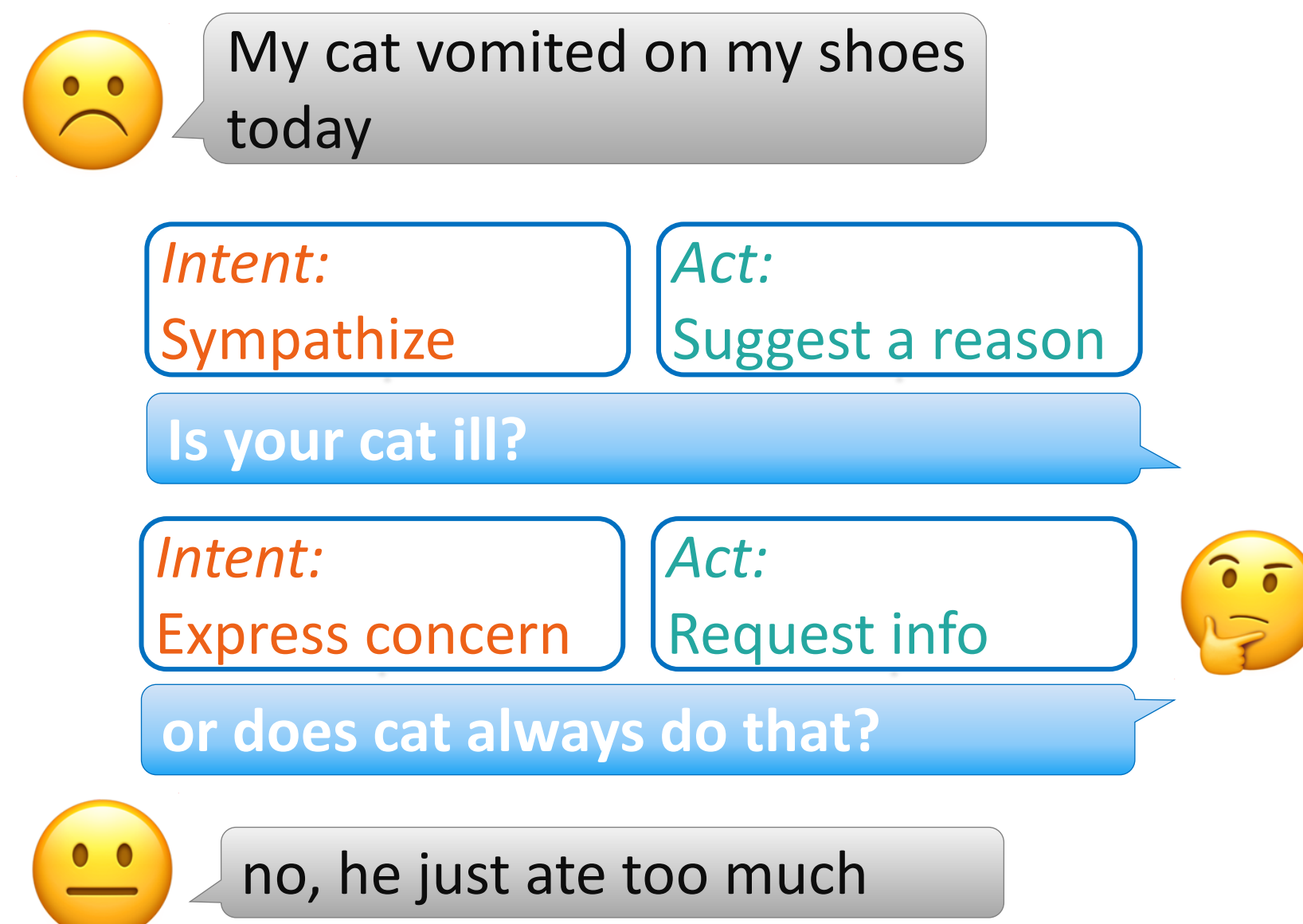


12 question intents:

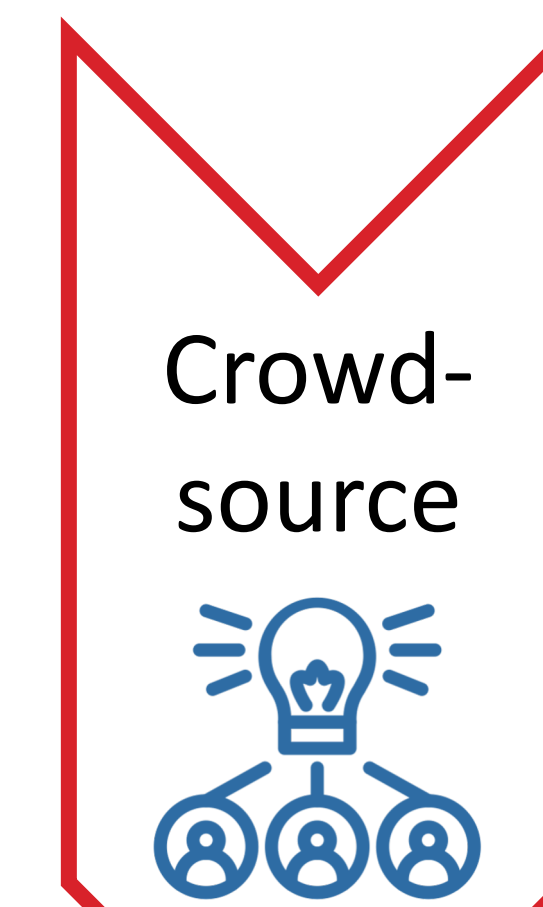
- Express interest (57.1%)
- Express concern (20.3%)
- Offer relief (4.8%)
- Sympathize (3.9%)
- Support (2.6%)
- Amplify pride (2.6%)
- Amplify excitement (1.9%)
- Amplify joy (1.6%)
- De-escalate (1.6%)
- Pass judgement (1.6%)
- Motivate (1.0%)
- Moralize speaker (1.0%)

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%)



ANNOTATION



Mturk Setup

- 40% of ED dialogs
- 25 dialogs per HIT
- 3 workers per HIT ⇒ majority voting

Mturk Results

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

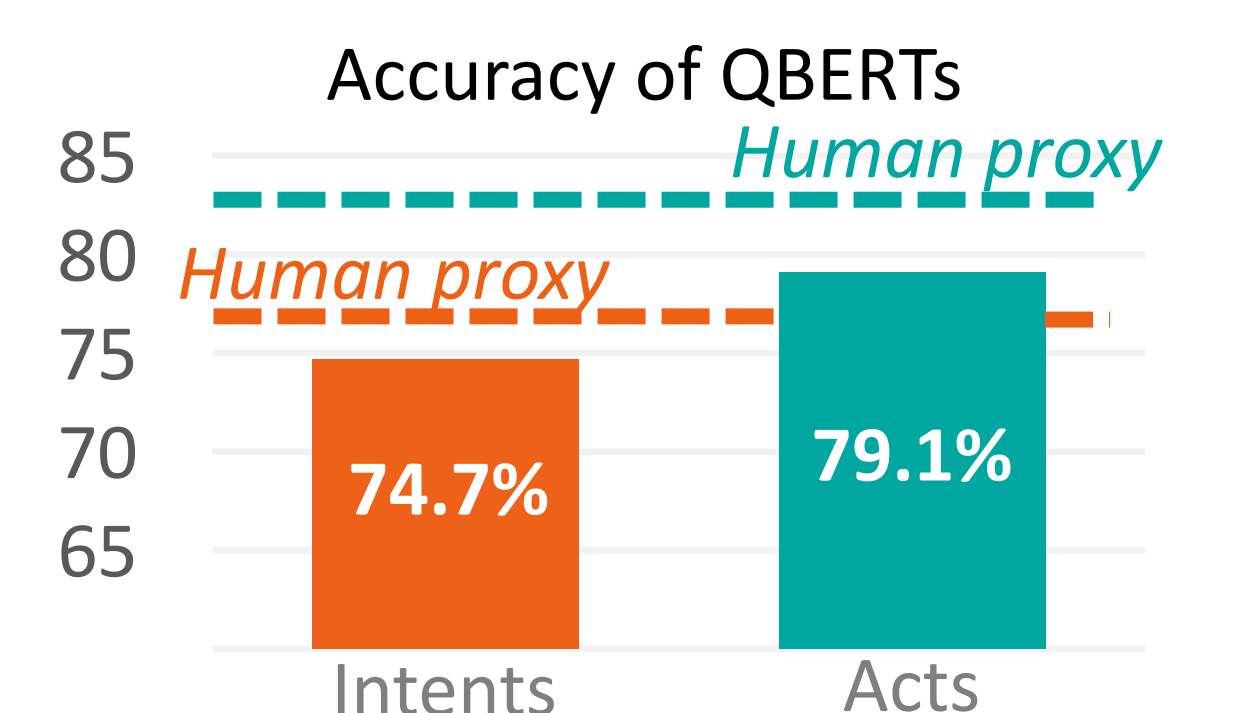
Data Augmentation

- Sentence-BERT framework to encode questions with contexts
- k-NN majority vote on cos similarity
 - 0.825 cos similarity with k=3
 - ~76% CV accuracy

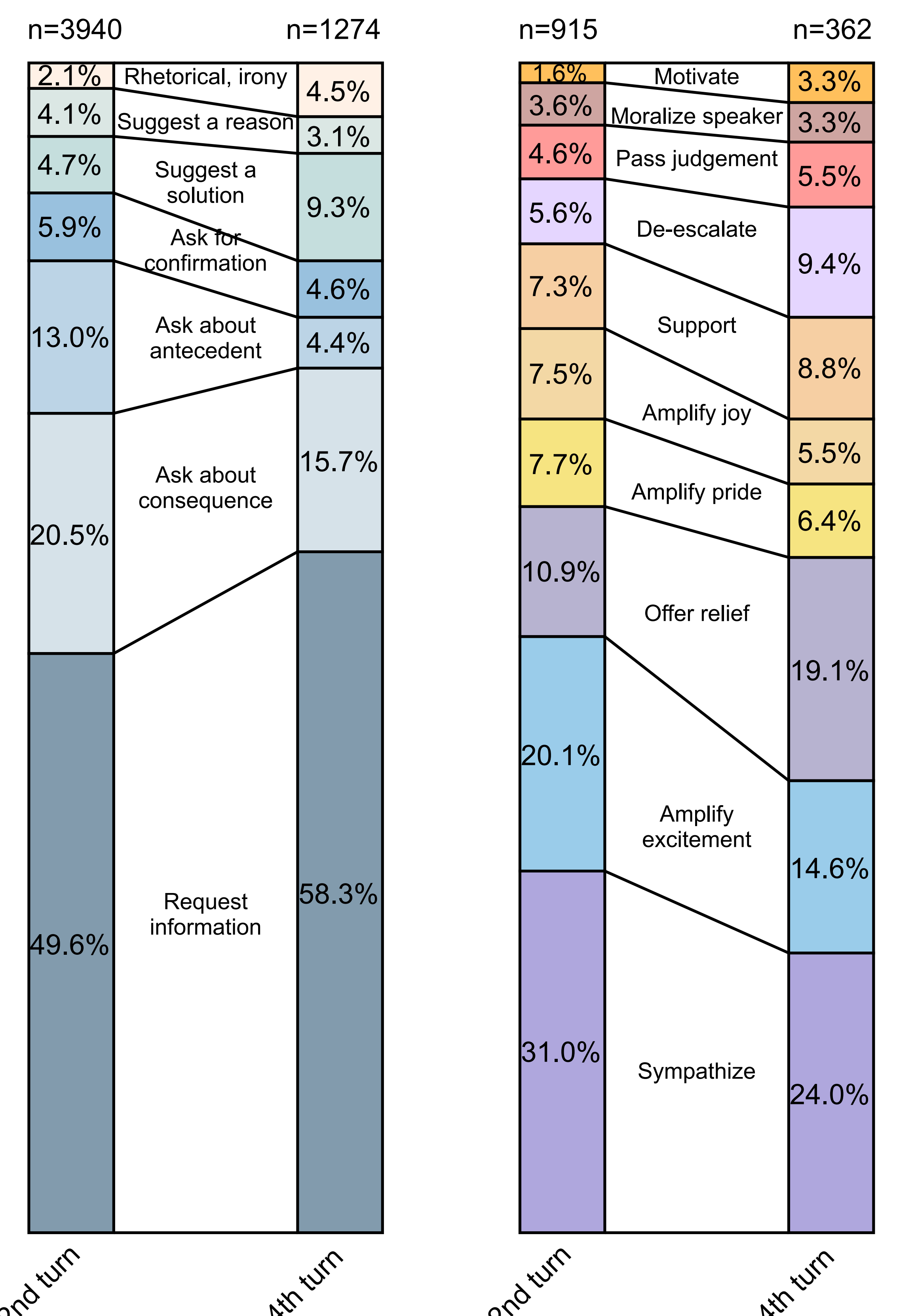
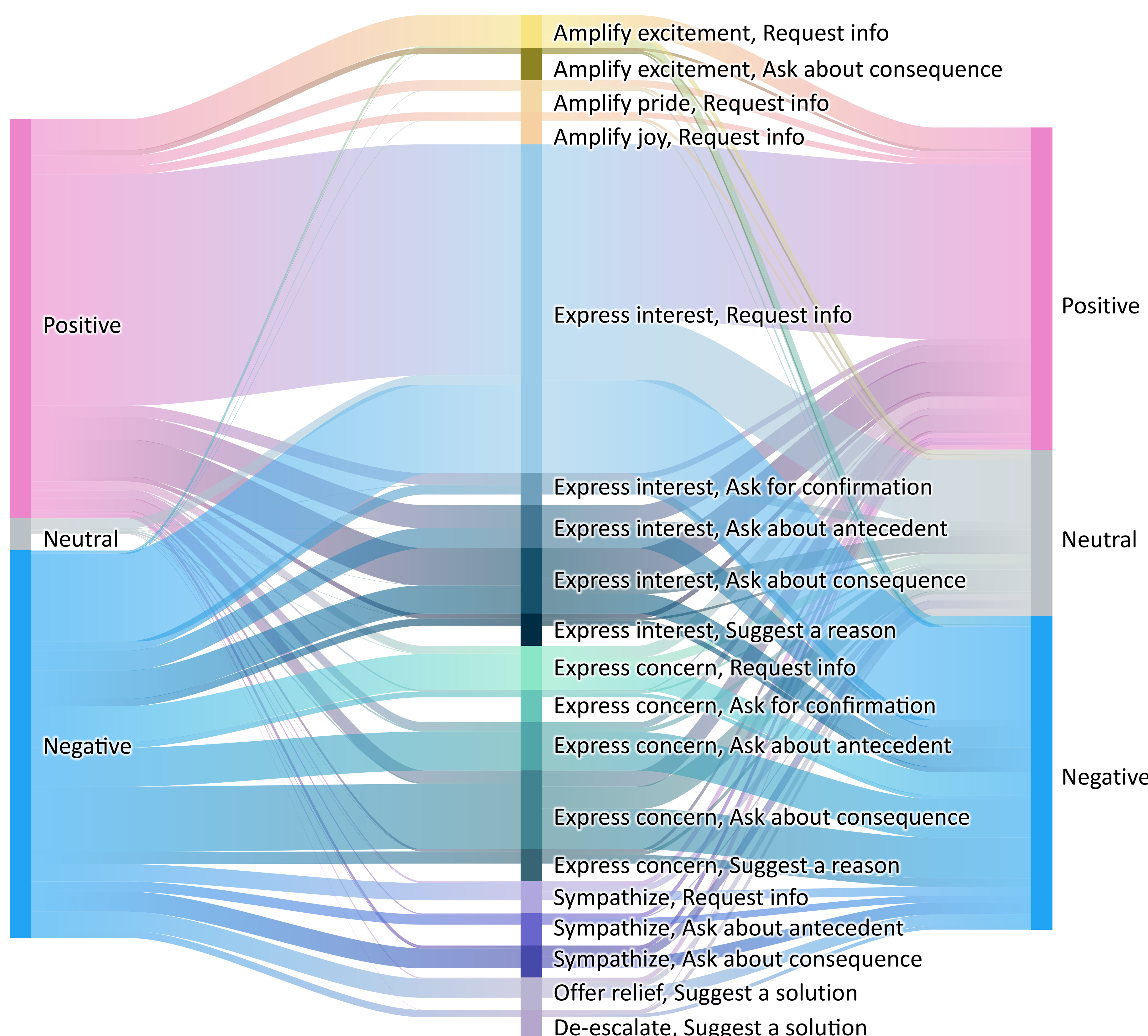
	Train	Val	Test
Intents	4,969	1,243	1,500
Acts	5,475	1,369	1,500

Classification

- 2 QBERT classifiers
- Trained separately for acts & intents



ANALYSIS OF QUESTIONING STRATEGIES



- 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