Towards an Online Empathetic Chatbot with Emotion Causes

https://arxiv.org/pdf/2105.11903.pdf

Under supervision of Dr. Sourav Kumar Dandapat

Link to dataset:
https://github.com/XiaoMi/emma/tree/master/data/raw

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Contents

What is Empathy?

Empathy is the ability to emotionally understand what other people feel, see things from their point of view, and imagine yourself in their place. Essentially, it is putting yourself in someone else's position and feeling what they are feeling.

Literature Review

Focus on controlling the response contents to align with a specific ***emotion class***

Turn	Utterance	Strategy & Cause
U1	I'm upset.	None
S1	Everything will be OK.	None

Based on - **EMOTION CLASS**

Limitations of Existing Models

- Focus on controlling the response contents to align with a specific *emotion class*
- Unable to understand or concern the feelings and experience of others
- Tend to produce responses that are rarely empathetic

Introduction to EMMA

- Online **Em**pathetic chatbot based on the user e**m**otion c**a**uses
- Learns the causes that evoke the users' emotion for empathetic responding, a.k.a. *emotion causes*
- Not only understand what is being discussed, but also acknowledge the implied feelings of the conversation and respond appropriately

Based on - **EMOTION CLASS** + **EMOTION CAUSES**

Turn	Utterance	Strategy & Cause
U1	I'm upset.	None
S1	Everything will be OK.	None

Existing approach - **EMOTION CLASS**

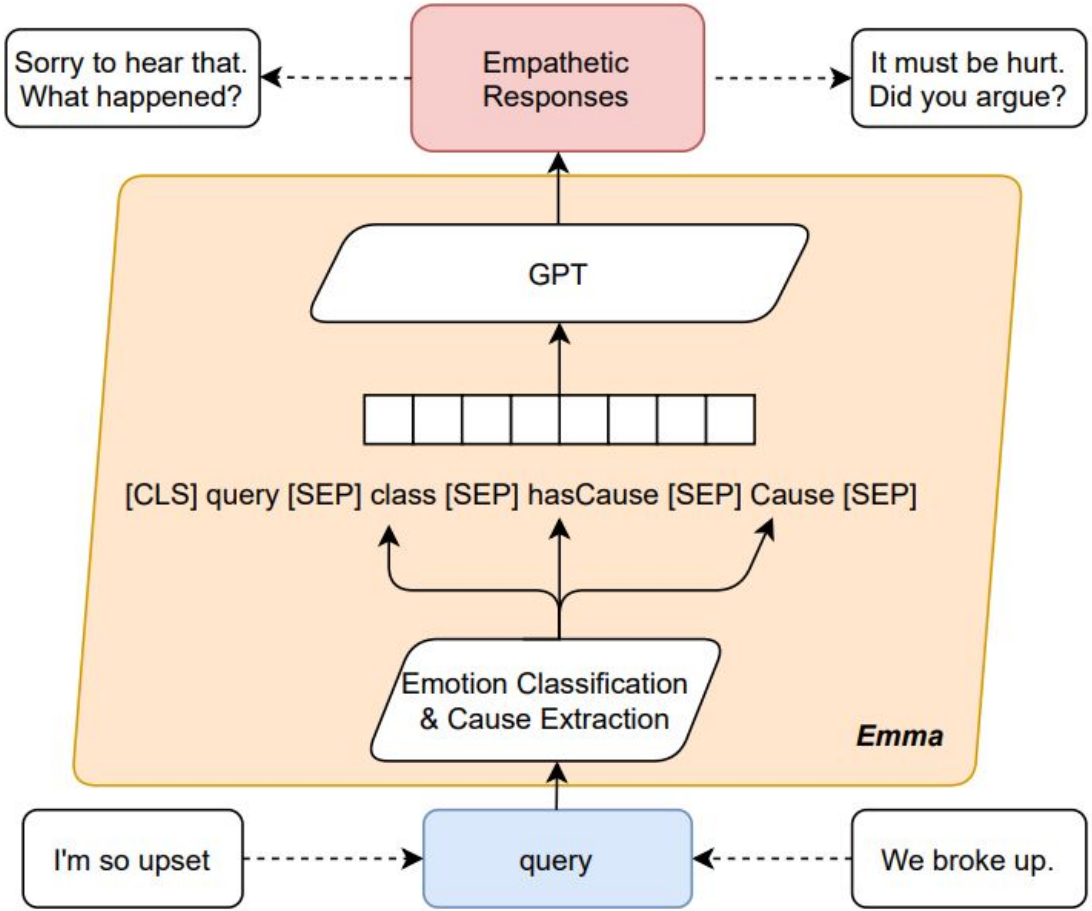
Turn	Utterance	Strategy & Cause
U1	I'm upset.	None
S1	Sorry to hear that. What happened?	Effective questioning
U2	We ***broke up***.	Emotion cause
S2	Oh dear, it must be hurt. Did you argue for something?	Active listening

EMMA - **EMOTION CLASS** + **EMOTION CAUSES**

Approach

1. Starts a conversation
2. Detects user emotion class
3. Recognizes emotion causes
4. If no emotion cause is detected, Emma directs users to self-disclose more based on ***effective questioning*** and ***active listening***
5. Produces empathetic responses based on the ***conversation history***, detected ***emotion class*** and ***emotion causes***

Architecture



Mathematical Formula

$$P_Y = \prod_{i=1}^{T} P(y_t | y_{0:t-1}, X, H, L, C)$$

Query : $X = \{x1, \cdots, xN\}$
H : History conversations
L : Emotion class label
C : Emotion causes
Response : $Y = \{y1, \cdots, yT\}$

[CLS] [speaker1] query1 [speaker2] response1 [speaker1] query2 [SEP] label [SEP] hasCause [SEP] Cause [SEP]

GPT-2

Generative Pretrained Transformer 2 is an autoregressive language model that uses deep learning to produce human-like text.

Given prompt 1: *The dog on the ship ran*

Generated prompt 1: *The dog on the ship ran* ***off, and the dog was found by the crew.***

Given prompt 2: *The motor on the ship ran*

Generated prompt 2: *The motor on the ship ran* ***at a speed of about 100 miles per hour.***

Story of talking, four-horned, half-breed unicorns in the Andes…

Written by GPT-2

SYSTEM PROMPT (HUMAN-WRITTEN)

In a shocking finding, scientist discovered a herd of unicorns living in a remote, previously unexplored valley, in the Andes Mountains. Even more surprising to the researchers was the fact that the unicorns spoke perfect English.

MODEL COMPLETION (MACHINE-WRITTEN, 10 TRIES)

The scientist named the population, after their distinctive horn, Ovid's Unicorn. These four-horned, silver-white unicorns were previously unknown to science.

Now, after almost two centuries, the mystery of what sparked this odd phenomenon is finally solved.

Dr. Jorge Pérez, an evolutionary biologist from the University of La Paz, and several companions, were exploring the Andes Mountains when they found a small valley, with no other animals or humans. Pérez noticed that the valley had what appeared to be a natural fountain, surrounded by two peaks of rock and silver snow.

Pérez and the others then ventured further into the valley. "By the time we reached the top of one peak, the water looked blue, with some crystals on top," said Pérez.

Pérez and his friends were astonished to see the unicorn herd. These creatures could be seen from the air without having to move too much to see them – they were so close they could touch their horns.

While examining these bizarre creatures the scientists discovered that the creatures also spoke some fairly regular English. Pérez stated, "We can see, for example, that they have a common 'language,' something like a dialect or dialectic."

Resources Explored

GPT-2 tutorial:
https://towardsdatascience.com/openai-gpt-2-understanding-language-generation-through-visualization-8252f683b2f8
https://blog.floydhub.com/gpt2/

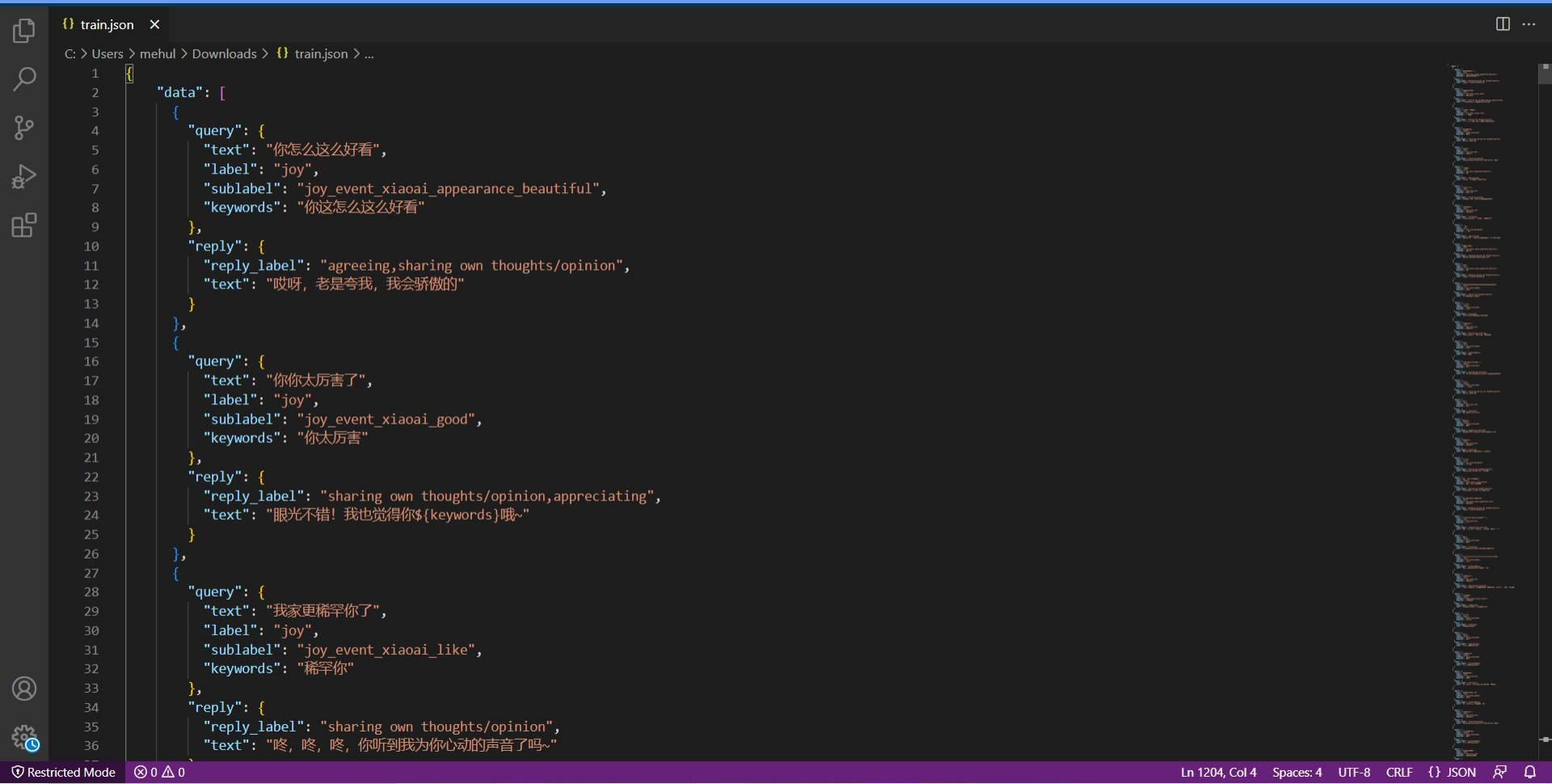
Fine-tuning GPT-2:
https://towardsdatascience.com/how-to-fine-tune-gpt-2-for-text-generation-ae2ea53bc272

BERT tutorial:
https://huggingface.co/bert-base-uncased
https://huggingface.co/docs/transformers/model_doc/bert#transformers.BertForMaskedLM.forward

Engine tutorial:
https://pytorch.org/ignite/generated/ignite.engine.engine.Engine.html#ignite.engine.engine.Engine

XiaoMi EMMA Chinese dataset:
https://github.com/XiaoMi/emma/tree/master/data/raw

Training on XiaoMi EMMA Chinese Dataset



Demo Video

Future Works

Training on a bigger dataset

Hyperparameter tuning

Improving validation score

Training on English dataset

Response generation

Thank You!..