Multi-Agent Debate Framework with Theory of Mind for Code Reasoning

Input(Question , Code)

A1: Predict, Confidence, Reasoning

A2: Predict, Confidence, Reasoning

A3: Predict, Confidence, Reasoning

A1:
1. Analyze: Prediction, Reasoning, Confidence. It will see the gap and alternative approaches
2. Create ToM(A2, A3)
3. Update: Own prediction, confidence, ToM
4. Output: Defend/explain their reasoning, challenge incorrect assumptions, Own Prediction, Confidence

A2:
1. Analyze: Prediction, Reasoning, Confidence. It will see the gap and alternative approaches
2. Create ToM(A2, A3)
3. Update: Own prediction, confidence, ToM
4. Output: Defend/explain their reasoning, challenge incorrect assumptions, Own Prediction, Confidence

A3:
1. Analyze: Prediction, Reasoning, Confidence. It will see the gap and alternative approaches
2. Create ToM(A2, A3)
3. Update: Own prediction, confidence, ToM
4. Output: Defend/explain their reasoning, challenge incorrect assumptions, Own Prediction, Confidence

A1:
1. Analyze: Prediction, Reasoning, Confidence. It will see the gap and alternative approaches
2. Create ToM(A2, A3)
3. Update: Own prediction, confidence, ToM
4. Output: Defend/explain their reasoning, challenge incorrect assumptions, Own Prediction, Confidence

A2:
1. Analyze: Prediction, Reasoning, Confidence. It will see the gap and alternative approaches
2. Create ToM(A2, A3)
3. Update: Own prediction, confidence, ToM
4. Output: Defend/explain their reasoning, challenge incorrect assumptions, Own Prediction, Confidence

A3:
1. Analyze: Prediction, Reasoning, Confidence. It will see the gap and alternative approaches
2. Create ToM(A2, A3)
3. Update: Own prediction, confidence, ToM
4. Output: Defend/explain their reasoning, challenge incorrect assumptions, Own Prediction, Confidence

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Multi-Agent Debate Framework with Theory of Mind for Code Reasoning

- The system takes code and input data, distributes it to multiple agents who form initial predictions with confidence scores. Each agent maintains Theory of Mind (ToM) modules that build mental models of other agents' beliefs and reasoning patterns. During debate rounds, agents engage in strategic argumentation informed by their mental models, exchange arguments, and update their beliefs based on compelling evidence. The process iterates until convergence is achieved or debate reached to 4 levels, after which the SLM will summarize the answer and will give the final answer.

Datasets

1. CodeQA
2. CS1QA
3. CruxEval
4. CodeSence
5. Mbpp

To prove the Generality of the algorithm, we need to add other reasoning datasets as well.

1. MathQA
2. GSM8K