AI for Mental Health

Explainable Suicide Phenotyping from Initial Psychiatric Evaluation Notes Using Reasoning Large Language Models

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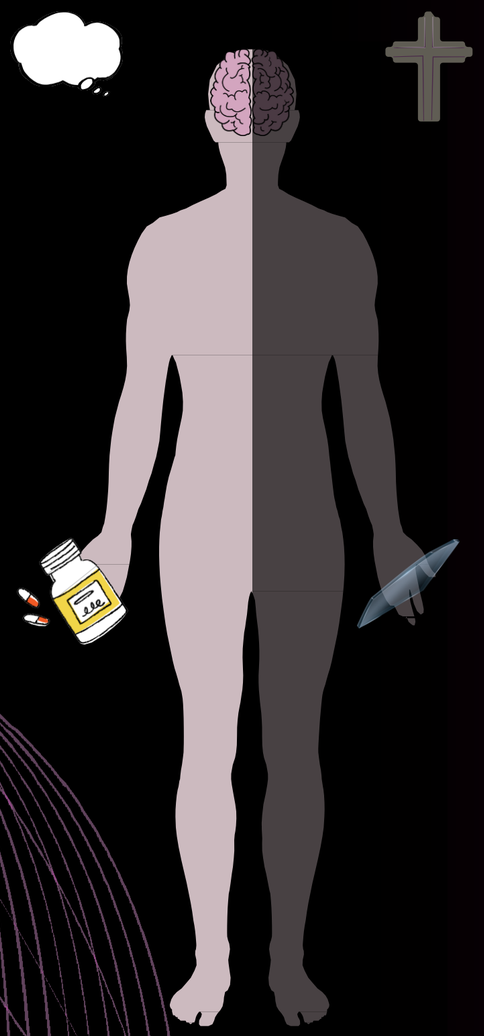
Suicide Phenotyping



SI

Suicide Ideation

- "I have been thinking about killing myself."
- "Recurrent thoughts of death."

SA

Suicide Attempt

- "he had a suicide attempt a year ago when he tried to slit his throat"

ES

Exposure to Suicide

- "blames himself for father committing suicide"

NSSI

Non-Suicidal Self-Injury

- "He cut on his forearm with razor several times."
- "Hx Self-mutilation."

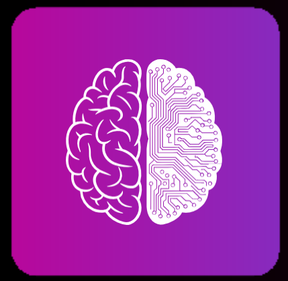
Reasoning LLMs

Redefined AI's problem-solving capabilities by extending LLMs with advanced reasoning mechanisms

GPT
o1,o3,o4

DeepSeek
r1, v3

Qwen



Emulating Human Cognition

Trained to think for longer before responding

Structured Output Format

Research Questions

1

Primary

Comparing to finetuned GPT3.5, how well do in-context learning RLMs perform on multi-label suicide classification task?

2

Secondary

How interpretable is the clinical justification generated by the RLMs?

3

Secondary

What are the clinical implications of adopting out-of-box RLMs VS fine-tuned LLMs?

Methods

Data

500 IPE notes - gold standard
Note level labels: {"SI": 1, "SA": 1, "ES": 0, "NSSI": 1}

Task

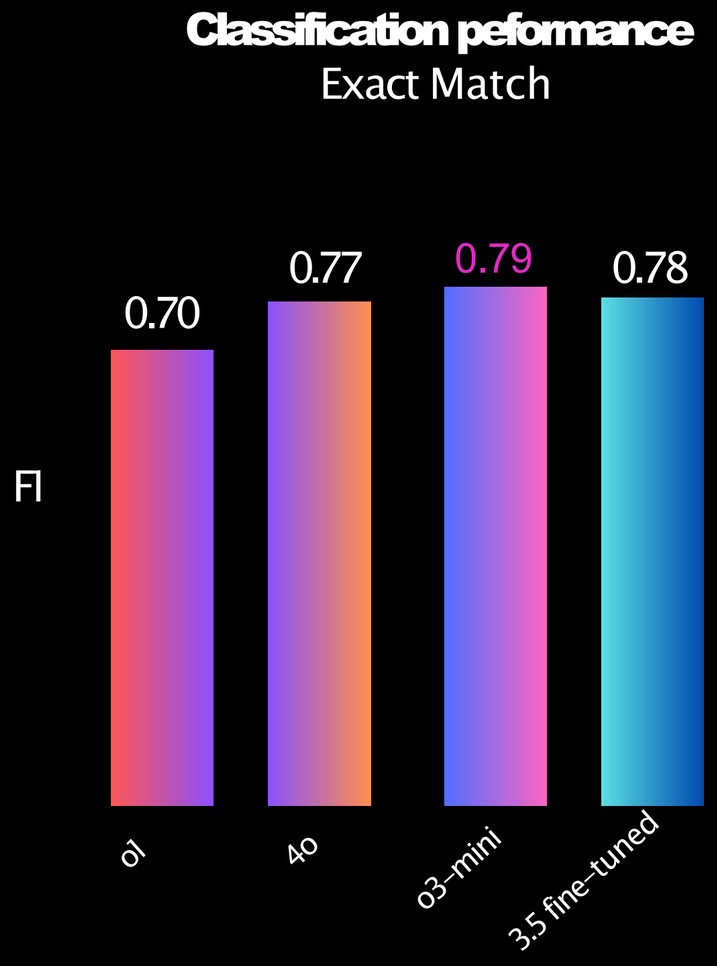
1. Multi-label classification
2. Explanation of each classification
3. Evidence extraction

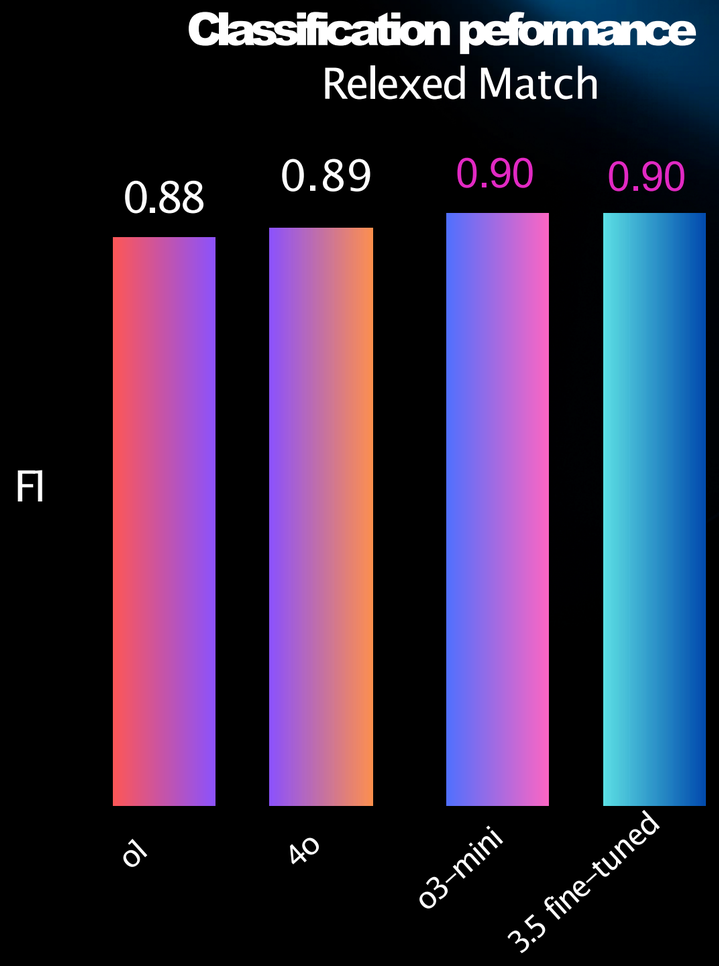
Models

GPT 3.5 - Baseline

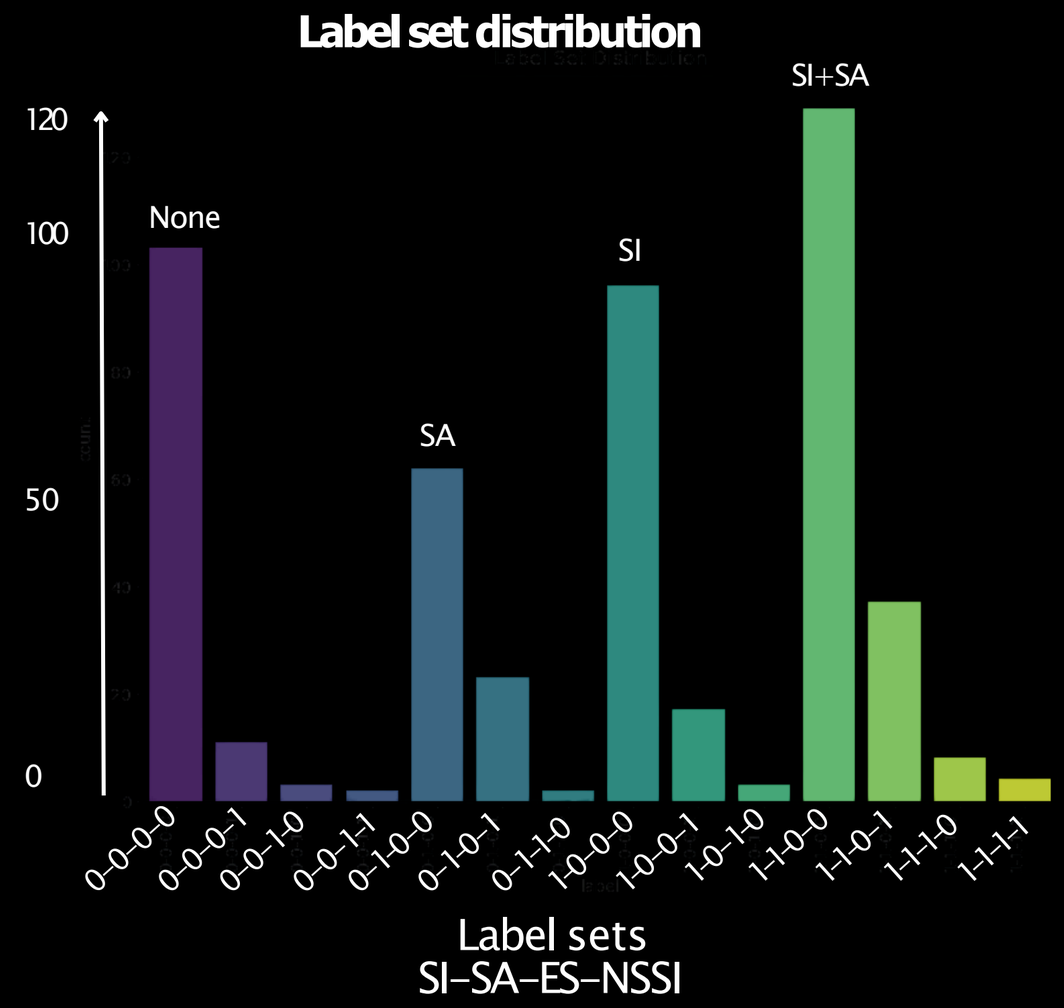
GPT o1
GPT o3-mini
GPT 4o

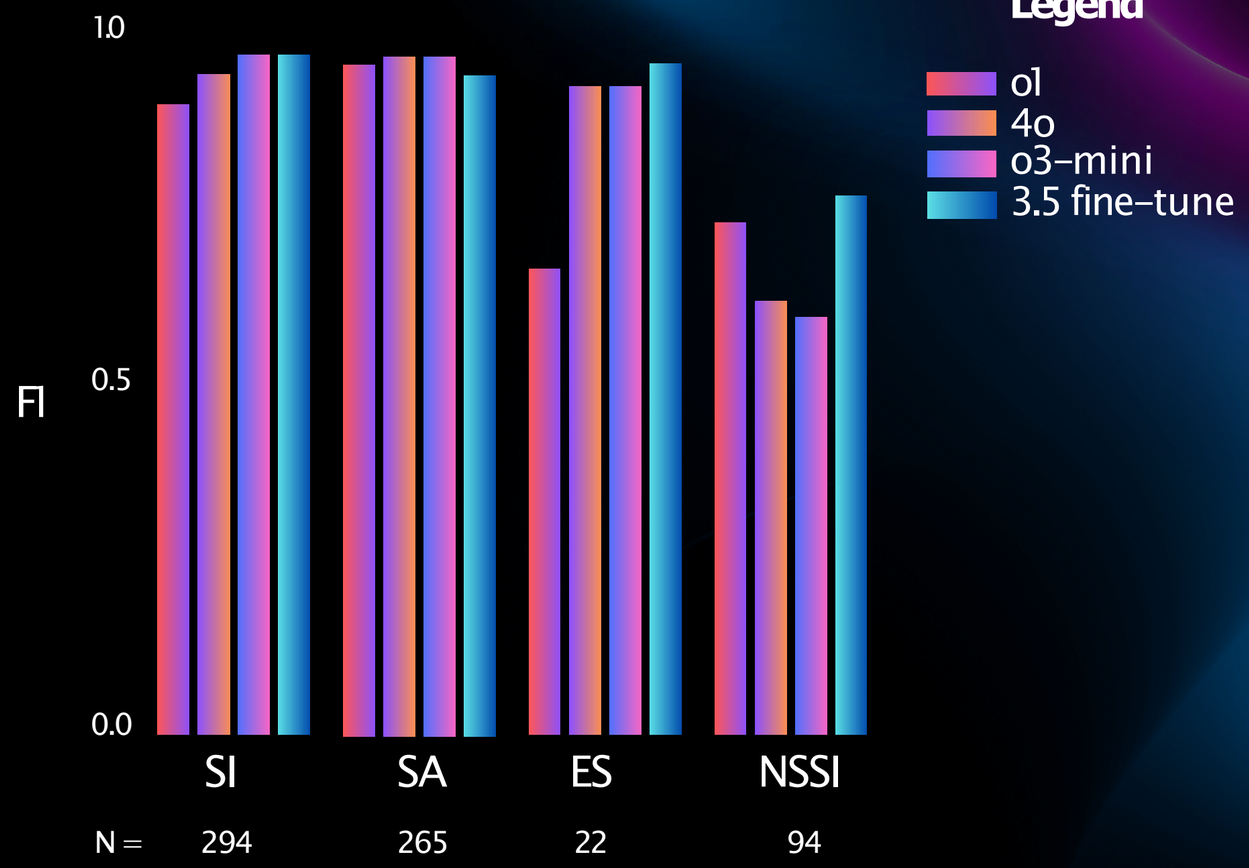
Results - Model Level





Results - Label Level





Reasoning o3-mini

Multiple clinical observations and reports indicate clear suicidal ideation. The note documents that Mr. Colbert expressed suicidal ideas during his transfer from XXX, with comments interpreted by staff and family members, even though his later self-report denies such thoughts. Given that physician observations take precedence, his earlier statement is decisive.

SI

"he expressed suicidal ideas telling the staff there that the next time she sees him will be at his funeral or his grave site"

Multiple clinical observations and reports indicate clear suicidal ideation. The note documents that Mr. Colbert expressed suicidal ideas during his transfer from NPC, with comments interpreted by staff and family members, even though his later self-report denies such thoughts. Given that physician observations take precedence, his earlier statement is decisive.

NSSI

"he expressed suicidal ideas telling the staff there that the next time she sees him will be at his funeral or his grave site"

Thank you

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