

Annota: Peer-based AI Hints Towards Learning Qualitative Coding at Scale

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- How might large classes be an advantage rather than a disadvantage for experiential learning?
- We repurpose label aggregation algorithms to provide peer-based hints that augment learning of complex work rather than for micro-task work.

Intro & Context

- Learning qualitative analysis (QA) requires personalized feedback and in-depth discussion, but educators cannot provide this in large classes.
- To overcome this challenge, we introduce a learnersourcing method that builds on the **Dawid-Skene expectation maximization algorithm (DS-EM)** to generate peer-based AI hints that support students in one aspect of QA: determining what sentences are relevant to the research question.
- The Annota system was deployed in a **large business strategy class ($N = 122$)**. Students each analyzed **8 stakeholder transcripts** in relation to **research questions**, including: *Strengths & Weaknesses*, and *Opportunities & Threats*.
- We measure the quality of hints with a **Macro-F1** score relative to **expert labels/annotations**. We understand the **value to student learning through surveys, interviews, and an inductive qualitative analysis process**.

Peer-Based AI Hints in Annota

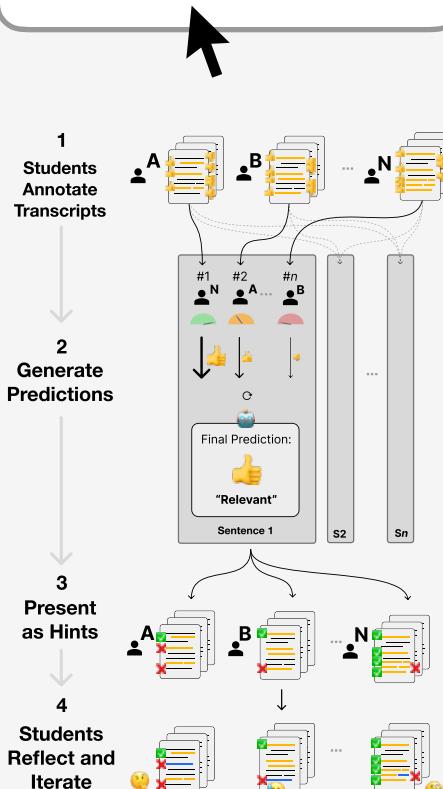
The screenshot shows the Annota system interface. At the top, there's a navigation bar with 'Transcript Interview with Jennifer' and a search bar. Below it, a sidebar lists 'Current Annotations' for 'RQ3 Opportunities and Threats'. The main area displays a transcript from 'John Doe' dated '12/11'. The transcript content is as follows:

Opportunities and Threats
What opportunities and threats are the organization facing on the external environment? What are the opportunities and threats that are internal to the organization? Are there competitive or cooperative?
...
UNIQUENESS AND STRENGTHS
What are the unique strengths of the organization? Why is this important?
...
CHALLENGES AND OPPORTUNITIES
What are the present challenges and opportunities the Art Center faces?
...
RESOURCES
What resources does the organization have available to support its mission?
...
At the bottom, there's a footer with 'Version 1.0.0' and a link to 'https://www.tech4goodlab.com/annota'.

Annotations for the transcript include:

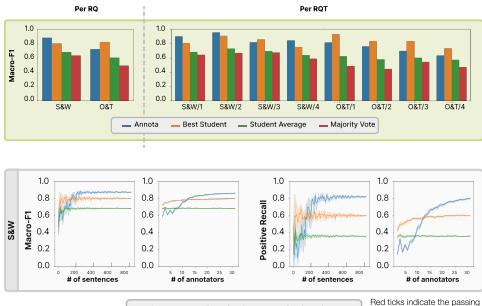
- RQ3 Opportunities and Threats:
 - S1: 'I think we're in a pretty good place right now with our opportunities and threats.'
 - S2: 'I think we're in a pretty good place right now with our opportunities and threats.'
 - S3: 'I think we're in a pretty good place right now with our opportunities and threats.'
 - S4: 'I think we're in a pretty good place right now with our opportunities and threats.'
 - S5: 'I think we're in a pretty good place right now with our opportunities and threats.'
 - S6: 'I think we're in a pretty good place right now with our opportunities and threats.'
 - S7: 'I think we're in a pretty good place right now with our opportunities and threats.'
 - S8: 'I think we're in a pretty good place right now with our opportunities and threats.'
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Can collaborative generative AI be used to facilitate peer learning through peer-based AI hints?



Results

- Annota predictions are **similar to the best students** and **far better than the average student or majority vote** in Macro-F1 scores, with quality gains primarily coming from **strong positive recall and negative precision**.
- Accurate feedback **only requires ~15 annotators** and **assigning ~2 transcripts**.
- Peer-based AI hints **helped students improve their understanding of research questions**, more carefully **examine their transcript annotations**, and improve their understanding of when they were **over-annotating or under-annotating** the transcript.



Collaborative Generative AI for Co-Creative Learning

- How might **collaborative generative AI** be used for **learning the more complex and interpretive aspects of qualitative analysis (QA)**, beyond simply determining relevant sentences?
- After determining relevant sentences, they must be appropriately coded to capture their value relative to answering the research question. Could GenAI help students **better articulate their intent** behind making an annotation, for peers to more easily build upon their work in the later stages of QA?
- Discussion is an integral part of QA. Could GenAI **facilitate discussion across large numbers of students** to surface their unique perspectives and identify areas of disagreement for discussion?