Aspect-based emotion detection from text

Instructions for corpus annotation

To evaluate the performance of the [Clean CaDET Tutor](#) intelligent tutoring system, we are analyzing student feedback in Serbian. The feedback represents students' textual responses to the question, "How would you describe your learning experience with the Clean CaDET platform?" Our task is to develop an AI-based solution for automatically detecting learning-related emotions based on different aspects. Your task is to annotate the texts with the emotions they express using these guidelines.

Annotation is performed at the sentence level. A single sentence can contain one emotion, each related to one aspect. Sentences are obtained by dividing the text accordingly. In addition to the sentences, you will also have access to the texts (responses/comments) to which they belong. The instructions for identifying aspects and emotions defined by the annotation model are given through explanations and examples. The annotation process is illustrated in Figure 1.
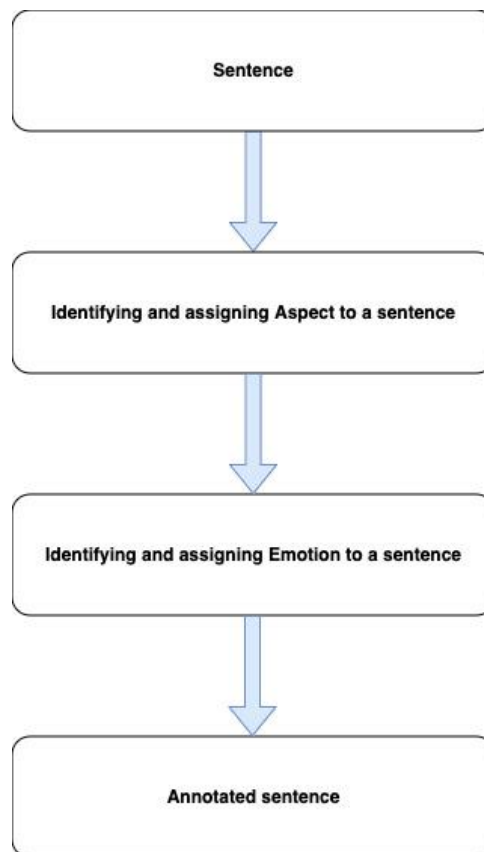

Figure 1. Annotation process

1. Annotation steps and general tips

1. Carefully read the sentence, if necessary, **multiple times**.
2. Analyze the sentence to determine the subject matter and assign **one** of the predefined values for the **Aspect** attribute described in section **2. Aspect**.
3. Determine which emotion is expressed in the sentence and assign **one** of the predefined values for the **Emotion** attribute described in section **3. Emotion**.
4. Aspects and emotions can be expressed **implicitly or explicitly**. **Explicit** writing directly and precisely conveys information, making it easy to understand. **Implicit** writing is indirect and suggestive, allowing multiple interpretations. Implicitness requires annotators to draw conclusions and fill in gaps to understand the author's intended meaning. Examples of implicitness can be found in section **4. Implicitness**.
5. If the aspect or emotion of a sentence cannot be determined without considering the context, annotators are directed to look at other sentences that make up the comment and then assign the appropriate attributes to the sentences they are annotating, as described in section **5. Context**.

2. Aspect

The **Aspect** attribute reflects the subject of the comment. The main aspects discussed are *Software* and *Lesson*. The *Software* aspect includes two categories: *Interface* and *Experience*. The *Lesson* aspect includes categories: *Instructional item* and *Assessment item*. For sentences where the aspect cannot be determined based on the content, the value *Other aspect* is defined. The hierarchy of aspects is shown in *Figure* 2. The annotator first considers whether the sentence can be assigned an aspect at a lower hierarchical level. Without a basis for such annotation, the sentence is assigned an aspect at a higher hierarchical level. The individual aspects are further explained and illustrated below.
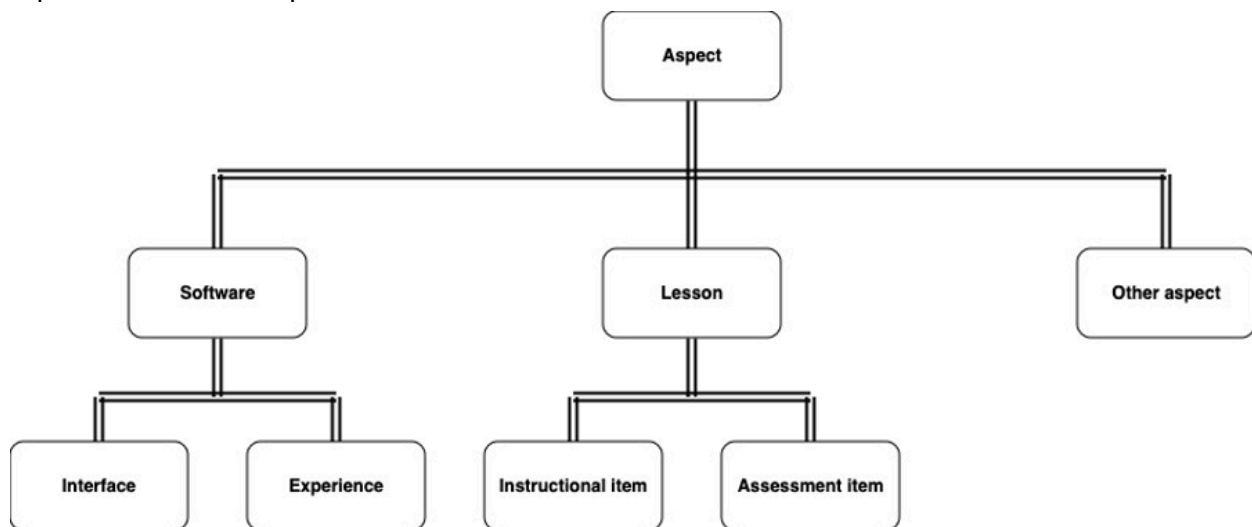

Figure 2. **Aspect** attribute values

Interface refers to how the user interacts with the software application and navigates through it. It includes the appearance of buttons, text, images, and other visual elements that make up the

interface. The user interface is designed to facilitate users in completing their tasks and finding the information they need. Examples of sentences where the aspect is *Interface*:

Sentence	Aspect	Emotion
This little window is starting to annoy me	Interface	Frustration
In the task of analyzing the diagram, semantic cohesion lesson, the diagram is not completely visible, and you need to reduce the page zoom to see the whole thing.	Interface	Frustration

Experience refers to the overall experience a user has while interacting with the software application. It includes factors such as ease of use, efficiency, and overall satisfaction. Examples of sentences where the aspect is *Experience*:

Sentence	Aspect	Emotion
It's quite an interesting way to conduct a class	Experience	Engagement
Great experience!	Experience	Delight

If a sentence about the software cannot be categorized into one of the previous two categories (*Interface* and *Experience*), assign the aspect of **Software** to such a sentence. Examples of sentences where the aspect is *Software*:

Sentence	Aspect	Emotion
I'm satisfied with the Tutor's performance.	Software	Delight
Great app.	Software	Delight

Instructional item refers to the availability and quality of teaching materials - instructional videos, texts, and illustrations. Examples of sentences where the aspect is an *Instructional item*:

Sentence	Aspect	Emotion
The illustrations are good.	Instructional item	Engagement
The material is difficult	Instructional item	Frustration

Assessment item refers to the availability and quality of knowledge assessment elements - multiple-choice questions, drag-and-drop tasks, and programming challenges. Examples of sentences where the aspect is an *Assessment item*:
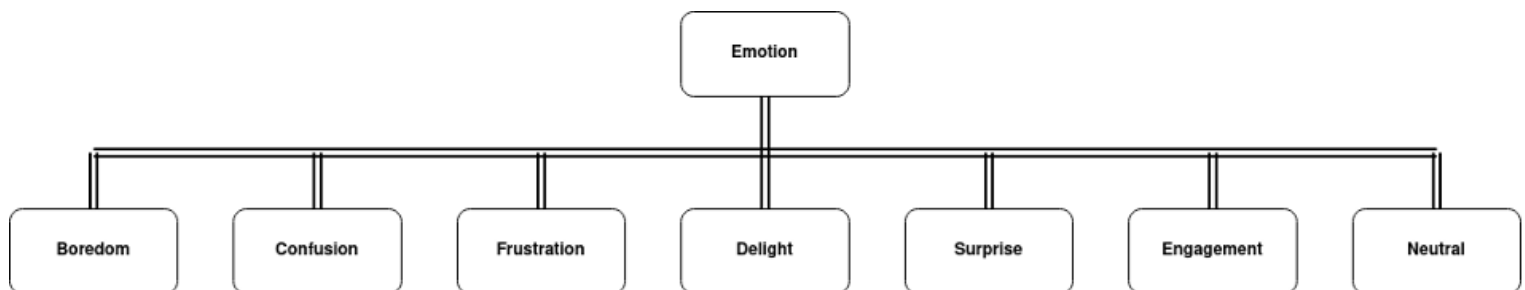
Sentence	Aspect	Emotion
The tasks are interesting.	Assessment item	Engagement
I liked the challenge!	Assessment item	Delight

If a sentence about the lesson cannot be categorized into one of the previous two categories (*Instructional item* and *Assessment item*), assign the aspect of the **Lesson** to such a sentence. Examples of sentences where the aspect is *Lesson*:

Sentence	Aspect	Emotion
The lesson was short, clear, and concise	Lesson	Engagement
The lesson was exhausting.	Lesson	Frustration

3. Emotion

The **Emotion** attribute assesses the emotion the writer expresses in their comment while evaluating or judging the subject of writing. This attribute can take the values of *Boredom*, *Confusion*, *Frustration*, *Delight*, *Surprise*, and *Engagement*, as shown in Figure 3. For sentences where no emotion can be determined, or the same cannot be determined with certainty, the value *Neutral* is defined. The individual emotions are further explained and

illustrated below.

Figure 3. **Emotion** attribute values

Boredom is a negative emotional state characterized by feelings of apathy and disinterest in the task. It is often accompanied by a lack of attention, low motivation, and a general feeling of disengagement. It can be recognized by using keywords or phrases: *boring*, *monotonous*,

uninteresting. It is marked by a lack of enthusiasm in writing. Examples of sentences where the emotion is *Boredom*:

Sentence	Emotion	Aspect
Checkbox tasks are monotonous.	Boredom	Assessment item
I already feel there are too many tasks, and I'm getting tired	Boredom	Assessment item
I can't concentrate on the lesson.	Boredom	Lesson
The Tutor puts me to sleep.	Boredom	Software
The lesson is unappealing.	Boredom	Lesson

Confusion is an affective state characterized by a sense of uncertainty, ambiguity, and difficulty in understanding information or situations. It can be recognized using keywords or phrases: *confused*, *uncertain*, *lost*. It is characterized by the use of language indicating a lack of clarity, such as expressing doubt in understanding or asking questions that require further clarification. Examples of sentences where the emotion is *Confusion*:

Sentence	Emotion	Aspect
The lesson requirements are confusing.	Confusion	Lesson
I didn't understand what was required in the task, the question needs to be better formulated	Confusion	Assessment item
I'm lost in this lesson	Confusion	Lesson
I have trouble understanding the idea of this diagram	Confusion	Instructional item
I'm struggling to understand this lesson	Confusion	Lesson

Frustration is a negative emotional response to obstacles or hindrances in achieving goals. It is a state of uncertainty and dissatisfaction that arises from unresolved problems or unmet needs. It can be recognized using keywords or phrases: *frustrated*, *irritated*, *discouraged*. It is characterized by the use of sharp language. Examples of sentences where the emotion is *Frustration*:

Sentence	Emotion	Aspect
Problems with challenges again	Frustration	Assessment item
Challenges irritate me	Frustration	Assessment item

Why are challenges so difficult?!	Frustration	Assessment item
The choice of colors drives me crazy	Frustration	Interface
Submitting a response takes forever	Frustration	Assessment item

Delight is a positive emotional response to aspects of the learning environment, such as interesting and pleasant content or successful task completion. It is often the result of experiencing or anticipating a desirable or pleasant event or satisfying a personal need or goal. It is characterized by feelings of joy and excitement. It can be recognized using keywords or phrases: *delighted*, *satisfied*, *excited*. It is marked by the use of positive language, an enthusiastic tone, or an energetic writing style. Examples of sentences where the emotion is *Delight*:

Sentence	Emotion	Aspect
Super, lessons are easy to understand!	Delight	Lesson
Quizzes are fun!	Delight	Assessment item
I'm delighted with the Tutor!	Delight	Software
These hints are such a relief	Delight	Instructional item
The Tutor is the best thing for learning	Delight	Software

Surprise is a feeling of unexpectedness or wonder regarding the teaching material or task. It is a sudden discovery of something unexpected and is characterized by a sense of unexpectedness or shock. It can be recognized using keywords or phrases: *surprised*, *astonished*, *shocked*, *unexpected*. It is marked by the use of exclamatory language, increased energy or excitement in writing, or sudden change in tone. Examples of sentences where the emotion is *Surprise*:

Sentence	Emotion	Aspect
I haven't encountered such learning before	Surprise	Experience
An interesting introduction to using the tutor	Surprise	Software
I didn't expect such a question!	Surprise	Assessment item
I'm shocked at how well the Tutor works.	Surprise	Software
Incredible experience!	Surprise	Experience

Engagement is a state of involvement or interest in the material or learning task. It is characterized by a feeling of focus, dedication, and complete immersion and focus on the subject of learning. Numerous factors, including personal motivation, task difficulty, and the presence of distractions, influence engagement. It can be recognized using keywords or phrases: *interested*, *focused*, *involved*, *fascinated*. It is marked by a consistent writing style, the use of descriptive language, or a positive tone. Examples of sentences where the emotion is *Engagement*:

Sentence	Emotion	Aspect
Very interesting interaction.	Engagement	Experience
Interesting tasks, it was interesting solving them.	Engagement	Assessment item
I'm completely focused on the lesson	Engagement	Lesson
I can't wait to solve another task	Engagement	Assessment item
The Tutor helps me pay attention to every detail	Engagement	Software

4. Implicitness

Implicitness refers to a writing style in which information is implied, suggested, or inferred rather than directly stated.
Examples of sentences where the **Aspect** is expressed implicitly:

Sentence	Aspect	Emotion
I feel confused right now.	Experience	Confusion
I am currently irritated.	Experience	Frustration
It's fun for me.	Experience	Delight
I'm not really motivated to work right now.	Experience	Boredom

Examples of sentences where the **Emotion** is expressed implicitly:

Sentence	Emotion	Aspect
The codes in the lessons are becoming unreadable.	Frustration	Lesson
Too many "philosophical questions".	Boredom	Assessment item

I'm not motivated to learn with the Tutor.	Boredom	Software
Many questions are repetitive.	Boredom	Assessment item
I lose focus on long texts	Boredom	Instructional item
Can the question be broken down better?	Confusion	Assessment item
I don't see how this question fits into the lesson.	Confusion	Assessment item
I think this hint lacks more details.	Confusion	Instructional item
This takes too long	Frustration	Experience
The question doesn't make sense	Frustration	Assessment item
I won't get anywhere with this lesson	Frustration	Lesson
The hint is what I needed	Delight	Instructional item
The Tutor is a step in the right direction	Delight	Software
I'm glad I'm using the Tutor	Delight	Software
Unexpected challenge outcome	Surprise	Assessment item
The experience was different from what I expected	Surprise	Experience
Surprising code execution results	Surprise	Assessment item
I think learning with the Tutor is really interesting	Engagement	Software
I want to dive deeper into the lesson	Engagement	Lesson
I understand the material better with the Tutor	Engagement	Software

5. Context

For sentences where the aspect or emotion cannot be determined without considering the context, it is necessary to look at other sentences that make up the comment. Examples of sentences where the aspect or emotion cannot be precisely determined without considering the context:

Sentence	It's different and therefore interesting.
The entire comment	I haven't encountered such learning before. It's different and therefore interesting.

Aspect	Experience
Emotion	Engagement

Sentence	I liked that
The entire comment	I didn't expect such a long task. I liked that
Aspect	Assessment item
Emotion	Delight