Probabilistic XAI (Final)

Q1 **Description**: This study explores how an AI agent can explain its decisions to help a human operator better understand its reasoning in an intelligent warehouse. As a participant, you will: Interact with an AI agent that provides explanations for its choices. Evaluate which explanations are easier to accept and more effectively adjust your understanding. The overall goal is to identify the most effective ways for AI agents to communicate their reasonings to human users. **Duration**: The expected duration of the study is approximately 7 minutes. **Compensation**: You will be compensated $2 for completing the study. Your participation in the study is voluntary.

Q2 **Consent Form** By selecting agree, you acknowledge that your participation in the study is voluntary, you are at least 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time for any reason.

○ I agree (1)

○ I do not agree (2)

Q1 Please enter your Prolific ID? *Please note that this response should auto-fill with the correct ID.*

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Q2 Age

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Q3 Gender

○ Male (1)

○ Female (2)

○ Other (3)

○ Prefer not to say (4)

Q4 Highest educational qualifications

○ Undergraduate Degree (1)

○ Graduate Degree (2)

○ High School Degree (3)

○ Other (4)

Q5 The above answers are truthful to the best of my understanding.

○ Yes (1)

End of Block: Prolific ID

Start of Block: Block 7

Q29 We will now introduce the scenario of our study. Please make sure you're in a comfortable environment where you can focus.

End of Block: Block 7

Start of Block: Block 3

Q8 **Scenario: Deciding Whether to Deliver Goods to the Loading Zone**
   In an intelligent warehouse, an AI agent, called *Blitzcrank,* is responsible for determining whether goods should be delivered to the loading zone. It makes decisions based on sensor data and a predefined model that considers multiple factors, such as order priority, inspection requirements, space availability, and congestion. Meanwhile, a human operator oversees the process, relying on experience and personal judgment to assess the situation.   During task execution, Blitzcrank and the operator may reach different conclusions about whether the delivery should proceed. This happens because they evaluate the same situation using different criteria.   To resolve these discrepancies, Blitzcrank provides explanations for its decision, helping the operator understand its reasoning process.   **Your task:** As a participant, you will evaluate different explanations and determine which ones help you better understand Blitzcrank's decision.

End of Block: Block 3

Start of Block: Block 5

Q10 **Scenario**
  We now require your full attention. Please make sure you are concentrated for the upcoming tasks.

Q12 Which of the following is a task that Blitzcrank performs in this scenario?

○ Sorting items in the warehouse (1)

○ Delivering goods to the loading zone (2)

○ Determining whether an order should be sent for manual review (3)

○ Packing orders for shipment (4)

End of Block: Block 5

Start of Block: Block 8

Q30 **Operator's Understanding of the Delivery Task**
  In our scenario, the main task is the delivery of two items, **Item A** and **Item B**, which are awaiting processing.

Importantly, the operator has her own understanding and beliefs about this situation. Specifically, the operator thinks that:

It is *highly likely* that Item A requires additional inspection. It is *much less likely* that Item B is part of a high-priority order.   It is *highly likely* that the loading zone has space available. **From the operator's perspective**, Blitzcrank should execute the delivery task **only if Item B is part of a high-priority order.**

Note: *Highly likely* refers to a high probability (for example, greater than 0.5), whereas *much less likely* refers to a low probability (for example, lower than 0.5).

Q9 **Explanations**

Blitzcrank decides to deliver the goods, but the operator believes the delivery should not have happened.   To help the operator understand, Blitzcrank has five possible explanations to justify its decision: **Explanation 1**: Item B is *highly likely* to be part of a high-priority order, whereas it was initially considered *much less likely*.   **Explanation 2**: The task can *also* be executed if Item B is not part of a high-priority order, provided that there is space available in the loading zone.   **Explanation 3**: Based on current information, the loading zone is *much less likely* to be congested. The task can *also* be executed if the loading zone has space available and is not congested.   **Explanation 4**: Item A is *much less likely* to require additional inspection, whereas it was originally thought to be *highly likely.* The task can *also* be executed if Item A does not require additional inspection and the loading zone has space available.   **Explanation 5**: The assumption that the task should only be executed when Item B is part of a high-priority order **is inaccurate***.* The task *should be* executed if Item B is not part of a high-priority order and the loading zone has space available*.*   In what follows, you will compare these explanations and determine which ones are better to be provided to the operator. To help your decision-making, try to think from the perspective of the operator -- if you were in their shoes, what kind of explanation would you prefer to receive from Blitzcrank?

Q32
Operator's Understanding

It is *highly likely* that Item A requires additional inspection. It is *much less likely* that Item B is part of a high-priority order.   It is *highly likely* that the loading zone has space available.   Blitzcrank should execute the delivery task **only if Item B is part of a high-priority order.**

Note: *Highly likely* refers to a high probability (for example, greater than 0.5), whereas *much less likely* refers to a low probability (for example, lower than 0.5).

EQ1_2 Which of the following two explanations should be provided to the operator?

Explanation 1: Item B is *highly likely* to be part of a high-priority order, whereas it was initially considered to be *much less likely.* **Explanation 2**: The task can *also* be executed if Item B is not part of a high-priority order, provided that there is space available in the loading zone.

○ Explanation 1 (1)

○ Explanation 2 (2)

EQ3_4 Which of the following two explanations should be provided to the operator?

Explanation 3*:* Based on current information, the loading zone is *much less likely* to be congested. The task can *also* be executed if the loading zone has space available and is not congested. **Explanation 4**: Item A is *much less likely* to require additional inspection now, whereas it was originally thought to be *highly likely*. The task can *also* be executed if Item A does not require additional inspection and the loading zone has space available.

○ Explanation 3 (1)

○ Explanation 4 (2)

EQ3_5 Which of the following two explanations should be provided to the operator?

Explanation 3*:* Based on current information, the loading zone is *much less likely* to be congested. The task can *also* be executed if the loading zone has space available and is not congested. **Explanation 5**: The assumption that the task should only be executed when Item B is part of a high-priority order **is inaccurate**. The task *should* be executed if Item B is not part of a high-priority order and the loading zone has space available.

○ Explanation 3 (1)

○ Explanation 5 (2)

EQ4_5 Which of the following two explanations should be provided to the operator?

Explanation 4: Item A is *much less likely* to require additional inspection now, whereas it was originally thought to be *highly likely*. The task can *also* be executed if Item A does not

require additional inspection and the loading zone has space available.   **Explanation 5**: The assumption that the task should only be executed when Item B is part of a high-priority order **is inaccurate**. The task *should* be executed if Item B is not part of a high-priority order and the loading zone has space available.

○ Explanation 4 (2)

○ Explanation 5 (3)

QQ1 Please briefly describe what influenced your decisions when comparing and choosing explanations?

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QQ2 Did you consider the operator's understanding of the task when choosing an explanation?

○ Yes (1)

○ No (2)

QQ3 Did you consider any (implicit) costs associated with communicating the chosen explanations to the operator?

○ Yes (1)

○ No (2)

QQ3_1 If answered "Yes" to the above question, please briefly explain your thinking.

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Q25 We are now done. Thank you for taking part in this study. Please click the button below to be redirected back to Prolific.