
# Factors Impacting the Quality of User Answers on Smartphones

**2023-06**

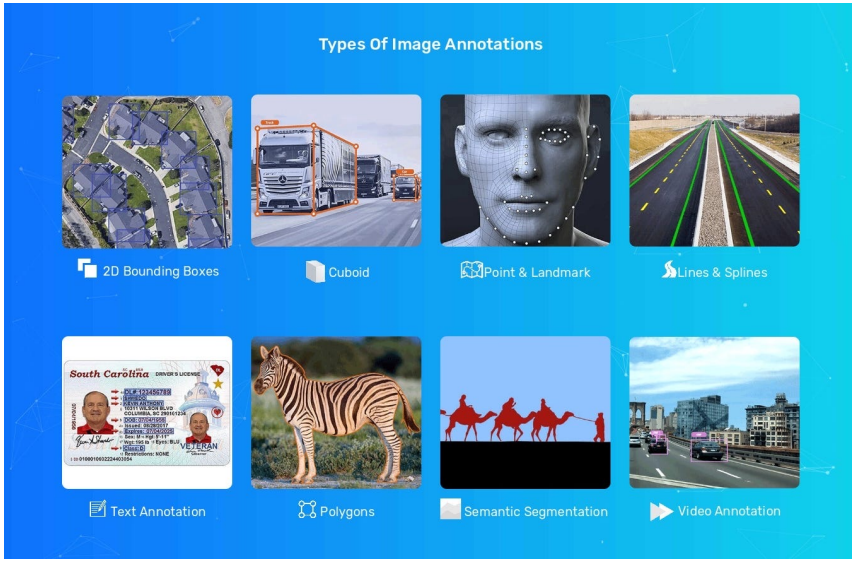
*University of Trento*

**Ivano BISON, Haonan ZHAO**

*UNITN*

# Index

- Annotated data is the key to Machine Learning
- The research question
- The causes of mistakes
- Theoretical model
- Response behaviour
- Conclusion

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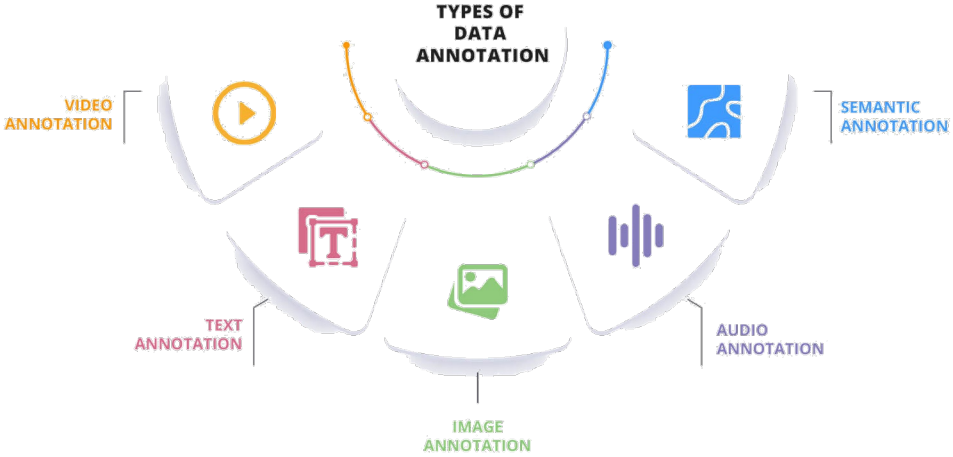
# Annotated data is the key to Machine Learning

# Annotated data is the key to Machine Learning:

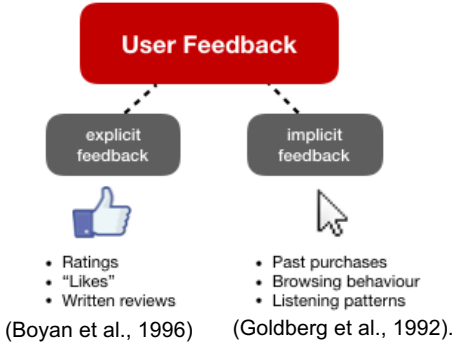
## When adding meaning becomes an issue.

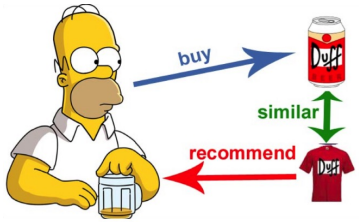
Manual data labeling is the most time-consuming and expensive method, but it may be warranted for important applications.




over 80% of the time enterprises spend on AI projects goes toward preparing, cleaning and labeling data.

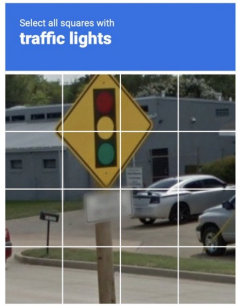
identifying certain properties or characteristics, or classifications or contained objects




Enables human-in-the-loop

Humans manually annotated data

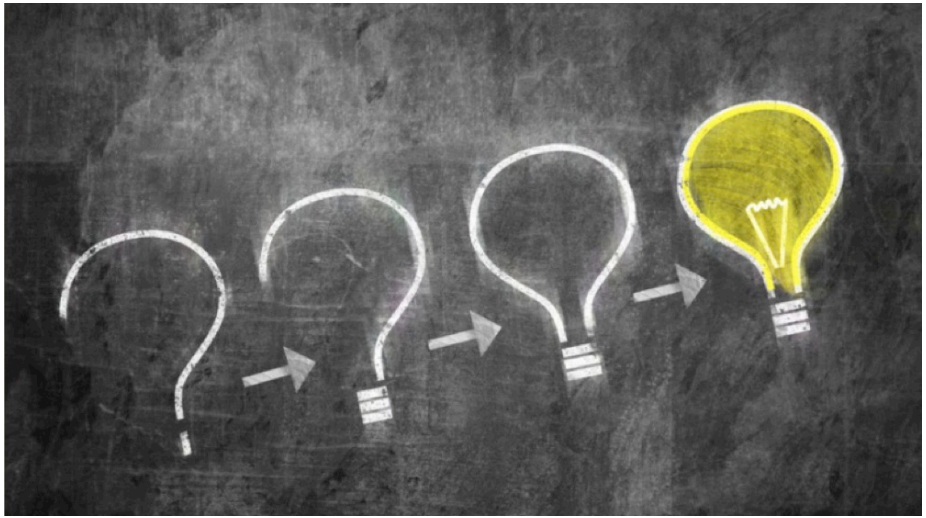


# Annotated data is the key to Machine Learning:

## When adding meaning becomes an issue.


No external encoder can answer these questions correctly.

The solution: is that the user becomes his/her own encoder.



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# The research question

# The research question

The quality of data, their reliability, and validity, are crucial for all the scientific disciplines, being key for the development of, e.g., supervised machine learning and deep learning models.

In the ESM (Experience sampling method) data collection, the main problems are the impossibility of capturing the real causes of mistakes, mainly because of the impossibility of observing the behavior of the respondent *in-the-wild*, while answering, e.g., which causes? which conditions?

Although finding the best time to send notifications is the main challenge in designing EMA/ESM technologies, and while literature has focused on increasing participant compliance to self-report questionnaires, ***relatively little work has assessed response accuracy***, no one has pointed out that EMA/ESM data collection is a process involving many different aspects and only a holistic perspective can provide improvements.


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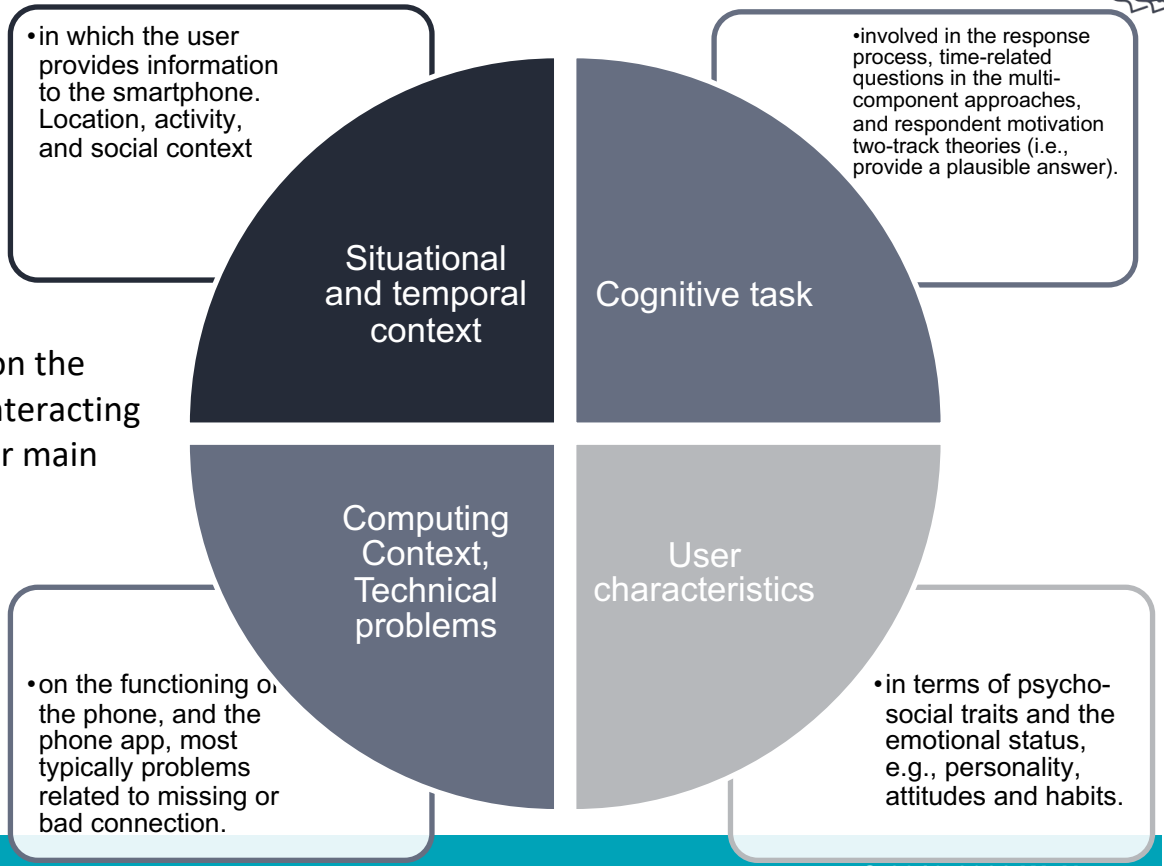
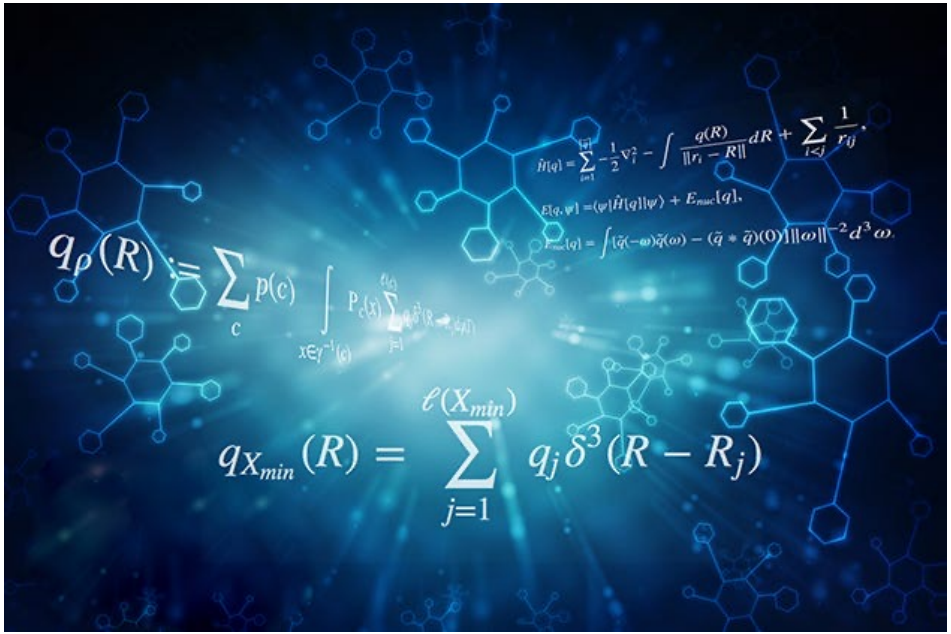
# The causes of mistakes

# Time to reply plus burdens plus context equal errors

The causes of mistakes on the side of the user, when interacting with the machine, in four main areas.



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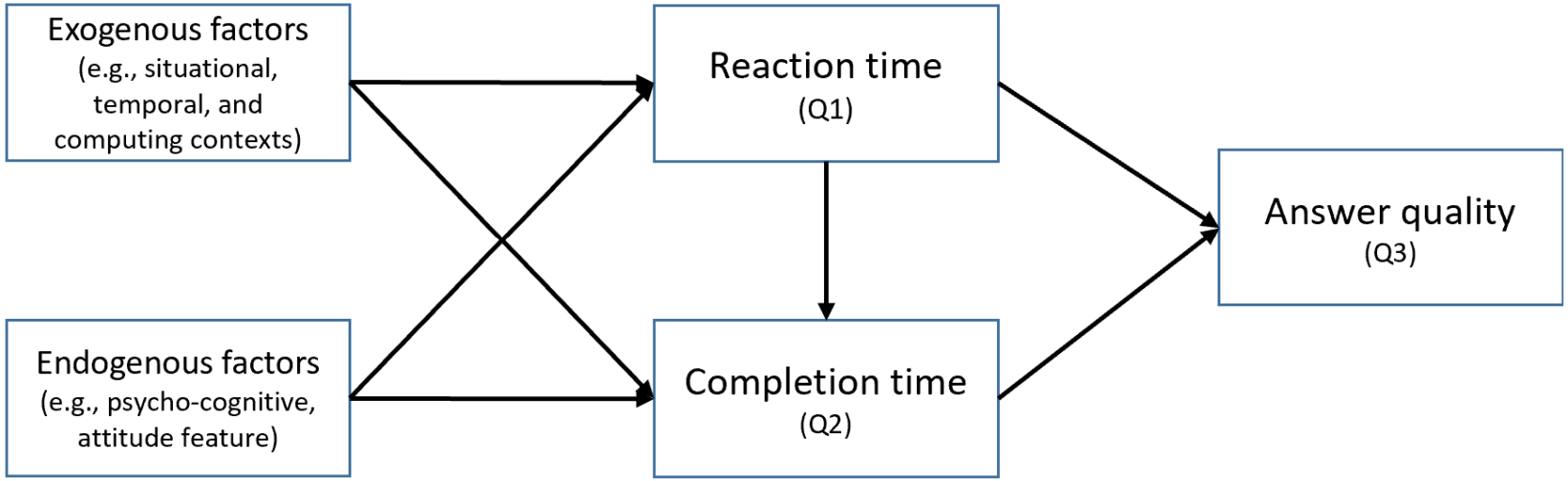
# Theoretical model

# Chain of errors

The **theoretical model** of the causal chain of events causing the answer quality.




The quality of responses depends on **exogenous** (e.g., *the situational, temporal, and computing contexts*) and **endogenous** (e.g., *cognitive, personality traits, attitude feature*) causes that influence both the user's *reaction time*, i.e., the decision to respond, and the *completion time*, i.e., the filling in the questions, and, consequently, the response accuracy.

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# Response behavior:
*time & memory*

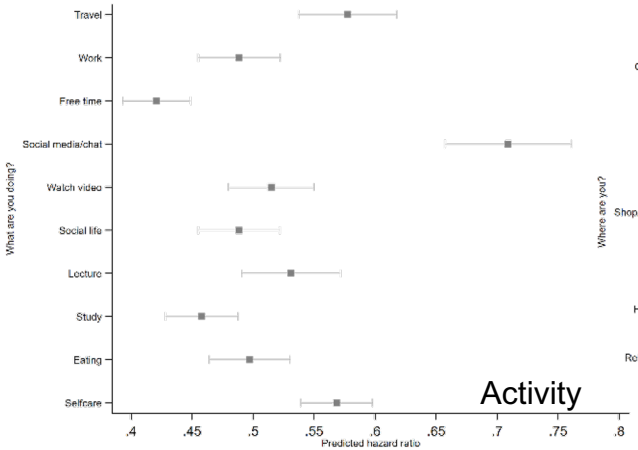
# We trust in our memory

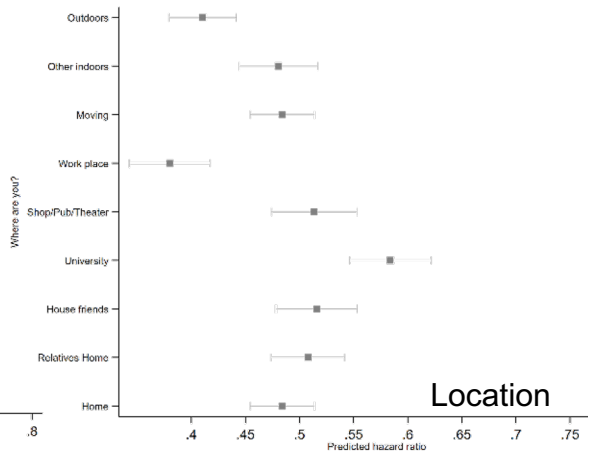
Although we trust in the goodness of our memories, research on autobiographical memory teaches us that memory can be unreliable.

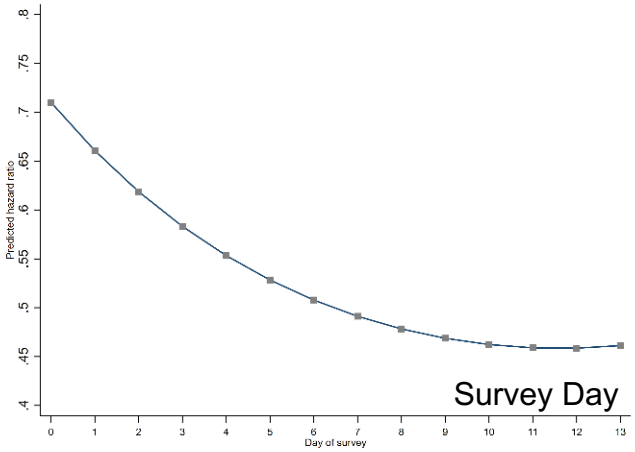
Our recollections are not just inaccurate: They are often systematically biased.

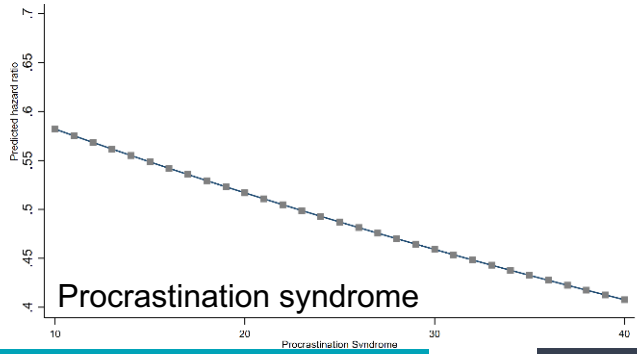
*The more time elapses from what we want to recall, the greater the risk of making mistakes.*

# Reaction time



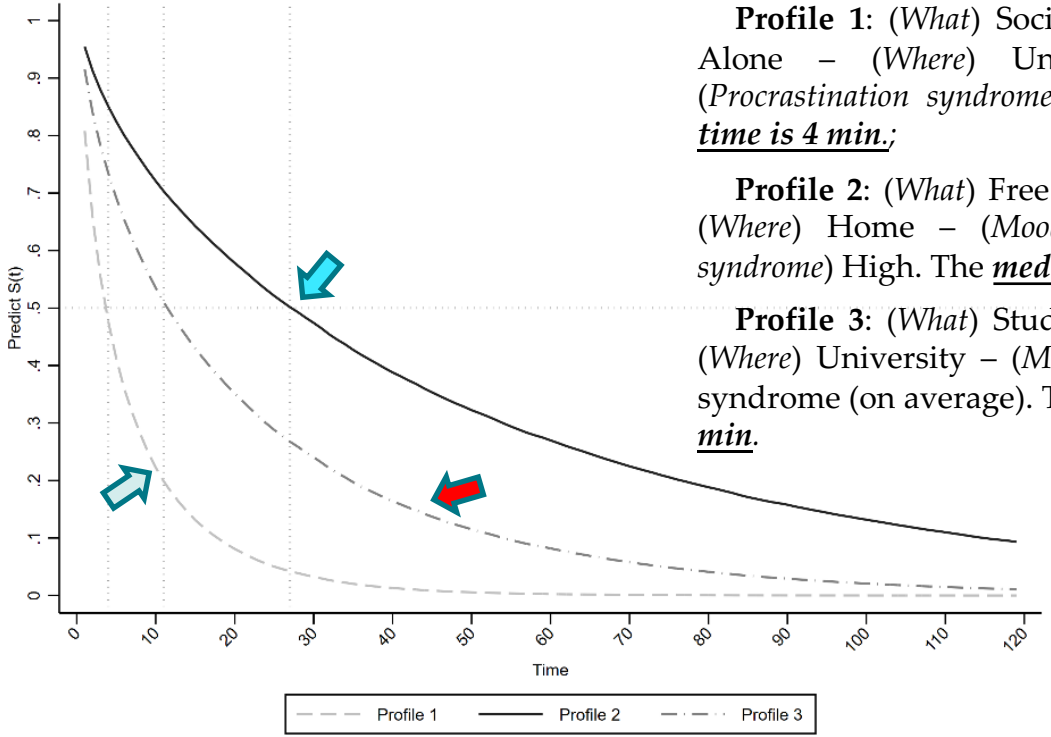




Survival analysis: Cox-regression model, Predicted hazard ratio

# Reaction time




Predicted survival function by some user's profile

**Profile 1**: (*What*) Social media/chat – (*With whom*) Alone – (*Where*) University – (*Mood*) sad - (*Procrastination syndrome*) Low. The ***median reaction time is 4 min.;***

**Profile 2**: (*What*) Free time - (*With whom*) Partner - (*Where*) Home – (*Mood*) Happy – (*Procrastination syndrome*) High. The ***median reaction time is 27 min.;***

**Profile 3**: (*What*) Study - (*With whom*) Classmate - (*Where*) University – (*Mood*) neutral - Procrastination syndrome (on average). The ***median reaction time is 11 min.***

Furthermore, when only 50.0% of Profile 2 users filled out the notification, about 75.0% of Profile 3 and 95.0% of Profile 1 did the same.

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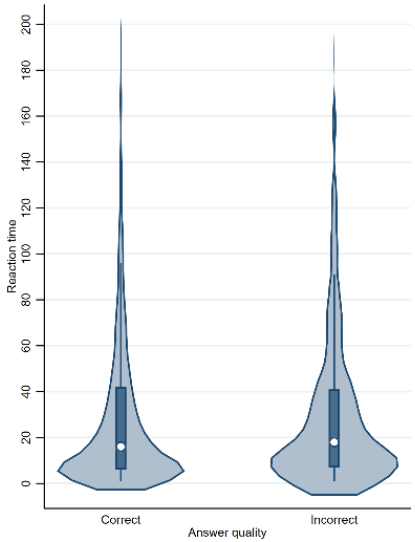
# Response behavior:
*The chain of errors*

# Chain of errors

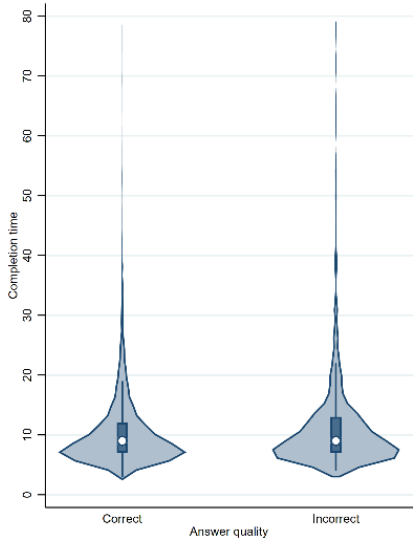
Reaction Time




Mean reaction time:

- Correct (38 minutes)
- Incorrect (43 minutes)

(Fisher F= 5.02 p <0.05)



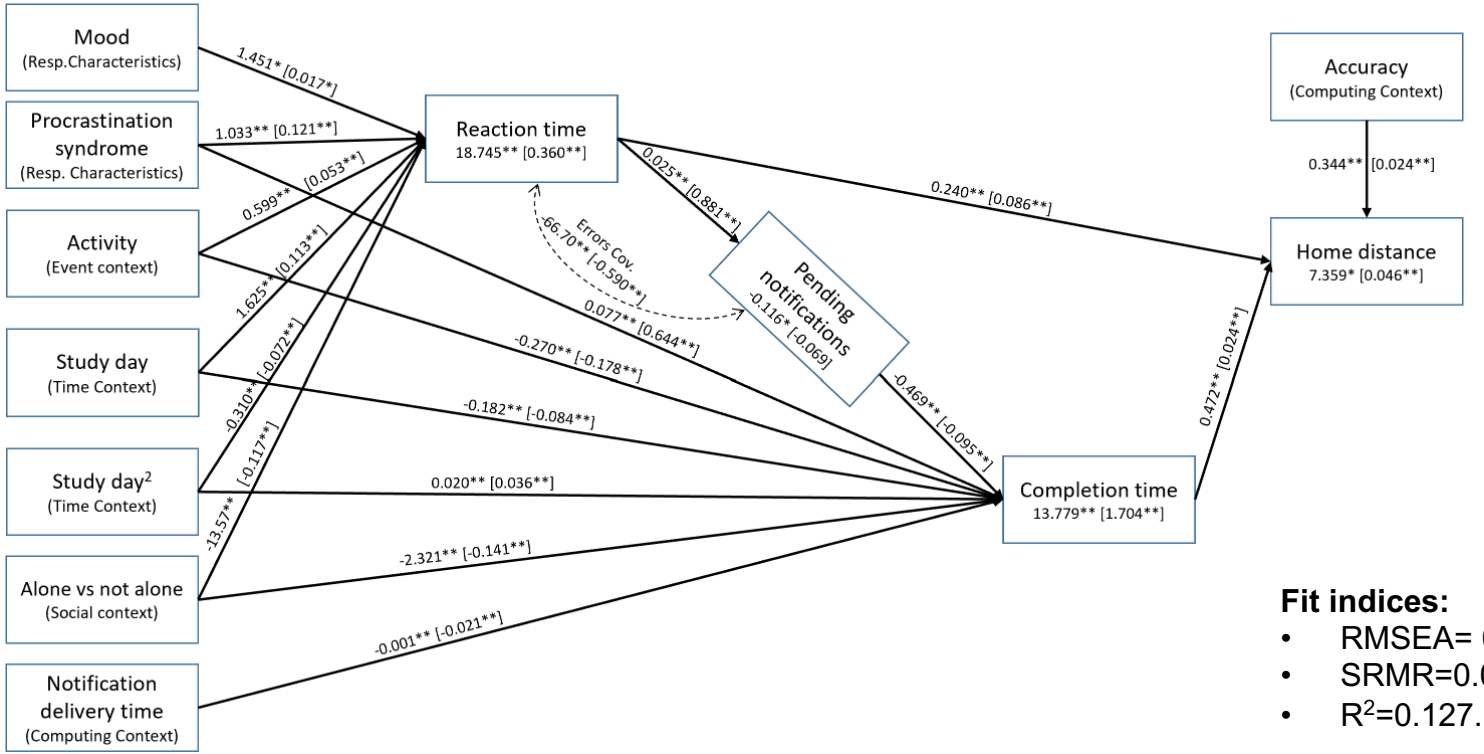

Completion time

Mean completion time:

- Correct (11.0 seconds)
- Incorrect (11.8 seconds)

(Fisher F= 4.73 p <0.05)

# Chain of errors




**Fit indices:**

- RMSEA= 0.022
- SRMR=0.013
- $R^2$=0.127.

Multilevel structural equation model and a Structural Equation model

***Exogenous*** and ***endogenous*** factors affect the quality of responses.

*Context history, cognitive ability, attention, effort, motivation, burden, procrastination, mood, and technical problems* **cause a decrease in the accuracy** of answers due to the increased probability of:

a. stopping the interaction with the machine;
b. not complying with the interaction protocol;
c. decreasing the level of attention.


# Conclusion

# Conclusion

**Actionable recommendations**:

(1) in the future the researcher's attention should be placed on several factors related to:

(a) controlling *the situational and temporal context* to find the best moment for administering a notification;

(b) focuses on the *human-machine interaction* not only on the layout of the apps, but *on the structure and order of the response alternatives, the ease of filling in, and finally on the support of the machine to help respond to reduce the response time and improve its quality*.

(2) results are related to the cognitive and psychosocial traits of the respondents. In the future, it will be a matter of finding:

*(a) what and how cognitive factors* act differently; and,

*(b) how to extrapolate* their data and replace missing data from the few and fragmented data provided

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Website
www.internetofus.eu

Email
info@internetofus.eu

Twitter
@WeNetProject

WeNet project is funded by the EU's Horizon2020 programme under Grant Agreement number 823783.

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# Thank you!