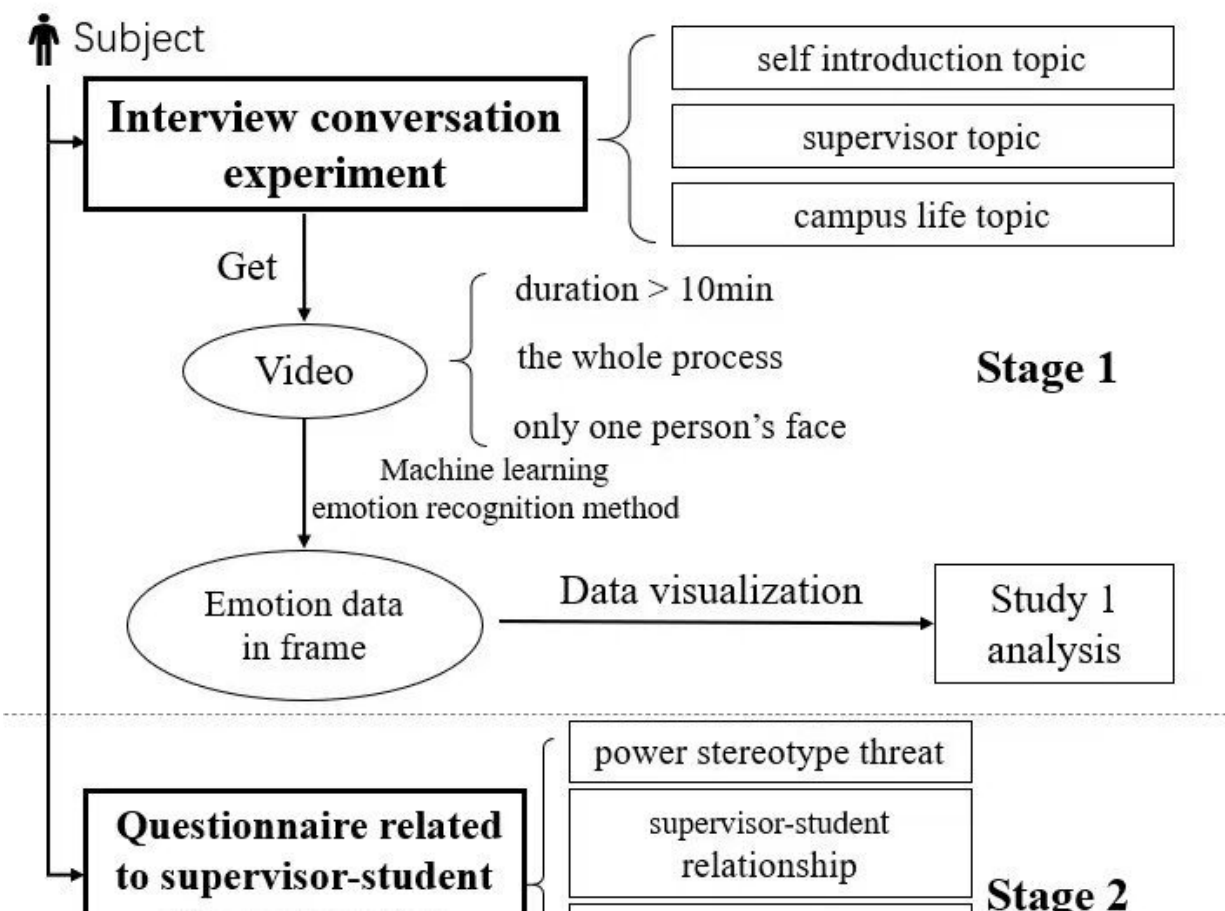


Machine-learning tools reveal impact of supervisor-student relationship on student creativity

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The experiment can be divided into two stages, as seen in this schematic. In stage 1, the subject takes an interview conversation experiment and the procedure is recorded by the camera for further analysis. In stage 2, the subject completes a questionnaire related to supervisor-student effect evaluation. The questionnaire

data are added to construct a structural equation model for study 2 analysis.
Credit: Jingyi Hu, Yaxuan Liu, Qijian Zheng, and Feng Liu

Creative minds contribute to innovation and exploration, two of the great engines of a flourishing society. Enhancing student creativity is often considered a priority of higher education as this can later contribute to economic and social development. In a recent paper, researchers from East China Normal University combined machine-learning methods with questionnaires to reveal new dimensions in the connections between supervisor-student relationships and student creative expression.

The paper was published in the *Journal of Social Computing*.

"By understanding and addressing the factors that shape the supervisor-student relationships, we can cultivate an environment that nurtures and empowers graduate students, fostering their creativity and paving the way for their academic success," said Jingyi Hu, the study's first author.

Chinese postgraduate education implements the supervisor system, and supervisors play an important role in the cultivation of postgraduate students' creativity, according to the study.

In addition to daily classroom learning, supervisor-student relationships are key to student growth and development.

"Postgraduate students who have closer communication and interaction with their supervisors exhibit higher levels of creativity," Hu said.

The reverse could also be true.

"It has also been argued that supervisor-student communication can

inhibit postgraduate students' creativity," said Feng Liu, corresponding author. "But the impact of supervisor-student relationship on postgraduate students' creativity has not been clearly established."

Previous studies mainly focused on measuring characteristics, typology, and predictors of supervisor-student relationships by administering questionnaires to detect and measure [human emotions](#).

While the research team in this study also solicited responses through questionnaires, the first stage of the experiment involved video interviews and analysis via facial expression recognition (FER) method. Based on deep-learning techniques, FER can directly identify [emotional responses](#) with more objectivity and accuracy than self-reporting surveys and questionnaires, according to the study.

The researchers collected and analyzed interview video data from 74 East China Normal University postgraduate students and conducted FER analysis on a frame-by-frame basis to capture subtleties and micro expressions. Through deep-learning methods, the team plotted the emotional distribution of each subject, which showed the probability ratios of seven basic emotions: anger, fear, happiness, neutral, surprise, sadness, and disgust.

The output data informed a [mathematical model](#) that the team then used to map emotional changes and identify underlying patterns in student-mentor relationships.

"The integration of machine learning and mathematical modeling enhances the precision and depth of our analysis, providing detailed insights into emotional experiences," said Liu, who is also associated with Wuxi University.

Research findings substantiated the groups' hypothesis: pervasive

negative emotions experienced by a student can indicate a dysfunctional supervisor-student [relationship](#).

"These findings contribute to a comprehensive understanding of the emotional landscape in such relationships, highlighting the need for interventions and improvements," Hu said.

Insights in this arena can inform [best practices](#), aid in the design of mentorship programs and policies and enable [educational institutions](#) to create an atmosphere that maximizes graduate students' creative contributions.

"In our ongoing research, we have undertaken a crucial endeavor to quantify computable emotions within the realms of education and psychology," Hu said. "Moving forward, our primary objective is to delve deeper into the mechanisms of emotional change and their impact on students in real educational settings."

In addition, the researchers will investigate methods to quantify [creativity](#), collaborating with experts in the field of psychology to explore the concept of computable emotion and its application to various interdisciplinary concerns.

"Ultimately, our goal is to quantify emotional processes in terms of computable sentiment and leverage this knowledge in a wide range of practical scenarios," Hu said.

More information: Jingyi Hu et al, Emotional Mechanisms in Supervisor-Student Relationship: Evidence from Machine Learning and Investigation, *Journal of Social Computing* (2023). [DOI: 10.23919/JSC.2023.0005](#)

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