Instagram teaches AI to recognize rooms

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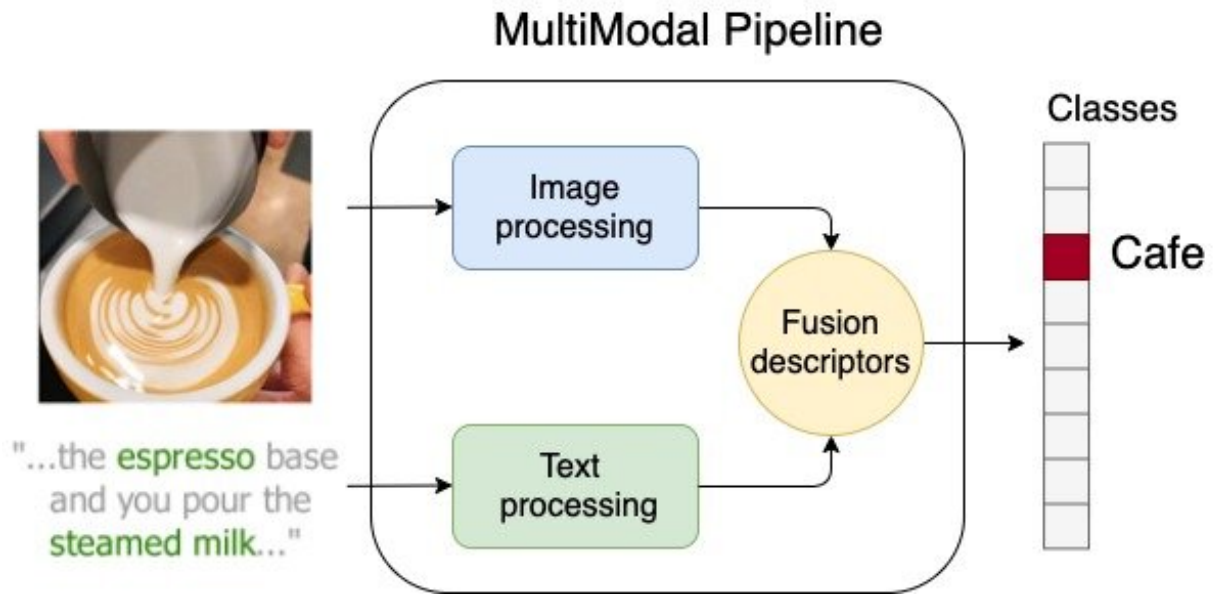

The picture illustrates the proposed multi-modal approach for video scene recognition: Given a video, visual and audio descriptors are extracted, processed and fused for the classification of the depicted scene into one of the different nine indoor environments. Credit: Estefanía Talavera Martínez

It is not hard for humans to recognize an indoor environment, but teaching an artificial intelligence (AI) system to distinguish an office from a library is. AI systems are usually trained to use images only, and recognizing a space just by looking at objects can easily go wrong. That is why computer scientist Estefanía Talavera Martínez added a new data modality, audio/sound, to the teaching material that the AI system looks

at. This resulted in a high success rate in recognizing indoor spaces, and in a new dataset of real-world videos to use in research. Her work was published in the journal *Neural Computing and Applications* on 22 January.

Estefanía Talavera Martínez is interested in developing algorithms for the automatic analysis of human behavior. In previous work, she relied on photo streams gathered by wearable cameras to gain an understanding of people's daily behavior. These images were first analyzed using AI systems. Doing the same with video is a next step, and one with more applications. "This could also be used to help robots find where they are, or to monitor the elderly, for example," explains Talavera Martínez. However, this requires an automated system that can identify indoor spaces.

Speech

Previous attempts to teach AI to recognize indoor spaces have not been very successful. "One of the reasons for this is that most systems are trained using just one modality, usually recognition of objects in a room." Therefore, Talavera Martínez decided to train her system using a second modality: transcribed texts of speech recorded in the videos.

She used real-world videos from Instagram to train her AI system. This was achieved using the images and speech. The spoken texts were transcribed using standard Google speech recognition software. Talavera Martínez and her then Master's student Andreea Glavan tried different approaches in combining information from images and audio, to find which approach would produce the best result. This resulted in a system that could recognize videos from nine different types of indoor spaces with a 70 percent accuracy, which is higher than previously published systems managed. "Tests that we performed confirmed that using this combination results in a better performance of this system than training

it using only images or text," says Talavera Martínez.

Behavior

Furthermore, the research project has produced a dataset of 3,788 Instagram videos describing nine indoor scenes. Also, a selection of 900 YouTube videos was used to confirm the results of the training program. "We have made both datasets publicly available, the first of their kind."

Talavera Martínez would like to use the new AI system to further analyze human behavior from videos: "They contain a lot of information, both as individual frames and as sequences. Importantly, our new system would be able to recognize the type of environment in which the images were made."

Apart from studying behavior, the system could be used, for example, to monitor patients with a special focus on healthy aging. It could also be used to identify positive experiences to be relived by people. "And we know that people often have a very subjective view of their own life. Our system could provide them with an objective registration and analysis."

More information: Andreea Glavan et al, InstaIndoor and multi-modal deep learning for indoor scene recognition, *Neural Computing and Applications* (2022). DOI: 10.1007/s00521-021-06781-2

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