Methods for Big Data Analysis through Artificial Intelligence

For the analysis, I provided my colleague Ing. Jiří Vyskočil with 1572 images downloaded from the Pinterest platform by random sampling technique, which he then used as inputs for the analysis. For each assignment based on my research questions, it was necessary to choose a different relevant method.

Colleague Ing. Jiří Vyskočil performed the individual methods listed in the chapter Methods of analysis for all photographs, where the output was the same image with marked joints on the figure and detailed data below it.

Image Segmentation

The Image Segmentation procedure was used to define the objects appearing in the photographs and to determine their position. Each input, image in .jpg format, had to be assigned annotations, so-called labels, which we understand as the names of subjects or classes. A colleague chose the COCO Data Set from Microsoft and the OneFormer model, which was trained for panoptic segmentation and selection of the classes we work with. In our case it was the following: bed, chair/sofa, plant, door, stairs, vase, wardrobe/dresser, table and bag/suitcase. These classes are already predefined within the COCO Data Set. During the analysis, I decided to drop the bag/suitcase class, as only interior elements are relevant for my research.

We distinguish segmentation into panoptic segmentation, instance and semantic segmentation, each of which offers different application options depending on specific goals. For these purposes, panoptical was chosen, thanks to which we can segment everything in the image. The output of this process was masks and raw data in Excel, which was later processed into a graph depending on the position of the objects.

Face Overlap

The InsightFace model helped determine whether a character's face is covered or not. If the model did not recognize the face, we define it as covered. If it was found, a mask (ellipse) was inserted from the detection and a cell phone was selected from the segmentation. The colleague then performed a morphological closure operation (e.g. covering the fingers with a mobile phone) and a convex cover. Using the logical operator of two masks (ellipse and close/convex), the intersection of the mobile phone and the face was created. From the share of the sum of the penetration mask and the sum of the face mask multiplied by 100, we got the figure in %. If it is greater than 50%, we define the face as covered.

Pose Estimation

YOLOv8x model trained on COCO Data. We define the figure through 17 points, or joints, where parts of the body bend or the face is defined. The input was again the same photos, the output was the coordinates (XY) of the individual 17 joints for each figure, which the colleague converted into a graphic form by displaying the points and connecting them with lines. In case any of the joints/points were missing, the coordinates were marked 00. At this stage, I was wondering what the ratio of sitting to standing people was. For the definition of sitting and standing, the rules for vectors, their inclination and comparison of their length and directions had to be determined.

K-means Clustering (clustering by the method of nearest directions)

This method was used to recognize the most frequently occurring colors in the images and then divide them into color palettes. As the main intention of this step was to obtain color palettes for clothing and interior separately, Ing. Jiří Vyskočil divided the images into two sectors – figure and interior, where a separate color palette was generated for each segment. The colors in the photographs were converted from the RGB space to HSV, in which we can obtain color data that maintain the same values without possible distortions due to light, shadow or other circumstances.

In addition to K-means clustering, the mean-shift method was also performed, the output of which was a table with all colors occurring in individual images. Clustering by the method of nearest directions, i.e. k-means clustering k-means clustering is a vector quantization method, originally from signal processing, which aims to divide n observations into k clusters, in which each observation belongs to the cluster with the closest mean value (cluster centers or centroid cluster), serving as a cluster prototype.

*I obtained all the analyzed data through Excel tables, which I further processed in written and graphic form.