

Statistics with a human face

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Three-dimensional surface imaging, through laser-scanning or stereo-photogrammetry, provides high-resolution data defining the surface shape of objects. Human faces are of particular interest and there are many biological and anatomical applications, including assessing the success of facial surgery and investigating the possible developmental origins of some adult conditions. An initial challenge is to structure the raw images by identifying features of the face. Ridge and valley curves provide a very good intermediate level at which to approach this, as these provide a good compromise between informative representations of shape and simplicity of structure. Some of the issues involved in analyzing data of this type will be discussed and illustrated. Modelling issues include simple comparison of groups, the measurement of asymmetry and longitudinal patterns of shape change. This last topic is relevant at short scale in facial animation, medium scale in individual growth patterns, and very long scale in phylogenetic studies.