

# Facial biometric: Versatile approach for personal identification

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**Abstract:** Biometrics refers to metrics related to human characteristics and facial biometric relates to different measurements taken on human face. Since face is the most recognizing feature for personal identification therefore lots of face recognition software are available which can identify a specific individual in a digital image by examining and evaluating from existing facial profiles. Such measures are extensively used for security purposes to identify an individual from CCTV footage or from a group. Demographic data on populations can facilitate the identification of ethnicity, sex and age of a person. An array of studies have already been accomplished by many scientists all over the globe using facial biometric which can be of great help in the field of Physical Anthropologists, Forensic Scientists, Human Biologists and Cosmetic Surgeons.

**Keywords:** Facial biometric; digital image; Identification; Security; Physical Anthropologists; Forensic Scientists

## Introduction:

Since we recognize a person by facial appearance therefore significant work has been carried out in the field of facial biometric where measurements are taken on human face for identification purposes. Measurements can be taken on live subjects and on their respective 2D photographs called as Photogrammetry. Measurements are taken between definite surface points called landmarks. There are intriguing applications of these measurements which help in identification of race, gender, ethnicity and age also.

Various somatometric landmarks which are taken in account for identification purpose:

1. **Alare (al):** The lateral most point on the wings of nose.
2. **Cheilion (ch):** Outer corners of the mouth or the points where lateral margins of upper and lower lips meet.
3. **Ectocanthion (ex):** Outer corners of the eyes or the outer points where upper and lower lid margins meet.
4. **Endocanthion (en):** Inner corners of the eyes or the inner points where upper and lower lid margins meet .
5. **Gnathion (gn):** The lowest median point on the lower border of chin.
6. **Labrale inferius (li):** The median point in the lower boundary of mucous surface of lower lip.
7. **Labrale superius (ls):** The point where the mid-sagittal plane crosses the tangent drawn across the upper curves of boundary of the mucous surface of the upper lip.
8. **Nasion (n):** The point where the inter-nasal suture meets the frontonasal suture in the mid-sagittal plane.
9. **Stomion (sto):** Median point of the oral slit when mouth is closed naturally.
10. **Subnasale (sn):** The point where nasal septum meets the surface of the upper lip on the mid-sagittal plane.
11. **Trichion (tr):** The point where the anterior line of hair on the forehead is cut by the mid-sagittal plane (to be used where hair are normal).
12. **Zygion (zy):** The lateral most point on the zygomatic arch. The point has to be explored <sup>[10,11]</sup>.

These measurements assist in estimating various indices like Morphological facial index (MFI), Physiognomic facial index (PFI), physiognomic facial height, Upper facial index (UFI), Inter orbito jugular index (IOJI), Interorbital breadth index (IOBI), Nasal index (NI), Face lip index (FLI), Lip index (LI) which are helpful in identification purposes.

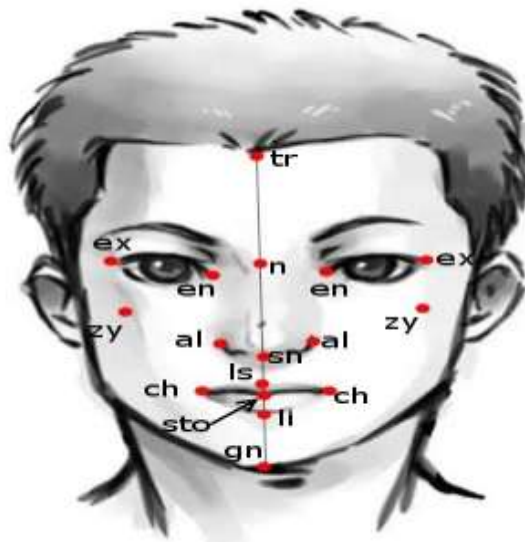


Fig. 1 – Positions of various landmarks on face (Image Source - [www.wikihow.com](http://www.wikihow.com)).

#### Applications of Facial Biometric Studies:

- ❖ **Identification of a person:** Facial landmarks and facial indices can give a perfect identity of a person.
- ❖ **Aging:** The average change in facial indices can be helpful in judging the age of a person to some extent, though intricate studies need to be undertaken on different races, ethnic groups. Although there are many influencing factors which affects such studies like back round of a person, genetic factors, eating habits, habitat or any disease etc.
- ❖ **Identification of Race and Ethnicity:** Studies have shown that we could establish a link between race and ethnicity on the basis of facial landmarks.
- ❖ **Gender Identification:** Many studies have shown that there is marked variation in the average size of facial landmarks between male and female.
- ❖ **Missing Identity:** Investigating agencies usually come across persons with unknown identity like in case of mass disaster, missing identity, massacre, insane persons; such studies can be helpful in developing their identity to a great extent.
- ❖ **Cosmetic Surgeon:** Facial biometric is also very useful in medical profession where aesthetic look is attained by overcoming some ailment or disorder.
- ❖ **Facial Recognition** a biometric software which is exercised either to restrict entry in secured area or to recognize a person from saved profiles. Law enforcement agencies use biometric software to scan faces in CCTV footage, as well as to identify a person of interest. Such softwares are now a day's used in selfie based authentication on smart phone, in gaming system to differentiate players, iPhone app that can take a picture of an individual and assess the age, even Facebook uses such software for tagging the photographs. Although there are many challenges which are faced while using facial recognition software like difference in imaging system where resolution affects the identification of landmarks. Face pose also affect the recognition of facial features. Facial nodal points are usually hidden due to beard, makeup, surgery or some hair style. Aging, change in weight due to disease or dietary habits also poses a challenge.

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