



Gender and ethnic analysis in the accuracy of age estimation

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AgeGuess Data Analysis

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Real **age estimation** using images of faces is a area of research in the computer vision community. However, the work related to analyse **how a observer perceived the apparent age of a person** needs to be understand better.

Apparent age estimation is a subjective task, which is affected by many factors present in the image as well as by observer's characteristics ([Clapés, A., et al. 2018](#))

Fig 1. Dataset generator software - Examples of photos used in the online game AgeGuess
Jones, J.A.B., Nash, U.W., Vieillefont, J. *et al.* The AgeGuess database, an open online resource on chronological and perceived ages of people aged 5–100. *Sci Data* **6**, 246 (2019).
Link: <https://www.nature.com/articles/s41597-019-0245-9#citeas>

AgeGuess

A citizen science project on human biological and chronological age

Guess my age?

☐ 24

☐ 34

☐ 44



Excellent Guess! 10 Points



Real age
24 years

Your Guess
24 years

Difference
0 years

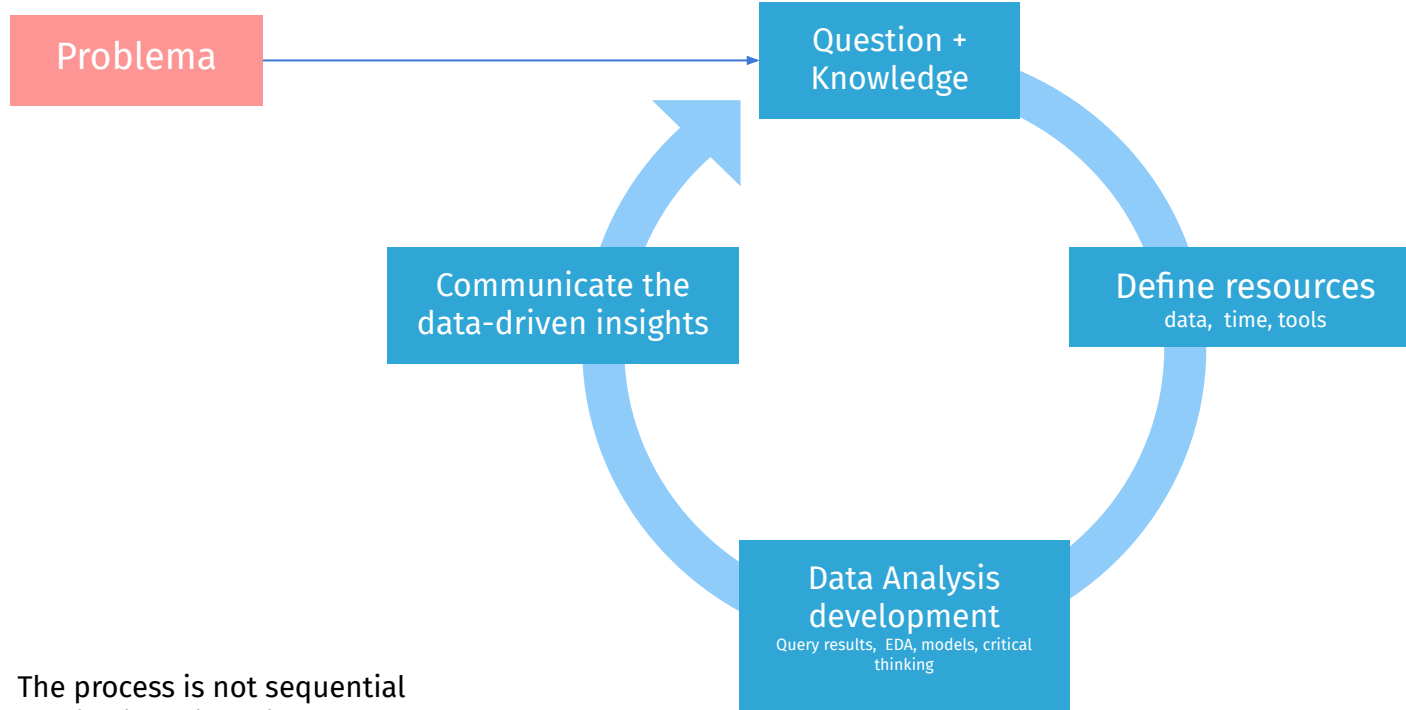
You've won **153 points** in total. Your rank is **1979** out of 4869 players.

Online Game Access <https://www.ageguess.org/home>

Dataset: AgeGuess.org Public Data Set

Dataset access: <https://www.ageguess.org/download>

Interactive Data Analysis approach



The process is not sequential
and is highly iterative

Analysis Methods

Database & Tools

- Gamers
- Photos
- Guess

For each real-age value there can be several users(gamers) with different guessed apparent age.
Lack of data for some ages, ethnicity and countries

AgeGuess.org Public Data Set. Dataset access:
<https://www.ageguess.org/download>

EDA

Empirical evaluation based on data exploration and observation (visual charts)

Identification of variables statistical techniques, enrich the dataset, creating new variables, and data treatment, as cleaning, outliers and missing data.

Analysis

Analysis the target-accuracy in the guess-real age and the behaviour of the guessers between the factors (gender, ethnicity)

- Correlation between real and apparent age
- Error - Mean Absolute Error



Is there a gender and ethnic bias in the accuracy of age estimation?

Participation of Citizen Science project AgeGuess

AgeGuess

4437 Citizens have been **engage** with the project since 2012

3644 Gamers (**guessers**) have guess the age in AgeGuess Project

4651 photos have been used by gamers in AgeGuess Project

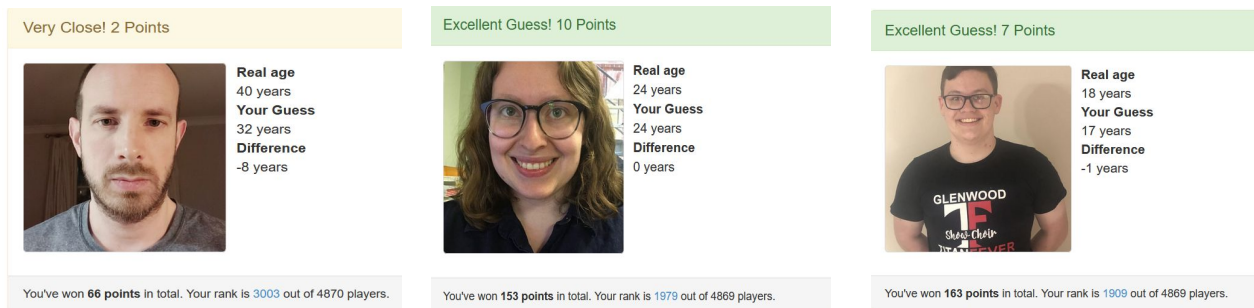


Fig 2. Examples of photos and front-end of the website AgeGuess.org

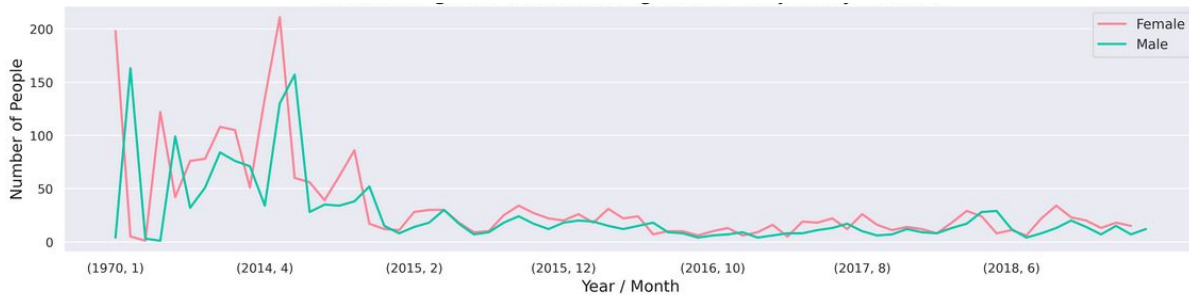
Jones, J.A.B., Nash, U.W., Vieillefont, J. *et al.* The AgeGuess database, an open online resource on chronological and perceived ages of people aged 5–100. *Sci Data* **6**, 246 (2019).

Link: <https://www.nature.com/articles/s41597-019-0245-9#citeas>

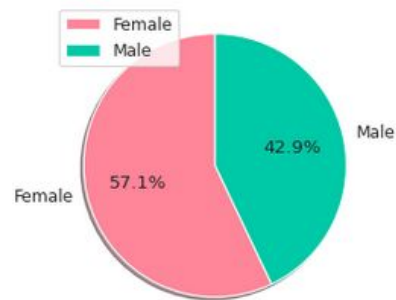
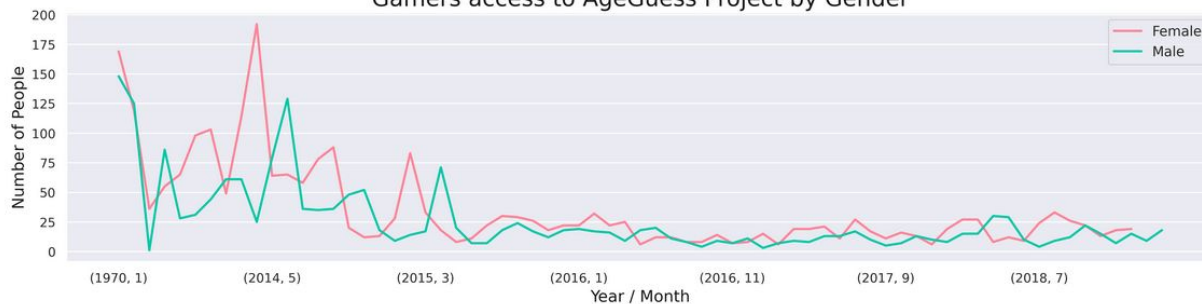
Who are the Guessers in AgeGuess - 3644 guessers

AgeGuess

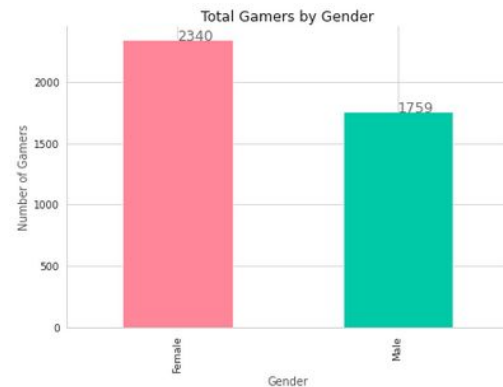
The register of guessers have been decrease since 2015



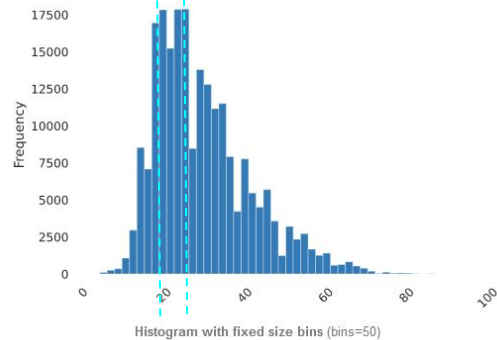
Gamers access to AgeGuess Project by Gender



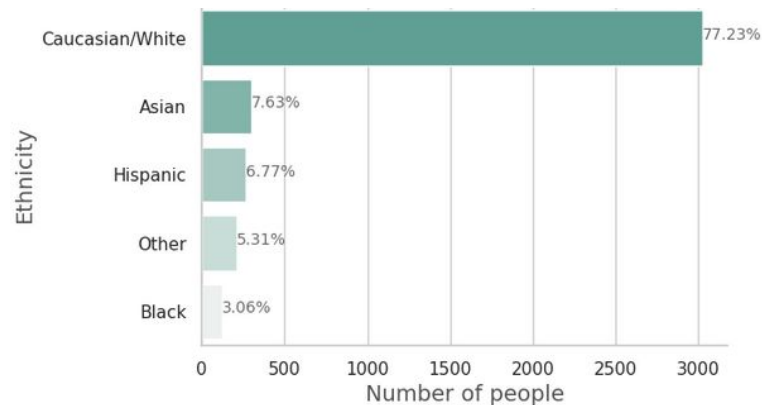
57% guessers are women



The majority of the guessers are between 20 -30 years old



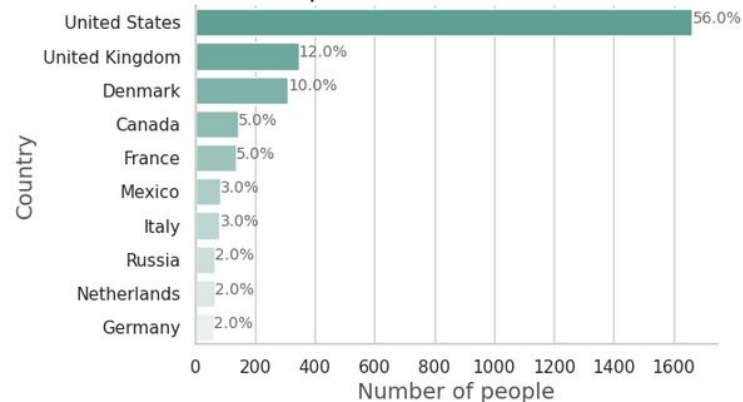
Differences in Social participation



Guessers are from 121 countries

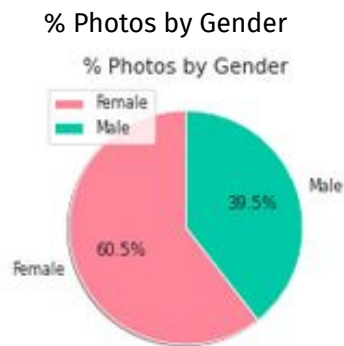
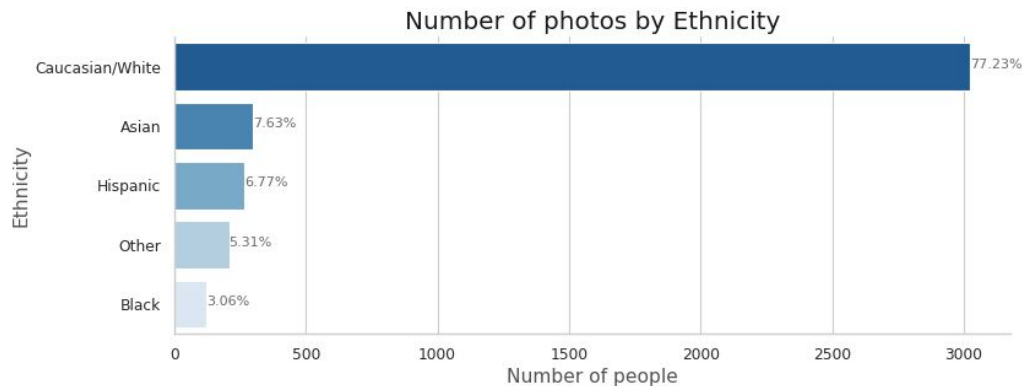


Top 10 Countries Gamers



Who are in the images? - 4651 photos

ETHnicity, Gender and Age



Age of People in the Images

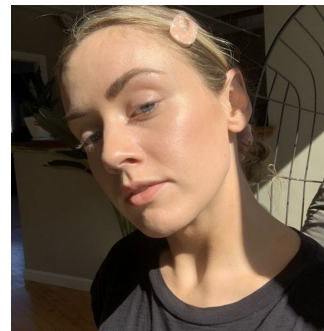
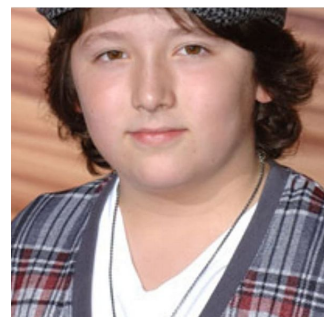
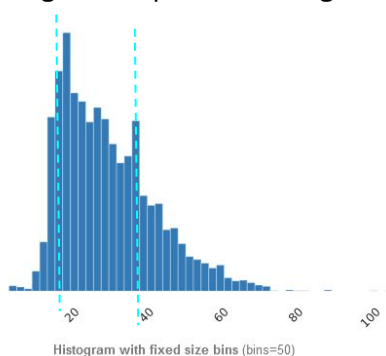
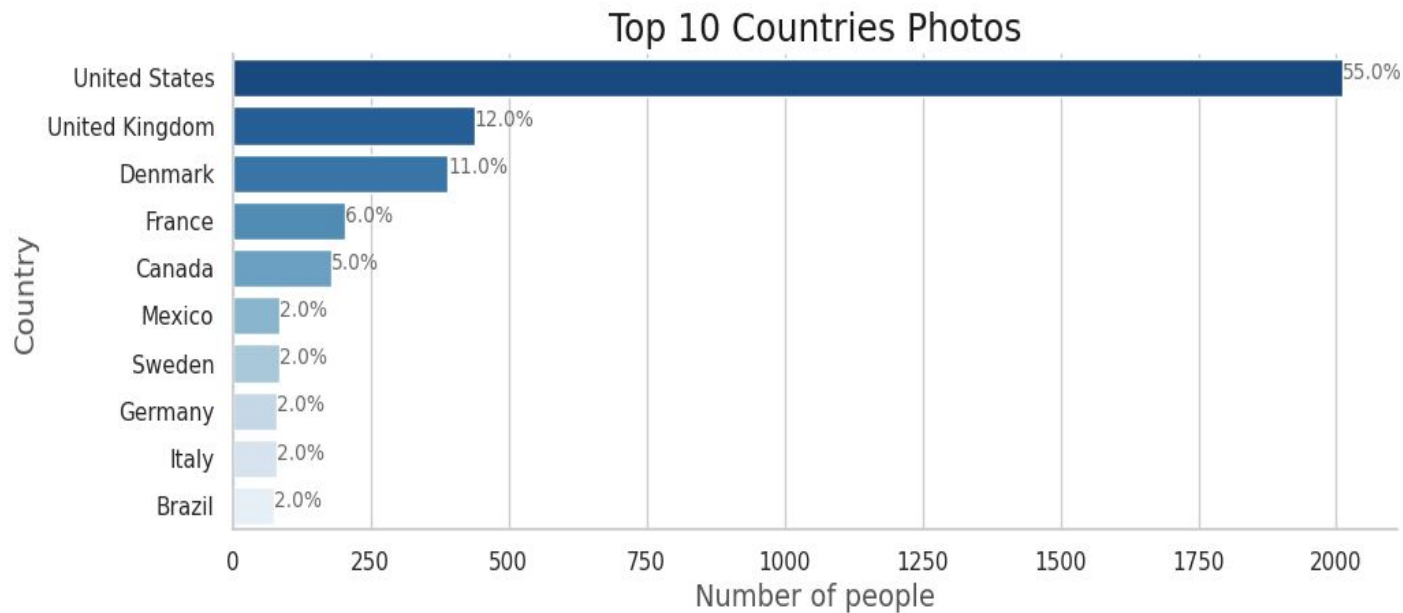


Fig 2 Images generate by AgeGuess - Examples of photos used in the online game AgeGuess
Jones, J.A.B., Nash, U.W., Viellefont, J. *et al.* The AgeGuess database, an open online resource on chronological and perceived ages of people aged 5–100. *Sci Data* **6**, 246 (2019).
Link: <https://www.nature.com/articles/s41597-019-0245-9#citeas>

Who are in the images? - 4651 photos



Age Guessing - 220.231 Age guess



Real age
32 years
Your Guess
24 years
Difference
-8 years

Fig 3. Image generate by AgeGuess - Examples of photos used in the online game AgeGuess

Link: <https://www.nature.com/articles/s41597-019-0245-9#citeas>

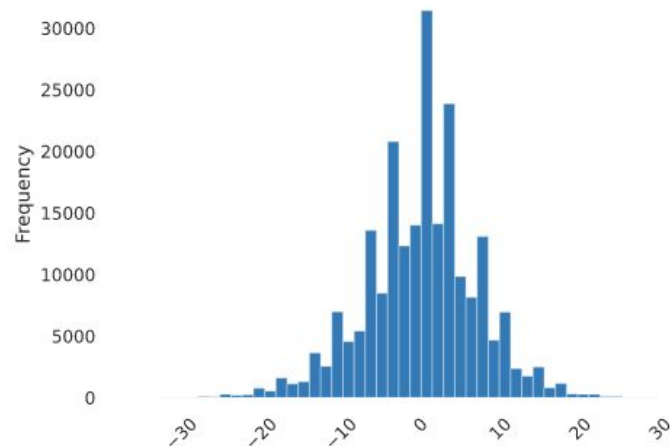
Age Guess Mean by image is the **4.3 times**
Maximum guess Picture: **242 times** guessed

Deviation (error) Mean by image is **-0.05**

Minimum -35

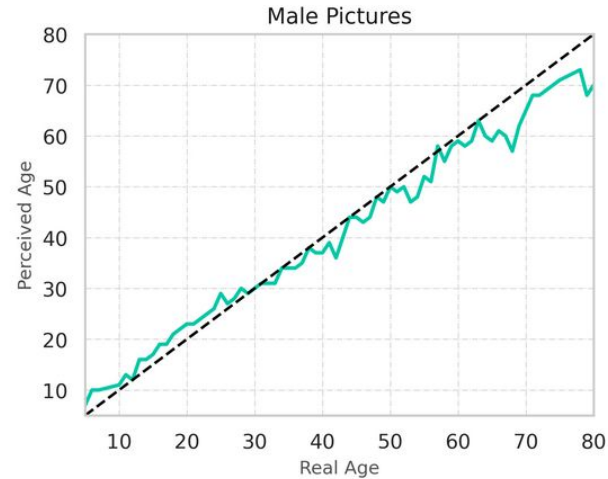
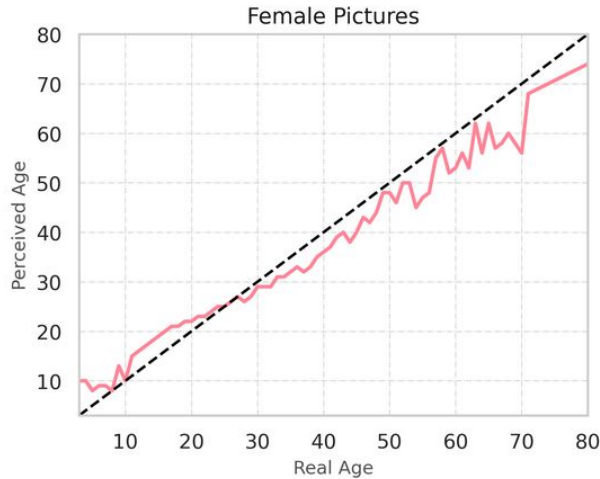
Maximum -35

Distribution Deviation of the mean age guess from real age for each photograph



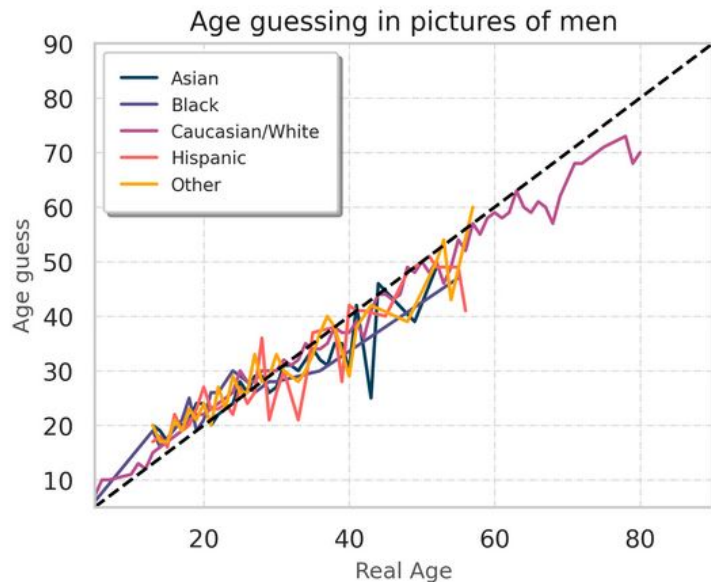
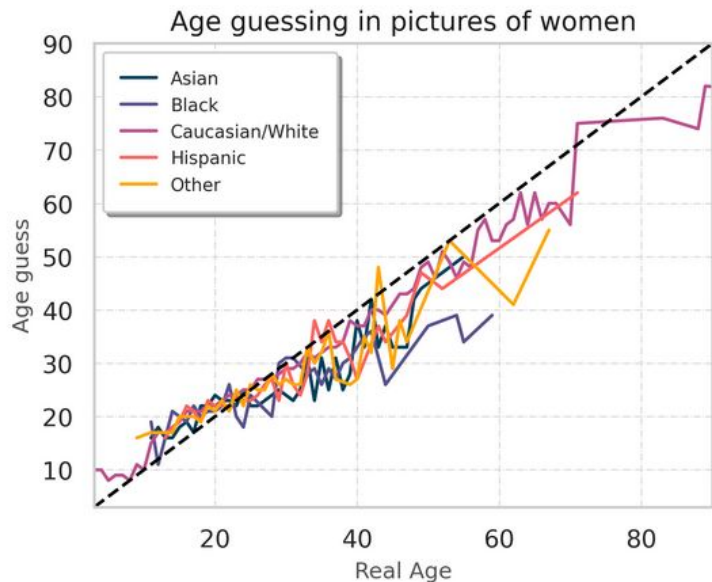
From apparent to real age: There is a gender, age, and ethnic bias analysis in real age estimation?

- Age estimation by gender in the image



There is not a significant difference among genders in age guessing

- **Age estimation by ethnicity in the image**



The Age Estimation of Asian Women after 40 years old is underestimated

This analysis take the mean age guess., introduce noise by the + - deviation (error)

- **Age estimation by gender difference in the image and guessers**



Approach analysis by gender and Ethnicity

Characteristic	Error	MAE
Gender		
Female	-0.26	5.54
Male	0.24	5.03
Ethnic Group		
Asian	-0.92	5.68
Black	-0.30	6.02
Caucasian/White	-0.04	5.31
Hispanic	-0.12	5.07
Other	-0.38	5.33

Mean Error

$$y - \hat{y}$$

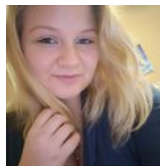
Blas

Mean Error Absolute

$$\frac{\sum |y - \hat{y}|}{N}$$

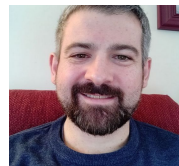
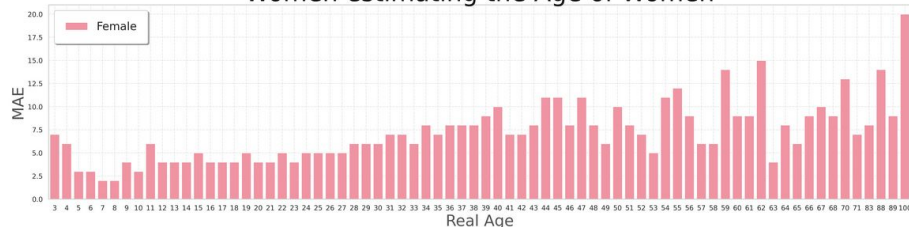
Accuracy

Gender accuracy in a Entire Age Range Estimation by gender



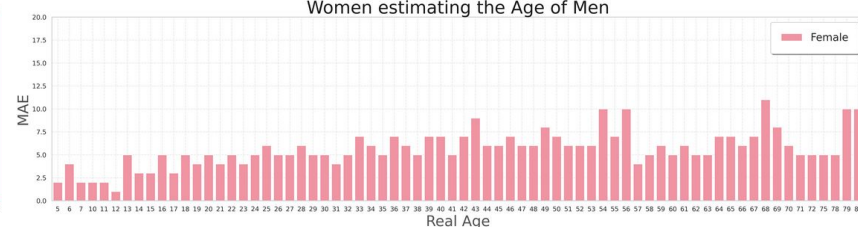
Women Age Estimation

Women estimating the Age of Women

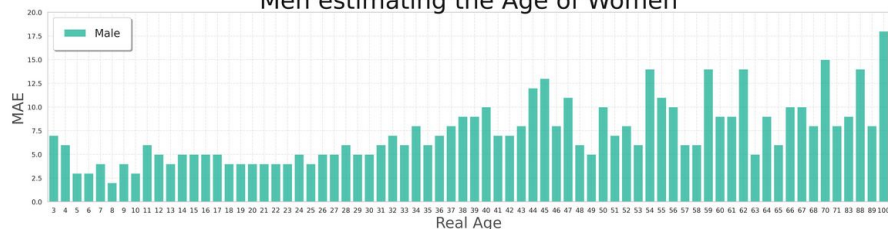


Men Age Estimation

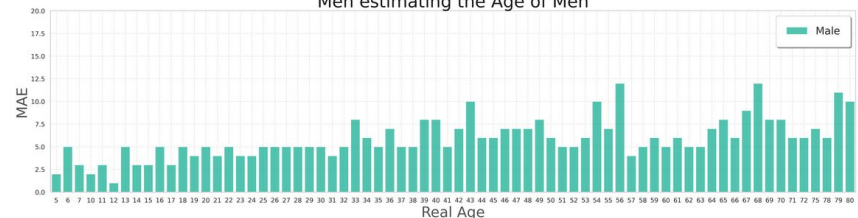
Women estimating the Age of Men



Men estimating the Age of Women



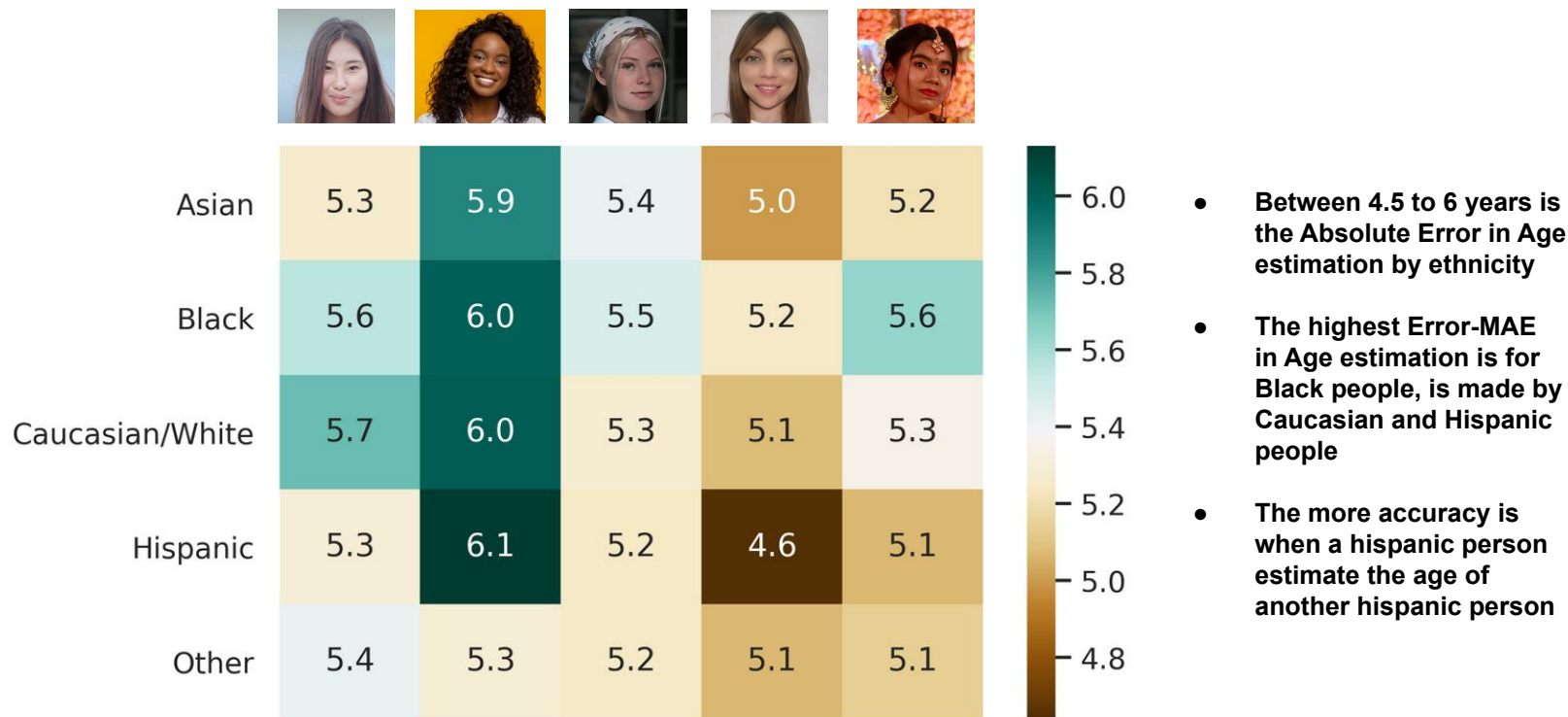
Men estimating the Age of Men



*photos are taking from the AgeGuess Website

- The MAE is more visible in the estimation of women age than the estimation of men age
- There is not difference by gender observers in Age estimation

Mean Absolute Error in Age Estimation by ethnicity



Conclusions

- The apparent to real age differences and accuracy were introduced by attributes as gender and ethnicity
- There is not a significant difference in age estimation among the gender of the observers
- Age estimation on women is less accuracy than estimate the Age of men
- Black people are the ethnic group who is most age misestimated, majority by white and Hispanic people
- Age estimation between ethnic groups has better accuracy
- The error in Age estimations is 4.5 to 6 years, then next data collection need to be address in a way to increase the accuracy and reduce the bias in the algorithms.

Limitations

- The data set are not equal to all the ages and ethic groups
- The dataset consisted of individuals guess primarily from the United States, United Kingdom and Denmark, that is an important limitation as could be a substantial variability in attitudes toward aging found across cultures and the wellbeing and life in the country ([North and Fiske, 2015](#)) and is not possible to analized how external factor suchs enviroment, economy, access to public services.

Recommendations for the future work

- Analyses in the underestimation and overestimation of the age
- Analyse the ways to improve the data collection process. The weakness of the current tool is where the photograph is not particularly clear, because of the angle at which it was taken and/or poor quality lighting
- Controlled the data introduce to reduce the cleaning data and missing data



Thank you

References

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