



# Yoti Facial Age Estimation

White Paper | Executive summary

September 2024



# Executive summary

Yoti's facial age estimation technology can determine a person's age from an image of their face, with no need for a physical document check or human intervention. It is accurate across gender and skin tone.

Yoti's facial age estimation technology is built in accordance with the GDPR principle of 'privacy by design' and data minimisation. Yoti's model has not been trained to recognise faces or match these against other faces in a database. Crucially, this is the difference between facial age estimation and facial recognition. Yoti immediately deletes all images of users as soon as the age is estimated.

Yoti's True Positive Rate<sup>1</sup> (TPR) for 13 to 17 year olds correctly estimated as under the age of 21 is 99.2% and there is no discernible bias across genders or skin tones. The TPRs for female and male 13 to 17 year olds are 99.1% and 99.3% respectively. The TPRs for skin tones 1, 2 and 3 are 99.5%, 98.8% and 98.7% respectively.

The TPR for 6 to 12 year olds correctly estimated as under the age of 13 is 99.5%. The TPRs for female and male 6 to 12 year olds are 99.6% and 99.4% respectively. The TPRs for skin tones 1, 2 and 3 are 99.7%, 99.2% and 99.4% respectively. So there is no material bias in TPR rates in this age group either.

Yoti's facial age estimation is accurate for 6 to 12 year olds, with a mean absolute error (MAE) of 1.2 years, and an MAE of 1.3 years for 13 to 17 year olds. Regulators are focused and most concerned with these two age ranges to ensure that under 13s and under 18s are only able to access age appropriate goods and services.

Yoti takes its ethical responsibilities very seriously when developing its technology. The data used to train the algorithm are obtained, in accordance with GDPR guidelines, during the onboarding process for the Yoti app. We also perform consented data collection exercises and purchase consented data from vetted suppliers where we require training data in efforts to ensure equality of performance across the population. Yoti's latest model continues to show improvements in accuracy.

1. True Positive Rate - the probability that an actual positive will test positive, such as an 18 year old being correctly estimated to be under the age of 25.

## Expanding the data set & improving accuracy

Our first white paper, published in December 2018, contained accuracy data by year across the 13-60 age range. Since May 2021, we have added data for the 6-12 age range, and from May 2022 included data for age range 60-70, with performance broken down by year of age, gender and skin tone.

### Key takeaways

- TPR for 13 to 17 year olds correctly estimated as under 21 is 99.2%.
- TPR for 6 to 12 year olds correctly estimated as under 13 is 99.5%.
- Mean Absolute Errors (in years) are 2.5 for ages 6 to 70, 1.3 for ages 13 to 17 & 1.2 for ages 6 to 12.
- Users are not individually identifiable.
- Helps organisations to meet Children's Codes or Age Appropriate Design Codes.
- Does not result in the processing of 'special category' data.
- Gender and skin tone bias is minimised.
- NIST ranked number 1 MAE for 13-16 year olds
- Training data is collected in accordance with GDPR.
- Independently tested and certified.
- A secure, privacy respecting solution that protects individuals.
- Yoti liveness and facial age estimation are very hard to 'fool'.
- Over 650 million checks performed worldwide.
- Solution is fast and scales to over 25 million checks per day, or 300 checks per second.

## NIST evaluation October 2024

In October 2024, [NIST published the results](#) of their evaluation of Yoti's Sep 2024 model, which ranked Yoti in first place when measured for accuracy on 'Visa' images for 13 to 16 year olds and second place when measured for accuracy on 'Mugshot' images for 18-30 year olds.

# Mean Absolute Error by age band

YOTI Yoti facial age estimation accuracy					Mean estimation error in years split by gender, skin tone and age band				
Gender	Female				Male				All
Skintone	Tone 1	Tone 2	Tone 3	All	Tone 1	Tone 2	Tone 3	All	
6-12	1.1	1.3	1.4	1.3	1.1	1.2	1.3	1.2	1.2
13-17	1.1	1.4	1.6	1.4	0.9	1.2	1.4	1.2	1.3
18-24	2.4	2.3	2.5	2.4	2.1	1.9	1.9	2.0	2.2
25-70	2.6	2.9	3.6	3.0	2.5	2.8	3.2	2.8	2.9
6-70	2.3	2.6	3.1	2.6	2.2	2.4	2.7	2.4	2.5

Whilst there are differences in MAEs between skin tones and gender, by setting appropriate thresholds, the true positive rates (TPRs) between skin tones and gender published earlier in this summary are very similar so avoiding discrimination.

## With facial age estimation, once you know you’re dealing with a child, you can...

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Turn off excessive notifications.
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Minimise the data you collect and do not store it.
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Set geolocation to off but give the child the ability to turn it on if needed.
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Shield their data. It shouldn’t be used for purposes not in their interest.
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Provide age-appropriate content.
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Use child-friendly language to explain platforms.
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Be certain the online community is within the same age threshold.
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Always be sure to treat a child like a child.

**About ‘Mean Absolute Error’**  
Yoti facial age estimation can make both positive and negative errors when estimating age (that is, it can estimate too high or it can estimate too low). By taking ‘absolute’ values of each error, this ignores whether the error is positive or negative, simply taking the numerical size of the error. We then take the average (or ‘arithmetic mean’) of all those absolute error values, to produce an overall ‘MAE’. For example, people aged 6-12 have an MAE of 124. That means they would be estimated to be within 1.2 years of their age. A table of MAE by year can be found in the appendix on pages 20-22.

## Memberships, associations and accreditations



## Reviewed by



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