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# The Big Picture

A picture's worth a thousand words, a camera is a never-ending story.



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Apple has been a leader in smartphone technology for decades, that constantly innovates to keep up and lead the development of hardware and software. One element of smartphones that has made drastic evolutionary leaps in the past decade is the camera. The iPhone has changed from simple photo capture to digital manipulation, pattern recognition, and advanced processes. By today, Apple have upgraded a phone camera to the quality of a DSLR, with unprecedented software features that will one day be essential, such as Face ID and Deep Fusion.

The Apple iPhone has made various choices to meet their competition. Their branding aesthetic provides much of their popularity, and their high prices are often justified by more advanced technology. The Apple camera as an application is quite like its rivals, but the Apple Store has a much more highly rated selection of third-party camera apps. The iPhone camera may only have a 12-megapixel camera compared to other phones with 16-megapixels or more, but its ability to film in 4K or perform better in low

light due to its larger sensor put it above many rivals such as Samsung.

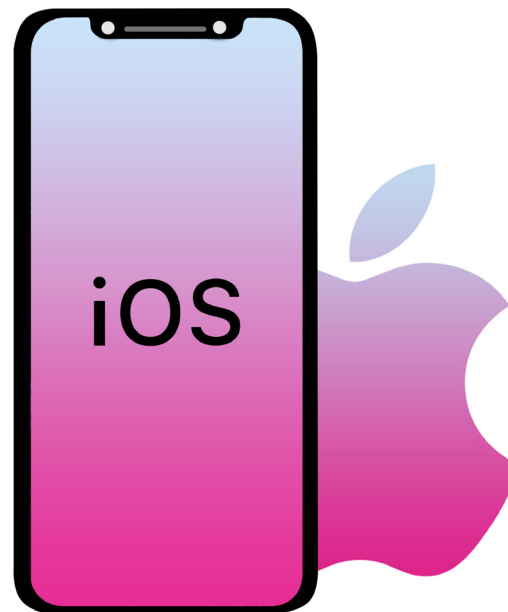
The iPhone 11 Pro for example has a 26mm 12-megapixel camera with optical image stabilisation and night mode for more detail at night. In addition to this it also has an ultra-wide 13mm 12-megapixel camera that can capture more surroundings with a 120° field of vision, and a front camera that is also 12-megapixels but can capture both slow motion and 4K 60FPS video. Other features of the iPhone camera also make it impressive, such as recording with more than one camera at a time, enhancing audio, and preventing unwanted shifts in exposure and colour. The dual lenses can also create a depth map that can simulate depth of field to DSLR camera quality. These improvements in software and hardware make the camera quite useful for photography, but this also grants it an importance in security.

Face ID replaced the Apple Touch ID fingerprint using a "TrueDepth camera system". With sensors and cameras, 30,000 laser dots project onto your face to



formulate a unique 3D map that is stored in neural networks that match new scans with previous ones. Now the camera provides more security through facial ID rather than passwords or fingerprints. To do this Apple had to develop the A11 Bionic Engine and test with billions of images, with learning algorithms that handle hundreds of billions of operations per second. Face ID is now 30% faster than at launch, supports more angles, and can't be tricked by photos or sent to other servers. The result is a secure and reliable system.

Deep Fusion from Apple is an integrated image processing technology that will draw its powers from the A13 Bionic processor, the most powerful in the world of smartphones. The exclusive technology will work on pixel-by-pixel processing, which will result in an image with excellent detail. This feature is exclusive to new phones, cannot be deactivated, and will only work in medium lighting. It should not be concerning this technology is "forced", as Apple have confirmed that it won't spoil your photos, even in the worst cases. The



phone will take six consecutive shots, three before and three after pressing the shoot button. A seventh, more detailed one will be taken last and they will merge into one final image. This technology will take long to process, but you can still view it while it processes in the background.

The moments we capture are informed by the means in which we capture them. The constant innovation and new technology from Apple such as lenses, Face ID, and Deep Fusion will create more possibilities for how we view and take photographs in the future. Apple have been innovating for decades and will not stop any time soon. Under the control of Apple what else could cameras evolve to do in the coming years?

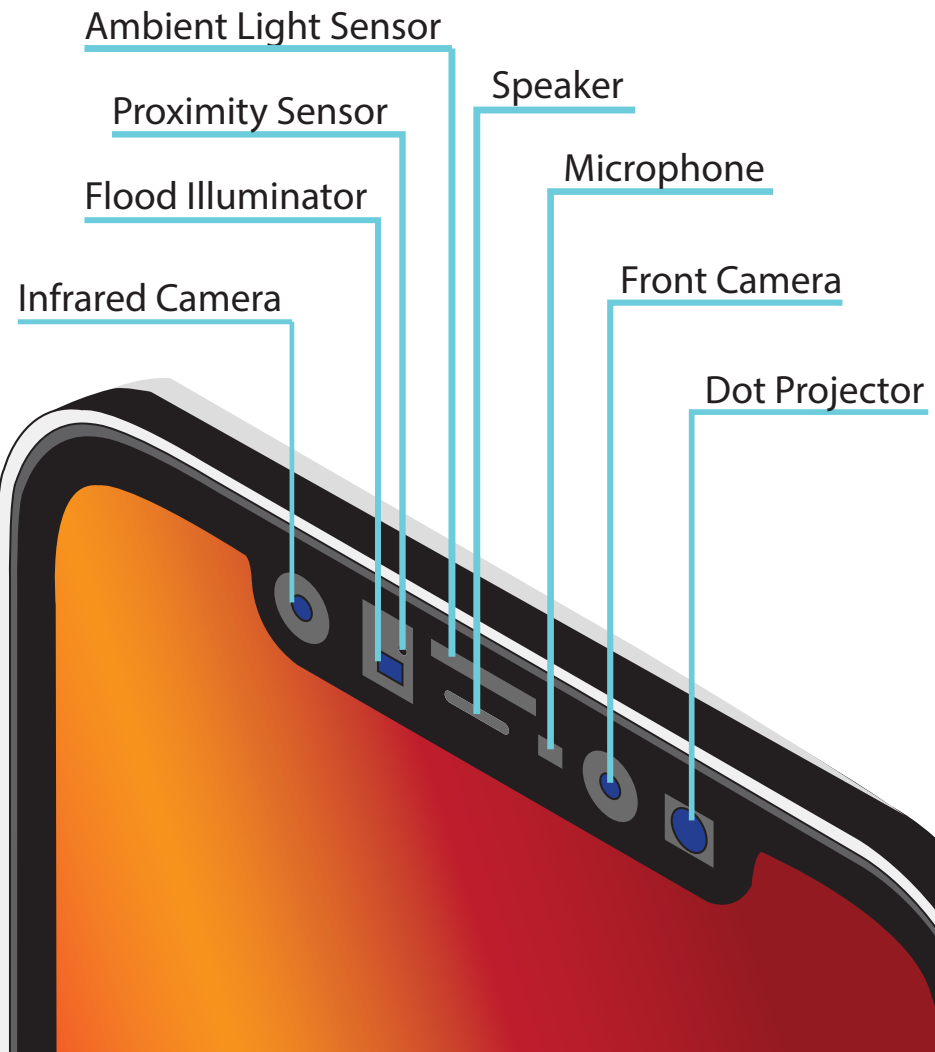
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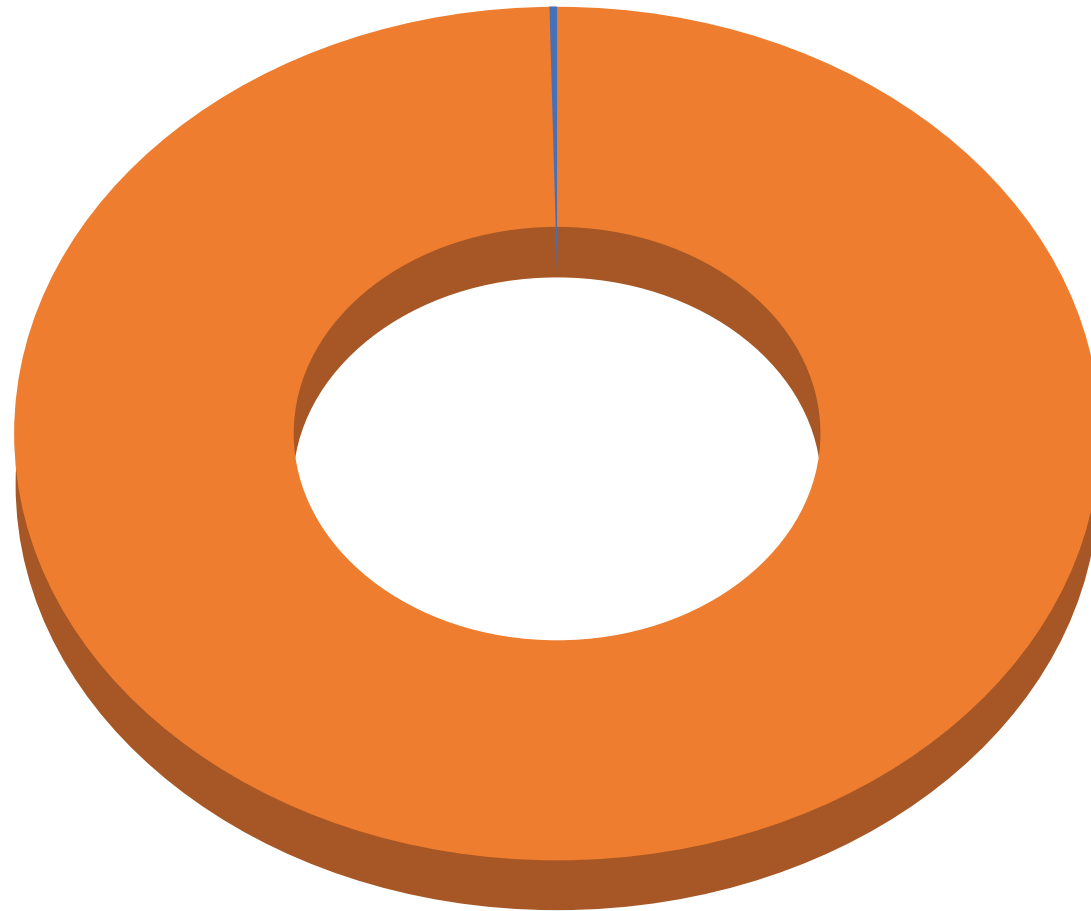
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# Aspects of the iPhone 11 Camera



# Apple Face ID False Positive Rate



● Successes (99.998%)

● Failures (0.002%)

Apple Face ID was tested by Apple and reported to fail once in every 50,000 attempts on average, making the rate of failure almost 0%.