

1 - The composite formula (the 'over' operator, Porter & Duff 1984)

output = fg x alpha + bg x (1 - alpha) -- mix you and the new bg per pixel.
alpha = how much of YOU to keep (1 = all you, 0 = all background).
Example: 200 x 0.6 + 50 x 0.4 = 140 -> a smooth blend, not a jagged cut.

Keep fg and bg in the SAME alpha convention, or you get an edge halo.

2 - Why replacement looks faker than blur: 3 seams + fixes

Hard cookie-cutter edge	feather the alpha + alpha matte (keeps hair)
Lighting / colour mismatch	colour-match + light wrapping (bg light on edges)
Green spill (green screen)	spill suppression - neutralise green-tinted edges

3 - Green screen? The chroma-key cheat code

No green screen: ML segmentation guesses your outline - needs a capable CPU/GPU.
Green screen: chroma key finds you by colour - sharper edges, runs on weak devices.
Cost: green spill -> add a spill-suppression step. Best for fixed studio setups.

4 - Background asset specs (2026 - re-verify per client release)

Zoom image	16:9, >=1280x720 (1920x1080 recommended)
Zoom video	MP4/MOV, 480x360 to 1920x1080, keep it small
Teams image	16:9, >=1920x1080; admin upload 100KB-2MB JPG/PNG

5 - Build it in your product (browser) - checklist

- Tap the raw-frame point: MediaStreamTrackProcessor in, MediaStreamTrackGenerator out.
- Segment with MediaPipe; run the composite (over operator) on the GPU (WebGL2 / WebGPU).
- Upload the background image to the GPU ONCE - never re-send it per frame.
- Scale-to-cover and centre the image so it does not stretch; handle the self-view mirror.
- Feather the edge, blend each mask with the previous frame, and close() every VideoFrame.