

Color Palette Extractor from Images

Project Abstract — projectech.in (built to order) · K-1628

Introduction / Background

Every designer has asked what colors make up a photograph, and most online tools answer with an unexplained black box. This project builds a color palette extractor that shows its work: dominant-color extraction with from-scratch median-cut quantization and k-means clustering running on the image's real pixels, an eyedropper loupe for exact sampling, usage shares, harmony suggestions, and export to ASE, CSS and PNG.

Problem Statement

Palette tools that hide their method leave students unable to explain their own project in the viva, and designers unable to trust the results. Implementing both classic algorithms from scratch — with visible intermediate steps — turns a utility into a genuine computer-science project.

Objectives

- Implement median-cut quantization and k-means clustering from scratch.
- Extract 3–10 dominant colors with per-color image shares.
- Provide an eyedropper with magnifier loupe for exact pixel sampling.
- Suggest complementary, analogous and triadic harmonies.
- Export palettes to ASE, CSS variables and PNG strip.

Proposed Methodology

The image is drawn to canvas and downsampled for speed; pixels are sampled into an RGB array. Median-cut recursively splits color space at medians until k boxes remain; k-means++ seeds k centroids and iterates assignment/update until convergence. Each pixel is assigned to its nearest swatch for share computation. The eyedropper reads raw ImageData under the cursor; harmonies rotate hues in HSV space.

System Architecture / Working

Single-file web app: image layer (upload + built-in photos, canvas pixel access), algorithm layer (median-cut, k-means, HSV utilities), interaction layer (eyedropper loupe, sliders, comparison view), and export layer (ASE binary writer, CSS serializer, PNG renderer). All computation is client-side with no dependencies.

Hardware / Software Requirements

- Hardware: any laptop/desktop with a modern browser (2 GB RAM minimum).
- Software: current Chrome, Edge, Firefox or Safari; no installation.

- Input: any browser-readable image (JPEG/PNG/WebP).

Expected Outcomes

- A working extractor producing designer-ready palettes from real photos.
- Readable from-scratch implementations of two classic algorithms.
- A comparison view that makes algorithm trade-offs tangible.
- Complete viva kit: report, PPT and Q&A.

Applications

- CS/IT image-processing coursework and demonstrations.
- Design students needing honest palette tooling.
- Web developers building theme pickers (CSS export).

Future Scope

- Perceptual color spaces (LAB) for clustering.
- Dithered re-render preview with the extracted palette.
- Palette search across an image collection.
- Figma plugin using the same engine.

This is a built-to-order project. The abstract above summarizes the project as delivered: working implementation, documentation, and viva preparation included.