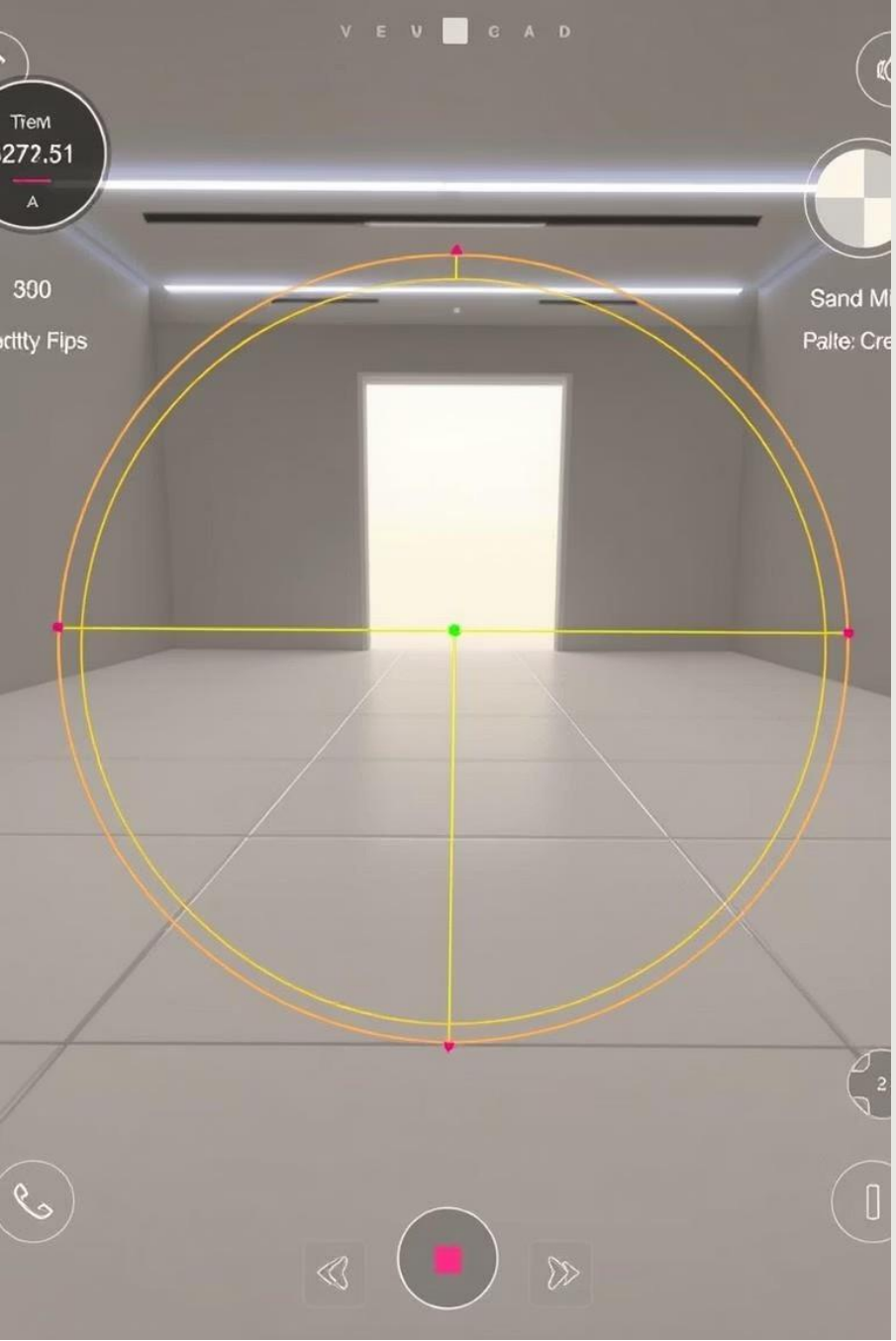


COLOR DETECTION WITH COMPUTER VISION

Explore how computers detect and analyze colors in images. Applications span robotics, image analysis, and quality control. BY – Rohan Singh (E22CSEU0235)

UNDERSTANDING COLOR SPACES

RGB

Uses Red, Green, Blue; additive and device- dependent model.

Common for digital screens but sensitive to lighting.

HSV

Hue, saturation, and value model matches human perception.

Makes color segmentation easier and intuitive.

CMYK & LAB

CMYK used in printing; subtractive color model.

Lab is device-independent, uniform for color analysis.

COLOR THRESHOLDING

DEFINE COLOR RANGES

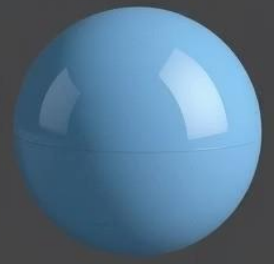
Set lower and upper bounds in HSV to isolate colors.

MASKING WITH OPENCV

`inRange()` selects pixels within target color range.

EXAMPLE USE

Detect blue objects by specifying hue intervals.



COLOR SEGMENTATION TECHNIQUES

K-MEANS CLUSTERING

Groups pixels into clusters based on color similarity.

WATERSHED ALGORITHM

Separates touching objects with gradient-based segmentation.

REGION GROWING

Expands regions by adding neighboring pixels of similar color.

FEATURE EXTRACTION

COLOR HISTOGRAMS

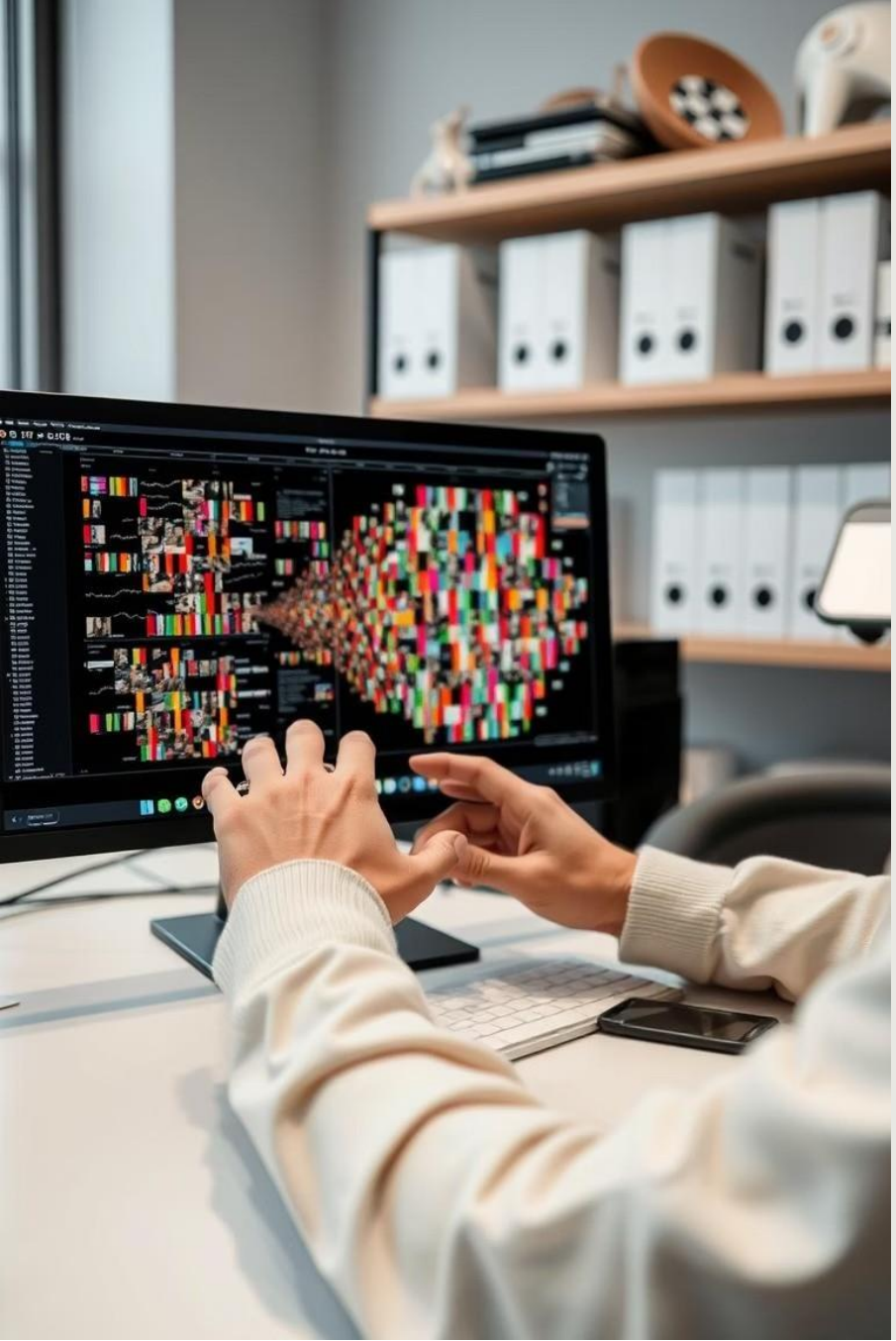
Summarize pixel color distributions for image representation.

COLOR MOMENTS

Cite mean, standard deviation, and skewness of colors.

TEXTURE FEATURES

Combine local binary patterns (LBP) with color for accuracy.



ADVANCED COLOR DETECTION METHODS

MACHINE LEARNING

Train classifiers to recognize colors from data samples.

SVMS

Classify colors by finding optimal boundaries in feature space.

CNNS

Detect complex color patterns with deep learning models.

APPLICATIONS OF COLOR DETECTION

ROBOTICS

Uses color for sorting and robot navigation.

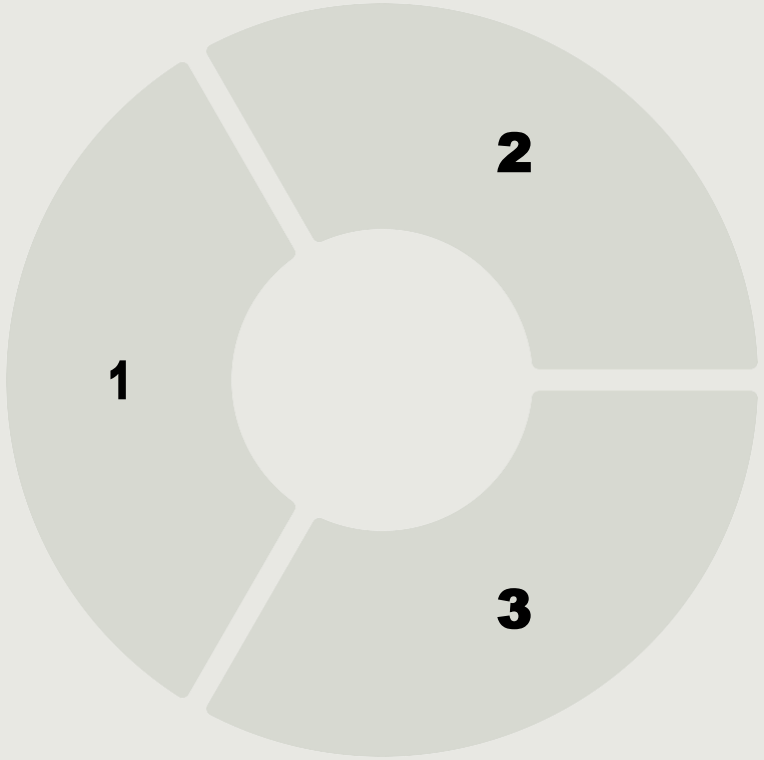
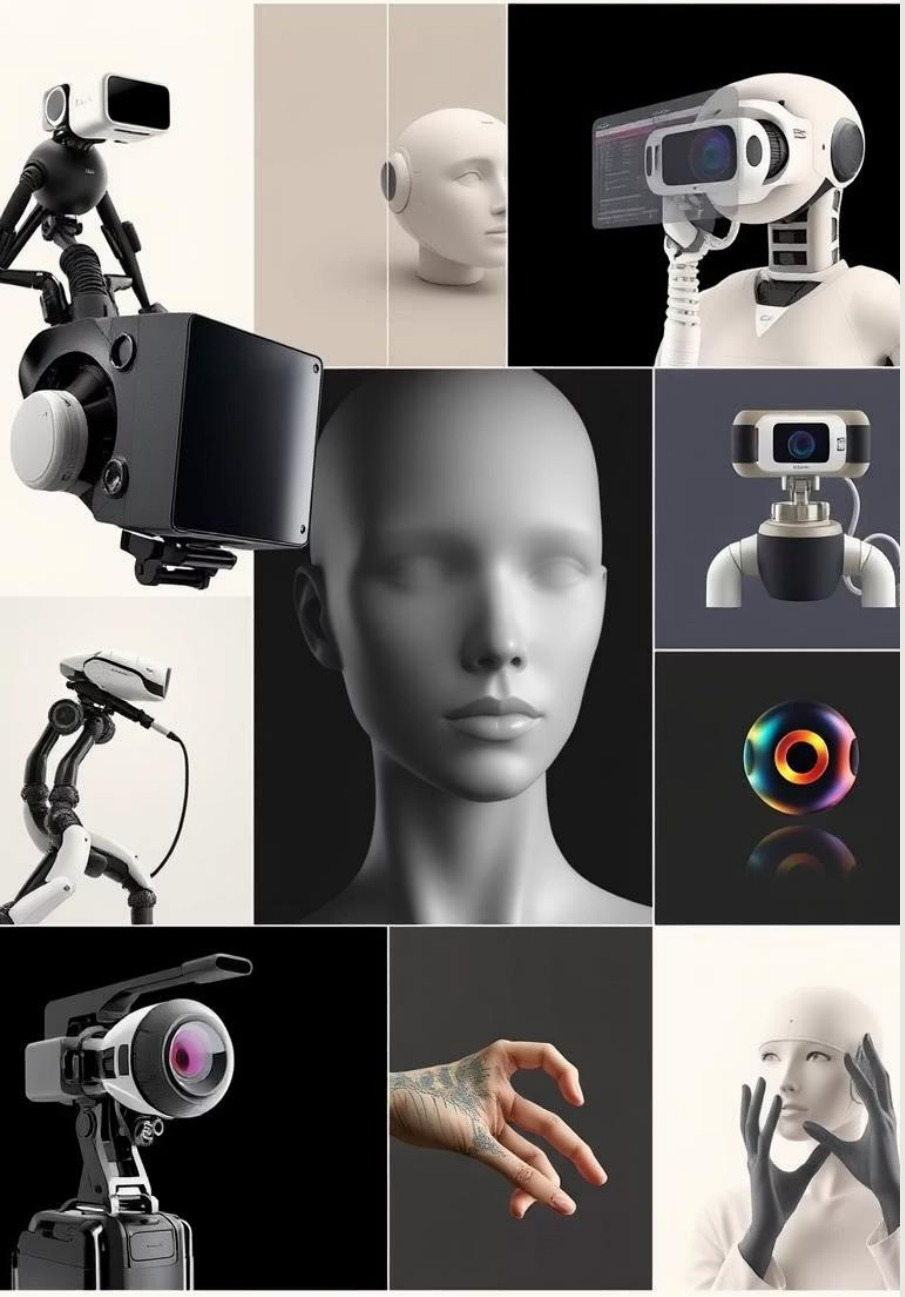


IMAGE ANALYSIS

Medical and satellite images benefit from color detection.

QUALITY CONTROL

Detects defects and sorts food by color consistency.



CONCLUSION

Color detection is a versatile tool in computer vision.

Techniques range from thresholding to deep learning

models. Ongoing innovations improve accuracy and real-

world usability.