CS-639 — Interaction Design Studio

Color, Grids, Spacing & Alignment*

Professor Bilge Mutlu

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Week 4: How Intelligence Adapts

— **Last week:** Typography, icons, and how intelligence appears (P1, P2)

— **This week:** Color, grids, spacing, alignment — and how intelligence adapts (P3, P4, P5)

Three new principles. Let's take them one at a time.

P3 — Honest Capabilities

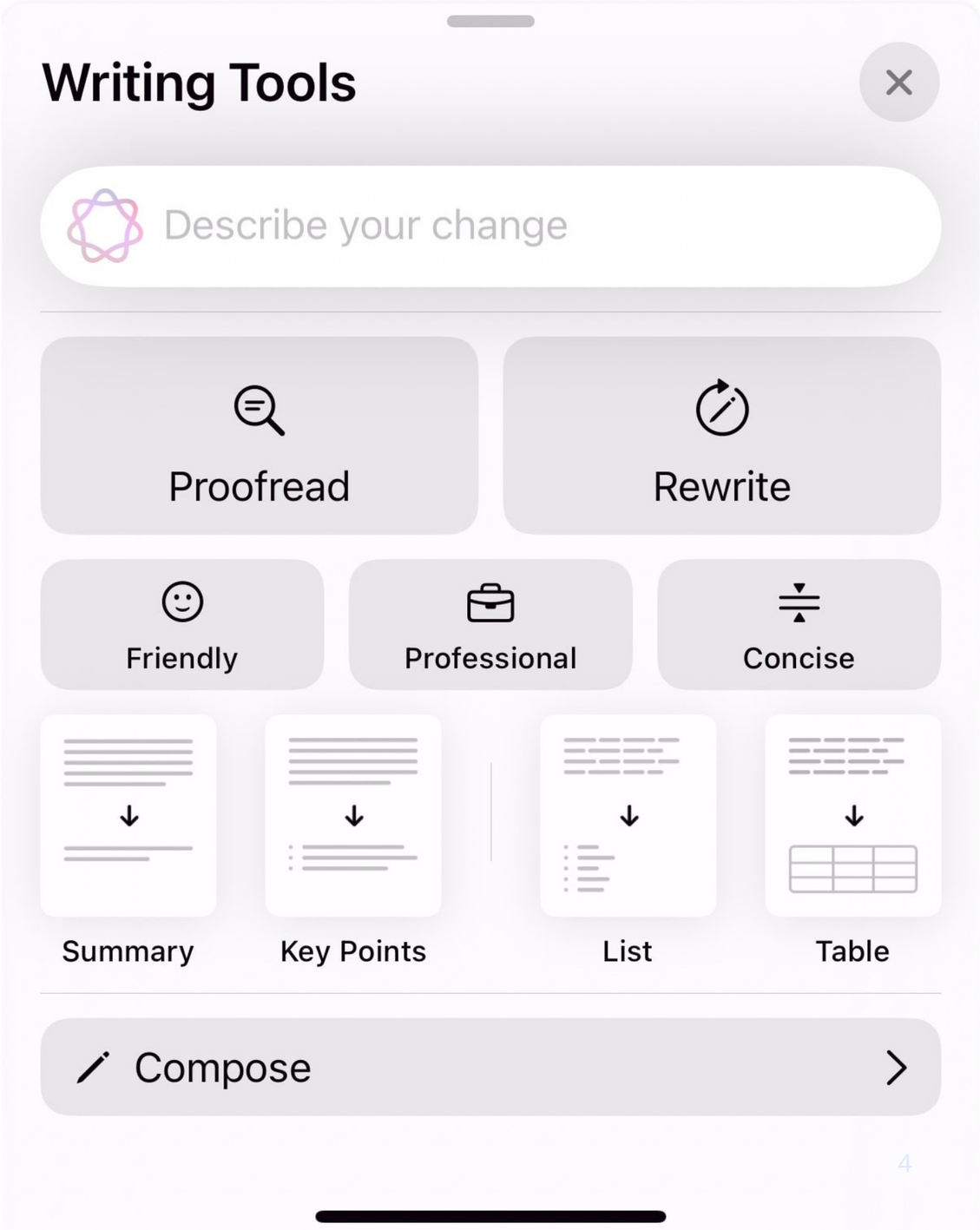
Make explicit what the system can and cannot do.

Set clear expectations about the scope and boundaries of intelligent features to build appropriate trust.[2]

[2] Amershi et al. (2019), G1-G2 · PAIR Guidebook

P3 in Practice: Apple Writing Tools

- Each button names one specific capability: Proofread, Rewrite, Summary, Key Points
- No vague "AI magic" — you know exactly what each tool does
- Scoped actions set honest expectations before you tap



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P4 — Communicate Uncertainty

Show when the system is confident versus uncertain.

Display confidence levels, present alternatives, or acknowledge when the AI might be wrong.[3]

[3] Horvitz (1999), P2 · Amershi et al. (2019), G10

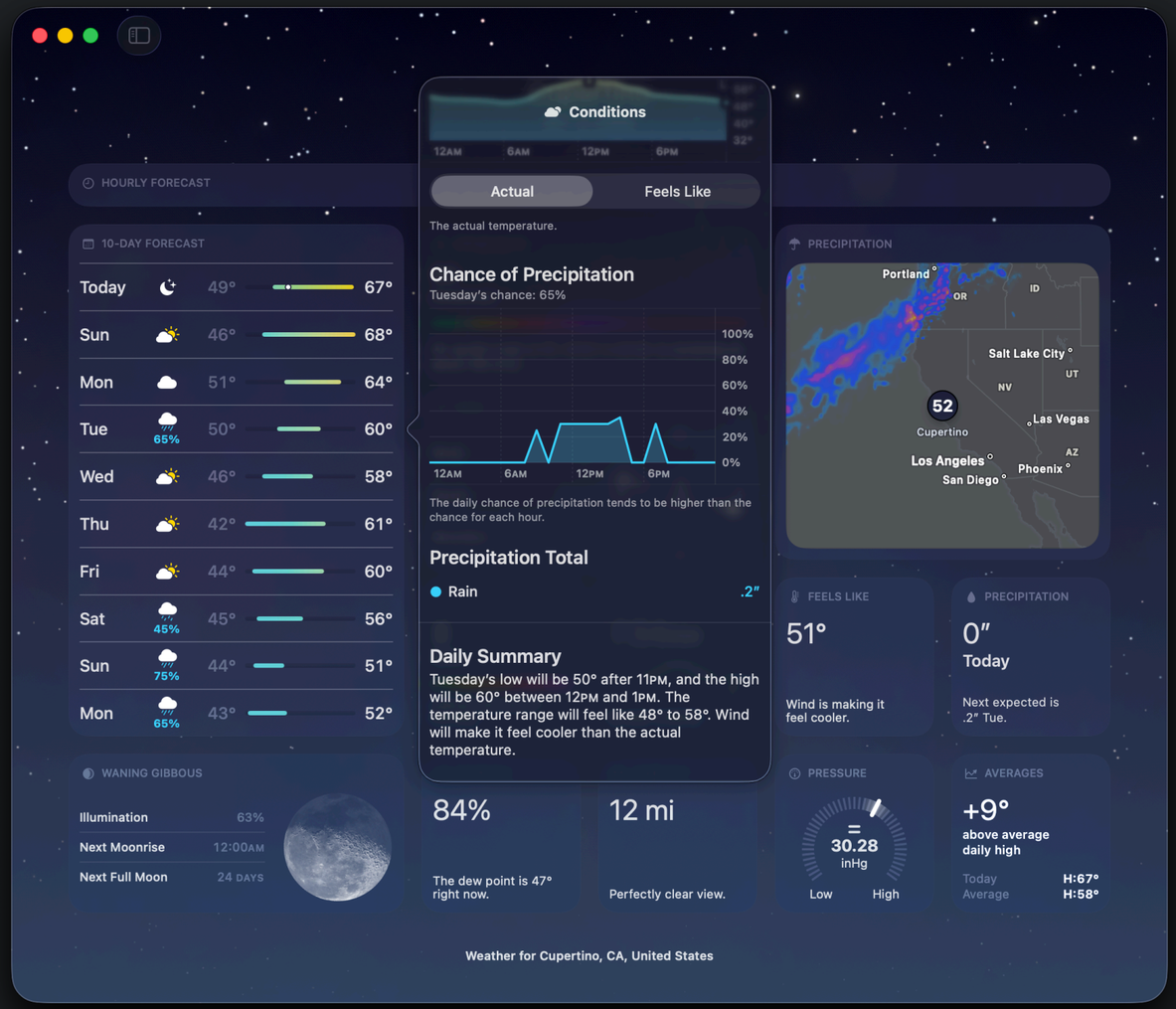
P4 in Practice: Apple Weather

— "60% chance of rain" — confidence as a literal number

— Next-hour forecast: high confidence, precise minute-by-minute

— 10-day forecast: lower confidence, shown as wider ranges

— Bar width and color intensity encode certainty visually



P5 — Predictable Adaptation

When interfaces adapt or change, they should follow clear, understandable rules.

Users should be able to anticipate how and when adaptation occurs.[4]

[4] Apple HIG · Amershi et al. (2019), G14

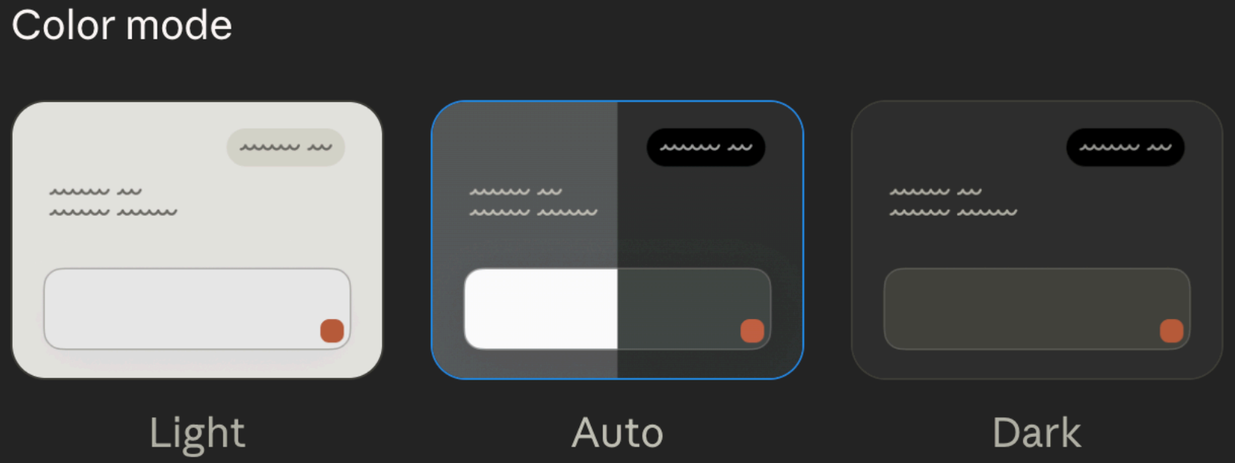
P5 in Practice: iOS Dark Mode

— Clear trigger: schedule-based or manual toggle

— User can predict exactly when it changes

— Every app follows the same adaptation rules

— Colors change. Grid doesn't. Positions don't. Spacing doesn't.



From Principles to Fundamentals

Now we'll learn **color, grids, spacing, and alignment** — the building blocks of visual systems.

Notice how each fundamental connects to P3–P5:

— **Color** → How do you express capability and uncertainty visually? (P3, P4)
— **Grids** → What stays fixed when interfaces adapt? (P5)
— **Spacing** → What's structure vs. surface? (P5)
— **Alignment** → What anchors the user's mental model? (P5)

Color Theory & Accessibility

The most powerful (and most misused) design tool

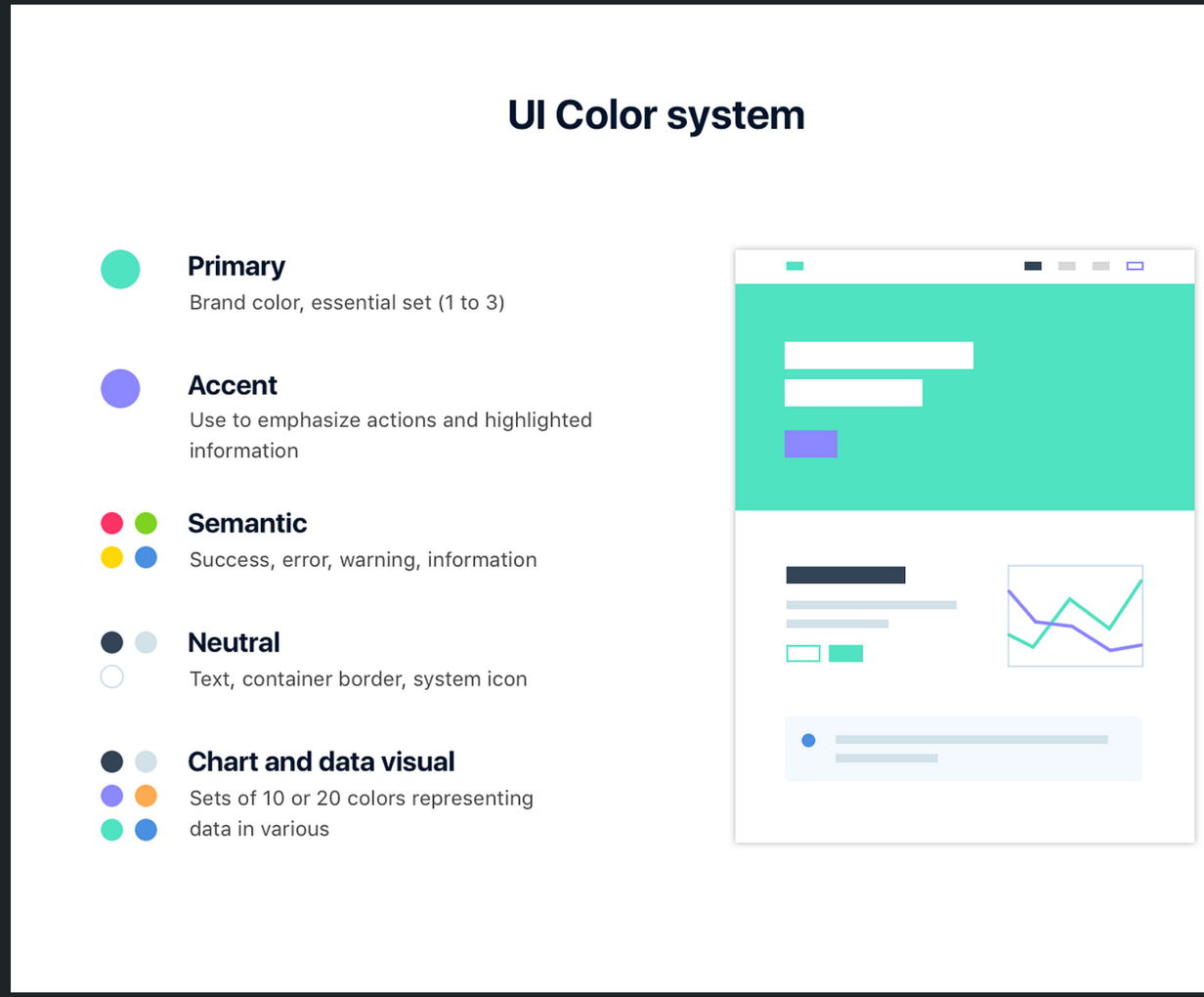
Color

Human visual perception of light reflecting from an object.

— **Creates emphasis** — draws attention to key elements

— **Organizes content** — groups related items, separates unrelated

— **Evokes emotion** — warmth, trust, urgency, calm



The Color Wheel

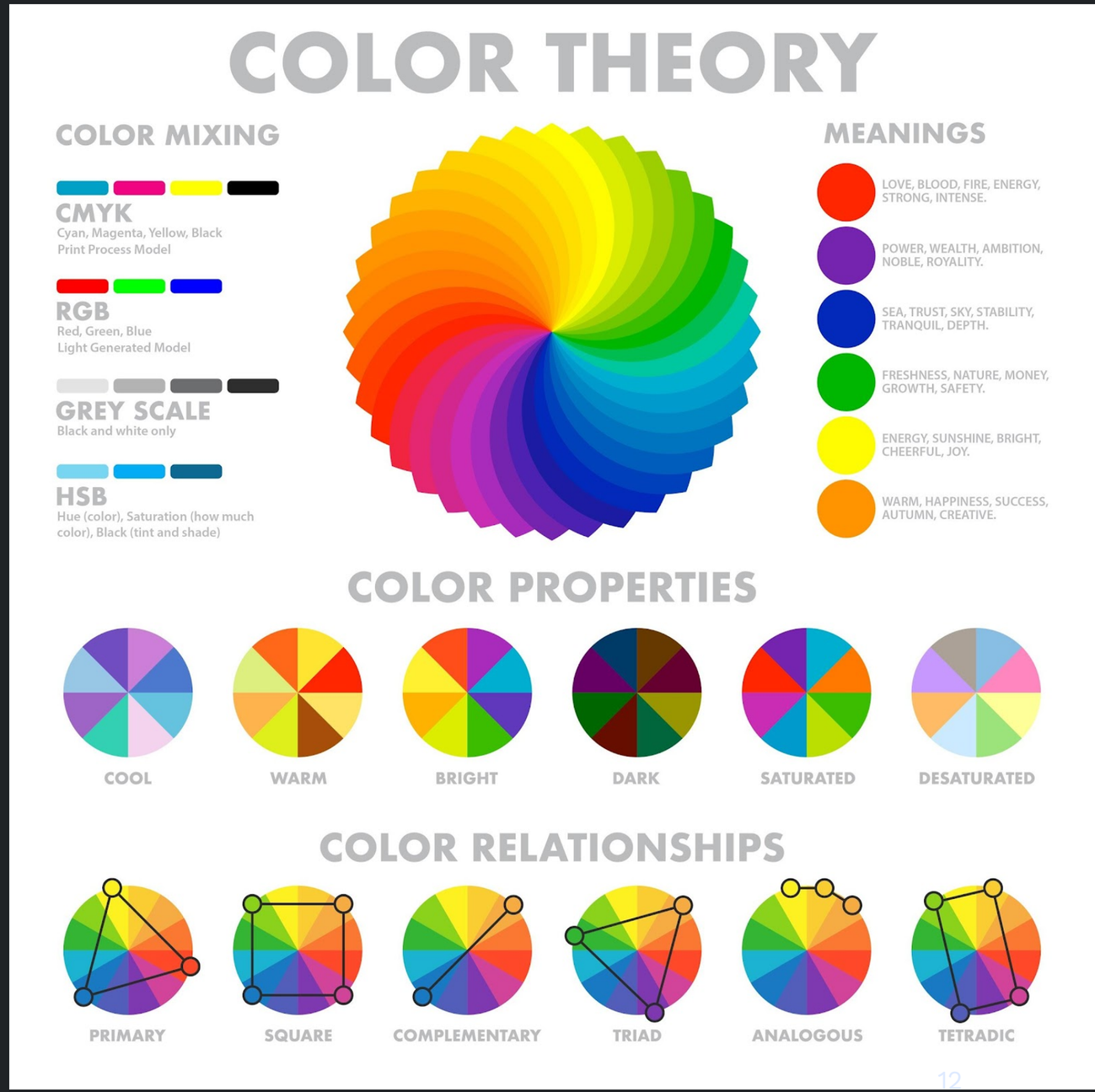
— **Primary:** Red, Blue, Yellow

— **Secondary:** Green, Orange, Purple (mix of primaries)

— **Tertiary:** Red-Orange, Blue-Green, etc.

— **Warm** (red, orange, yellow) — advance, energize

— **Cool** (blue, green, purple) — recede, calm



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Color Schemes

Scheme	Definition	Effect
Monochromatic	Variations of one hue	Unified, calm
Analogous	Adjacent on wheel	Harmonious, natural
Complementary	Opposite on wheel	High contrast, vibrant
Split Complementary	One hue + two adjacent to its complement	Contrast with more nuance
Triadic	Three equidistant	Dynamic, balanced
Achromatic	No hue — black, white, grays only	Elegant, minimal, neutral

Tints, Shades & Saturation

A single hue gives you an entire range through tints, shades, and saturation.

Tint: Add white → lighter

Shade: Add black → darker

Tone: Add gray → muted

Saturation:

High = vivid, energetic

Low = muted, sophisticated

Color Accessibility

8% of males and 0.5% of females have some form of color vision deficiency.

— **Deuteranopia** (most common) — red-green confusion

— **Protanopia** — red weakness

— **Tritanopia** (rare) — blue-yellow confusion

— **Achromatopsia** (very rare) — no color vision

Designing for Color Vision Deficiency

Consider alternatives to hue-only encoding:

— Use **intensity** (light/dark) instead of hue for emphasis
— Increase **size** of colored elements
— Pay attention to **proximity** of similar colors
— Add **icons, patterns, or labels** alongside color
— Use tools to simulate how your design looks with CVD

Rule: Avoid using color as the only way to convey information.

WCAG Contrast Standards

WCAG 2.1 defines minimum contrast ratios for readability

Level	Normal Text	Large Text
AA	4.5 : 1	3 : 1
AAA	7 : 1	4.5 : 1

Large text = 18pt+ regular or 14pt+ bold

Test your colors:

— WebAIM Contrast Checker

— Squint test: blur your eyes — can you still read it?

— Dark text on light background (or vice versa)

— Never red on green, or green on red

Building a Color Palette

- **Step 1:** Choose 1 primary color (brand/identity)
- **Step 2:** Add 1-2 secondary colors (complement or analogous)
- **Step 3:** Create tints and shades (light, medium, dark)
- **Step 4:** Define semantic colors (success, error, warning)
- **Step 5:** Test all combinations for WCAG compliance

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Context-Aware Color Systems

Use semantic colors (names that describe purpose, not value) so the same palette works across light and dark appearances.[5]

Traditional: One fixed palette

Intelligent: Palette adapts to context

— Time of day → dark mode
— Ambient light → contrast adjustment
— User activity → Focus modes
— Accessibility need → high contrast

[5] Based on Apple Human Interface Guidelines approach to dynamic color

The Key Insight

Your color system stays the same — semantic meaning persists.

— Error is still the red family.
— Primary action is still blue.
— Only the values change.

Structure: semantic roles. Surface: color values.

Beyond Dark Mode

Context-aware color includes:

— **Ambient light** → contrast and brightness adaptation
— **Activity mode** → iOS Focus modes use different accent colors for Work, Personal, Sleep
— **Accessibility** → high contrast mode, reduced transparency, increased text size
— **Content** → Spotify's album-colored player, Apple Music's adaptive backgrounds
— **Time/Location** → weather apps, maps shift rendering for day/night

Each adaptation follows a **rule the user can learn**.

"Update and adapt cautiously."[6]

[6] Amershi et al. (2019), Guideline 14

Color and System Confidence

Color communicates system state — including uncertainty

Confident:

— Solid, saturated, full-weight
— Blue primary button
— Sharp, clear borders

Uncertain:

— Desaturated, lighter, translucent
— Dotted or pulsing borders
— Muted tones, reduced

Confidence in Practice

Examples:

— **Maps:** confident route is solid blue, alternatives are gray

— **Autocomplete:** multiple suggestions use progressively lighter text

— **Search:** "Did you mean...?" appears in secondary color

P4 — Communicate Uncertainty: Your color system needs confidence levels, not just semantic categories.

Grid Systems

Structure at every scale

Why Grids?

"The grid system is an aid, not a guarantee."
— Josef Müller-Brockmann, Grid Systems in Graphic Design (1981)

— Grids create **consistency** across screens
— Grids enable **scalability** across devices
— Grids provide **structure** for content

Proportional Systems

The Golden Ratio (1:1.618)

— Found in nature, art, and architecture.

— Creates aesthetically pleasing proportions.

— Guides layout ratios — sidebar to content, image to text.

Rule of Thirds

— Divide your frame into a **3×3 grid**.

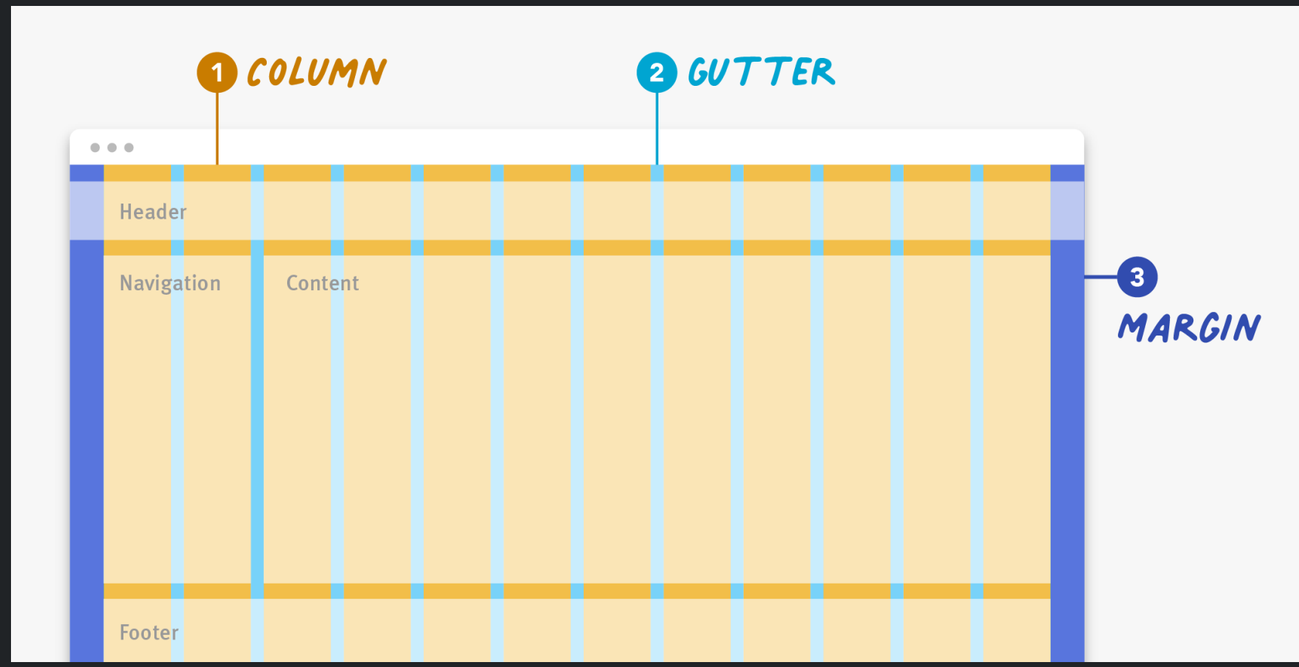
— Place key elements at **intersections**.

— Easier to apply than golden ratio.

— Used in photography, film, and interface

Grid Anatomy

Grids serve as a visual framework for organizing elements in an orderly and balanced fashion.



Grid Parameters

— **Format:** Overall dimensions of the canvas
— **Margins:** Space at edges of frame
— **Columns:** Vertical divisions (4, 8, or 12 common)
— **Gutters:** Space between columns
— **Alleys:** Horizontal space between rows

Common Grid Systems

Platform	Columns	Gutter	Margin
Desktop	12	24px	24-32px
Tablet	8	16-24px	24px
Mobile	4	16px	16px

Material Design uses these as defaults.

Breaking the Grid

Break the grid on purpose, never by accident.

Intentional breaks:

— Full-bleed images
— Overlapping elements
— Asymmetric emphasis

Accidental breaks:

— Slightly off-grid elements
— Inconsistent margins
— Unintentional misalignment

Grids: The Structure That Doesn't Move

The grid is the user's spatial memory. Change it, and users are lost.

Light mode ↔ Dark mode

— Same app. Same screen.
— Every element is in the same position.
— Every column boundary is identical.
— Colors changed. Grid didn't.

Compact ↔ Comfortable

— Same app. Same grid.
— Content takes different space.
— But the column structure persists.
— Spacing changed. Grid didn't.

From Grids to Spacing

— Grids define **structure** — where things go

— Spacing defines **rhythm** — how things breathe

Consistent spacing is the difference between ineffective and effective design.

The 8-Point Grid System

Base unit: 8px — All spacing uses multiples of 8:

Value	Feel	Use
8px	Tight	Related elements, icon padding
16px	Normal	Default spacing, list items
24px	Comfortable	Group spacing, card padding
32px	Loose	Section spacing
48px	Spacious	Major section breaks
64px	Open	Page-level separations

Spacing Tokens

Named design decisions — not arbitrary pixel values

```
space-xs:   8px    (tight)
space-sm:  16px    (normal)
space-md:  24px    (comfortable)
space-lg:  32px    (loose)
space-xl:  48px    (section)
space-2xl: 64px    (major)
```

Why tokens?

— Consistent across your entire design

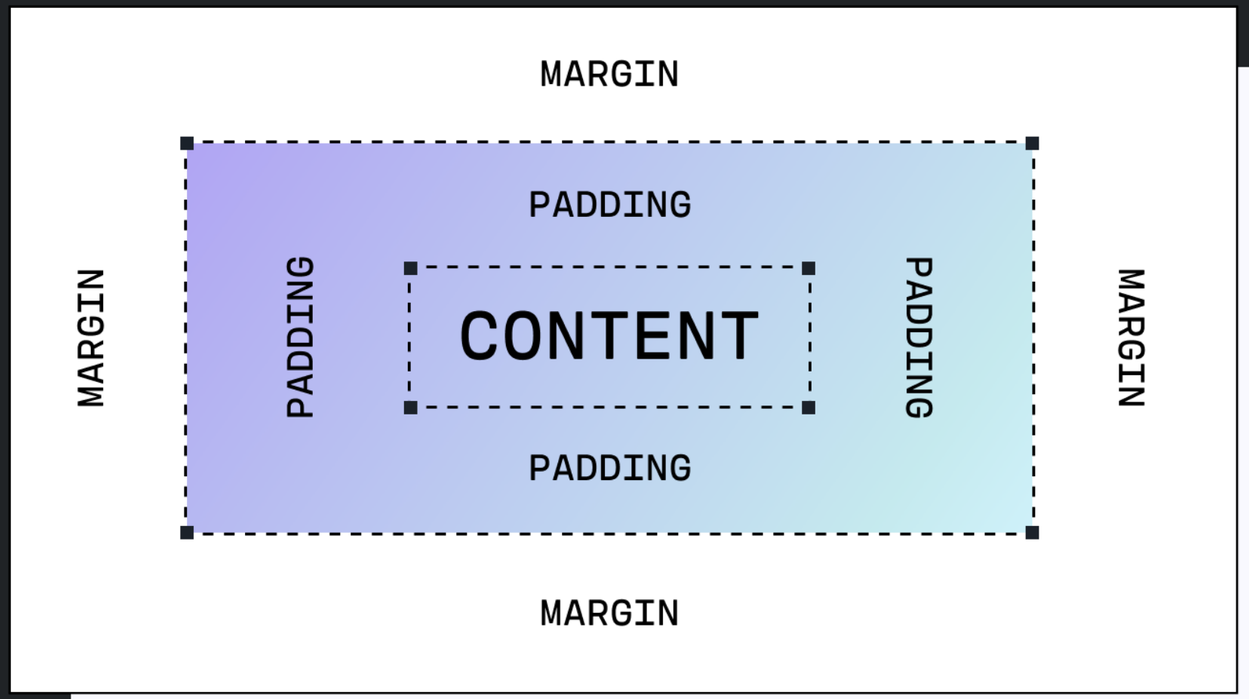
— Easy to maintain and update

— Foundation for design systems

Padding vs. Margin

— **Padding:** Space inside a component — the breathing room between content and its container edge

— **Margin:** Space between components — the gap that separates one element from another



Density Adaptation: When Spacing Flexes

Spacing sits at the boundary of surface and structure:

Structure — the 8pt scale itself

— Always multiples of 8

— Relationships between tokens persist

Surface — which token to use

— Compact mode → space-xs where comfortable uses space-sm

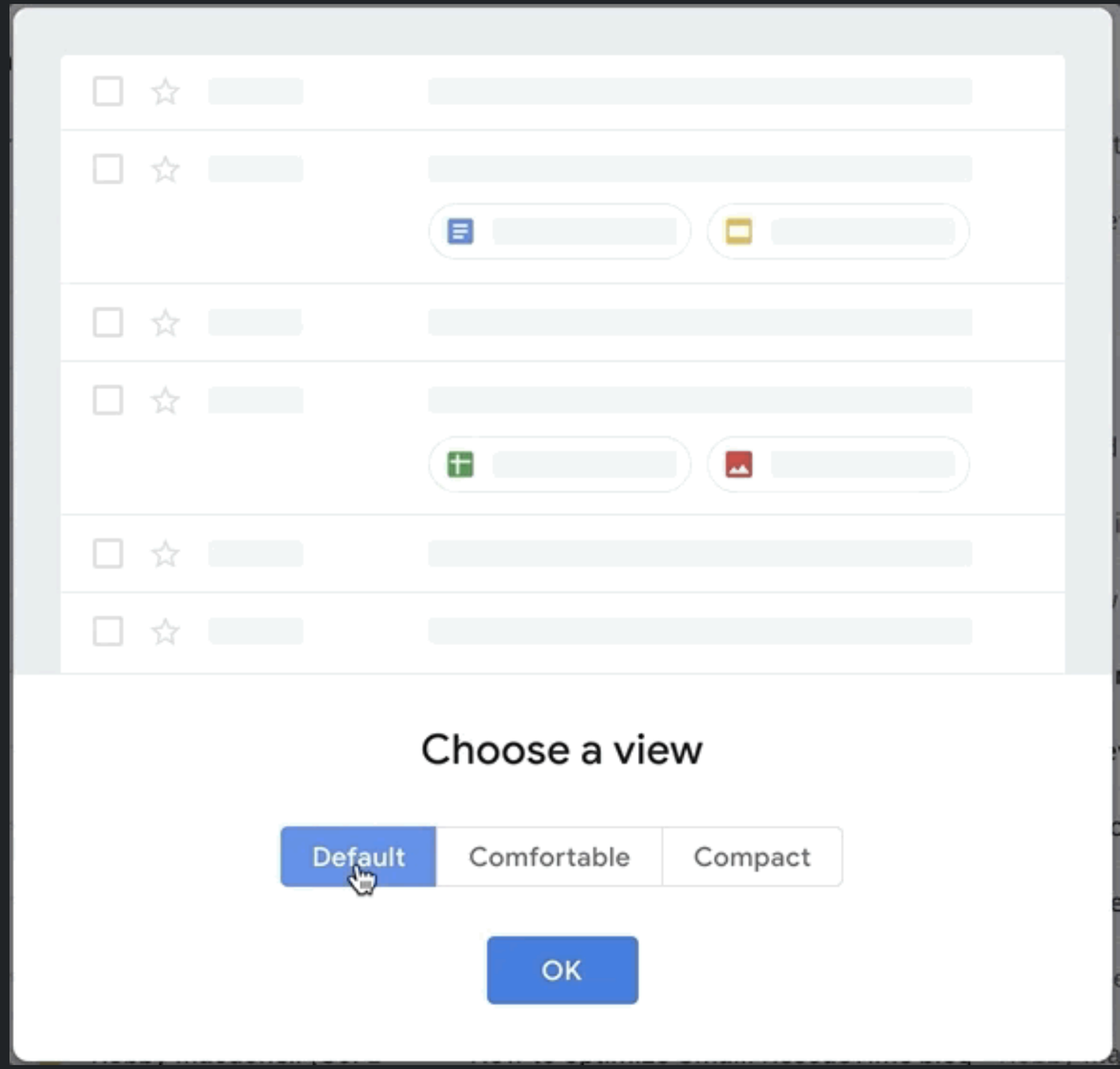
— Same grid. Same alignment. Different density.

Density in Practice: Gmail

Gmail offers three density settings: Default, Comfortable, Compact.

— Same 12-column grid
— Same alignment relationships
— Different spacing tokens applied

Structure stays. Surface flexes.



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Alignment

"Nothing should be placed on the page arbitrarily. Every item should have a visual connection with something else on the page."
— Robin Williams, The Non-Designer's Design Book

Type	What It Does	When to Use
Edge	Elements share a left/right/top/bottom edge	Forms, lists, text blocks
Center	Elements share a center axis	Modals, hero sections
Baseline	Text baselines align across elements	Mixed text sizes side by side
Optical	Adjusted for visual perception, not math	Icons next to text, triangular shapes

Designing Adaptive Systems

Putting P3–P5 to work

The Stable/Adaptive Table

Foundation	Structure (stable)	Surface (adaptive)
Color	Semantic meaning (error = red family)	Actual values (light ↔ dark)
Grid	Column structure, spatial positions	Which content fills columns
Spacing	8pt scale system	Density preference (compact ↔ comfortable)
Alignment	Alignment relationships	What content is being aligned

When evaluating any adaptive system, map what's surface vs. structure.

Intelligence Design Principle Cards

You're getting the full set of **10 principle cards** — keep them in your sketchbook.

Week	Principles	Design Lens
W03	P1 Subordinate Intelligence, P2 Efficient Dismissal	How intelligence appears
W04	**P3 Honest Capabilities, P4 Uncertainty, P5 Predictable Adaptation**	**How intelligence *adapts***
W05	(next week)	How intelligence intervenes
W06	(coming)	How intelligence collaborates

You'll see these in action throughout studio work, critiques, and assignments.

This Week's Hands-On Work

Predictable Adaptation

Putting It All Together

Week	Skill	System	Intelligence Principle
W02	Elements & Principles	Visual vocabulary	—
W03	Typography & Affordances	Type hierarchy	Subordinate Intelligence, Efficient Dismissal
W04	**Color, Grids, Spacing, Alignment**	**Visual systems**	**Predictable Adaptation**

Together, these form a design system, the foundation for intelligent adaptation.

Adaptation Analysis — Homework

Due before Wednesday | Graded: ✓ / ✓- / ✓+

Toggle an adaptation in **2-3 apps** (dark mode, compact mode, text size, Focus mode):

1. **Screenshot both states** (before and after)
2. **Annotate what changed** — the surface (colors, density, contrast)
3. **Annotate what stayed** — the structure (grid, positions, spacing relationships)
4. **Evaluate using P5 (Predictable Adaptation):** Is the adaptation predictable? Does the surface change while structure stays intact? Where does it succeed? Where does it break?
5. **Connect to Week 3:** In the adapted state, are AI suggestions still visually subordinate?

Your observations will inform Wednesday's studio work.

Studio Challenge Preview

Design 3 Screens + 1 Adapted Variant

Pick a 3-Screen Flow

Choose a flow where 3 screens tell a complete story:

— **E-commerce checkout:** Browse → Cart → Confirmation
— **Flight search:** Search → Results → Booking details
— **Recipe app:** Browse → Recipe → Cooking mode
— **Music player:** Library → Album → Now playing
— **Fitness tracker:** Dashboard → Workout → Summary

Or propose your own — any flow with 3 distinct screens that share a visual system.

Then Adapt It

Pick one adaptation trigger and redesign one of your screens:

— **Dark mode** — invert your palette, preserve structure
— **Compact/comfortable density** — change spacing tokens, keep the grid
— **High contrast / accessibility** — boost contrast ratios, maintain layout
— **Focus mode** — reduce visual noise, keep core content

Show your adapted screen next to the original. Annotate what changed (surface) and what stayed (structure).

Before Wednesday

— **Submit:** Adaptation Analysis on Canvas (before Wednesday)
— **Pick:** Your 3-screen flow and adaptation trigger
— **Gather:** Colored markers, pencils, ruler, grid paper if you have it
— **Review:** Today's slides — especially the stable/adaptive table
— **Bring:** Your principle cards

What's Next?

— **Wednesday:** Studio — Design your 3-screen visual system + adapted variant

— **Friday:** Critique — Are your systems consistent, accessible, and adaptable?

— **Next week:** Composition, flow design, and how intelligence intervenes in user flows

References

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