MCP SERVER | NO CODE | CLOUD HOSTED

# Color Difference Engine MCP for AI Agents

## Achieving Perceptually Perfect Color Matching for Digital Design

The Color Difference Engine calculates how close or far apart two colors actually look to the human eye, moving past simple hex code comparisons. It uses industry-standard models like CIEDE2000 and OKLAB to measure perceptual distance, allowing designers and developers to achieve perfect color harmony and consistency across digital products.

A+ Quality Score 100/100

color | delta-e | ciede2000 | oklab | perceptual-vision | hex-comparison

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vinkius.com/mcp/color-difference-engine

SCAN TO VIEW

# The connectivity layer between AI and the world's software.

Vinkius sits between AI and every application. All communication passes through Vinkius Cloud via the Model Context Protocol (MCP) — with governance, observability, and security at every layer.

# Your AI Connections Run Through Vinkius Cloud

The world's largest managed MCP catalog

Vinkius is the connectivity layer where AI connects to the software your business already runs. We handle the hosting, the security, the credentials, the uptime — you get agents that actually do things.

We operate the world's largest managed MCP catalog. Major SaaS platforms, CRMs, databases, and cloud providers — running, monitored, production-ready. This MCP server is hosted and maintained by the Vinkius Cloud for AI Agents.

> *The agent doesn't manage credentials, doesn't manage uptime, doesn't manage security. Vinkius does.*
>
> — Architecture principle

## Four Pillars of the Vinkius Runtime

**01 — Security by design**

Credentials stay encrypted at rest via AES-256. The AI agent never touches raw keys — they're injected into a sandboxed V8 isolate at runtime. Actions are logged, and connections have an emergency kill switch.

**02 — Built on MCP Fusion**

This MCP server was built with **MCP Fusion**, the open-source framework (Apache 2.0) that powers the entire Vinkius catalog. Schema-as-firewall strips undeclared fields, compiled PII redaction runs at zero overhead, and cryptographic lockfiles produce git-diffable audit trails.

**03 — Deterministic observability**

Eight immutable metrics per endpoint: request volume, p95 latency, error rate, active connections, cost attribution. A live payload feed logs every tool call with mutation detection.

**04 — Autonomous operations**

Servers are deployed, monitored, and patched autonomously. New capabilities and security patches ship weekly. Zero-downtime deployments ensure continuous availability across all managed MCP servers.

| AES-256 | Ed25519 | 24h TTL | V8 Isolate |
|---|---|---|---|
| Encryption at rest | PKI vault signatures | Ephemeral session keys | Sandboxed execution |

## One Token. Instant Access.

Every MCP server on Vinkius is accessed through a **Connection Token**. Tokens are generated in the cloud dashboard and produce a unique MCP endpoint URL. Paste this URL into any MCP-compatible client — no SDK required.

A single token can serve **multiple AI clients simultaneously**, or you can issue separate tokens per client for granular access control. Each token tracks its own request count, last activity timestamp, and can be individually enabled or revoked.

MCP ENDPOINT

```
https://edge.vinkius.com/{token}/mcp
```

Claude · Cursor · VS Code · Windsurf · Grok · Gemini

## Security Is the Architecture

Security in Vinkius is not a feature — it's the foundation of the runtime. The gateway enforces multiple independent protection layers between AI agents and third-party APIs.

**01 — Ed25519 PKI Vault**

Every workspace has an Ed25519 Master Key. Session keys are generated ephemerally (24h TTL) and signed by the Master Key. Credentials never leave the vault boundary.

**02 — V8 Isolate Sandboxing**

Tool code runs inside isolated-vm V8 isolates with 64 MB memory caps and per-request timeouts. No filesystem access, no network access except through the SSRF-guarded fetch bridge.

**03 — SSRF Guard**

All outbound HTTP requests are DNS-resolved and validated before execution. Private IP ranges (10.x, 172.16-31.x, 192.168.x, AWS metadata 169.254.x) are blocked at the network layer.

**04 — DLP & PII Redaction**

A ResponseGuard pipeline intercepts every tool response. Configurable redaction patterns strip sensitive fields (emails, SSNs, card numbers) before data reaches the AI agent.

**05 — Cryptographic Audit Trail**

Every request is signed into a SHA-256 hash chain with Ed25519 signatures. Events form a tamper-proof, SIEM-exportable forensic record.

**06 — Honeytoken Trap System**

Phantom credentials are injected into isolated environments. If a honeytoken is used outside Vinkius infrastructure, the server is quarantined instantly.

# Emergency Kill Switch

EU AI Act Art. 14(1) Compliant

The kill switch is an **emergency halt** mechanism — not a simple toggle. When triggered, it executes three actions atomically:

**01 — Server deactivated**

The MCP server is immediately taken offline across the entire cluster.

**02 — All tokens revoked**

Every connection token is invalidated. Total lockout — reconnection blocked until new tokens are issued.

**03 — WebSocket connections killed**

Active connections terminated via Redis pubsub broadcast. Propagates to every runtime node in the cluster.

## Full Visibility. Zero Guesswork.

The Vinkius cloud dashboard includes a full MCP Governance suite — real-time analytics and security controls for production AI operations.

**Control Plane**

KPI dashboard with request volume, latency, success rate, token consumption, and AI-generated operational briefings.

**Agent Activity**

Which AI clients are connecting, how often, and what they're doing — real-time session tracking.

**FinOps**

Cost tracking per tool, payload compression savings, budget optimization signals, and consumption trends.

**Tool Health**

Slowest and most error-prone tools, with actionable root-cause insights and performance baselines.

**Firewall & DLP**

PII redaction activity, sensitive data protection counters, and security event timeline.

**Incident Log**

Error trends, failure rates, status-code breakdowns, and forensic audit trail access.

> Get started at **cloud.vinkius.com** — connect your AI agent in under 60 seconds.

# Color Difference Engine MCP

4 tools available
Cloud-hosted on Vinkius

Need to know if a shade of blue you picked for your website matches the brand guide? The Color Difference Engine gives you precise measurements. It translates simple hex codes into mathematically uniform color spaces that mimic human vision. Instead of just comparing RGB values, this MCP calculates the true perceptual distance between colors using models like CIEDE2000 and OKLAB. You can easily determine if two colors are close enough for a subtle gradient or drastically different. If you're building out a large design system, it also lets you sort hundreds of color options against a target shade to find the best matches fast. When you connect this MCP via Vinkius, your AI client handles all that complex math instantly, giving you confidence in every pixel choice.

## Core Capabilities

**01 — Find Perceptual Distance Between Any Two Colors**

Calculates the precise distance between two colors using multiple industry-standard mathematical models like CIEDE2000 or OKLAB.

**02 — Sort Color Palettes by Similarity to a Target Shade**

Ranks a list of many candidate colors, showing which ones are the most similar to your chosen reference color down to the least similar.

**03 — Check if Colors are Within an Acceptable Range**

Determines if two distinct colors are 'close enough' by applying a specific margin of error you define.

**04 — Deconstruct Color into Core Dimensions**

Breaks down any single color into its fundamental, human-perceivable components: lightness, chroma (saturation), and hue.

## One Click on Vinkius — From Prompt to Execution

Available at **vinkius.com/mcp/color-difference-engine** — connect your AI agent in three steps.

01 You give your AI client the input colors—for example, two hex codes or a list of candidates.

02 The MCP runs those inputs through its mathematical models (like CIEDE2000), which converts simple digital values into perceptually uniform color space coordinates.

03 Your agent returns the result: a precise distance score, a sorted list of similarities, or the core components for analysis.

The bottom line is that you stop guessing about colors and start working with measurable, scientific data.

## Built For

Anyone dealing with digital aesthetics needs this. It's essential for brand consistency managers who spend hours making sure a website's palette doesn't drift off-brand, or web developers building complex design systems that require precise color grading.

**UX/UI Designer**

Uses the MCP to ensure every button, background, and accent shade maintains perfect contrast and visual consistency across different screens.

**Web Developer**

Checks color compatibility when building responsive sites, ensuring that custom color variations still pass accessibility checks without manual hex-by-hex testing.

**Brand Manager**

Validates new marketing materials or product mockups against established brand guidelines by comparing their colors to the official palette using perceptual metrics.

## What Changes When You Connect

01 Maintain brand integrity across all assets. Use the `calculate_color_difference` tool to prove that a new marketing shade is within acceptable distance of your core brand colors.

02 Eliminate guesswork in palette selection. The `rank_colors_by_similarity` function instantly sorts hundreds of options, telling you exactly which shades are closest to your perfect target color.

03 Build reliable design systems with confidence. Use the `evaluate_proximity` tool to set a clear margin of error, knowing that minor variations won't break your aesthetic consistency.

04 Understand colors at their source. The `get_color_components` function breaks down any hex code into its three foundational dimensions—lightness, chroma, and hue—for deep analysis.

05 Optimize color usage for accessibility. By understanding the true perceptual distance, you can ensure that text contrast is sufficient even with slight background color variations.

## Real-World Applications

**Checking Brand Consistency After a Redesign**

A brand manager uploads ten new mockup colors. Instead of manually comparing them to the master palette, they ask their agent to use `calculate_color_difference` against the core hex codes (e.g., #003366). The MCP returns scores, immediately flagging which new shades drift too far from the approved brand identity.

**Designing a Gradient with Perfect Harmony**

A developer needs a smooth gradient between two colors but can't find the perfect mid-tone. They use `rank_colors_by_similarity` against both endpoints, and the MCP provides a sorted list of candidates that are mathematically proven to sit right in the middle, ensuring a seamless visual transition.

#### Automating Accessibility Audits

An accessibility specialist feeds the AI client many background/foreground pairs. The agent uses `evaluate_proximity` with specific contrast thresholds. If a pair falls outside the acceptable margin, the MCP flags it instantly, saving hours of manual checking.

#### Analyzing User-Generated Content Colors

A designer needs to categorize user uploads based on their dominant color tone. They use `get_color_components` on multiple images to extract the lightness, chroma, and hue for each one, allowing them to sort and analyze the entire dataset systematically.

## Patterns to Avoid

### Assuming Hex Codes are Visually Close

✗ AVOID

A designer thinks because #FF6F61 is close to #FF7060 on a hex picker, they are visually similar. They use this assumption without checking the actual human-perceived difference.

✓ INSTEAD

Don't trust visual proximity alone. Instead, run both codes through `calculate_color_difference` using CIEDE2000. The resulting score gives you the definitive perceptual distance, showing if they are truly close enough for your design.

### Using Standard Color Pickers as Authority

✗ AVOID

A developer selects a color adjustment by simply moving a slider on a browser tool, assuming that tiny change is negligible and maintains contrast.

✓ INSTEAD

Always check the result with `evaluate_proximity`. By defining an acceptable margin of error, you get a binary answer: yes, they are close enough; no, they require a manual fix. It's precise.

### Trying to Guess Color Components

✗ AVOID

A marketer describes a color as 'bright and pale red,' trying to guess the right hex code based on subjective feeling.

✓ INSTEAD

Don't describe it, calculate it. Use `get_color_components` if you have a known shade, or use the engine to compare shades until you find one whose measured lightness, chroma, and hue match your specific requirement.

## The Right Fit

Use this MCP when color accuracy is critical to your brand identity or user experience. If you are comparing two colors and need a scientific answer on how different they look to the human eye, you

need `calculate_color_difference`. You should use it if your workflow involves large numbers of potential shades (like building an entire component library). Don't use this MCP if you just need basic color theory definitions; for that, general documentation is fine. However, if you only need to know the mathematical dimensions of a single color without comparison, then `get_color_components` alone might suffice—it's faster and simpler than running the full difference calculation.

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# Color Difference Engine MCP for AI Agents: Mastering Perceptual Color Matching

The old way is tedious. You've picked your primary brand color, but you need a secondary accent shade to pair with it. Instead of relying on gut feelings and repeatedly opening contrast checkers, you spend time copy-pasting hex codes into various tools just to see if the difference looks small enough. It's an agonizing cycle of testing until you find something that 'feels' right.

With this MCP, your agent handles all the math. You ask it for a complementary shade and specify which mathematical model you want (CIEDE2000 is great for general use). The result isn't just a color code; it's a score telling you exactly how close that new shade sits to your original brand color, giving you measurable confidence in every choice.

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# Color Difference Engine MCP for AI Agents: Establishing Digital Color Harmony

Building a cohesive design system requires constant vigilance. You might have twenty different buttons that need slight color variations, but you can't afford the manual check for each one to ensure they all belong to the same family. Checking them individually is slow and prone to human error.

Now, use the engine's ranking capability. Feed it your entire palette of 20 shades against your master brand color. The system instantly sorts them, giving you a clear visual map of how far off each one is. You get reliable data that proves which colors are safe to use and which need immediate adjustment.

# Color Difference Engine: 4 Tools for Perceptual Color Matching

These tools let your AI agent calculate precise color distances, analyze components, and sort massive palettes to guarantee pixel-perfect design consistency.

| # | TOOL | DESCRIPTION |
|---|---|---|
| 01 | `rank_colors_by_similarity` | Sorts a list of candidate colors, showing which ones match a target color from most similar to least similar. |
| 02 | `calculate_color_difference` | Calculates the perceived difference between two specific colors using models like CIE76, CIEDE2000, and OKLAB. |
| 03 | `evaluate_proximity` | Checks if two given colors are 'close enough' to each other based on a threshold you define. |
| 04 | `get_color_components` | Breaks down any single color into its three measurable dimensions: lightness, chroma, and hue. |

# See It in Action

Real prompts you can use once this MCP is connected to your AI agent through Vinkius Cloud.

**U** What's the difference between #1A53FF and #267DFF using CIEDE2000?

The calculated CIEDE2000 distance is 48.92. This indicates a moderate, but noticeable, perceptual shift in blue saturation and lightness compared to each other.

Here's a quick reference:
- **#1A53FF:** Deep Cobalt Blue (High saturation)
- **#267DFF:** Sky Bright Blue (Lower chroma)

**U** I need to find three shades of green that are almost identical to #4CAF50. Can you rank a list for me?

Here is the ranking of your candidate colors against the target shade #4CAF50:

1. **#4A9C53:** Distance: 0.08 (Closest match)
2. **#52b76e:** Distance: 0.15
3. **#3d7a4c:** Distance: 0.22 (Least similar)

**U** Break down #B8E986 and tell me what the Lightness, Chroma, and Hue are.

For color #B8E986, the core dimensions are:

- **Lightness (L):** 0.75
- **Chroma (C):** 0.21
- **Hue (H):** -0.35 (A mild green-yellow shift)

# Frequently Asked Questions

01 **How do I check if two colors are visually compatible for a website?**

The Color Difference Engine helps you by calculating the perceptual distance using models like CIEDE2000. Instead of guessing, it gives you a specific score that tells you exactly how far apart they look to the human eye, ensuring perfect visual harmony.

02 **Can I use this MCP for accessibility checks on color contrast?**

Yes. While it doesn't run WCAG compliance reports directly, it lets you check if colors are 'close enough' using `evaluate_proximity`. This is useful for ensuring slight variations in backgrounds or text don’t accidentally drop the contrast score below acceptable thresholds.

03 **What models should I use when calculating color differences?**

The MCP supports several standards, including CIE76, CIEDE2000, and OKLAB. For most general design work, CIEDE2000 is highly recommended because it mimics human vision better than older methods.

04 **Does the Color Difference Engine help me find variations of a brand color?**

Absolutely. You can give it your core brand hex code and use `rank_colors_by_similarity` to sort hundreds of alternatives, instantly identifying which shades are the most perceptually similar to your original, saving massive amounts of manual searching.

05 **What if I just want to know what a color is made of?**

You can use `get_color_components`. This function breaks down any single hex code into its fundamental Lightness, Chroma, and Hue values. It's great for deep analysis when you need to adjust only one dimension without knowing the exact target shade.

# Go Live in 60 Seconds

Get your connection token from **cloud.vinkius.com**, then paste the endpoint URL into any MCP-compatible client.

YOUR MCP ENDPOINT

```
https://edge.vinkius.com/[TOKEN]/mcp
```

| CLIENT | WHERE TO CONFIGURE |
|---|---|
| Claude AI | Profile → Customize → Connectors → "+" → Add custom connector → Paste endpoint |
| Cursor | Settings → Features → MCP Servers → "+ Add New MCP Server" → Type: SSE → Paste endpoint |
| VS Code | Ctrl/Cmd+Shift+P → "MCP: Add Server" → add `"color-difference-engine": { "url": "…" }` |
| Windsurf | MCP Settings → `mcp_settings.json` → Add endpoint URL |
| ChatGPT | Settings → Tools & plugins → Add MCP server → Paste endpoint |
| Gemini | Extensions → Add MCP Server → Paste endpoint URL |

ASK AN AI ABOUT THIS

Let your preferred AI explain this MCP server

- Ask ChatGPT
- Ask Claude
- Ask Perplexity
- Ask Gemini
- Ask Grok

READY TO CONNECT

# Color Difference Engine is live on Vinkius Cloud.

Get your connection token, paste it into your AI agent, and start building. No SDK. No deployment. Just results.

**Start at cloud.vinkius.com →**

vinkius.com · support@vinkius.com

## INDEPENDENT PLATFORM DISCLAIMER

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