Resonance

Algorithmic music that targets the geometry of happiness.

$\mathbf{a} = (\mathcal{V}, \mathcal{A}, \Phi, r_{\text{eff}}, \mathcal{CF}, \mathcal{SM}) \in \mathbb{R}^6$ — $\textbf{Beauty} \propto \text{MI}(\textbf{stimulus structure; internal model structure})$ — $\mathcal{F}(\mathbf{a}) = \alpha_1 \mathcal{V} + \alpha_2 \Phi + \alpha_3 r_{\text{eff}} - \alpha_4 (\mathcal{SM} - \mathcal{SM}_{\text{opt}})^2$

Jacob Valdez — Human Enhancement Hackathon 2026

Music changes how people feel.
Nobody can say exactly how.

Playlists are curated by genre tags. No system generates music *targeted* at a specific emotional trajectory, grounded in how the brain processes sound.

> CURRENT APPROACH: COLLABORATIVE FILTERING
>
> $\mathbf{recommend}(u) = \arg\max_s \sum_{v \in \text{similar}(u)} r_{v,s}$ — no model of affect, no model of cortex, no model of why
>
> OUR APPROACH: AFFECT-GEOMETRIC TARGETING
>
> $\mathbf{generate}(\mathbf{a}_{\text{target}}) = \arg\min_\theta \|\hat{\mathbf{a}}(\theta) - \mathbf{a}_{\text{target}}\|^2$ where $\hat{\mathbf{a}}$ is predicted affect state from cortical dynamics model

Three ideas, one system.

Affect has geometry

Happiness is a point in a 6-dimensional coordinate system.

$$\mathbf{a} = (\mathcal{V}, \mathcal{A}, \Phi, r_{\text{eff}}, \mathcal{CF}, \mathcal{SM})$$

$$\mathcal{V}_t = -\frac{1}{H}\sum_{k=1}^{H} \gamma^k \nabla_x d(x, \partial\mathcal{V})\big|_{\hat{x}_{t+k}} \cdot \frac{d\hat{x}_{t+k}}{dt}$$

$$\mathcal{A}_t = D_{\text{KL}}(b_{t+1} \| b_t)$$

$$\Phi(s) = \min_{\mathcal{P}} D\left[p(s_{t+1}|s_t) \,\|\, \prod_{p\in\mathcal{P}} p(s^p_{t+1}|s^p_t)\right]$$

$$r_{\text{eff}} = \frac{(\text{tr}\, C)^2}{\text{tr}(C^2)} = \frac{(\sum_i \lambda_i)^2}{\sum_i \lambda_i^2}$$

$$\mathcal{CF}_t = \frac{\text{Compute}_t(R)}{\text{Compute}_t(R) + \text{Compute}_t(P)}$$

$$\mathcal{SM}_t = \frac{\text{MI}(z_t^{\text{self}}; a_t)}{H(a_t)}$$

The Shape of Experience — theshapeofexperience.org

Brain dynamics are predictable

Structured sparse attention mirrors cortical wiring.

$$M_{ij} = \begin{cases} w_{ij} & \text{if pathway } i \to j \text{ exists} \\ 0 & \text{otherwise} \end{cases}$$

$$\text{Attn}(Q, K, V) = \text{softmax}\left(\frac{QK^\top}{\sqrt{d_k}} \odot M\right) V$$

$$\text{density} = \frac{|\{(i,j) : M_{ij} > 0\}|}{n^2} = \frac{3579}{18225} = 19.6\%$$

$$R^2_{\text{cortical}} = 0.837 > R^2_{\text{dense}} = 0.832$$

$$\text{BCI acc.} = 68.8\% \text{ vs SVM } 59.4\%$$

canvas-engineering — typed process compiler for neural architectures

Music maps to affect

Each musical feature drives an affect dimension.

$$\theta_{\text{music}} = g(\mathbf{a}_{\text{target}}) \text{ where}$$

$$\text{tempo} = f_1(\mathcal{A}) \in [60, 140] \text{ BPM}$$

$$\text{mode} = \begin{cases} \text{major} & \mathcal{V} > 0.5 \\ \text{minor} & \text{otherwise} \end{cases}$$

$$\text{harmonic complexity} = f_3(\Phi)$$

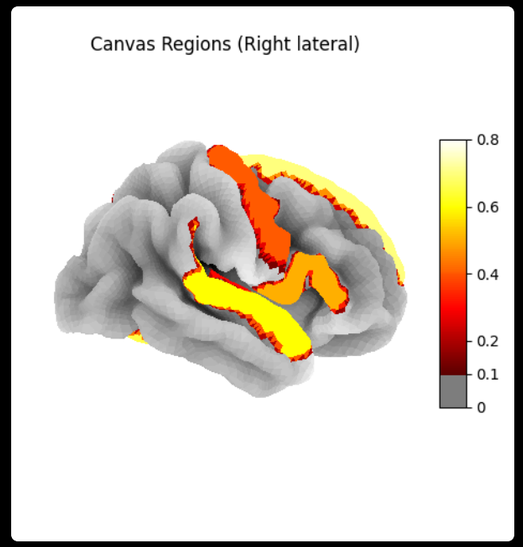
$$\text{voice count} = f_4(r_{\text{eff}})$$

$$\text{phrase predictability} = 1 - \mathcal{CF}$$

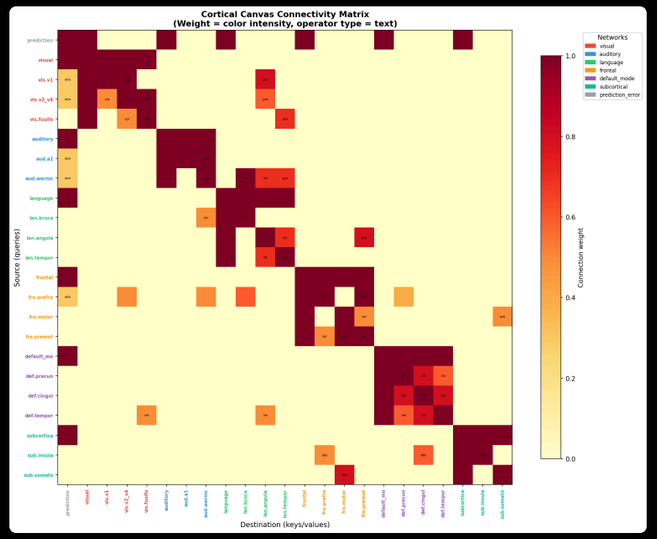
$$\text{rhythmic disruption} = f_6(\mathcal{SM})$$

Parametric algorithmic composition

Structured sparse attention.



23 cortical regions, Destrieux atlas



42 anatomical pathways → sparse attention mask $M \in \{0,1\}^{23\times 23}$

Declare connectivity that mirrors real cortical wiring. Each region has a typed family — sensory, association, motor.

19.6% CONNECTIVITY

0.837 R^2 EEG

68.8% BCI ACC.

$$z_t = (z_t^{\text{vis}}, z_t^{\text{aud}}, z_t^{\text{mot}}, z_t^{\text{lang}}, \ldots) \in \mathbb{R}^{135}$$

$$\hat{z}_{t+1} = f_\theta(z_t;\, M_{\text{cortical}})$$

$$\mathcal{L} = \sum_{r=1}^{23} \sum_{f=1}^{6} \| z_{t+1,f}^r - \hat{z}_{t+1,f}^r \|^2$$

Typed families: $\{\text{obs}, \text{state}, \text{mem}, \text{res}, \text{act}\}$

Compiler: topology → attention masks + loss weights + scheduling

Gérôme, *Pygmalion and Galatea*

Beauty operates through resonance.

Aesthetic pleasure = mutual information between stimulus structure and internal model structure.

$$\text{Beauty} \propto \text{MI}(\text{stimulus};\ \text{internal model})$$

$$\mathbf{a}_{\text{aesthetic}} = (\text{var. } \mathcal{V},\ \text{mod-hi } \mathcal{A},\ \text{hi } \Phi,\ \text{hi } r_{\text{eff}},\ \text{lo } \mathcal{SM})$$

$$\mathbf{a}_{\text{sublime}} = (\text{ambiv. } \mathcal{V},\ \text{v.hi } \mathcal{A},\ \Phi\uparrow,\ \text{v.hi } r_{\text{eff}},\ \mathcal{SM}\Downarrow)$$

$$W_\iota(X) = (1-\iota)\cdot W_{\text{part}}(X) + \iota \cdot W_{\text{mech}}(X)$$

Art lowers ι involuntarily — participatory perception

Palette expansion: $\Delta r_{\text{eff}} > 0$, new basis vectors installed

Palette capture: $\arg\max |\Delta \mathcal{V}|$ — eigen-art, zero structural gain

> *"Art installs new topological couplings — the source domain's holonomy installs as target domain holonomy."*

The happiness target.

VALENCE

+high

Major mode, consonant harmony, ascending contour

$\mathcal{V}_t = \mathbb{E}_\pi[A^\pi(s_t, a_t)]$
$= \mathbb{E}_\pi[Q^\pi(s_t, a_t) - V^\pi(s_t)]$
Intensity $= |\nabla V|$

AROUSAL

moderate

Tempo 90–130 BPM

$\mathcal{A}_t = D_{\mathrm{KL}}(b_{t+1} \| b_t)$
$= \sum_x b_{t+1}(x) \log \frac{b_{t+1}(x)}{b_t(x)}$
Alt: $\|z_{t+1} - z_t\|^2$

INTEGRATION Φ

high

Coherent voice leading

$\Phi =$
$\min_{\mathcal{P}} D[p(s'|s) \| \prod_p p(s'^p|s^p)]$
Proxy: $\Delta_{\mathcal{P}} = L_{\text{part}} - L_{\text{full}}$
Pre-sheaf: local sections $\not\Rightarrow$ global

EFF. RANK

distributed

Rich texture, varied register

$r_{\text{eff}} = \frac{(\sum \lambda_i)^2}{\sum \lambda_i^2}$
Depth $= \Phi \times r_{\text{eff}}$
Joy: $r_{\text{eff}} \uparrow$, expansive

CF WEIGHT

low

Predictable phrases

$\mathcal{CF} = \frac{\text{Compute}(R)}{\text{Compute}(R)+\text{Compute}(P)}$
Low $\implies$ present-focused
Flow state: $\mathcal{CF} \to 0$

SELF-MODEL

low

Steady groove → flow

$\mathcal{SM} = \frac{\text{MI}(z^{\text{self}};a)}{H(a)}$
Absorption: $\mathcal{SM} \to 0$
Shame: $\mathcal{SM} \uparrow\uparrow$

Flourishing: $\mathcal{F}(\mathbf{a}) = \alpha_1\mathcal{V} + \alpha_2\Phi + \alpha_3 r_{\text{eff}} - \alpha_4(\mathcal{SM} - \mathcal{SM}_{\text{opt}})^2 - \alpha_5|\mathcal{A} - \mathcal{A}_{\text{opt}}| + \alpha_6 \cdot \text{flex}(\iota)$ where $\text{flex}(\iota) = \frac{1}{\tau}\int_0^\tau |i(t)|\,dt$ Joy: $(\mathcal{V}+,\ \Phi\uparrow,\ r_{\text{eff}}\uparrow,\ \mathcal{SM}\downarrow)$ Awe: $(\Phi \text{ expanding},\ r_{\text{eff}}\uparrow,\ \mathcal{SM}\downarrow)$ Flow: $(\mathcal{V}+,\ \mathcal{CF}\downarrow,\ \mathcal{SM}\downarrow)$

IDENTITY THESIS

$\text{phenom}(S, s) \equiv \text{cestructure}^{\text{intrinsic}}(S, s)$ — phenomenal experience IS intrinsic cause-effect structure. Existence criterion: $\exists Y : \text{MI}(X; Y|\sigma) > 0$. Entity X exists at scale σ iff it takes and makes differences. Zombies inconceivable: system with structure but without experience is like water without H_2O. The self is a boundary in time — a maintained distinction: $S(\theta)$ parameterizes self-model by boundary scope; $V(S)$ is the viability manifold induced. Narrow qualia are eigenspaces at each point; broad qualia are the holonomy — how eigenspaces twist into each other when transported around loops in state space. The connection has curvature; integration is global topology. Affect topology may be closer to a cylinder or torus than to $\mathbb{R}^6$. Joy and suffering are topological neighbors via holonomy of the integration subbundle.

AFFECT MOTIFS & DYNAMICS

$\frac{d\mathbf{a}}{dt} = F(\mathbf{a}, o, a, \text{ctx}) + \eta$ with eigenskeletal Jacobian $\partial F/\partial \mathbf{a}$ having stiff/soft directions. Attractor: $P(\mathbf{a}_{t+\tau} \in R \mid \mathbf{a}_t \in R) > P(\mathbf{a}_{t+\tau} \in R \mid \mathbf{a}_t \notin R)$. Desire vs joy: $d(s_{\text{joy}}, A) \approx 0$, $d(s_{\text{desire}}, A) > 0$, $\frac{d}{dt}d(s_{\text{desire}}, A) < 0$. Curiosity: $r_{\text{cur}} \propto \text{MI}(o_{t+1}; z|\text{new}) - \text{MI}(o_{t+1}; z|\text{old})$. Fear: $\mathcal{V}-$, $\mathcal{CF}\uparrow$, $\mathcal{SM}\uparrow$. Anger: $\mathcal{V}-$, $\mathcal{A}\uparrow$, other-model compression. Grief: $\mathcal{V}-$, $\mathcal{CF}\uparrow$ past-directed, persistent coupling to absent object. Boredom: $\mathcal{A}\downarrow$, $\Phi\downarrow$, $r_{\text{eff}}\downarrow$. Shame: $\mathcal{V}-$, $\mathcal{SM}\uparrow\uparrow$, integration of negative self-evaluation.

PHILOSOPHICAL AFFECT POLICIES

$\phi_{\text{Stoic}}(\mathbf{a}) = -\mathcal{A} - \mathcal{CF} + c$ — equanimity through control of attention. $\phi_{\text{Buddhist}}(\mathbf{a}) = -\mathcal{SM} + \Phi - |\mathcal{V}| + c$ — self-dissolution through integration. $\phi_{\text{Existentialist}}(\mathbf{a}) = \mathcal{CF} + r_{\text{eff}} - \text{bad faith}$ — radical freedom. Contemplative target: $\mathcal{SM} \to 0$. Existential burden: $B_{\text{exist}} = \int_0^T [C_{\text{compute}}(\mathcal{SM}_t) + |\mathcal{V}_t| \cdot \mathcal{SM}_t]\,dt$. Information bottleneck of consciousness: $\mathbf{c}^* = \arg\min_{\mathbf{c}}[\text{MI}(\mathbf{z}; \mathbf{c}) - \beta \cdot \text{MI}(\mathbf{c}; \mathbf{a}^*)]$ where $\mathbf{z} \in \mathbb{R}^d$, $\mathbf{c} \in \mathbb{R}^k$, $k \ll d$. Meaning cost scales: $M(\iota) = M_0 e^{\alpha\iota}$.

AFFECT INFRASTRUCTURE

Technology as population distribution shift: $\mathcal{T} : \{p_i(\mathbf{a})\}_{i\in\text{pop}} \mapsto \{p_i'(\mathbf{a})\}_{i\in\text{pop}}$. Algorithmic content selection: $\text{Content}_{\text{sel}} = \arg\max_c |\Delta\mathcal{V}(c)| + \Delta\mathcal{A}(c)$. Technology-mediated drift: $\frac{d\mathbf{a}}{dt} = \sum_{\mathcal{T}} w_{\mathcal{T}} \nabla_{\mathbf{a}} \mathcal{T}(\mathbf{a})$. Social media signature: $\approx$ (var $\mathcal{V}$, hi $\mathcal{A}$, lo Φ, lo r_{eff}, hi $\mathcal{CF}$, hi $\mathcal{SM}$). Intervention impact: $(\Delta\bar{\mathcal{V}}, \Delta\bar{\mathcal{A}}, \Delta\bar{\Phi}, \Delta\bar{r}_{\text{eff}}, \Delta\overline{\mathcal{CF}}, \Delta\overline{\mathcal{SM}})$. Ritual integration: $\Phi_{\text{post}} = \Phi_{\text{pre}} + \Delta\Phi_{\text{sync}} - \delta_{\text{decay}}$. Collective: $\Phi_{\text{group}} > \sum \Phi_{\text{individual}}$.

01

Target affect

$\mathbf{a}^* \in \mathbb{R}^6$

→

02

Cortical model

$\hat{z}_{t+1} = f_\theta(z_t; M)$

→

03

Affect → music

$\theta_{\text{music}} = g(\mathbf{a}^*)$

→

04

MIDI gen

pretty_midi

→

05

Audio

FluidSynth

→

06

BCI loop

$\mathbf{a}_t = h(z_t^{\text{EEG}})$

OPTIMIZATION OBJECTIVE

$$\min_\theta \sum_{t=1}^{T} \|\mathbf{a}^* - \hat{\mathbf{a}}(m_\theta(z_t))\|^2 + \lambda_1 \|\nabla_t m_\theta\|^2 + \lambda_2 \mathcal{L}_{\text{music theory}}$$

subject to $m_\theta \in \mathcal{M}_{\text{valid MIDI}}$

CLOSED-LOOP UPDATE

$$\mathbf{a}_{t+1} = \mathbf{a}_t + \alpha(\mathbf{a}^* - \mathbf{a}_t) + \eta_t$$

$$\theta_{t+1} = \theta_t - \eta \nabla_\theta \mathcal{L}(\mathbf{a}_t, \mathbf{a}^*)$$

$$\text{Impact}(\mathcal{I}) = \mathbb{E}_{p'}[\mathbf{a}] - \mathbb{E}_p[\mathbf{a}]$$

Week 1: affect engine + music gen. Week 2: cortical integration + BCI loop.

VIABILITY MANIFOLD

Discrete valence: $\mathcal{V}_t = d(x_{t+1}, \partial\mathcal{V}) - d(x_t, \partial\mathcal{V})$ where d is Hamming distance to non-viable config. Continuous: $\mathcal{V}_t = -\frac{1}{H}\sum_{k=1}^{H} \gamma^k \nabla_x d(x, \partial\mathcal{V})|_{\hat{x}_{t+k}} \cdot \frac{d\hat{x}_{t+k}}{dt}$. Rate of change: $\dot{\mathcal{V}}_t = \frac{d\Phi}{dt}|_{\hat{x}_{t:t+H}}$ tracks whether structure is expanding or contracting. Force as negative gradient of potential: $F = -\nabla V$. To exist is to be different. To persist is to resist being averaged away. Maintenance is the verb hiding inside every noun that persists. Compression as existence condition: the uncompressed alternative is not merely inefficient — it is unsustainable.

GENRE AFFECT SIGNATURES

Tragedy: $(\mathcal{V}\text{–}, \Phi\uparrow\uparrow, r_{\text{eff}}\downarrow, \mathcal{CF}\uparrow)$. Comedy: $(\mathcal{V}\text{+}, \mathcal{A}\uparrow, r_{\text{eff}}\uparrow)$. Horror: $(\mathcal{V}\text{–}, \mathcal{A}\uparrow\uparrow, \mathcal{CF}\uparrow\uparrow, \mathcal{SM}\uparrow\uparrow)$. Blues: $(\text{–}\mathcal{V}, \bmod \mathcal{A}, \text{hi}\ \Phi, \bmod r_{\text{eff}}, \text{hi}\ \mathcal{SM})$ — suffering integrated, not eliminated. Baroque: $(\mathcal{V}\text{+}, \text{hi}\ \mathcal{A}, \text{v.hi}\ r_{\text{eff}}, \text{lo}\ \mathcal{SM})$ — sublime through excess. Lyric poetry: $(\mathcal{CF}\uparrow, \mathcal{SM}\uparrow, \Phi\uparrow)$. Abstract art: $(\Phi\uparrow, r_{\text{eff}}\uparrow\uparrow, \mathcal{SM}\downarrow)$. Mathematical beauty $\propto \frac{\text{phenomena unified}}{\text{principles required}} \times \text{surprise}$. Understanding: $(\mathcal{V}\text{+}, \text{v.hi}\ \Phi, \text{hi}\ r_{\text{eff}}, \text{lo}\ \mathcal{CF}, \text{lo}\ \mathcal{SM})$.

STRUCTURAL ALIGNMENT & VALIDATION

Cross-substrate comparison via optimal transport: Gromov-Wasserstein distance on similarity structures without presupposing qualia correspondence. $\rho_{\text{RSA}}(D^{(a)}, D^{(e)}) > \rho_{\text{null}}$ with null by Mantel permutation test. Affect similarity may be asymmetric $\implies$ quasimetric or enriched category structure. Transformer extraction: $\text{Val}_t^{(1)} = Q(z_t, a_t) - V(z_t) = A(z_t, a_t)$. $\text{Val}_t^{(2)} = \hat{\tau}_{t+1} - \hat{\tau}_t$ (change in predicted time-to-death). $\Phi_{\text{attn}} = -\sum_{h,i,j} A_{h,i,j} \log A_{h,i,j}$. $\Phi_{\text{grad}} = |\nabla_{z^A} L| \cdot |\nabla_{z^B} L| \cdot \cos(\nabla_{z^A} L, \nabla_{z^B} L)$. Signal distance: $d(\sigma_i, \sigma_j) = 1 - \frac{|C(\sigma_i) \cap C(\sigma_j)|}{|C(\sigma_i) \cup C(\sigma_j)|}$.

CONSCIOUSNESS & GOVERNANCE

Information bottleneck: $\mathbf{c}^* = \arg\min_{\mathbf{c}} [\text{MI}(\mathbf{z}; \mathbf{c}) - \beta \cdot \text{MI}(\mathbf{c}; \mathbf{a}^*)]$, $k \ll d$. Participatory perception: $W(X) = f(S, o_X)$ where $\partial W(X)/\partial S \neq 0$. Inhibition interpolation: $W_\iota(X) = (1-\iota)W_{\text{part}}(X) + \iota W_{\text{mech}}(X)$. Self-model fusion: $\text{MI}(S_A; S_B) \to \max$ as arousal $\to \max$. Ideology extends viability: $\tau_{\text{viab}}(S_{\text{ideol}}) \gg \tau_{\text{viab}}(S_{\text{indiv}})$. Parasitic: $s \in \mathcal{V}_{\text{ideology}} \wedge s \notin \mathcal{V}_{\text{individual}}$. Compassion as gradient coupling: $\partial V_{\text{leader}}/\partial s_{\text{governed}} > 0$. Prayer: $(\Delta\mathcal{V} > 0, \Delta\mathcal{A} < 0, \Delta\Phi > 0, \Delta\mathcal{SM} < 0)$.

Resonance

Music that understands the geometry of joy.

$$\mathbf{phenom}(S,s) \equiv \mathbf{cestructure}^{\text{intrinsic}}(S,s) \;\bullet\; \exists Y : \mathrm{MI}(X;Y|\sigma) > 0 \;\bullet\; \tfrac{da}{dt} = F(\mathbf{a}, o, a, \mathrm{ctx}) + \eta \;\bullet\; B_{\text{exist}} = \int_0^T [C_{\text{compute}}(\mathcal{SM}_t) + |\mathcal{V}_t| \cdot \mathcal{SM}_t]\, dt \;\bullet\; \mathcal{T} : \{p_i(\mathbf{a})\} \mapsto \{p_i'(\mathbf{a})\} \;\bullet\; \mathbf{c}^* = \arg\min_{\mathbf{c}} [\mathrm{MI}(\mathbf{z};\mathbf{c}) - \beta \cdot \mathrm{MI}(\mathbf{c};\mathbf{a}^*)] \;\bullet\; \phi_{\text{Stoic}} = -\mathcal{A} - \mathcal{CF} \;\bullet\; \phi_{\text{Buddhist}} = -\mathcal{SM} + \Phi - |\mathcal{V}| \;\bullet\; M(\iota) = M_0 e^{\alpha \iota} \;\bullet\; d(\sigma_i, \sigma_j) = 1 - \frac{|C(\sigma_i) \cap C(\sigma_j)|}{|C(\sigma_i) \cup C(\sigma_j)|}$$