

Neon-Affect: Emotion Pattern Detection

A Supplement to the Neon-Affect Deep Code Analysis

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Positive, Growth, and Any-Direction Emotional Trajectory Pattern Matching with 15 Pattern Families, 120 Simple Motifs, and 15 Compound Patterns

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S1. Introduction

The companion *Pathology Detection* supplement introduced a system for detecting clinically concerning emotional patterns — descent, oscillation, fixation, eruption, and disconnection. While pathology detection identifies when an agent's emotional trajectory is becoming unhealthy, it provides no signal when the trajectory is *healthy*, *improving*, or exhibiting sophisticated emotional processing.

This supplement describes a parallel subsystem — the **Emotion Pattern Detection Engine** — that performs real-time analysis of the same affect history for positive, growth, and any-direction emotional patterns. The engine introduces:

- **120 simple motifs** organized into 15 families covering positive trajectories (ascent, stability, flexibility, regulation, engagement), growth patterns (resilience, flow, growth, bonding, integration), and any-direction patterns (transition, complexity, intensity, rhythm, contagion).
- **15 compound patterns** representing higher-order emotional states such as FLOURISHING, MINDFULNESS, HEALING, WISDOM, and PEAK_EXPERIENCE.
- **Strength scoring** (NONE/FAINT/MODERATE/STRONG/DOMINANT) based on family-specific dynamics evaluation and overall pattern diversity.
- **Independent operation** from the pathology detector — both systems share the foundation classes (EmotionCategory, AffectDynamicsCalculator, AffectDynamicsParams, MBTIBaselines) but score and report independently.

The subsystem is implemented as four plain Java classes:

S1.1 New Files

File	Type	Purpose
EmotionPatternMotif.java	Plain Java	Single pattern motif definition
EmotionPatternLibrary.java	Plain Java	All 120 simple + 15 compound motifs
EmotionPatternResult.java	Plain Java	Detection output structure
EmotionPatternDetector.java	Plain Java	Main detection engine

S1.2 Relationship to the Pathology Detector

The pathology detector and emotion pattern detector form complementary layers:

Aspect	Pathology Detector	Emotion Pattern Detector
Focus	Concerning patterns	Positive, growth, any-direction
Families	5 (DESCENT, OSCILLATION, FIXATION, ERUPTION, DISCONNECT)	15 (ASCENT, STABILITY, FLEXIBILITY, etc.)
Simple motifs	40	120
Compound patterns	15 (clinical: DEPRESSION, ANXIETY, etc.)	15 (wellness: FLOURISHING, HEALING, etc.)
Scoring metric	Severity (NONE→CRITICAL)	Strength (NONE→DOMINANT)
Output	Tier 2 route with MBTI grip detection	Dominant family identification

Both systems run after every emotion addition, providing the agent with a complete picture of its emotional trajectory — what is going wrong *and* what is going right.

S1.3 Shared Foundation

The emotion pattern detector reuses the same foundation classes described in the pathology supplement:

- **EmotionCategory** — maps 155 emotions to 15 categories (10 valence + 5 special tags)
- **AffectDynamicsCalculator** — computes 20 temporal parameters from `AffectHistoryVar` timeline
- **AffectDynamicsParams** — data class holding all 20 parameters
- **MBTIBaselines** — per-type parameter norms, deviation scoring, and dynamics thresholds

No new foundation classes are needed. The pattern detector calls `AffectDynamicsCalculator.Compute()` and `MBTIBaselines.Get()` exactly as the pathology detector does.

S2. Pattern Motif Definition — `EmotionPatternMotif.java`

S2.1 Structure

Each motif is defined by the same core fields as `PathologyMotif`, plus two additional dynamics qualifiers:

```
public class EmotionPatternMotif implements Serializable {
    private final String id;
    private final String family;
    private final String description;
    private final int[] categorySequence;
    private final boolean requireHighVelocity;
    private final boolean requireLowVolatility;
    private final boolean requireHighInertia;
    private final boolean requireLowEntropy;
    private final boolean requireHighEntropy;
}
```

S2.2 Extended Dynamics Qualifiers

The pathology motif uses three qualifiers (high velocity, low inertia, high volatility) tuned for detecting instability. The emotion pattern motif replaces these with five qualifiers tuned for detecting both stability and diversity:

Qualifier	Threshold	Meaning
requireHighVelocity	velocity > velocityThreshold	Fast emotional transitions
requireLowVolatility	volatility < volatilityThreshold * 0.5	Steady, predictable changes
requireHighInertia	inertia > 0.5	Persistent emotional states
requireLowEntropy	emotionalEntropy < 1.5	Focused, concentrated emotional range
requireHighEntropy	emotionalEntropy > 2.5	Diverse, broad emotional exploration

The low volatility and high inertia qualifiers are particularly important for detecting stability and flow patterns — states where the agent maintains a consistent emotional trajectory rather than fluctuating unpredictably.

S2.3 Matching Logic

```

public boolean Matches(int[] window, AffectDynamicsParams params,
                      double velocityThreshold, double volatilityThreshold) {
    if (window.length < categorySequence.length) return false;

    for (int i = 0; i < categorySequence.length; i++) {
        if (categorySequence[i] != window[i]) return false;
    }

    if (requireHighVelocity && params.velocity < velocityThreshold) return
false;
    if (requireLowVolatility && params.volatility > volatilityThreshold * 0.5)
return false;
    if (requireHighInertia && params.inertia < 0.5) return false;
    if (requireLowEntropy && params.emotionalEntropy > 1.5) return false;
    if (requireHighEntropy && params.emotionalEntropy < 2.5) return false;

    return true;
}

```

As with the pathology detector, velocity and volatility thresholds are derived from the agent's MBTI baseline, making detection personality-relative.

S3. Pattern Families — EmotionPatternLibrary.java

The library contains 120 simple motifs organized into 15 families of eight, plus 15 compound patterns. The families are divided into three groups: **Positive** (families 1-5), **Growth** (families 6-10), and **Any-Direction** (families 11-15).

S3.1 Positive Pattern Families

ASCENT (A01-A08) — Upward Emotional Trajectories

ID	Sequence	Qualifiers	Description
A01	POS_MILD → POS_MOD	—	Mild to moderate positive climb
A02	POS_MOD → POS_STRONG	—	Moderate to strong positive climb
A03	POS_STRONG → POS_PEAK	—	Strong to peak positive climb
A04	NEG_MOD → NEG_MILD → NEUTRAL	—	Negative to neutral recovery
A05	NEG_MOD → NEUTRAL → POS_MILD	—	Negative to positive full recovery
A06	SHADOW → NEUTRAL → POS_MILD	—	Shadow to positive climb
A07	NEG_DEEP → NEUTRAL → POS_PEAK	High velocity	Deep negative to peak turnaround
A08	NEG_MILD → POS_MILD → POS_MOD	—	Sustained multi-step upward trend

Ascent motifs capture upward emotional movement at various scales. A07 (deep turnaround) requires high velocity to distinguish genuine recovery from slow drift.

STABILITY (S01-S08) — Healthy Emotional Consistency

ID	Sequence	Qualifiers	Description
S01	NEUTRAL → NEUTRAL → NEUTRAL	Low volatility + high inertia	Sustained neutral groundedness
S02	POS_MILD → POS_MILD → POS_MILD	Low volatility + high inertia	Sustained mild positive contentment
S03	POS_MOD → POS_MOD → POS_MOD	Low volatility	Sustained moderate positive
S04	NEG_MILD → NEUTRAL → POS_MILD	—	Quick return after negative dip
S05	POS_MILD → POS_MOD → POS_MILD	Low volatility	Steady positive despite variation
S06	POS_MOD → POS_STRONG → POS_MOD	Low volatility	Low volatility positive maintenance
S07	NEG_MOD → POS_MILD → POS_MILD	—	Emotional anchoring after disruption
S08	POS_MILD → NEUTRAL → POS_MILD	Low volatility + high inertia	Equilibrium maintenance

Stability motifs require low volatility and/or high inertia qualifiers to ensure the sustained state is genuine stability rather than coincidental repetition.

FLEXIBILITY (L01-L08) — Healthy Emotional Range

ID	Sequence	Qualifiers	Description
L01	POS_MILD → POS_STRONG → POS_MOD	High entropy	Varied positive states
L02	NEG_MILD → POS_MILD → POS_STRONG	High entropy	Broad range with positive bias
L03	POS_MOD → POS_MILD → POS_STRONG	—	Healthy transition across range
L04	POS_MILD → POS_MOD → POS_MILD	High entropy	High granularity positive
L05	POS_STRONG → POS_MOD → POS_PEAK	High entropy	Positive exploration
L06	NEG_MILD → POS_MOD → POS_MILD	—	Adaptive shifting
L07	POS_MILD → POS_STRONG → POS_MOD	High entropy	Balanced arousal variation
L08	POS_MOD → POS_MILD → POS_STRONG	High entropy	Diverse emotional vocabulary

Flexibility motifs require high entropy to confirm the agent is genuinely traversing diverse states rather than being stuck in a narrow range.

REGULATION (R01-R08) — Successful Emotional Management

ID	Sequence	Qualifiers	Description
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R01	NEG_STRONG → NEG_MILD → NEUTRAL	—	Negative dampened to neutral
R02	NEG_STRONG → NEG_MOD → NEG_MILD	—	High arousal de-escalated
R03	NEG_MOD → NEUTRAL → POS_MILD	—	Self-soothing sequence
R04	NEG_MOD → NEG_MILD → POS_MILD	—	Proportional response modulation
R05	NEG_STRONG → NEG_MOD → NEUTRAL	—	Gradual de-escalation from intensity
R06	NEG_STRONG → NEG_MILD → NEUTRAL	Low volatility	Velocity reduction deceleration
R07	NEG_STRONG → NEG_MOD → NEG_MILD	—	Containment without suppression
R08	NEG_MOD → NEUTRAL → NEUTRAL	—	Negative processed without spreading

Regulation motifs are the functional opposite of pathology's ERUPTION family. Where eruption detects explosive emotional shifts, regulation detects successful de-escalation and containment.

ENGAGEMENT (G01-G08) — Emotional Presence and Connection

ID	Sequence	Qualifiers	Description
G01	NEUTRAL → POS_MILD → POS_MOD	—	Increasing emotional responsiveness

G02	POS_MILD → POS_MOD → POS_STRONG	—	Deepening emotional range
G03	NEUTRAL → POS_MILD → POS_STRONG	—	Growing emotional investment
G04	POS_MILD → POS_MOD → POS_STRONG	High entropy	Increasing granularity over time
G05	POS_MILD → POS_STRONG → POS_PEAK	—	Positive arousal engagement
G06	NEG_MILD → POS_MILD → POS_MOD	—	Emotional attunement
G07	POS_MOD → POS_MILD → POS_STRONG	High entropy	Authentic varied expression
G08	NEUTRAL → POS_MILD → POS_MOD	—	Progressive emotional openness

Engagement motifs are the functional opposite of pathology's DISCONNECT family. They detect increasing emotional investment and responsiveness.

S3.2 Growth Pattern Families

RESILIENCE (B01-B08) — Bouncing Back from Adversity

ID	Sequence	Qualifiers	Description
B01	NEG_STRONG → NEUTRAL → POS_MILD	—	Quick recovery from negative

B02	NEG_STRONG → POS_MILD → POS_STRONG	—	Post-adversity growth
B03	NEG_STRONG → NEG_MOD → NEG_MILD	—	Decreasing negative impact
B04	POS_MILD → NEG_MILD → POS_MILD	—	Maintained positive despite negative
B05	NEG_MOD → NEG_MILD → POS_MOD	—	Adaptive coping sequence
B06	NEG_MOD → NEUTRAL → POS_MILD	Low volatility	Stress inoculation
B07	NEG_DEEP → NEG_MILD → POS_MILD	—	Bounce-back from deep negative
B08	NEG_STRONG → POS_MILD → POS_STRONG	High velocity	Anti-fragility strengthening

B02 (post-adversity growth) and B08 (anti-fragility) are particularly significant — they detect cases where the agent emerges from negative states *stronger* than before, not merely recovered.

FLOW (W01-W08) — Optimal Engagement States

ID	Sequence	Qualifiers	Description
W01	POS_MOD → POS_MOD → POS_MOD	Low volatility + high inertia + low entropy	Sustained moderate arousal positive
W02	POS_STRONG → POS_STRONG → POS_STRONG	Low volatility + high inertia + low entropy	Absorbed low entropy focus

W03	POS_MILD → POS_MOD → POS_STRONG	Low volatility	Progressive deepening
W04	POS_PEAK → POS_STRONG → POS_MOD	Low volatility	Sustained peak with graceful descent
W05	POS_STRONG → POS_MOD → POS_STRONG	Low volatility + high entropy	Creative flow varied positive
W06	POS_STRONG → POS_PEAK → POS_STRONG	Low volatility	Peak experience sequence
W07	POS_MOD → POS_STRONG → POS_MOD	Low volatility + high inertia	Focused engagement plateau
W08	POS_MOD → POS_MOD → POS_STRONG	Low volatility + low entropy	Energized calm

Flow motifs combine sustained positive valence with low volatility. W01 and W02 (sustained states) additionally require low entropy, confirming focused concentration rather than scattered positive affect.

GROWTH (H01-H08) — Emotional Development

ID	Sequence	Qualifiers	Description
H01	POS_MILD → POS_MOD → POS_STRONG	High entropy	Increasing emotional granularity
H02	NEG_MILD → POS_MILD → POS_STRONG	High entropy	Expanding emotional range
H03	NEG_MOD → NEG_MILD → POS_MILD	—	Decreasing regulation resistance

H04	NEG_STRONG → NEG_MILD → POS_MILD	High velocity	Improving recovery time
H05	POS_MILD → POS_STRONG → POS_PEAK	High entropy	Expanding positive repertoire
H06	SHADOW → NEG_MILD → POS_MILD	—	Shadow integration processing
H07	POS_MILD → POS_MOD → POS_STRONG	—	Increasing emotional depth
H08	NEG_MILD → NEUTRAL → POS_MOD	—	Progressive maturation

Growth motifs detect development over time. H06 (shadow integration) is particularly notable — it detects the agent processing shadow states (controlling, aggressive, arrogant) into positive affect, indicating psychological integration.

BONDING (N01-N08) — Interpersonal Connection

ID	Sequence	Qualifiers	Description
N01	NEUTRAL → POS_MILD → POS_MOD	—	Trust building cautious to warm
N02	SHADOW → POS_MILD → POS_MOD	—	Vulnerability shared positive received
N03	POS_MILD → POS_MOD → POS_STRONG	—	Mutual positive escalation
N04	NEG_MILD → POS_MILD → POS_STRONG	—	Progressive disclosure warmth

N05	NEUTRAL → POS_MILD → POS_MILD	Low volatility	Comfort establishment
N06	NEUTRAL → POS_MILD → POS_MOD	Low volatility	Rapport building sequence
N07	POS_MOD → POS_STRONG → POS_PEAK	—	Collaborative joy shared peaks
N08	NEG_MILD → NEG_MILD → POS_MILD	High inertia	Empathic mirroring

Bonding motifs capture the emotional arc of interpersonal connection. N02 (vulnerability shared) detects the agent moving from shadow states to positive affect — sharing vulnerability and receiving positive response.

INTEGRATION (I01-I08) — Processing and Synthesizing Emotions

ID	Sequence	Qualifiers	Description
I01	NEG_MOD → NEG_MILD → POS_MILD	—	Mixed emotions resolving to clarity
I02	NEG_DEEP → NEG_MOD → NEUTRAL	—	Grief processing to acceptance
I03	NEG_STRONG → NEUTRAL → POS_MILD	—	Conflict resolution
I04	NEG_DEEP → NEG_MILD → POS_MILD	—	Catharsis release to peace
I05	NEG_MILD → SHADOW → POS_MILD	—	Ambivalence resolved

I06	SHADOW → NEUTRAL → POS_MOD	High entropy	Meaning-making from shadow
I07	NEG_STRONG → NEG_MILD → NEUTRAL	—	Negative processed to acceptance
I08	NEG_MOD → POS_MILD → POS_MOD	High entropy	Emotional synthesis

Integration motifs detect successful emotional processing. I02 (grief processing) and I04 (catharsis) represent deep emotional work — the agent moving through intense negative states and emerging into neutral or positive territory through processing rather than suppression.

S3.3 Any-Direction Pattern Families

TRANSITION (T01-T08) — Significant Emotional Shifts

ID	Sequence	Qualifiers	Description
T01	POS_STRONG → NEG_MOD	—	Positive valence reversal to negative
T02	NEG_MOD → POS_STRONG	—	Negative valence reversal to positive
T03	POS_PEAK → NEG_MOD	High velocity	Rapid category change
T04	POS_STRONG → POS_MOD → POS_MILD	—	Gradual category drift downward
T05	NEG_MILD → NEUTRAL → POS_MILD	—	Multi-step upward transition
T06	NEG_MILD → NEUTRAL → POS_MILD	—	Neutral boundary crossing upward

T07	NEUTRAL → POS_MILD → POS_STRONG	High velocity	Arousal activation
T08	NEG_MOD → POS_STRONG	High velocity	Category leap skipping levels

Transition motifs are valence-neutral — they detect any significant emotional shift regardless of whether it is positive or negative. They are useful for understanding the agent's emotional dynamics independent of direction.

COMPLEXITY (K01-K08) — Emotional Sophistication

ID	Sequence	Qualifiers	Description
K01	NEG_MILD → POS_MILD → NEG_MILD	High entropy	High granularity mixed states
K02	SHADOW → POS_MILD → NEG_MILD	High entropy	Multi-category co-activation
K03	POS_MILD → NEG_MILD → POS_MILD	—	Ambivalent processing
K04	POS_MOD → NEG_MILD → POS_MOD	High entropy	Mixed valence exploration
K05	NEG_MOD → POS_MILD → SHADOW	High entropy	Emotional layering
K06	POS_STRONG → SHADOW → POS_STRONG	High entropy	Paradoxical emotional state
K07	POS_MILD → NEG_MILD → POS_MOD	High entropy	Nuanced expression markers

K08	POS_MOD → POS_MILD → POS_STRONG	High entropy	Sophisticated differentiation
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Complexity motifs detect emotional sophistication — the ability to experience and process mixed, layered, or paradoxical emotional states. High entropy requirements confirm genuine emotional diversity.

INTENSITY (Y01-Y08) — Arousal and Amplitude Patterns

ID	Sequence	Qualifiers	Description
Y01	NEG_MILD → NEG_MOD → NEG_STRONG	High velocity	Escalating intensity any direction
Y02	NEG_STRONG → NEG_MOD → NEG_MILD	—	De-escalating intensity
Y03	POS_STRONG → POS_PEAK → POS_STRONG	—	Sustained high positive intensity
Y04	NEUTRAL → POS_MILD → NEUTRAL	Low volatility + high inertia	Sustained low intensity calm
Y05	NEUTRAL → POS_STRONG	High velocity	Intensity spike from baseline
Y06	POS_MOD → POS_MILD → POS_MOD	—	Intensity cycling moderate
Y07	POS_MILD → POS_MOD → POS_STRONG	—	Gradual intensity build
Y08	POS_STRONG → POS_STRONG → POS_STRONG	Low volatility + high inertia	Intensity plateau sustained

Intensity motifs measure amplitude patterns regardless of valence direction. Y04 (sustained calm) and Y08 (sustained intensity) require stability qualifiers to confirm the state is maintained rather than momentary.

RHYTHM (M01-M08) — Temporal Emotional Patterns

ID	Sequence	Qualifiers	Description
M01	POS_MOD → POS_MILD → POS_MOD	Low volatility	Regular healthy cycling
M02	NEUTRAL → POS_MILD → POS_MOD	—	Conversation arc opening
M03	POS_MOD → POS_STRONG → POS_PEAK	—	Conversation arc deepening
M04	POS_MOD → POS_MILD → NEUTRAL	—	Conversation arc closing
M05	POS_STRONG → POS_MOD → POS_MILD	—	Energy wave activity to rest
M06	POS_MILD → POS_MOD → POS_STRONG	—	Building momentum
M07	POS_STRONG → POS_MOD → POS_MILD	Low volatility	Winding down gracefully
M08	POS_MILD → POS_MILD → POS_MOD	Low volatility + high inertia	Punctuated equilibrium shift

Rhythm motifs detect temporal patterns in the conversation's emotional arc. M02-M04 together capture a complete conversation arc: opening engagement, deepening connection, and graceful closing.

CONTAGION (Q01-Q08) — Emotional Spread Across Dimensions

ID	Sequence	Qualifiers	Description
Q01	POS_MILD → POS_MILD → POS_MOD	High entropy	Single emotion broadening
Q02	POS_MOD → POS_STRONG → POS_STRONG	Low entropy	Emotional narrowing to focus
Q03	POS_MILD → POS_MOD → POS_STRONG	High entropy	Cross-dimensional spread positive
Q04	NEG_MILD → POS_MILD → POS_STRONG	—	Emotional cascade upward
Q05	NEG_MOD → NEG_MILD → NEUTRAL	Low volatility	Successful containment
Q06	POS_MILD → POS_STRONG → POS_PEAK	—	Selective amplification positive
Q07	NEUTRAL → POS_MOD → POS_PEAK	—	Positive chain reaction
Q08	NEG_MOD → NEUTRAL → NEUTRAL	Low volatility	Dimensional decoupling stabilize

Contagion motifs measure how emotional states spread or are contained. Q01 and Q03 detect positive emotional broadening; Q05 and Q08 detect successful containment of negative states.

S3.4 Compound Patterns

Compound patterns are detected when two or more simple motifs from different families co-occur in the same affect history:

ID	Components	Pattern Tag	Description
P01	A02 + L01 + G02	FLOURISHING	Thriving emotionally
P02	S02 + R01 + G01	MINDFULNESS	Present and grounded
P03	B02 + H03 + I01	BREAKTHROUGH	Transformative processing
P04	W05 + L01 + Y03	CREATIVE_FLOW	Absorbed creative state
P05	N05 + S02 + B04	SECURE_ATTACHMENT	Safe connection
P06	R01 + L03 + H03	EMOTIONAL_MASTERY	Skilled emotional management
P07	I04 + H06 + T02	TRANSFORMATION	Deep personal change
P08	A03 + W03 + Y07	VITALITY	Energized positive state
P09	S02 + R06 + Y04	SERENITY	Calm contentedness
P10	I06 + K08 + H01	WISDOM	Mature emotional understanding
P11	W06 + Y03 + A03	PEAK_EXPERIENCE	Maslow-type peak moments
P12	B07 + I02 + A05	HEALING	Recovery and renewal
P13	G07 + K04 + L01	AUTHENTICITY	Genuine emotional expression
P14	S01 + R08 + K01	EQUANIMITY	Balanced composure
P15	G01 + S05 + W07	PRESENCE	Fully here and attentive

Each compound requires all component motifs to be present in the detected set. The three-motif requirement (vs. two for pathology compounds) ensures compound patterns represent genuine convergence across multiple pattern families.

S4. Strength Scoring

S4.1 Per-Motif Strength

Each motif match is scored based on its family using family-specific dynamics evaluation:

```
private static int scoreStrength(EmotionPatternMotif motif, ...) {
    int score = 0;
    String family = motif.GetFamily();

    if (family.equals(FAMILY_ASCENT)) {
        // Score based on positive height: POS_PEAK = +2, POS_STRONG = +1
        for (int cat : motif.GetSequence()) {
            if (cat == EmotionCategory.POS_PEAK) score += 2;
            else if (cat == EmotionCategory.POS_STRONG) score += 1;
        }
    } else if (family.equals(FAMILY_STABILITY)) {
        // Score based on low volatility
        if (overallParams.volatility < 0.3) score += 2;
        else if (overallParams.volatility < 0.5) score += 1;
    } else if (family.equals(FAMILY_FLEXIBILITY)) {
        // Score based on emotional granularity
        if (overallParams.emotionalGranularity > 0.7) score += 2;
        else if (overallParams.emotionalGranularity > 0.5) score += 1;
    } else if (family.equals(FAMILY_REGULATION)) {
        // Score based on low regulation resistance
        if (overallParams.regulationResistance < 0.2) score += 2;
        else if (overallParams.regulationResistance < 0.4) score += 1;
    }
    // ... similar for other 11 families
}
```

S4.2 Family-Specific Dynamics Criteria

Family	Primary Dynamics Signal	Strong (score +2)	Moderate (score +1)
ASCENT	Positive valence height	POS_PEAK in sequence	POS_STRONG in sequence
STABILITY	Low volatility	volatility < 0.3	volatility < 0.5
FLEXIBILITY	Emotional granularity	granularity > 0.7	granularity > 0.5
REGULATION	Low regulation resistance	resistance < 0.2	resistance < 0.4
ENGAGEMENT	Conversation arc slope	slope > 0.3	slope > 0.1
RESILIENCE	Recovery time	time < 2.0s	time < 5.0s
FLOW	High inertia + low volatility	inertia > 0.6 & vol < 0.3	inertia > 0.4
GROWTH	Arc slope + granularity	slope > 0.2 & gran > 0.5	slope > 0.1
BONDING	Positive valence asymmetry	asymmetry > 0.3	asymmetry > 0.1
INTEGRATION	Arc slope + low resistance	slope > 0.2 & resist < 0.3	slope > 0.0
TRANSITION	Window velocity	velocity > 0.5	any match
COMPLEXITY	Emotional entropy	entropy > 3.0	entropy > 2.0
INTENSITY	Amplitude	amplitude > 6.0	amplitude > 3.0
RHYTHM	Periodicity	periodicity > 0.3	periodicity > 0.1
CONTAGION	Contagion breadth	breadth > 5	breadth > 3

S4.3 Overall Strength

The overall strength aggregates multiple signals:

Signal	Contribution
Highest individual motif strength	Base score
Compound pattern detected	+1
4+ families present	+2
2-3 families present	+1
10+ total motif matches	+2
5-9 total motif matches	+1

The strength levels are:

Level	Score Range	Label	Meaning
0	0	NONE	No patterns detected
1	1-2	FAINT	Isolated minor pattern
2	3-4	MODERATE	Multiple patterns or sustained trajectory
3	5-6	STRONG	Cross-family patterns with supporting dynamics
4	7+	DOMINANT	Compound pattern with broad family coverage

S5. Detection Engine — EmotionPatternDetector.java

S5.1 Detection Loop

The detection loop is structurally identical to the pathology detector's:

```
public static EmotionPatternResult Detect(ArrayList<AffectHistoryVar>
history,
                                     String mbtiType) {
    // 1. Compute full-history dynamics
    dynamics = AffectDynamicsCalculator.Compute(history);

    // 2. Convert emotions to categories
    for (int i = 0; i < n; i++) {
        categories[i] = EmotionCategory.GetPrimaryCategory(
            history.get(i).GetType());
    }

    // 3. Get MBTI baseline for thresholds
    MBTIBaselines.Baseline baseline = MBTIBaselines.Get(mbtiType);

    // 4. Sliding window motif matching
    for (int windowStart = 0; windowStart <= n - 2; windowStart++) {
        for (EmotionPatternMotif motif : motifs) {
            int len = motif.GetLength();
            if (windowStart + len > n) continue;
            // ... match and score
        }
    }

    // 5. Compound pattern detection
    // 6. Overall strength computation
    // 7. Dominant family identification
}
```

S5.2 Dominant Family

Unlike the pathology detector which produces a Tier 2 route string, the emotion pattern detector identifies the **dominant family** — the family with the most motif matches in the current affect history:

```

private static String computeDominantFamily(Map<String, Integer>
familyCounts) {
    String dominant = null;
    int maxCount = 0;
    for (Map.Entry<String, Integer> entry : familyCounts.entrySet()) {
        if (entry.getValue() > maxCount) {
            maxCount = entry.getValue();
            dominant = entry.getKey();
        }
    }
    return dominant;
}

```

A dominant family of "RESILIENCE" tells the system the agent is primarily exhibiting bounce-back patterns. A dominant family of "FLOW" indicates absorbed engagement. This information can inform behavior selection without the clinical routing that the pathology detector provides.

S6. Output Structure — EmotionPatternResult.java

S6.1 Fields

```

public class EmotionPatternResult implements Serializable {
    private final ArrayList<MotifMatch> motifMatches;
    private final ArrayList<CompoundMatch> compoundMatches;
    private final AffectDynamicsParams dynamics;
    private final int overallStrength; // 0-4 strength level
    private final String mbtiType;
    private final String dominantFamily; // family with most matches
}

```

S6.2 MotifMatch

Each match records: - **motifId**: The pattern identifier (e.g. "A02", "W05"). - **family**: The pattern family (e.g. "ASCENT", "FLOW"). - **description**: Human-readable label (e.g. "Moderate to strong positive climb"). - **windowStart**: The index in the affect history where the pattern begins. - **strength**: The per-motif strength score (0-4).

S6.3 CompoundMatch

Each compound match records: - **compoundId**: The compound identifier (e.g. "P01"). - **description**: Human-readable label (e.g. "Flourishing"). - **patternTag**: The wellness category (e.g. "FLOURISHING"). - **componentIds**: The simple motifs that compose it (e.g. ["A02", "L01", "G02"]).

S6.4 Serialization

All result classes implement `java.io.Serializable`, enabling inter-agent communication through the JACK event system.

S7. Integration with NeonAffectAgent

S7.1 New Field

One field is added to `NeonAffectAgent.agent`:

```
private EmotionPatternResult lastEmotionPatternResult = null;
```

This sits alongside the existing `lastPathologyResult` and `lastDynamicsParams` fields.

S7.2 New Methods

Two public methods are added:

```

public EmotionPatternResult DetectEmotionPatterns() {
    ArrayList affectHistory = GetAffectHistoryItems();
    lastEmotionPatternResult = EmotionPatternDetector.Detect(
        affectHistory, strPersonalityType);
    return lastEmotionPatternResult;
}

public EmotionPatternResult GetLastEmotionPatternResult() {
    return lastEmotionPatternResult;
}

```

S7.3 Automatic Invocation

DetectEmotionPatterns() is called immediately after DetectPathology() in all three emotion addition methods:

```

public void AddEmotionDirect(int iAffect) throws Exception {
    try {
        emotionMutex.acquire();
        // ... existing emotion processing ...
    } catch (Exception e) {
    } finally {
        emotionMutex.release();
    }

    DetectPathology();
    DetectEmotionPatterns(); // NEW: runs after pathology detection
}

```

S7.4 Data Flow

The emotion pattern detector reuses the same data path as the pathology detector:

S8.2 Threshold Variation Across Types

The 16 MBTI types span a wide range of baseline emotional dynamics:

G Type		Velocity Mean	Volatility Mean	Velocity Threshold	Volatility Threshold
Analysts	INTJ	0.30	0.25	0.60	0.50
	INTP	0.35	0.30	0.70	0.60
	ENTJ	0.50	0.35	1.00	0.70
	ENTP	0.60	0.50	1.20	1.00
Diplomats	INFJ	0.40	0.35	0.80	0.70
	INFP	0.45	0.40	0.90	0.80
	ENFJ	0.55	0.40	1.10	0.80
	ENFP	0.65	0.55	1.30	1.10
Sentinels	ISTJ	0.25	0.20	0.50	0.40
	ISFJ	0.30	0.25	0.60	0.50
	ESTJ	0.45	0.30	0.90	0.60
	ESFJ	0.50	0.40	1.00	0.80
Explorers	ISTP	0.35	0.30	0.70	0.60
	ISFP	0.40	0.35	0.80	0.70
	ESTP	0.60	0.50	1.20	1.00
	ESFP	0.65	0.55	1.30	1.10

An unrecognized or null MBTI type falls back to a DEFAULT_BASELINE (velocity 0.50, volatility 0.40).

S8.3 Personality Dimension Effects

The MBTI dimensions create systematic differences in pattern detection sensitivity:

Extraversion vs. Introversion — Extraverts have substantially higher velocity thresholds (ESFP: 1.30 vs. ISTJ: 0.50). An emotional shift that registers as "high velocity" for an ISTJ agent would be well within normal range for an ESFP agent. This means the `requireHighVelocity` qualifier on motifs like A07 (deep turnaround) and B08 (anti-fragility) fires at personality-appropriate levels.

Sensing vs. Intuition — Intuitives (especially Perceiving types) tend toward higher volatility baselines. This raises their volatility thresholds, making the `requireLowVolatility` qualifier on stability and flow motifs (S01, S02, W01, W02) harder to satisfy for intuitive types — appropriately, since "low volatility" for an ENFP is still higher than "low volatility" for an ISTJ.

Feeling vs. Thinking — Feeling types have higher reactivity means (2.0-2.2 vs. 1.0-1.8 for Thinking types). While reactivity is not directly used as a motif qualifier threshold, it influences the dynamics parameters that feed into strength scoring — particularly for the ENGAGEMENT and BONDING families.

Judging vs. Perceiving — Judging types show higher baseline inertia (resistance to emotional change), while Perceiving types show lower inertia (greater adaptability). This affects the `requireHighInertia` qualifier on motifs like S01 (sustained neutral), S08 (equilibrium), W01 (sustained flow), and Y08 (intensity plateau).

S8.4 Practical Implications

Consider motif W01 — sustained moderate positive flow — which requires `requireLowVolatility`, `requireHighInertia`, and `requireLowEntropy`:

- For an **ISTJ** agent (volatility threshold 0.40): the low volatility check passes when $\text{volatility} < 0.20$ (threshold * 0.5). The ISTJ's naturally stable emotional profile makes this achievable.
- For an **ENFP** agent (volatility threshold 1.10): the low volatility check passes when $\text{volatility} < 0.55$. The ENFP needs a higher absolute volatility to trigger "low" because their baseline is inherently more variable.

This calibration prevents the system from over-detecting flow states in naturally stable types (who would trivially satisfy low-volatility requirements) while under-detecting them in naturally variable types (who would rarely meet an absolute threshold). The same emotional *achievement* — sustained engagement relative to one's personality — is recognized across all types.

S8.5 Interaction with Strength Scoring

The MBTI baseline also influences strength scoring indirectly. The dynamics parameters used in per-family scoring (Section S4.2) — volatility, inertia, granularity, recovery time, arc slope — are computed from the raw affect history without personality normalization. However, because the motif-matching step already filters through personality-calibrated thresholds, the motifs that *reach* the

scoring stage have already passed the personality-appropriate gate. The strength score then adds a dynamics-quality overlay on top of the personality-filtered match.

S9. Summary

S9.1 New Data Classes

Class	Fields	Purpose
EmotionPatternMotif	id, family, sequence, 5 qualifiers	Single pattern definition
EmotionPatternLibrary	static ArrayList of 120 + 15	All pattern motifs
EmotionPatternResult	matches, compounds, dynamics, strength, dominant	Detection output
EmotionPatternDetector	static methods	Main detection engine

S9.2 New NeonAffectAgent Fields and Methods

Addition	Type	Purpose
lastEmotionPatternResult	EmotionPatternResult	Most recent detection result
DetectEmotionPatterns()	method	Full pattern detection — called after every emotion
GetLastEmotionPatternResult()	method	On-demand access by any agent or plan

S9.3 Complete Detection Coverage

With both detectors active, the system now monitors 160 simple motifs and 30 compound patterns across 20 families:

System	Families	Simple Motifs	Compound Patterns	Scoring
Pathology Detector	5	40	15	Severity (0-4)
Emotion Pattern Detector	15	120	15	Strength (0-4)
Total	20	160	30	—

S10. Conclusions

The Emotion Pattern Detection Engine completes the analytical layer that the Pathology Detection Engine began. Several design decisions are worth noting:

Parallel architecture: The two detectors are independent systems that share foundation classes but maintain separate motif libraries, scoring logic, and result structures. This allows each to evolve independently — adding new positive patterns does not affect pathology detection, and vice versa.

Positive pattern vocabulary: The 15 compound patterns (FLOURISHING, MINDFULNESS, HEALING, WISDOM, etc.) provide a vocabulary for describing healthy emotional states that is as rich as the pathology vocabulary (DEPRESSION, ANXIETY, BORDERLINE, etc.). This enables balanced assessment — the system can characterize what is going *right* as precisely as what is going wrong.

Any-direction families: The TRANSITION, COMPLEXITY, INTENSITY, RHYTHM, and CONTAGION families are valence-neutral. They detect patterns that are neither inherently positive nor negative — emotional sophistication, natural rhythms, intensity modulation. These patterns provide context for interpreting the positive and negative results.

Strength vs. severity: The deliberate choice of "strength" over "severity" reflects the different nature of these patterns. A DOMINANT strength score indicates the agent's emotional trajectory is strongly characterized by positive or growth patterns — this is informational, not alarming. The vocabulary avoids pathologizing normal emotional experience.

Three-motif compounds: Requiring three component motifs (vs. two for pathology compounds) sets a higher bar for compound detection. FLOURISHING requires simultaneous ascent, flexibility, and engagement — a genuine convergence across three independent pattern families, not merely two co-occurring motifs.

Foundation for behavior selection: The dominant family identification provides a direct signal for plan competition. An agent in a FLOW state may warrant different behavior selection than an agent in a RESILIENCE state. This lays groundwork for replacing LLM-based plan selection with native JACK plan competition driven by observed emotional patterns.

The emotion pattern detector transforms Neon-Affect from a system that only flags concerning trajectories into one that understands the full spectrum of emotional experience. Combined with the pathology detector, the affect dynamics calculator, and the MBTI baselines, the analytical layer now provides a comprehensive, personality-calibrated assessment of the agent's emotional state at every moment in the conversation.

This supplement was generated from direct source code analysis of the tenbase2-com-LLC/Neon-Affect repository. All code excerpts are taken directly from the repository source files.