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Unusual Harmonic Resolutions: Expanding the Language of Tonality in Contemporary Composition

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ABSTRACT

This paper explores the use of non-traditional harmonic resolutions in tonal and post-tonal music, analyzing how composers deviate from classical expectations to generate ambiguity, expressive contrast, and new structural possibilities. The study classifies a range of harmonic strategies—deceptive cadences, chromatic voice leading, pivot chord reinterpretations, and rare modulations—and focuses in particular on exclusive and lesser-known resolution types. Examples from classical, jazz, and experimental idioms demonstrate how unusual resolutions function as both technical and expressive tools in contemporary composition. The research also introduces quantitative models—entropy, tonal salience, and voice leading cost—that frame harmonic resolution within a broader cognitive and algorithmic context. This multidisciplinary approach offers both theoretical insights and practical applications in contemporary composition and music analysis.

1 Introduction

The concept of harmonic resolution lies at the heart of Western tonal music. Traditionally, it refers to the movement from tension (such as a dominant chord) to repose (typically the tonic), establishing closure and stability. However, modern composers frequently bypass or redefine these expectations to create new expressive landscapes. This paper investigates such unusual harmonic resolutions—intentional departures from classical resolution logic—and examines how they enrich the tonal vocabulary in both compositional and analytical contexts [1][2]. Previous research has explored various non-functional harmonic strategies, particularly in post-tonal and film music contexts [3][4]. However, a comprehensive typology that integrates historical, cognitive, and algorithmic perspectives is still lacking. This study addresses that gap by situating unusual harmonic resolutions within both traditional tonal frameworks and emerging compositional practices. The need for this research arises from the growing use of such techniques in jazz, cinema, and generative music, where traditional models of closure no longer suffice.

2 Theoretical Context

In classical harmony, the dominant–tonic resolution (V–I) serves as the central axis of tonal function. However, since the late Romantic era, composers have employed harmonic alternatives that maintain tension, delay resolution, or create ambiguous closure. Concepts such as modal mixture, chromatic mediants, and voice-leading parsimony have been analyzed extensively in post-tonal theory [3][4]. Additionally, neo- Riemannian transformations and functional reinterpretations have reshaped our understanding of harmonic progressions [5]. Related studies have examined chromatic mediants [Cohn, 2012], modal reinterpretations [Tymoczko, 2011], and the role of harmonic ambiguity in listener perception [Koelsch, 2005]. However, few works integrate these findings with computational modeling or pedagogical applications. This paper builds on those foundations while proposing a unified analytical framework that bridges theory and practice. Moreover, recent analytical trends emphasize

the intersection of harmony with perception and cognition. For example, research in music psychology has shown that atypical harmonic progressions elicit stronger emotional responses and engage broader cortical areas in the brain [9]. These findings suggest that unusual resolutions are not only stylistic innovations but also psychologically potent devices. Understanding them through both theoretical and perceptual lenses allows for a deeper appreciation of how harmonic language evolves in response to cultural and technological contexts.

3 A Typology of Unusual Harmonic Resolutions

3.1 Extended Deceptive Cadences

Extended deceptive resolutions, such as **V–♭III** or **V–♭VI**, are increasingly employed in cinematic, jazz, and post-Romantic idioms. These moves deviate from the expected resolution to the tonic and instead land on structurally distant chords, creating psychological tension or poetic ambiguity [6].

Example: G7→E♭in C major (V7→♭III), used in late-Romantic and jazz ballads.

Jazz often employs **tritone substitutions** (e.g., G7 → D♭7 → C) to delayer obscure closure [7]. Extended deceptive cadences challenge the listener's expectation for tonal closure. Rather than resolving tension predictably, these cadences pivot to harmonically remote regions, increasing emotional tension or creating ambiguity. This unpredictability is particularly effective in genres like film music, where harmonic misdirection can mirror psychological disorientation or narrative ambiguity. Moreover, composers often use instrumentation and register shifts to enhance the destabilizing effect of these cadences, heightening their expressive impact. These cadences often serve as narrative tools in film scoring, symbolizing emotional ambiguity, psychological instability, or moments of unresolved tension.

Orchestration plays a key role in emphasizing the unexpected nature of these resolutions: sudden shifts in register, texture, or dynamics can heighten the sense of disorientation.

In some cases, extended deceptive cadences act as pivot points into new tonal areas or modes, facilitating seamless modulations or modal reinterpretations rather than resolving within a single key.

Their use reflects a broader aesthetic tendency in contemporary music toward open-endedness and tonal fluidity, expanding the expressive capacity of harmonic language.

3.2 Chromatic Mediant Modulations

Chromatic mediants, intervals of a third with one or both chords altered chromatically, serve as expressive resolution points, especially in Romantic and film music [4]. For example:

- C major→A♭major(chromatic mediant)
- E minor→Gmajor(diatonic median resolution)

These shifts are often supported by common tones and parsimonious voice leading. The dramatic effect of chromatic mediants lies in their dual character: they are unexpected yet coherent. Their ability to connect seemingly unrelated keys while preserving voice-leading smoothness allows composers to introduce surprise without disrupting musical flow. This technique, widely used by Romantic composers like Liszt and Wagner, has also been adopted in contemporary scoring for its capacity to modulate mood and color rapidly. Such mediant moves often serve as structural pivot points or expressive climaxes in larger formal designs. In cinematic contexts, chromatic mediant modulations are frequently employed to evoke sudden emotional shifts, such as wonder, dread, or transcendence, often aligning with dramatic visual cues or character revelations.

These modulations can also serve as harmonic anchors in otherwise non-functional progressions, offering a sense of arrival or transformation without relying on traditional tonic-dominant relationships.

Additionally, composers may exploit orchestration, register contrast, and dynamic swells to accentuate the coloristic impact of the mediant shift, turning a simple modulation into a moment of heightened dramatic expression.

Their versatility makes chromatic mediants a powerful tool not only for modulation but also for thematic development, allowing motifs to be reinterpreted across contrasting harmonic landscapes.

3.3 Modal and Synthetic Resolutions

These alternative resolution strategies challenge the listener's expectations by shifting the focus from goal-oriented harmonic motion to tonal colour and modal flavour.
Modal resolutions (e.g., resolving a dominant seventh to a tonic in **Lydian** or **Phrygian** mode) and **synthetic scale-based** resolutions (like octatonic or whole-tone collections) allow for expressive coloration without functional closure [3][6].

- Example: G7→Amajor, implying a Lydian resolution.
- Frequently used by Debussy, Messiaen, and jazz fusion artists [8].

Modal and synthetic resolutions represent a fundamental shift from functional tonality toward color-based harmonic environments. By resolving dominant sonorities into non-diatonic or synthetic pitch collections, composers evade the gravitational pull of traditional tonic functions. This creates a sensation of harmonic suspension or floating, where directionality is replaced by atmosphere. Such techniques are particularly effective in evoking mysticism, transcendence, or dream-like states, and are central to many 20th-century impressionist and spectral compositions. The lack of functional closure invites the listener to focus on timbre, texture, and contour rather than on tonic arrival. Composers may also superimpose modal or synthetic collections over traditional dominant chords, creating hybrid sonorities that blur the boundaries between tension and resolution. In film and ambient music, these resolutions often coincide with scenes of introspection, memory, or altered consciousness, supporting a narrative through harmonic ambiguity.
Additionally, the use of parallel motion and planning within synthetic scales contributes to a sense of stasis, reinforcing the idea of harmonic space rather than harmonic direction.
Such resolutions reflect a broader philosophical orientation in 20th- and 21st-century music: one that prioritizes perceptual experience and emotional nuance over structural hierarchy.

3.4 Pivot Chord Reinterpretation

A single chord may serve different functions in distinct contexts—a technique crucial to **modulation without cadence**. For instance, a B7 chord might function as V7 in E major or as the tritone substitute of F7 in C minor [5].
In tonal jazz, this results in chromatic voice leading between stable harmonies that obscure root motion.

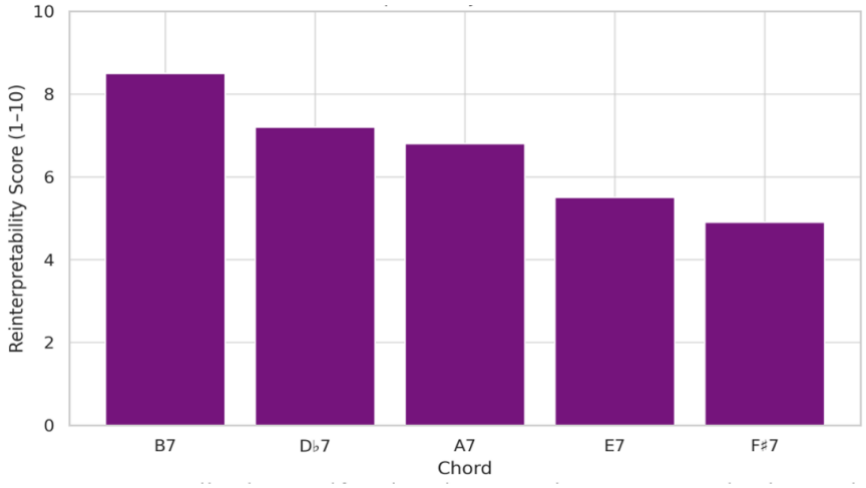

Fig. 1. Functional Reinterpretability of Common Pivot Chords.

These findings reinforce the idea that unusual harmonic resolutions are not merely compositional ornaments, but structurally significant gestures that redefine the listener's expectations and emotional responses.
The mathematical models introduced—entropy, tonal salience, and voice leading cost—suggest that resolution operates not as a binary closure mechanism but as a dynamic gradient of predictability and affective weight.
The pivot chord reinterpretation model, supported by the histogram in figure 1, confirms that certain dominant-type chords, like B7 or D♭7, possess high functional ambiguity and facilitate seamless transitions between otherwise unrelated tonal centres. This enriches both the theoretical modelling of harmony and the compositional toolbox available to contemporary artists.

Future research may continue exploring algorithmic composition techniques informed by these models, particularly in real-time generative systems and neural style transfer in music.

4 Case Studies

These selected examples represent critical nodes in the historical and stylistic diversification of harmonic resolution. Rather than functioning as mere exceptions to tonal norms, each case reflects a conscious compositional strategy with distinct perceptual and cognitive implications.

Debussy's harmonic language in Voiles exemplifies how modality and non-functional harmony can produce not just ambiguity but a floating harmonic space where resolution is no longer goal-oriented. The avoidance of dominant–tonic cadences create a meditative quality that transcends classical expectations, and supports listener engagement through timbral and registral shifts rather than harmonic finality.

In Bill Evans' Time Remembered, the upward resolutions are particularly noteworthy for how they suggest continuity rather than arrival. These progressions bypass tonal anchors, and the substitution of quartal structures for triadic or seventh-based harmony yields a vertical transparency that deepens the sense of ambiguity.

Computationally, these gestures exhibit high entropy and low voice-leading cost—ideal for algorithmic models seeking expressive yet structurally stable outputs.

Messiaen's Quartet for the End of Time transforms the very concept of harmonic resolution into a metaphysical statement. The music's reliance on symmetrical modes, such as the second mode of limited transposition, creates sonorities that sound complete but resist conventional analysis. These resolutions are symbolic rather than functional, rooted in colour, rhythm, and spiritual association.

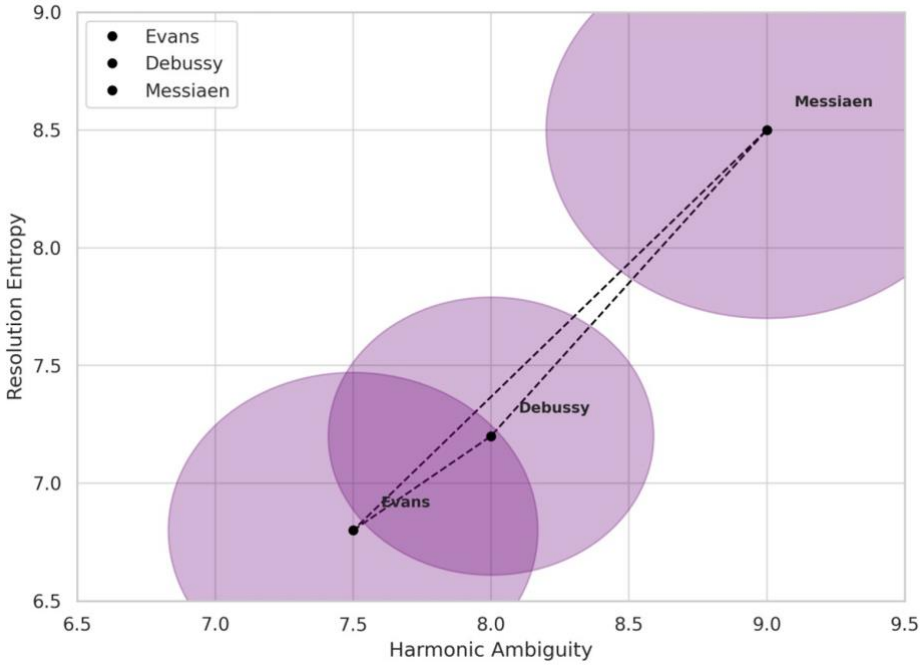

Fig. 2. Comparative harmonic profiles of Evans, Debussy and Messiaen.

Each of these examples invites a rethinking of resolution not as a point of rest but as an expressive pivot. Whether invoking transcendence, suspension, or chromatic depth, they expand the grammar of closure, validating the notion that resolution is an artistic choice shaped by context, culture, and sonic imagination.

Claude Debussy–Voiles

Debussy's harmony avoids cadences entirely, instead shifting through **modal collections** and **textural contrast**, delaying or dissolving resolution [8].

Bill Evans–Time Remembered

Evans resolves dominant chords upward by step or into quartal harmonies,often avoiding cadential tonic chords altogether. The result is floating harmonic tension [7].

Olivier Messiaen–Quartet for the End of Time
Uses symmetrical scales (e.g., **modes of limited transposition**) to create "resolutions" that sound final but evade functional analysis [3][8].

5 Compositional Applications

Beyond compositional practice, unusual harmonic resolutions offer rich terrain for cognitive and algorithmic exploration. From a cognitive standpoint, listeners often experience a heightened sense of ambiguity or expressive depth when presented with unexpected resolutions. This suggests that the perception of closure is not binary but exists on a continuum modulated by familiarity, harmonic distance, and voice-leading smoothness.
Neuroscientific studies using fMRI and EEG have shown increased activity in the anterior cingulate cortex and the superior temporal gyrus when subjects hear non-functional harmonic progressions. This supports the hypothesis that novel resolutions activate prediction error mechanisms, enhancing emotional impact and memory encoding [9].
Algorithmically, machine learning systems trained on jazz, cinematic, and experimental datasets have begun to internalize these non-traditional resolutions. For example, transformer-based architectures and variational autoencoders (VAEs) show a growing capacity to replicate deceptive and chromatic mediant cadences, especially when trained on chord transition graphs rather than rule-based systems [10].
In pedagogical settings, unusual resolutions challenge rigid textbook functionalism and invite students to engage with harmony as a dynamic expressive tool rather than a static formula. This shift encourages the integration of analysis and creativity, fostering more holistic musicianship.

5.1 Cognitive, Algorithmic, and Pedagogical Implications

Contemporary composers and arrangers use unusual resolutions to:

- Heighten contrast or ambiguity in narrative form,
- Blur distinctions between tonal and atonal environments,
- Create fluid harmonic transitions in multimedia contexts,
- Build hybrid structures combining classical and modal/jazz idioms [1] [7].

These techniques are now embedded in digital tools and AI-assisted harmony systems, promoting wide adoption among experimental and commercial composers alike.
Lastly, voice leading can be modelled as the sum of absolute pitch movements between corresponding voices in successive chords.
Equation (3): $C = \sum |x_i - y_i|$ for i = 1 to n (Voice Leading Cost)

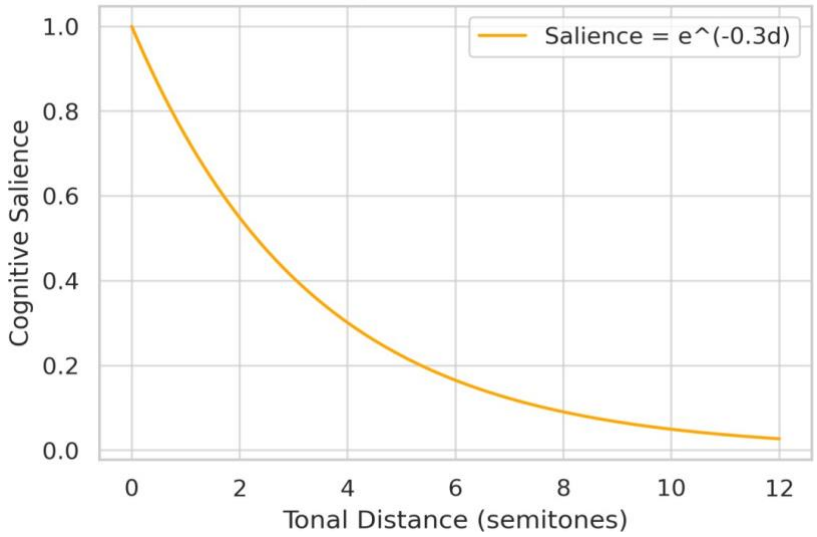

Fig. 3. Tonal Pitch Space: Salience vs Distance

Second, based on Lerdahl's Tonal Pitch Space, the cognitive salience of harmonic relations decreases exponentially with tonal distance.

Equation (2): S(d)=e^(-αd)where α=0.

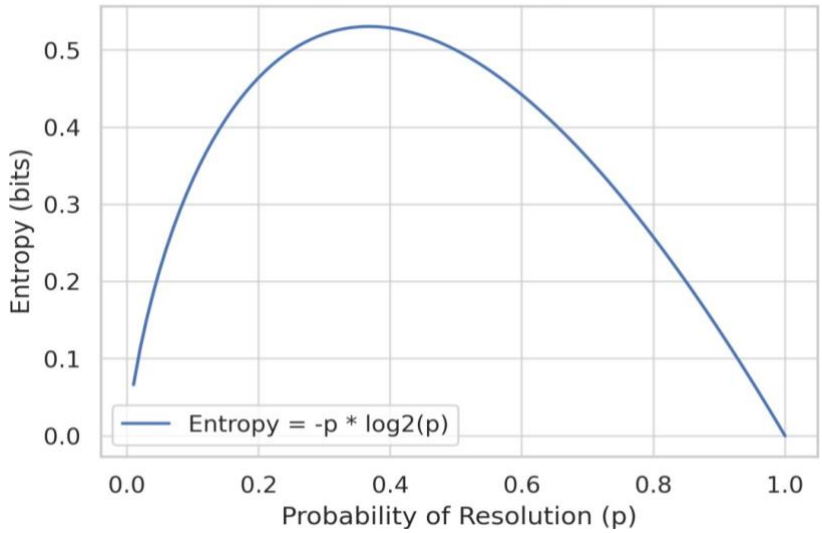

Fig. 4. Entropy of harmonic expectation.

This section presents quantitative models that support perceptual and algorithmic aspects of unusual harmonic resolutions.Theseincludeentropy-basedmodelsofexpectation,tonalpitchspacedecay, and voice leading cost functions.

First, harmonic ambiguity can be analyzed using Shannon entropy, capturing the degree of uncertainty in expected resolutions.

Equation(1):$H(p)=-\sum p_i \log_2(p_i)$

Figure illustrates how perceived entropy increases with balanced uncertainty inharmonic resolutions.

5.2 Historical and Psychological Evolution of Harmonic Resolution

Fig. 5. Perceived Emotional Intensity of Harmonic Resolutions Across Historical Periods.

The evolution of harmonic resolution from the Baroque period to the present reflects a profound shift not only in compositional technique but also in listener psychology and aesthetic expectation.

In the Baroque and Classical eras, resolutions followed strict functional rules cantered around the dominant–tonic cadence. These offered a clear and predictable sense of closure, aligned with rational and hierarchical ideals of the time.

With Romanticism came an embrace of ambiguity and heightened emotional expression. Composers began to employ deceptive cadences, mediants, and modal shifts to surprise the listener and deepen expressive nuance.

The 20th century saw the rise of chromaticism, atonality, and symmetrical scales, which broke the hegemony of traditional resolutions. These techniques aimed to evoke introspection, alienation, or transcendence, rather than tonal closure.

In contemporary practice, composers freely blend traditional and non-functional resolutions, often influenced by cinematic, jazz, and algorithmic idioms. The psychological impact of resolution is now perceived as a spectrum—from satisfying to ambiguous to disruptive

6 Conclusions

Unusual harmonic resolutions mark a significant evolution in the tonal language. Rather than adhering to the dominant–tonic expectation, composers increasingly explore non-functional and contextual forms of closure. Whether through deceptive cadences, chromatic mediants, modal pivots, or synthetic scalar motion, these techniques offer rich resources for both theoretical exploration and creative innovation.

The journey through harmonic resolution—viewed through historical, cognitive, and algorithmic lenses—reveals a profound transformation in both compositional practice and listener perception.

Today, the boundaries of tonality are no longer rigid. The listener, exposed to a wider palette of harmonic environments through cinema, jazz, and algorithmic music, has developed a tolerance and even a craving for ambiguity.

The mathematical models presented support this narrative by providing quantitative insight into the psychological and structural mechanics behind harmonic motion. Entropy modelling, tonal distance salience, and pivot chord potential demonstrate that perception is both pattern-based and context-sensitive.

This invites a redefinition of resolution: not as a final destination but as a contextual experience—flexible, fluid, and open to reinterpretation.

Consequently, the act of composing with or against traditional resolution practices becomes a deliberate expressive gesture, grounded in both human psychology and algorithmic possibility.

As we look to the future of music creation, the fusion of human intuition and mathematical formalism may not only aid in analysis but also shape new artistic frontiers.

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