

# About Layered Voice Analysis (LVA™)

Layered Voice Analysis, or LVA, is a technology that provides a unique analysis of human voices.

This technology can detect a full range of genuine emotions, such as stress, sadness, joy, anger, discomfort, and embarrassment - and many more emotional/cognitive states that the speaker may not express outwardly using words and/or expressed intonation.

What sets LVA apart from other voice analysis technologies is its ability to go deep into the inaudible and uncontrollable properties of the voice and reveal emotional elements that are not expressed vocally while speaking.

This exceptional approach allows the technology to remain unbiased and free from the influence of cultural, gender, age, or language factors.

LVA has served cooperations and security entities for over 25 years and is research-backed and market-proven.

It can be used for various applications, ranging between fintech, insurance, and fraud detection, call center monitoring and real-time guidance, employee recruitment and assessments, bots and smart assistants, psycho-medical evaluations, investigations, and more.

With LVA, organizations can gain valuable insights to help make better decisions, save resources, and prevent misunderstanding.

It can also contribute to making the world safer by determining the motivation behind words used in high-risk security or forensic investigations.

Overall, LVA technology provides a unique knowledge that allows you to analyze reality, protect your businesses and customers, manage risks efficiently, and save resources.

## LVA Concepts

This documentation page provides an overview of the key concepts and components of the Emotion Logic hub's Language and Voice Analysis (LVA) system. The LVA system is designed to analyze the deeper layers of the voice, ignoring the text and expressed emotions. It looks only at the uncontrolled layers of the voice where genuine emotions reside, making it useful for applications in customer support, sales, mental health monitoring, and human-machine

interactions.

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## Bio-Markers Extraction

The initial process in the LVA system involves capturing 151 bio-markers from voice data. These biomarkers are generally divided into five main groups:

1. Stress
2. Energy
3. Emotional
4. Logical
5. Mental states (including longer reactions that are more stable by definition, such as embarrassment, concentration, uneasiness, arousal)

## Objective Emotions

After extracting the bio-markers, the LVA system calculates "Objective emotions." These emotions are called "Objective" because they are compared to the general public's emotional states. Objective emotions are scaled from 0 to 30, providing a quantitative representation of the individual's emotional state.

## Calibration and Subjective Measurements

Next, a calibration process is performed to detect the normal ranges of the bio-markers for the current speaker, at that specific time. Deviations from this baseline are then used to calculate "Subjective measurements." These measurements range from 30% to 300%, as they describe the current voice sample's changes from the baseline (100%).

## Risk Formulas

In some applications of LVA, risk formulas will be employed to assess how extreme and unique the current emotional response is. This helps determine the level of honesty risk that should be assumed for a given statement. Different methods are used for evaluating the risk, depending on the application and context.

## Integration and Use Cases

The LVA system can be integrated into various applications and industries, including:

1. Customer support - to gauge customer satisfaction and tailor support interactions
2. Sales - to identify customer needs and sentiments during sales calls
3. Human resources (HR) - to evaluate job candidates during interviews, providing insights into their emotional states, stress levels, and authenticity, thus aiding in the selection of suitable candidates and improving the hiring process
4. Mental health monitoring - to track emotional states and provide data for mental health professionals
5. Human-machine interactions - to improve the naturalness and effectiveness of communication with AI systems
6. Fraud detection - to assess the honesty risk in phone conversations or recorded messages, assisting organizations in detecting fraudulent activities and protecting their assets
7. Human resources (HR) - to evaluate job candidates during interviews, providing insights into their emotional states, stress levels, and authenticity, thus aiding in the selection of suitable candidates and improving the hiring process

## Emotional styles

Repeating emotional indicators around specific topics were found to reveal emotional styles and behavioral tendencies that can deliver meaningful insights about the speaker.

We have found correlations between the poles of the Emotional Diamond and several types of commonly used personality assessment systems around the BIG5 classifications.

Below are the identified correlations in the Emotional Diamond poles:

**Emotional style:** Energetic-Logical (EN-LO)

**Characteristics:** Fast-paced and outspoken, focused, and confident.

**Emotional style:** Energetic-Emotional (EN-EM)

**Characteristics:** Innovator, passionate leader, a people person.

**Emotional style:** Stressful-Emotional (ST-EM)

**Characteristics:** Accepting and warm, cautious and defensive at times.

**Emotional style:** Stressful-Logical (ST-LO)

**Characteristics:** Confident and logic-driven, intensive thinker, and protective.

# LVA theory and types of lies

The LVA theory recognizes 6 types of lies differing one from the other by the motivation behind them and the emotional states that accompany the situation:

1. **Offensive lies** - Lies made to gain profit/advantage that would otherwise not be received.
2. **Defensive lies** - Lies told to protect the liar from harm, normally in stressful situations, for example when confronting the authorities.
3. **“White lies”** - An intentional lie, with no intention to harm - or no harmful consequences, nor self-jeopardy to the liar.
4. **“Embarrassment lies”** - Told to avoid temporary embarrassment, normally with no long-term effect.
5. **“Convenience lies”** - Told to simplify a more complicated truth and are normally told with the intention to ease the description of the situation.
6. **Jokes** - an untruth, told to entertain, with no jeopardy or consequences attached.

## The “Deception Patterns”

### Description

The Deception Patterns are 9 known emotional structures associated with different deceptive motivations that typically have a higher probability of containing deception.

The Deception Patterns are used for deeper analysis in the Offline Mode.

Using the Deception Patterns requires a good understanding of the situation in which the test is taken, as some deception patterns only apply to certain situations.

The following list explains the various Deception Patterns and the meanings associated with each of them:

# Global Deception Patterns

Global deception patterns (Deception analysis without a 'Pn' symbol) reflect a situation in which two algorithms detected a statistically high probability of a lie, coupled with extreme lie stress. This default deception pattern is LVA7's basic deception detection engine, as such, it is always active, regardless of mode or user's preferences.

## Deception Pattern # 1 - "Offensive lies"

This pattern indicates a psychological condition in which extreme tension and concentration are present.

treat this pattern as a high risk of deception when talking to a subject who might be an offensive liar for determining a subject's involvement or knowledge about a particular issue.

This deception pattern can also be used when the subject feels that they are not in jeopardy.

When using the P.O.T. (explain)Investigation technique this is likely to be the case that indicates deception together with the "high anticipation" analysis.

## Deception Pattern # 2 - "Deceptive Circuit" lies

A psychological condition in which extreme logical conflict and excitement indicate a probable deception.

Treat this pattern as a high risk of deception in a non-scripted conversation, in which a subject is feeling abnormal levels of excitement and extreme logical or cognitive stress.

## Deception Pattern # 3 - "Extreme fear" lies

A psychological condition in which extreme levels of stress and high SOS ("Say or Stop") are present.

Treat this pattern as a high risk of deception only for direct responses such as - "No, I did not take the bag."

If you detect deception using this pattern, this is a serious warning of the general integrity of the tested party.

## **Deception Pattern # 4 - “Embarrassment lies”**

Pay attention to this indication only if you feel the subject is not expected to feel embarrassed by the nature of the conversation.

Usually, it applies to non-scripted conversations.

Differentiate between the relevant issues when using this pattern to gauge situations with a high risk of deception.

When deception is detected around irrelevant topics, this is likely an indication that the speaker does not wish to talk about something or is embarrassed, in which case the deception indication should be ignored.

In relevant cases, try to understand whether the feeling of embarrassment is comprehensible for this specific question or sentence.

Because of its dual implication, Pattern # 4 is considered less reliable than the others.

## **Deception Pattern # 5 - “Focus point” lies**

This pattern indicates a structure of extreme alertness and low thinking levels.

With this pattern too, it is important to differentiate between relevant, or hot issues and cold, or non-relevant ones.

If Deception Pattern # 5 was found in a relevant segment, this is likely an indication of deception. However, if this deception pattern is found in non-relevant segments, it may be an indication of sarcasm or a spontaneous response.

Treat this pattern as a high risk of deception only when interrogating a subject within a structured conversation or any time the subject knows this will be the topic or relevant question.

This pattern should not be used for a non-scripted conversation.

## **Deception Pattern # 6 - “SOS lies”**

This pattern indicates extremely low alertness and severe conflict about whether to “Say-Or-Stop” (S.O.S.).

If you receive an indication of this pattern, it is recommended that you continue investigating this issue in a non-scripted conversation in the Online Mode.

In a relevant issue, you may want to drill down into the related topic with the analyzed subject, as this could imply evasiveness on their part.

If you receive a warning of deception in an irrelevant top, it is up to you to decide whether to continue investigating this topic.

It may reveal an item the subject does not want to discuss.

It may, however, be an indication that there is a high level of background noise or a bad segment contained in the file.

It is recommended that you double-check these segments.

## **Deception Pattern # 7 - “Excitement-based lies”**

This pattern indicates extremely low alertness and very high excitement.

This is an indication that the subject is not accustomed to lying or perhaps just doing it for "fun."

On the other hand, it might indicate a traumatic experience related to this issue.

Do not use this deception pattern when interrogating a subject about possible traumatic events.

Treat this pattern as a high risk of deception when interviewing a subject suspected to be an offensive liar, when offensive lies are suspected, or when using a Pick-of-Tension method for determining a subject's involvement or knowledge of a particular issue.

Moreover, this deception pattern can be effective even when the subject feels they are not in jeopardy.

## **Deception Pattern # 8 - “Self-criticism” lies**

This pattern indicates extremely low alertness and very high conflict. The subject has a logical problem with their reply.

Do not use this pattern with a subject that may be extremely self-criticizing.

Repeated conflict about this specific issue may indicate a guilt complex. Here, it is important for you to decide whether you sense that the subject is confused. In case of a “justified” confusion, the P8 results should be ignored.

If the subject does not display any confusion, seems confident, expresses themselves clearly, and phrases things with ease, a P8 deception pattern will indicate a high probability of deception.

## **Deception Pattern # 9 - General extreme case**

This pattern indicates extremely low alertness, high conflict, and excitement.

Treat this pattern as a high risk of deception when the subject appears as a normal, average person, i.e. when the other test parameters look fine.

The deception pattern itself is very similar to the Global Deception Pattern, and Deception Pattern # 9 is used as a backup for borderline cases.

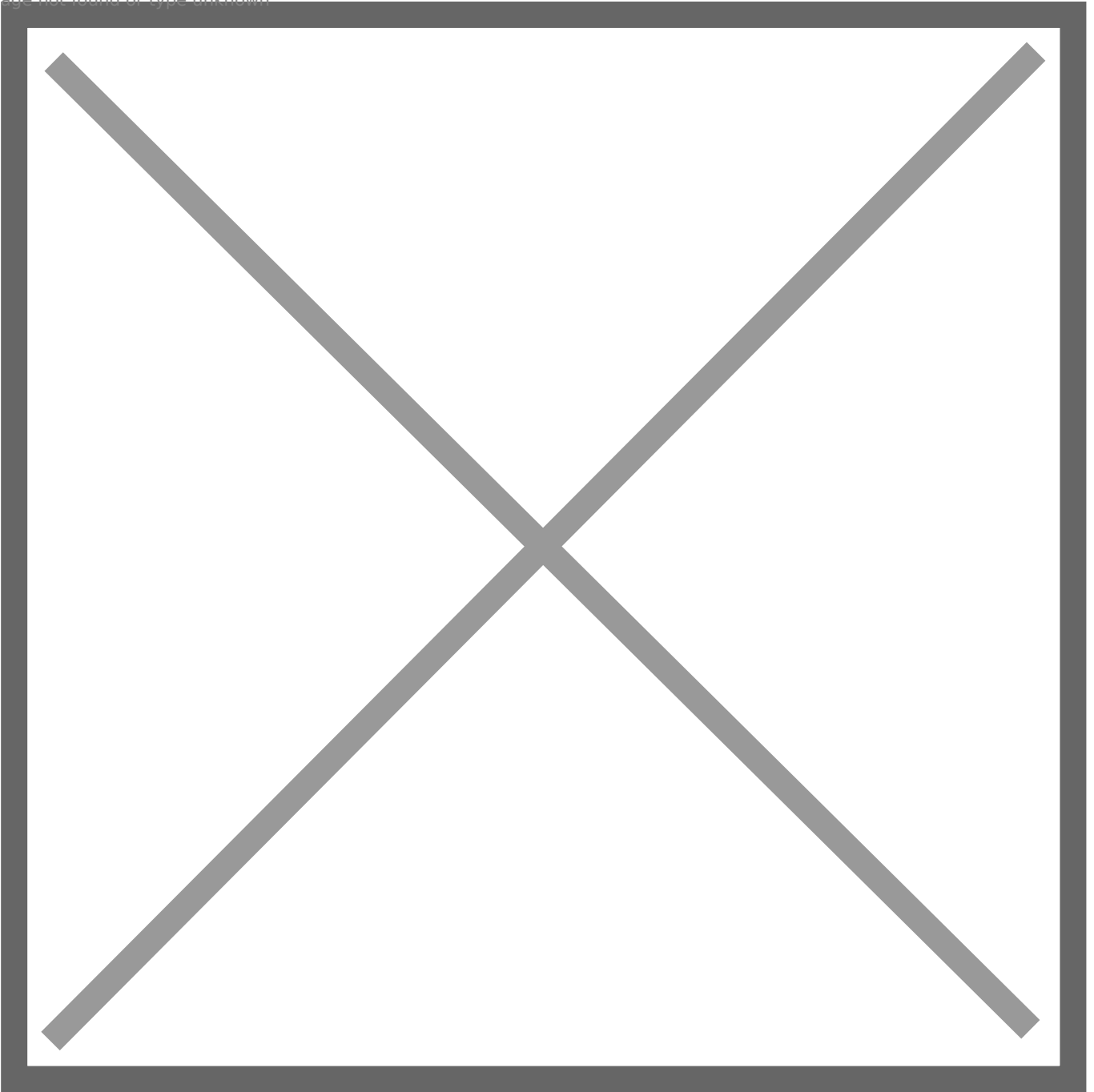
# Mental Effort Efficiency pair (MEE)

The MEE value, or Mental Effort Efficiency set of values describes 2 aspects of the mental effort (thinking) process over time, using more than a few segments:

The first index value is assessing the effort level as can be assumed from the average AVJ biomarker levels, and the other is how efficient the process is as can be assumed from the diversity (standard error rates) of the same AVJ biomarker over time.

For example, in both cases below the average AVJ level is almost the same, but the behavior of the parameter is very different, and we can assume the efficiency of the process on the left chart is much higher compared to the one on the right:

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(In a way, that looks very similar to the CPU operation in your PC).

## **Interesting pairs of emotional responses**

Out of the plurality of emotional readings LVA generates, comparing some values may add an additional level of understanding as to the emotional complexities and structures of the analyzed

person.

**Energy/Stress balance:** Indicates aggressiveness Vs. one's need to defend themselves.

**Anticipation/Concentration:** Indicates the level of desire to please the listener Vs. standing on his/her own principles.

**Emotion/Logic:** Indicated the level of rationality or impulsiveness of the analyzed person.

\* Additional pairs may be added as the research develops.

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