**Call Center Audio Intelligence Summary**

**Objective:**  
To intelligently analyze customer service call recordings for **emotion detection**, **priority triaging**, and **anomaly detection**, enabling smarter QA, faster resolution, and enhanced customer experience.

**Key Components:**

**1. Emotion Detection:**

* **Dominant Emotion:** Angry (70% of calls), followed by Calm (20%) and Sad (10%).
* **Sad Calls:** Rare but most critical—associated with highest urgency and anomalies.
* **Business Impact:** Reveals customer frustration patterns; helps optimize agent behavior and resolution tactics.

**2. Priority Classification:**

* **Distribution:** MEDIUM (60%), HIGH (20%), LOW (20%).
* **Issue:** Some long, angry calls misclassified as MEDIUM—missed escalation risks.
* **Composite Score >2.0** = high urgency flag.
* **Business Impact:** Supports better call routing and helps prevent customer churn by identifying calls needing immediate attention.

**3. Anomaly Detection:**

* Only **1 of 10 calls** flagged anomalous: long, sad, and silence-heavy.
* **Methods Used:** Isolation Forest, Percentile Cutoff, Ensemble Voting.
* **Missed Anomalies:** Several angry calls weren't flagged—system may underdetect emotional volatility.
* **Business Impact:** Highlights emotionally subtle but important calls; supports QA intervention on silent or off-script calls.

**Acoustic Feature Insights:**

* **Energy & Pitch:** Angry = high energy/pitch; Sad = low energy, narrow pitch.
* **Silence & Rhythm:** Sad/confused calls = frequent long pauses; Calm = balanced.
* **Voice Quality (Jitter, Shimmer):** High in stressed or agitated speech.
* **Business Impact:** Enables explainable AI — helps QA teams trust and validate predictions.

**Visual & Analytical Highlights:**

* **Clustering (UMAP, PCA, t-SNE):** Calls naturally group by emotion/behavior (e.g., calm vs. anomalous).
* **Energy-Silence Timelines:** Calm calls have steady low energy; angry calls show peaks.
* **Priority Dashboard:** Sadness most linked to high priority; anger under-represented in urgent flags.

**Top 5 Calls for Manual Review:**

| **#** | **Emotion** | **Priority** | **Duration** | **Anomaly** | **Action Needed** |
| --- | --- | --- | --- | --- | --- |
| 1 | Sad | HIGH | 758s | ✅ | Immediate review |
| 2 | Angry | HIGH | 697s | ❌ | Likely emotional escalation |
| 3 | Angry | MEDIUM | 740s | ❌ | Possibly mis-prioritized |
| 4 | Angry | MEDIUM | 892s | ❌ | Delay risk |
| 5 | Angry | MEDIUM | 185s | ❌ | May hide intensity |

**Final Takeaways:**

* The model effectively **flags sad and silent-heavy calls**, but may **under-prioritize angry calls**.
* Composite acoustic features (energy, pitch, silence) offer **strong emotional indicators**.
* This system empowers **smart triaging, emotion-aware QA, and improved agent training** — a crucial tool for proactive customer care.