Fraud Detection ML Pipeline Report

Comprehensive Analysis and Insights

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Executive Summary

TL;DR - Key Findings

Key Metrics	
Total Channels Analyzed	21,330
High-Risk Channels	3,355 (15.7%)
Channels with Anomalies	170 (0.8%)
Average Quality Score	3.44/10
Average Bot Rate	2.3%
Total Traffic Volume	1,487,379

Critical Findings

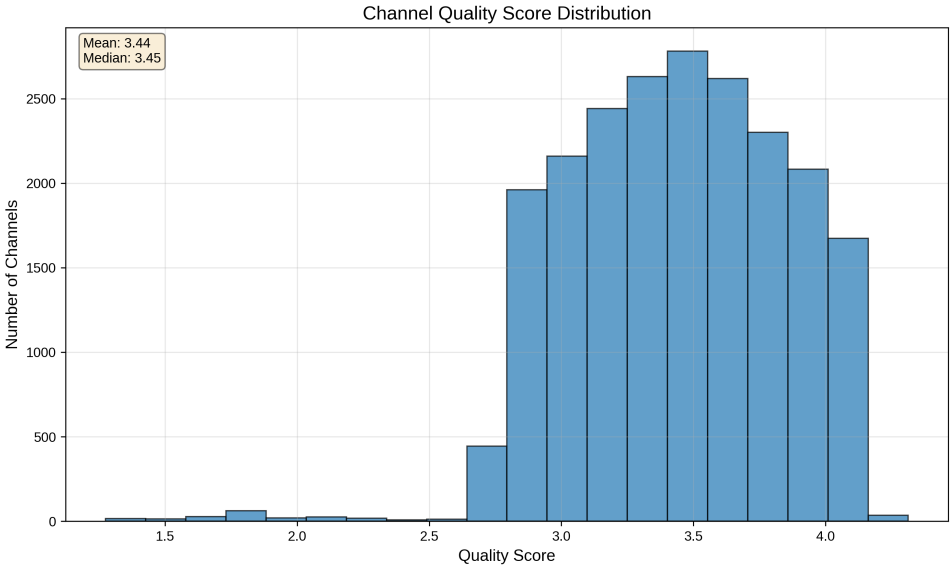
• **High Risk:** 3355 channels (15.7%) classified as high-risk

Action Items

1. Immediately investigate top 50 high-risk channels
2. Review 100 channels with multiple anomalies
3. Implement automated filtering for channels with quality score < 3.0
4. Set up real-time alerts for new fraud patterns

Quality Score Analysis

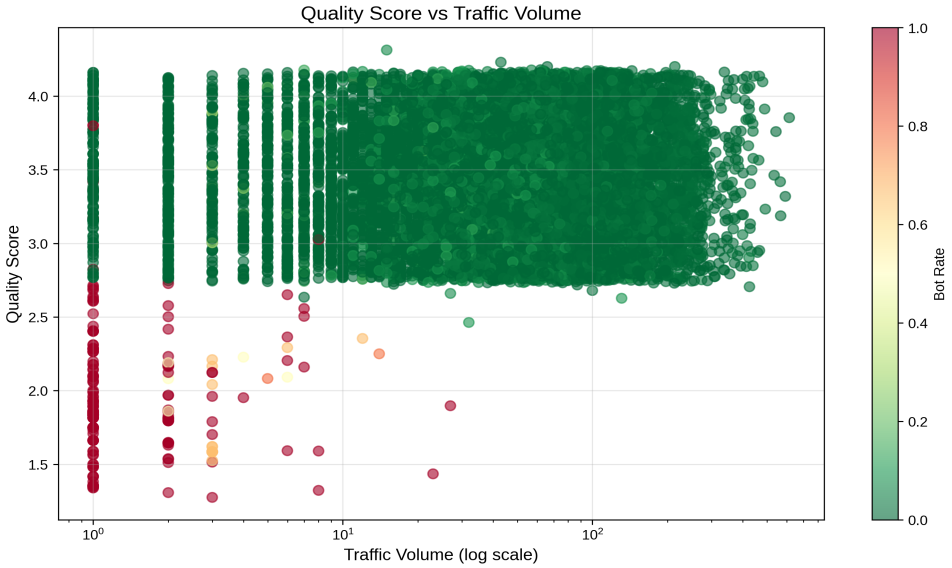
Channel Quality Distribution



What this shows: This histogram displays how channels are distributed across different quality score ranges. The x-axis shows quality scores (0-10), and the y-axis shows the number of channels in each range.

How to interpret: Look for concentration patterns: A right-skewed distribution (more channels with high scores) indicates overall good traffic quality. Left-skewed suggests widespread quality issues. Bimodal distributions may indicate distinct channel groups.

Quality Score vs Traffic Volume



What this shows: This scatter plot correlates channel quality scores with traffic volume. Each point represents a channel, with position indicating its quality (y-axis) and traffic volume (x-axis, log scale).

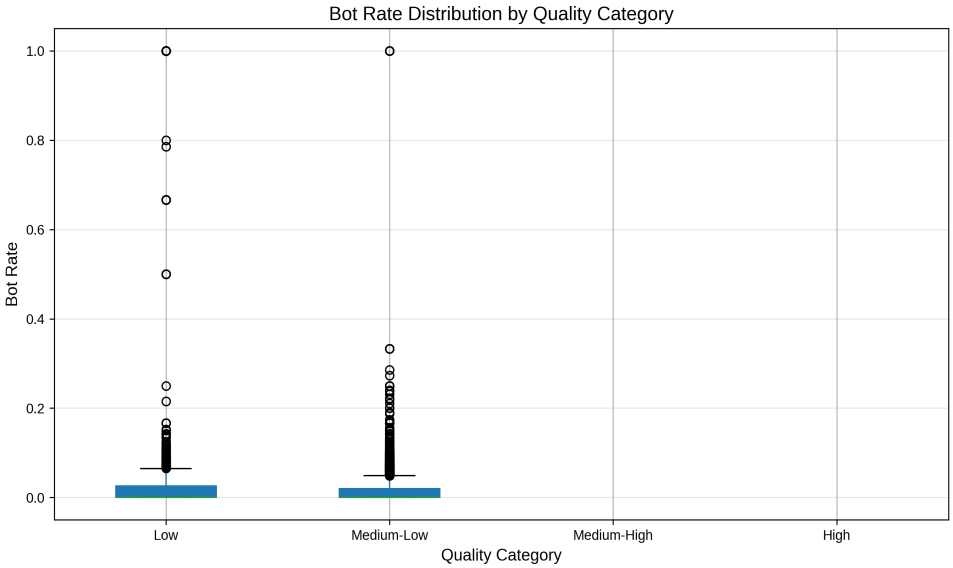
How to interpret: Ideal channels appear in the top-right (high quality, high volume). Bottom-right channels (low quality, high volume) pose the highest risk. Top-left channels (high quality, low volume) may be underutilized opportunities.

Top Performing Channels

Channel ID	Quality Score	Bot Rate	Volume
11867...	4.31	6.7%	15
2890...	4.23	2.3%	43
10711...	4.20	1.9%	214
17561...	4.20	0.0%	66
12152...	4.18	0.0%	62

Risk Analysis

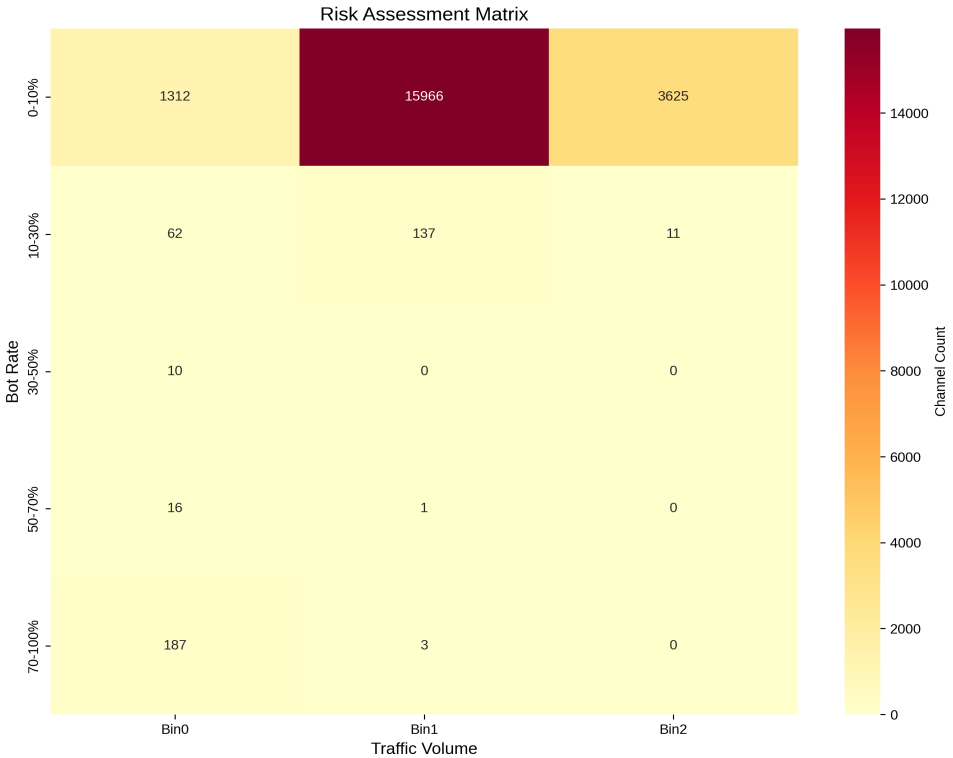
Bot Rate Analysis by Quality Category



What this shows: This box plot shows the distribution of bot rates within each quality category. The boxes show quartiles, whiskers show the range, and dots indicate outliers.

How to interpret: Lower bot rates in higher quality categories validate the scoring model. Wide boxes indicate high variability within a category. Many outliers suggest inconsistent patterns that need investigation.

Risk Assessment Matrix

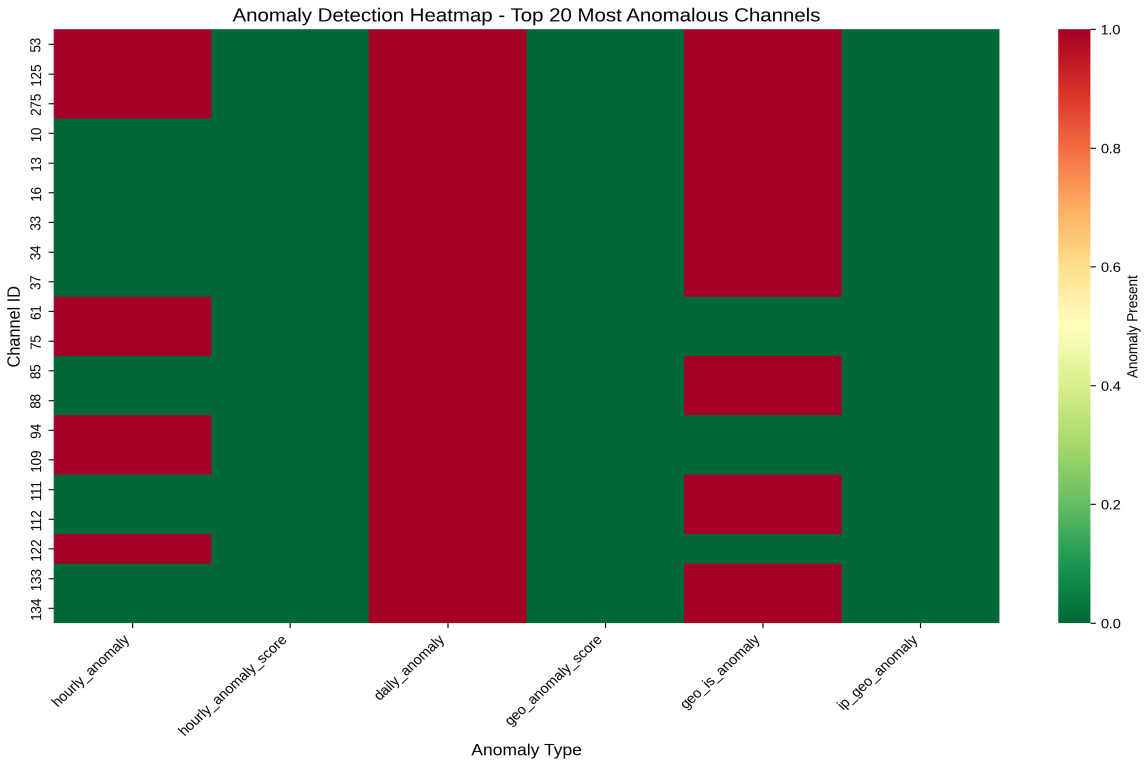


What this shows: This 2D heatmap maps channels by bot rate (y-axis) and volume (x-axis), with color intensity showing the number of channels in each zone.

How to interpret: Red zones (high bot rate + high volume) require immediate action. The darker the color, the more channels in that risk zone. Focus on reducing channels in the upper-right quadrant.

Anomaly Detection Results

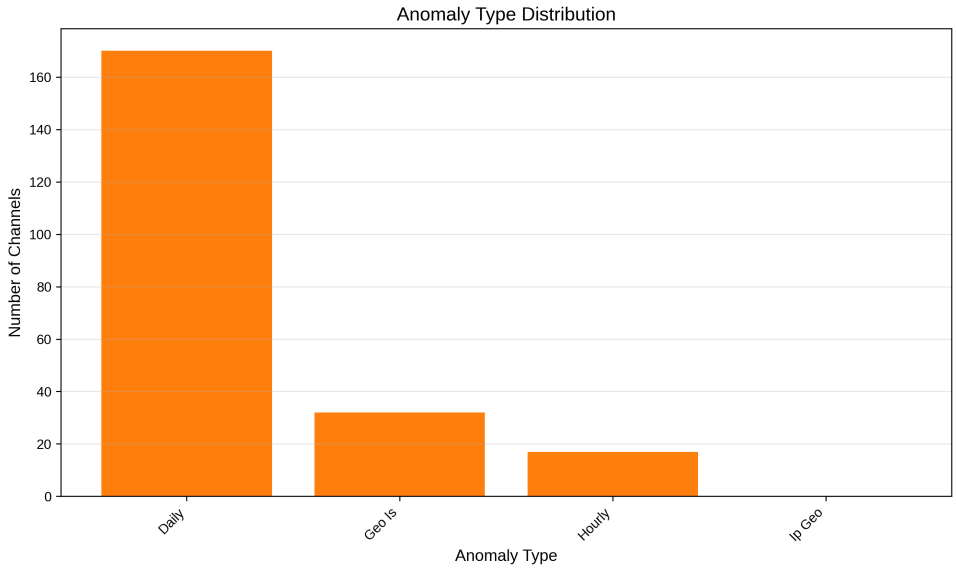
Anomaly Detection Heatmap



What this shows: This heatmap visualizes which channels (rows) have which types of anomalies (columns). Dark cells indicate the presence of an anomaly.

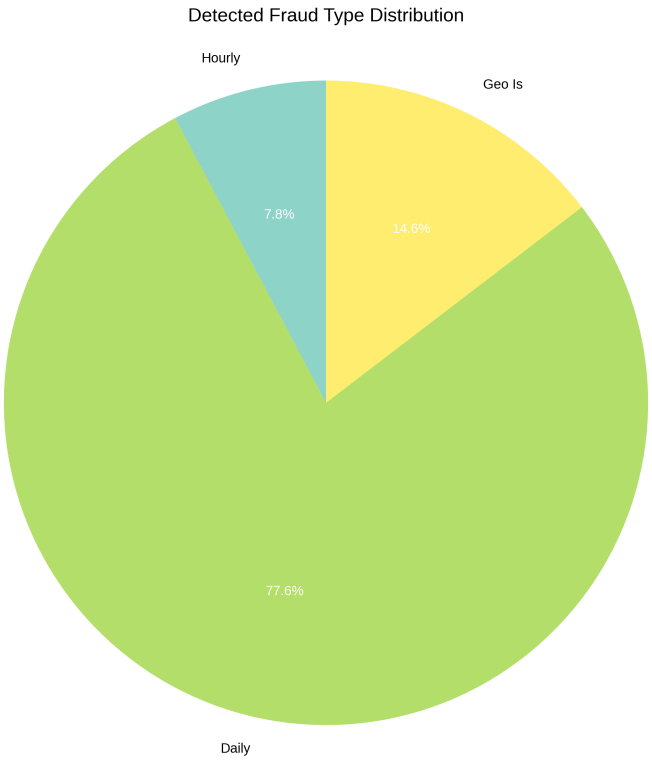
How to interpret: Channels with multiple dark cells across the row have multiple anomaly types and need priority investigation. Columns with many dark cells indicate common anomaly patterns affecting many channels.

Anomaly Type Distribution



What this shows: This bar chart shows how many channels are affected by each type of anomaly, helping prioritize which anomaly patterns to address first.

How to interpret: Focus on anomaly types with the highest counts first, as they affect the most channels. Types with very low counts might indicate rare but potentially serious issues.

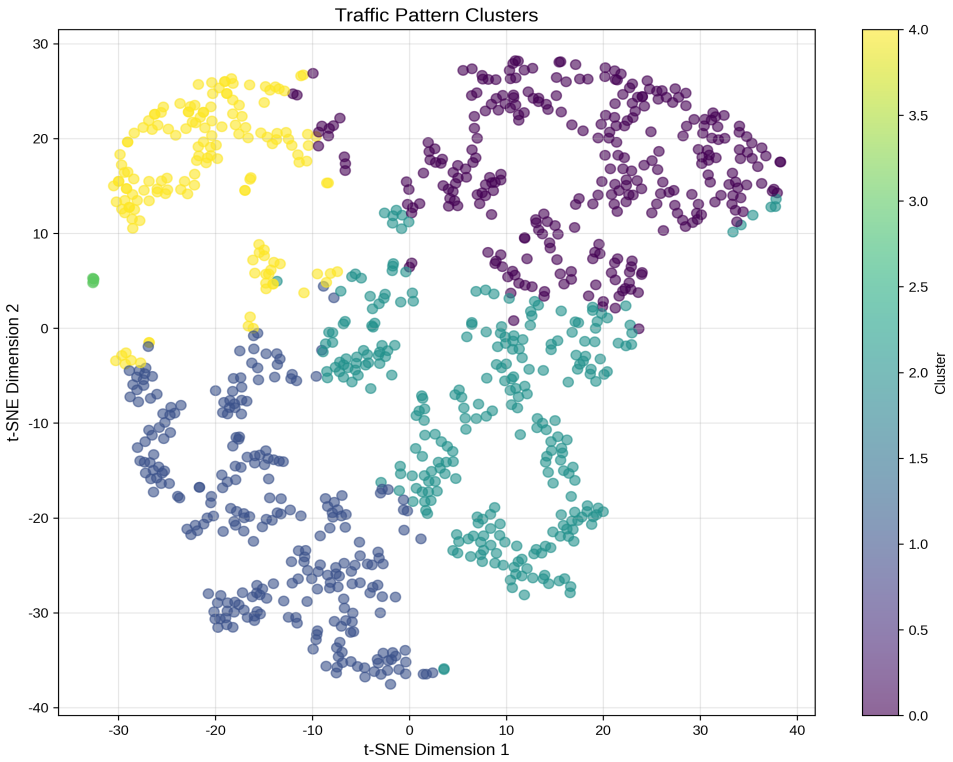


What this shows: This pie chart breaks down the proportion of different fraud types detected across all channels.

How to interpret: Large slices indicate prevalent fraud types requiring systematic solutions. Multiple small slices suggest diverse fraud tactics. Use this to prioritize anti-fraud measures.

Traffic Similarity Analysis

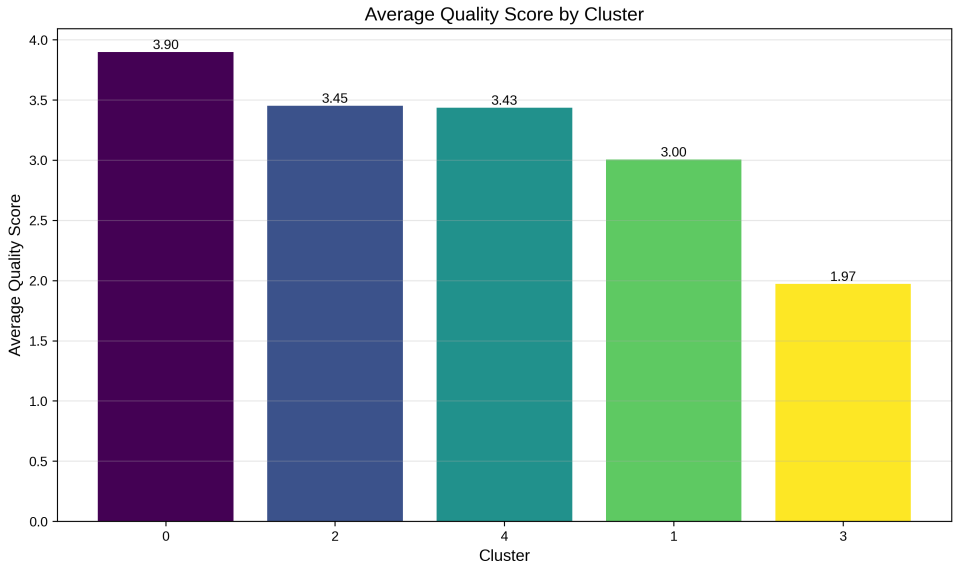
Traffic Pattern Clusters



What this shows: This t-SNE plot shows how channels group into natural clusters based on their traffic patterns. Each point is a channel, colored by its cluster assignment.

How to interpret: Well-separated clusters indicate distinct traffic patterns. Channels far from any cluster center are outliers. Large clusters may represent common traffic patterns, while small clusters might be niche or suspicious.

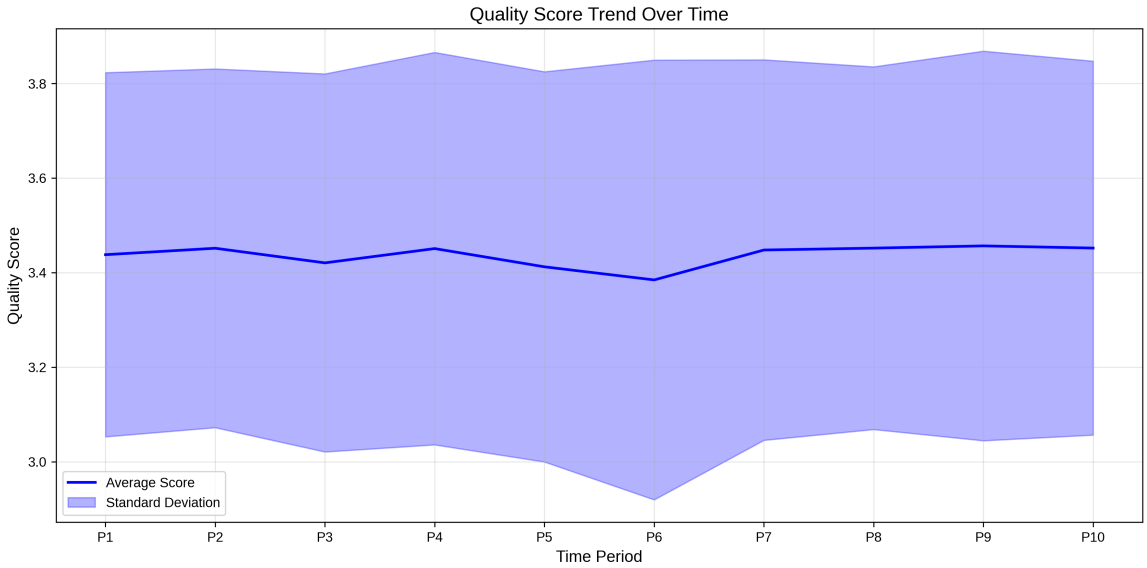
Average Quality Score by Cluster



What this shows: This bar chart displays the average quality score for each traffic cluster, helping identify which traffic patterns correlate with quality.

How to interpret: Clusters with low average quality scores likely contain fraudulent or low-quality traffic patterns. High-scoring clusters represent desirable traffic patterns to encourage.

Quality Score Analysis



What this shows: This line chart tracks quality score trends over time periods, revealing patterns and changes in traffic quality.

How to interpret: Upward trends indicate improving quality. Sudden drops may signal new fraud campaigns. Seasonal patterns help predict future quality fluctuations.

Recommendations

Immediate Actions Required

1. **Block/Investigate High-Risk Channels:** 3355 channels identified as high-risk with average bot rate of 7.4%
2. **Review Anomalous Patterns:** Focus on channels with multiple anomaly types
3. **Protect Revenue:** Potential revenue at risk: $22210.30

Short-term Improvements

1. **Quality Improvement:** Work with 17988 medium-low quality channels
2. **Pattern Monitoring:** Set up alerts for channels matching high-risk patterns
3. **Enforce Standards:** Require minimum quality score of 4.0 for new channels

Long-term Strategy

1. **Model Enhancement:** Retrain models monthly with new data
2. **Process Optimization:** Automate channel blocking for scores < 2.0
3. **Dashboard:** Create real-time dashboard for ongoing monitoring
4. **ML Integration:** Implement real-time scoring for new channels