

A Weighted Churn Forecasting Framework for Seller Retention

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Abstract—This paper formalizes the churn forecasting algorithm currently used at Deale, a digital mergers and acquisitions (M&A) platform for small and medium-sized enterprises (SMEs). The model combines deterministic override rules (e.g., cancellation, disputes, last resource) with a weighted scoring mechanism based on behavioral and process-related signals. The output is a churn probability in the interval $[0, 1]$, designed to be transparent, interpretable, and operationally actionable.

Index Terms—Churn prediction, M&A platforms, seller retention, rule-based models.

I. INTRODUCTION

Seller retention is a critical operational challenge in SME-focused M&A platforms. The economic value of a marketplace depends on sellers remaining engaged through key milestones such as qualification, meetings, LOI, and due diligence.

Deale currently applies a rule-based and weighted scoring algorithm to estimate seller churn probability. The algorithm follows a strict precedence hierarchy: high-signal override rules are evaluated first; if none applies, a weighted aggregation of behavioral variables is computed.

II. CHURN PROBABILITY OUTPUT

The model outputs a churn probability

$$P(\text{churn}) \in [0, 1],$$

where higher values indicate higher risk of churn within the evaluated period.

III. DECISION HIERARCHY

The algorithm is structured as follows:

- Cancellation override.
- New-user churn module (1–2 months).
- High-signal overrides.
- Weighted scoring computation.
- External-interest adjustment.

IV. OVERRIDE RULES

A. Cancellation

If the seller cancels during the current period:

$$P(\text{churn}) = 1.$$

B. New User Churn Module (1–2 months)

If a non-null *New User Churn Probability* exists, it dominates.

- Last resource $\rightarrow 0.9$
- Qualified or QA/Meeting (CS pipeline) $\rightarrow 0$
- Sentiment ANXIOUS $\rightarrow 0.7$
- Sentiment VERY_ANXIOUS $\rightarrow 0.9$

C. Last Resource

Independently of stage or sentiment:

$$P(\text{churn}) = 0.9.$$

D. Dispute

Active disputes yield:

$$P(\text{churn}) \in \{0.7, 0.9\}.$$

E. Outlier

If flagged as outlier:

$$P(\text{churn}) = 0.8.$$

F. Advanced Deal Stage

If the most advanced stage is *Pre LOI*, *LOI*, or *Due Diligence*:

$$P(\text{churn}) = 0.$$

G. Non-Monthly Plans

For 3-, 6-, or 12-month plans:

- `cancel_at_period_end = true` $\rightarrow 1$
- `cancel_at_period_end = false` $\rightarrow 0$

V. WEIGHTED SCORING VARIABLES

If no override applies, five factor probabilities are computed:

$$p_C, p_M, p_D, p_S, p_U.$$

A. Contacts Activity

$$p_C = \begin{cases} 0.2 & \text{if } \text{contacts}_{30d} \geq 8, \\ 0.4 & \text{if } \geq 5, \\ 0.6 & \text{if } \geq 2, \\ 0.8 & \text{if } < 2. \end{cases} \quad (1)$$

B. Meetings

$$p_M = \begin{cases} 0.0 & \text{if investors} \geq 2, \\ 0.1 & \text{if investors} = 1, \\ 0.25 & \text{if sales} \geq 2, \\ 0.5 & \text{if 1 sales only,} \\ 0.8 & \text{if no meetings.} \end{cases} \quad (2)$$

C. Sentiment

Missing sentiment is imputed as NEUTRAL.

$$p_S = \begin{cases} 0.2 & \text{VERY_CALM,} \\ 0.3 & \text{CALM,} \\ 0.5 & \text{NEUTRAL,} \\ 0.7 & \text{ANXIOUS,} \\ 0.9 & \text{VERY_ANXIOUS.} \end{cases} \quad (3)$$

D. Subscription Month (1-month plan)

$$p_U = \begin{cases} 0.3 & 1-3, \\ 0.5 & 4-5, \\ 0.7 & 6-7, \\ 0.9 & 8-9, \\ 1.0 & \geq 10. \end{cases} \quad (4)$$

VI. TIME-DEPENDENT WEIGHTS

- 1–2 months: (0.25, 0.20, 0.10, 0.35, 0.10)
- 3–4 months: (0.15, 0.10, 0.30, 0.25, 0.20)
- 5+ months: (0.15, 0.10, 0.40, 0.15, 0.20)

VII. FINAL CHURN PROBABILITY

$$P(\text{churn}) = w_C p_C + w_M p_M + w_D p_D + w_S p_S + w_U p_U. \quad (5)$$

VIII. EXTERNAL INTEREST ADJUSTMENT

$$P(\text{churn}) \leftarrow \begin{cases} 0.4 P(\text{churn}) & \text{STRONG,} \\ 0.7 P(\text{churn}) & \text{WEAK.} \end{cases}$$

IX. MODEL DIAGRAM

X. CONCLUSION

The model prioritizes interpretability and operational usability. Hard overrides capture high-signal churn conditions, while weighted behavioral signals provide a calibrated estimate when deterministic rules do not apply. This structure provides a stable baseline for future sentiment and behavioral extensions.

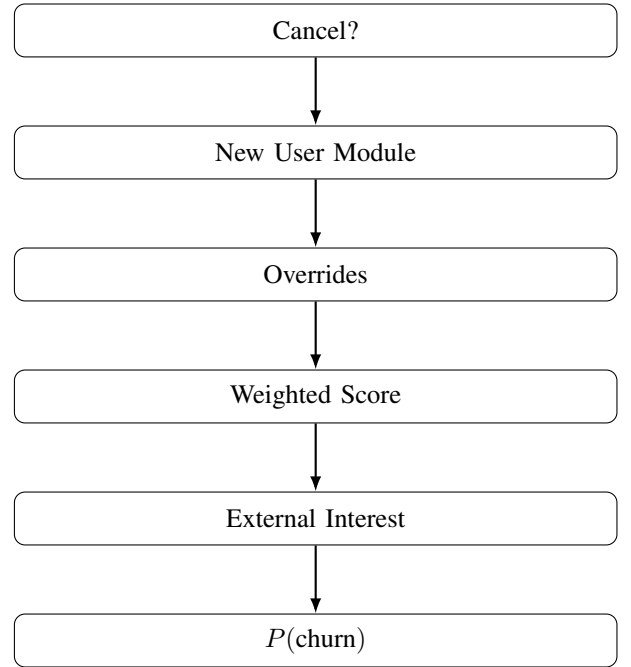


Fig. 1. Churn forecasting logic with precedence-based overrides and weighted scoring.