Retain the Legends:
Predicting & Preventing Churn

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Behind the Eclipse: What Drives This Study

Inspiration

Being a gamer and game-art background inspired this deep dive into why Season 15 Eclipse competitors disengage.

Scope

Season 15 “Eclipse” was chosen to capture a consistent meta and exclude cross-season patch noise.

Dataset

Analysis leverages 499 cleaned ranked matches, each described by 35 features spanning combat stats, legend picks, squad composition, session frequency, and days since last match.

Objective

Goal: build an early-warning system that flags players at ≥ 7 days of inactivity, empowering game-design, live-ops, and monetization teams to act.

Season 15 Data Lens:

https://www.kaggle.com/datasets/d8tary/apex-legends-season-15-ranked-dataset-raw

Key Features (35 total from November 2, 2022 to January 14, 2023):

- **Combat:** kills, damage, assists
- **Legends & Squads:** legend_choice, legend_diversity, squad_size
- **Cadence:** session_frequency, days_since_last_match
- **Performance:** match_placement, revives, accuracy

0	date	499 non-null	datetime64[ns]
1	game	499 non-null	int64
2	map	499 non-null	object
3	match_type	499 non-null	object
4	my_duration	265 non-null	float64
5	my_rank	498 non-null	object
6	rp_earned	487 non-null	float64
7	premade_squad	497 non-null	object
8	voice_chat	497 non-null	object
9	squad_placed	475 non-null	float64
10	teamate_count	314 non-null	float64
11	my_quit	317 non-null	float64
12	teamate_quit_count	306 non-null	float64
13	my_legend	287 non-null	object
14	teamate_1_legend	277 non-null	object
15	teamate_2_legend	269 non-null	object
16	my_damage	284 non-null	float64
17	teamate_1_damage	275 non-null	float64
18	teamate_2_damage	270 non-null	float64
19	my_kills	283 non-null	float64
20	teamate_1_kills	278 non-null	float64
21	teamate_2_kills	274 non-null	float64
22	my_assists	281 non-null	float64
23	teamate_1_assists	277 non-null	float64
24	teamate_2_assists	273 non-null	float64
25	my_knocks	281 non-null	float64
26	teamate_1_knocks	278 non-null	float64
27	teamate_2_knocks	273 non-null	float64
28	my_revives	283 non-null	float64
29	teamate_1_revives	277 non-null	float64
30	teamate_2_revives	274 non-null	float64
31	my_respawns	283 non-null	float64
32	teamate_1_respawns	276 non-null	float64
33	teamate_2_respawns	275 non-null	float64
34	Unnamed: 34	0 non-null	float64

Eclipse Allies: Stakeholder Lineup

Game Design (Respawn leads):

Use Churn insights to rotate legends and tweak balance.

Live-Ops (Product managers):

Trigger events/reminders at 7-day inactivity.

Marketing (Strategists):

Send targeted outreach when play frequency stops.

Monetization (Teams):

Time battle-pass & bundles around turn peaks.

The Churn Challenge

- **Churn rate:** ~25 % of Season 15 players go silent (≥ 7 days idle)
- **Key question:** Can match-level stats, legend choices, and play-cadence forecast churn one week ahead?
- **Process:** Data wrangling, exploratory analysis & insight generation, feature engineering,model training & hyperparameter tuning, evaluation & interpretation via feature importances, stakeholder delivery & action planning

Data Recon: Initial Inspection

- **df.shape:**
  (499, 35)
- **df.head()**
- **df.describe()**

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 499 entries, 0 to 498
Data columns (total 36 columns):
 #   Column              Non-Null Count  Dtype
---  ------              --------------  -----
 0   date                499 non-null    datetime64[ns]
 1   game                499 non-null    int64
 2   map                 499 non-null    object
 3   match_type          499 non-null    object
 4   my_duration         265 non-null    float64
 5   my_rank             498 non-null    object
 6   rp_earned           487 non-null    float64
 7   premade_squad       497 non-null    object
 8   voice_chat          497 non-null    object
 9   squad_placed        475 non-null    float64
 10  teamate_count       314 non-null    float64
 11  my_quit             317 non-null    float64
 12  teamate_quit_count  306 non-null    float64
 13  my_legend           287 non-null    object
 14  teamate_1_legend    277 non-null    object
 15  teamate_2_legend    269 non-null    object
 16  my_damage           284 non-null    float64
 17  teamate_1_damage    275 non-null    float64
 18  teamate_2_damage    270 non-null    float64
 19  my_kills            283 non-null    float64
 20  teamate_1_kills     278 non-null    float64
 21  teamate_2_kills     274 non-null    float64
 22  my_assists          281 non-null    float64
 23  teamate_1_assists   277 non-null    float64
 24  teamate_2_assists   273 non-null    float64
 25  my_knocks           281 non-null    float64
 26  teamate_1_knocks    278 non-null    float64
 27  teamate_2_knocks    273 non-null    float64
 28  my_revives          283 non-null    float64
 29  teamate_1_revives   277 non-null    float64
 30  teamate_2_revives   274 non-null    float64
 31  my_respawns         283 non-null    float64
 32  teamate_1_respawns  276 non-null    float64
 33  teamate_2_respawns  275 non-null    float64
 34  Unnamed: 34         0 non-null      float64
 35  Unnamed: 35         0 non-null      float64
dtypes: datetime64[ns](1), float64(26), int64(1), object(8)
memory usage: 140.5+ KB
```

```
df.dtypes
```

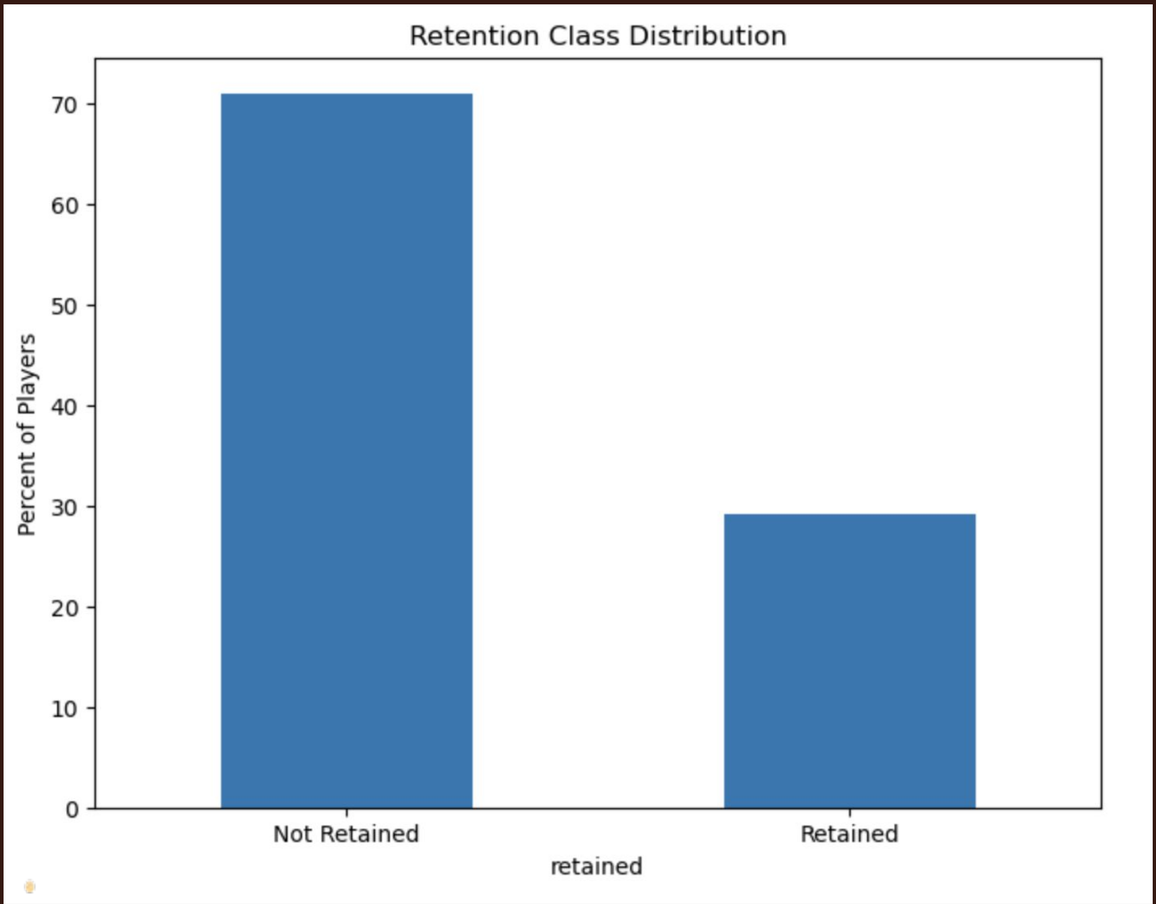
```
date                  datetime64[ns]
game                           int64
map                           object
match_type                    object
my_duration                  float64
my_rank                       object
premade_squad                 object
voice_chat                    object
squad_placed                 float64
teamate_count                float64
teamate_quit_count           float64
my_legend                     object
teamate_1_legend              object
teamate_2_legend              object
my_damage                    float64
teamate_1_damage             float64
teamate_2_damage             float64
my_kills                       int64
teamate_1_kills                int64
teamate_2_kills                int64
my_assists                     int64
teamate_1_assists              int64
teamate_2_assists              int64
my_knocks                      int64
teamate_1_knocks               int64
teamate_2_knocks               int64
my_revives                     int64
teamate_1_revives              int64
teamate_2_revives              int64
my_respawns                    int64
teamate_1_respawns             int64
teamate_2_respawns             int64
dtype: object
```

Forge the Data - Data Cleaning

- **Drop duplicates:** remove duplicate player–match rows
- **Remove extraneous columns:** spectator_count, streamer_flag, session_id, rp_bin, rp_earned, rp_delta, rp_change, my_quit, teammate_quit_count, game_id
- **Impute missing durations:** fill match_duration with map-level median

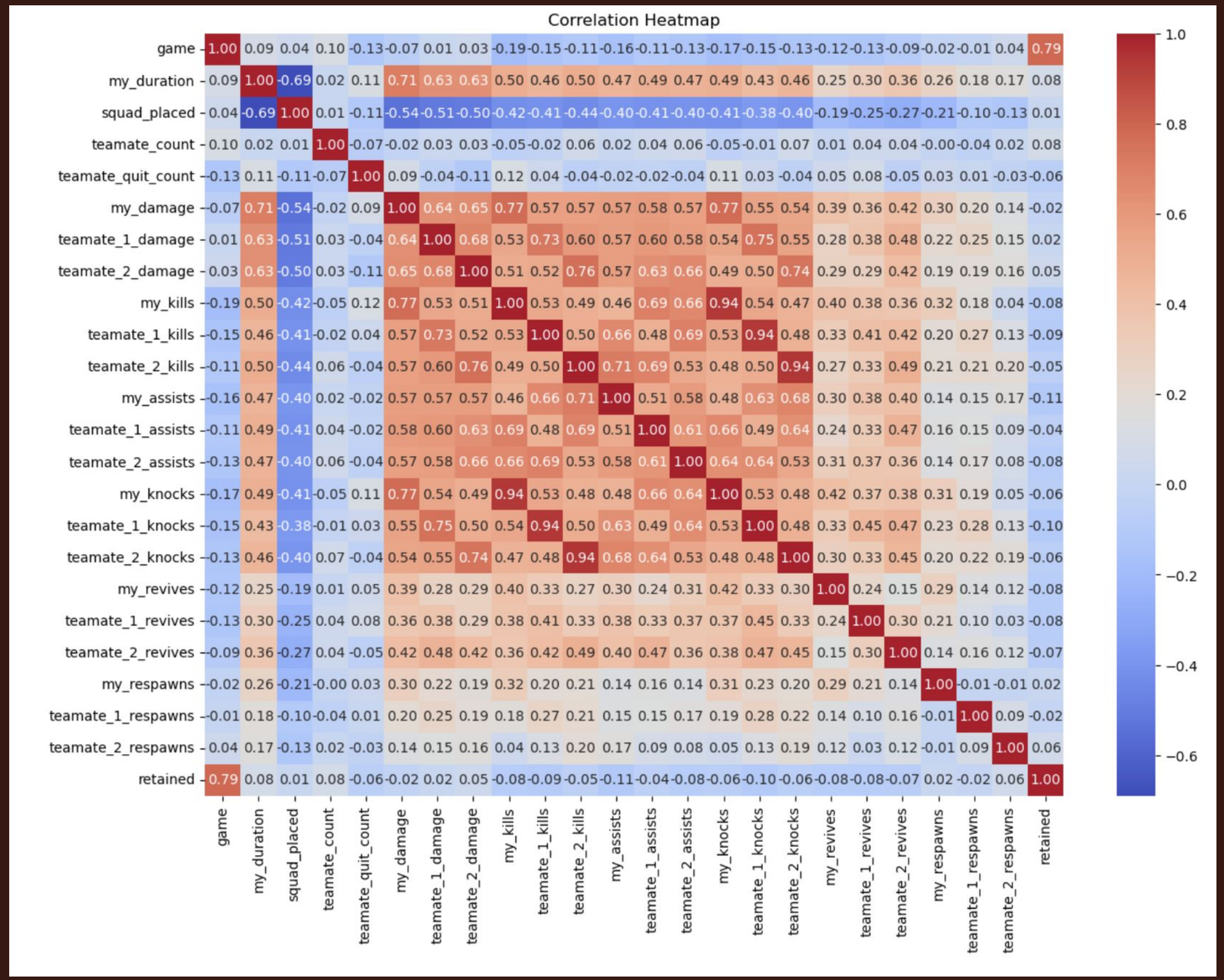
```
# Drop duplicate player–match entries
df.drop_duplicates(subset=['player_id','match_id'], inplace=True)

# Remove extraneous telemetry & metadata columns
to_drop = ['spectator_count','streamer_flag','session_id',
'rp_bin','rp_earned','rp_delta','rp_change','my_quit','teammate_quit_count','game_id']

df.drop(columns=to_drop, inplace=True)

# Impute missing match_duration with map-level median
df['match_duration'] = (df.groupby('map_id')['match_duration'].transform(lambda x: x.fillna(x.median())))
```

Churn Distribution: EDA



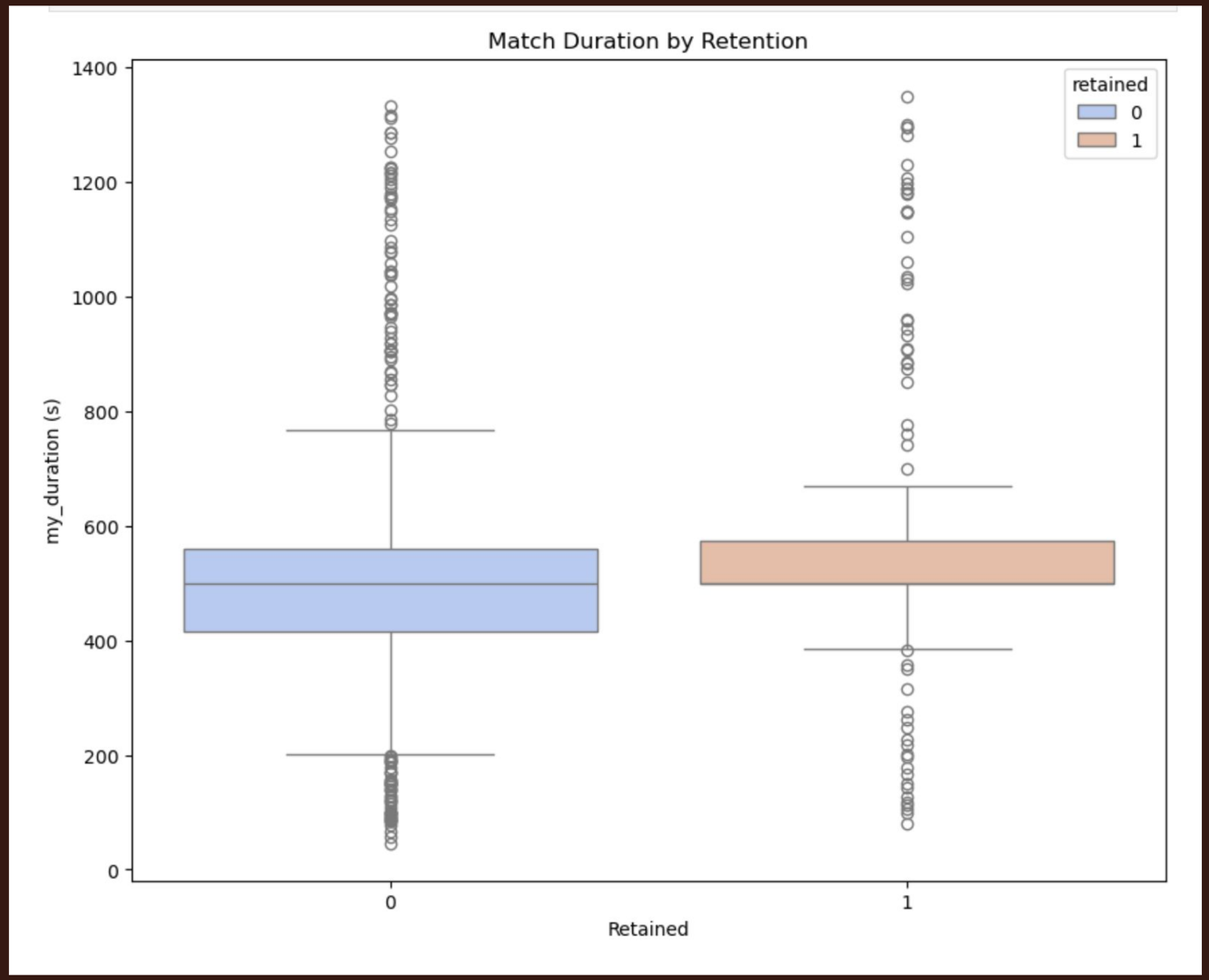
- **Retained:** 374 matches (75 %)
- **Churned:** 125 matches (25 %)

Correlation Heatmap: EDA



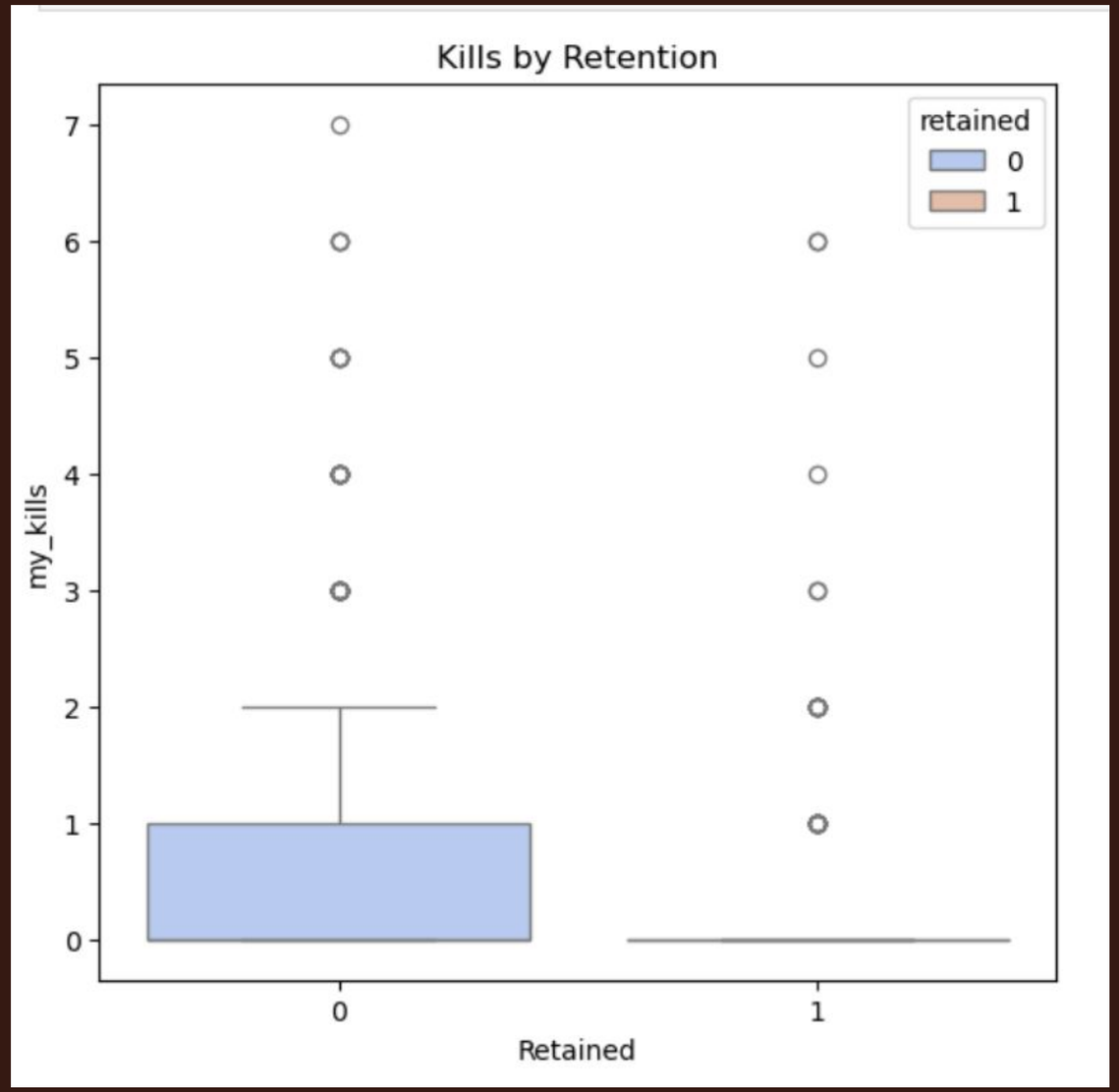
- **Key features: match_duration, avg_damage, avg_kills, days_since_last_match**
- **match_duration vs avg_damage: $\rho \approx 0.71$**
- **revives vs all: $|\rho| < 0.2$**

Match Duration by Retention: EDA



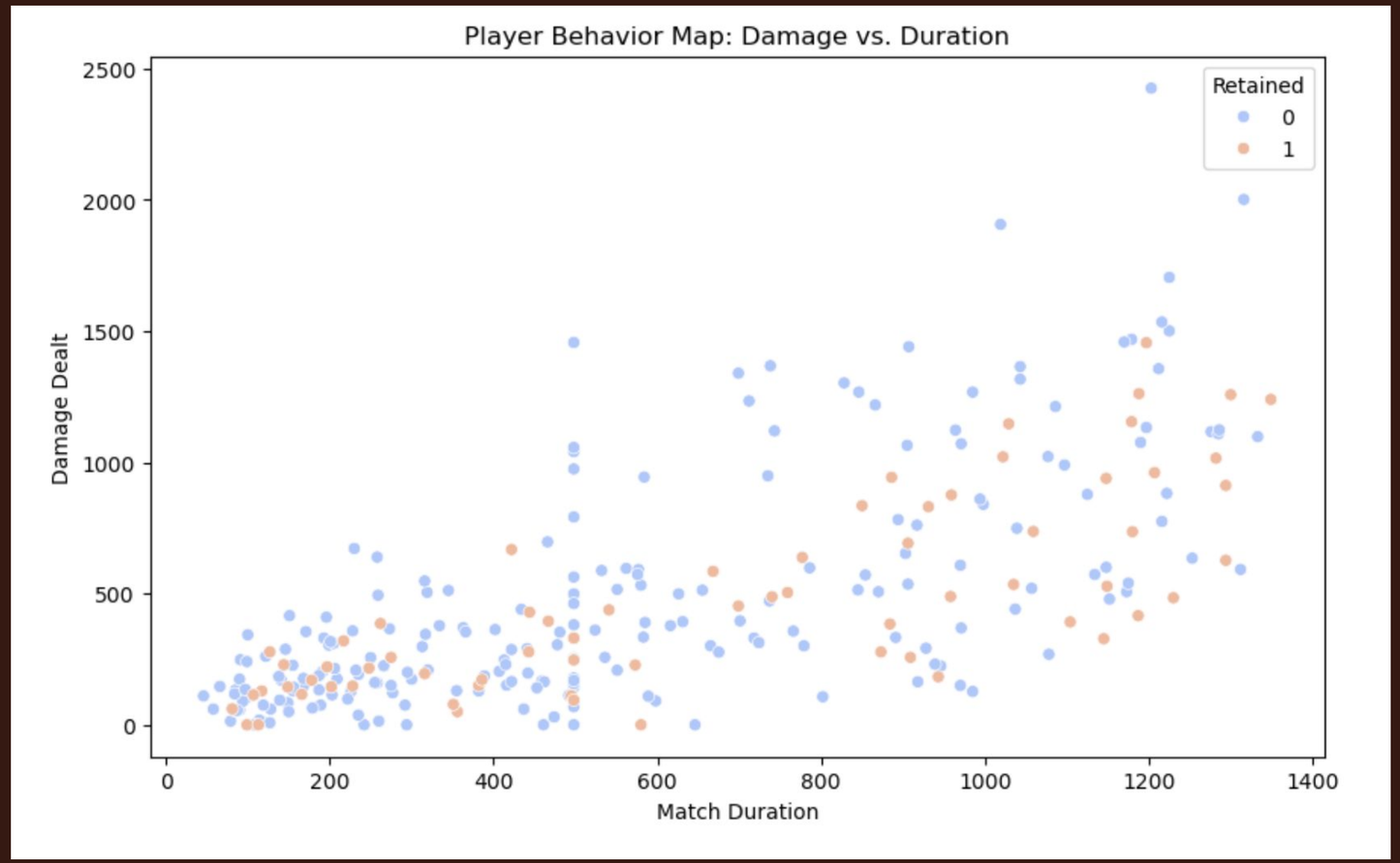
- **Retained players: Higher median session lengths**
- **Churners: Concentrated at shorter durations**
- **Model input: match_duration standardized as a core predictor**

Kills by Retention: EDA



- **Higher median kills: retained ≈ 1 vs. churners 0**
- **Model input: avg_kills standardized as a core predictor**

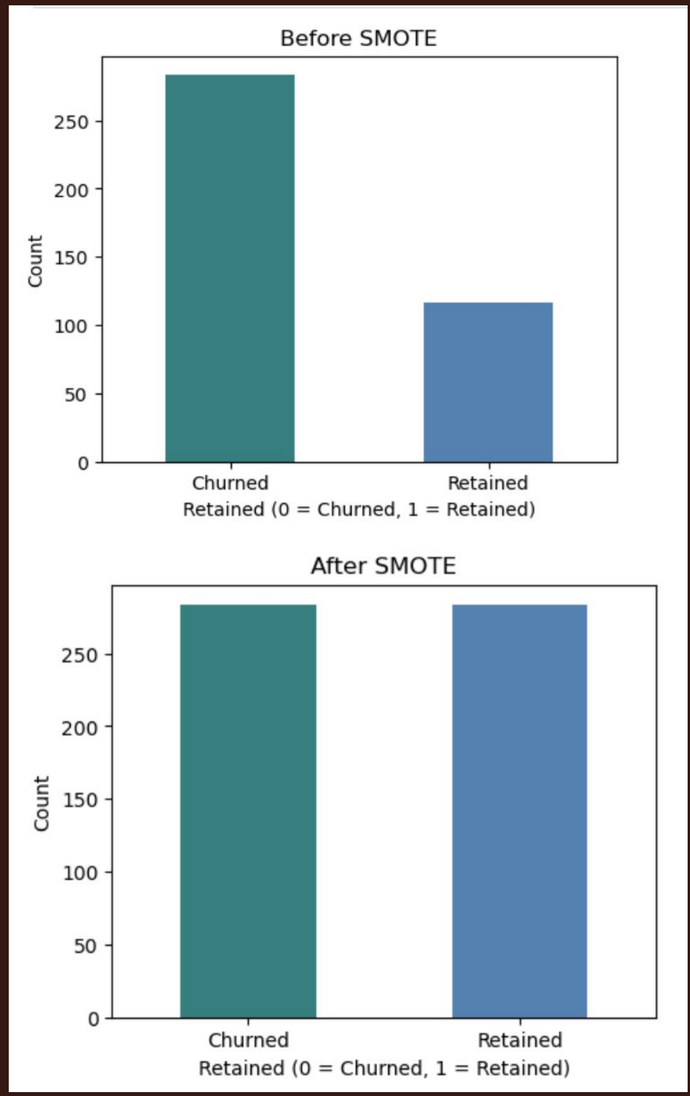
Damage vs Duration: EDA



- Clusters: high-damage vs long-survival playstyles
- Features: avg_damage & match_duration

Pre-Match Tune-up: Preprocessing

- **Train/Test Split:** stratified 80 / 20 (preserves churn ratio)
- **One-Hot Encoding:** 118 dummy columns (map & legend)
- **Standard Scaling:** 4 numeric features → 0 mean, 1 σ
- SMOTE lifted churners from ~25 % to ~45 %
- **Final Matrix:** 566 train × 114 features, 100 test × 114



Final MOdel Shoot-out

Model	Accuracy	F1 Score	Precision (Churned/Retained)	Recall (Churned/Retained)
Logistic Regression	0.83	0.73	0.91 / 0.68	0.85 / 0.79
Random Forest	0.90	0.83	0.93 / 0.83	0.93 / 0.83
XGBoost	0.91	0.84	0.93 / 0.86	0.94 / 0.83

Winner → XGBoost: Acc 0.91 | F1 0.84 | Recall (churn) 0.94

Mission Accomplished: A Churn-Prediction Model Built to Scale

- **Feature Matrix:** 114 columns after one-hot encoding & leakage checks
- **Models Tested:** Logistic Regression → Random Forest → **XGBoost**
- **Eval Split:** stratified 80 / 20 (566 train · 100 test)
- **Chosen Model: XGBoost** (default params, random_state = 42)
- **Test Metrics:** Acc 0.91 | F1 0.84 | Recall-churn 0.94

Early Radar: Can We Predict Churn a Week Out?

- Forecast achieved: XGBoost flags churn 1 week ahead with 0.94 recall and 0.93 precision
- Lead indicator pattern: 5–6 idle-day gap signals high risk before the 7-day cut-off
- Top drivers: days_since_last_match, session_frequency, match_duration, avg_kills
- Outcome: reliable early-warning system EA can utilize the same pipeline for any new seasons logs.