

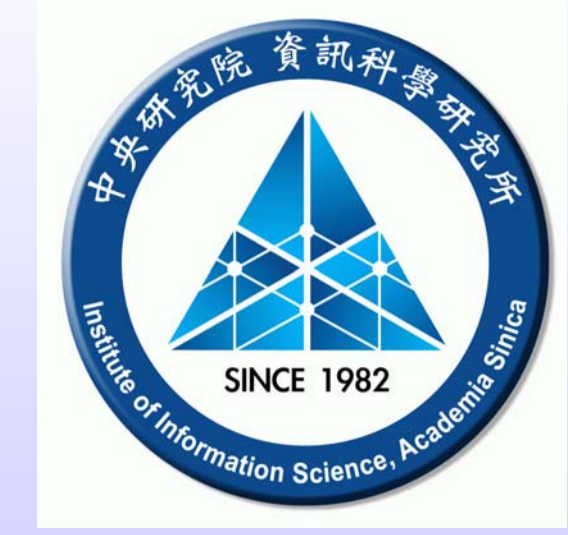


# ON PROPHEYSING ONLINE GAMER DEPARTURE

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## Introduction and Motivation

Business model of online game companies usually depends on:

- Sale of virtual items
- Monthly subscriptions in which gamers must pay for credits to continue their adventures in the virtual world.

Being able to predict how long people will stay in the game will directly affects game companies' revenue.

This study provides a practical scheme for predicting player unsubscription:

- **Input**– a player's game hours
- **Output**– whether or not he will renew an expiring subscription.
- Our rationale– *if we can predict the departure of a player before he actually quits a game, the game operator can take remedial measures to prevent it from happening and improve the game along the way based on the feedback provided by such a player.*

Our traces are from ShenZhou Online, a mid-scale commercial MMORPG in Taiwan sustaining at any moment thousands of players online.

ShenZhou Online Traces Summary	
Start date	2003-03-01
End date	2007-02-15
Length	1,447 days
Total sessions	102,233,240
Accounts observed	162,980
Non-censored accounts	20,514

FIGURE 1: Summary of ShenZhou traces

## Classification of Online Gamers

From observations on gamers' playing history (as in Fig.2), an intuitive categorization of unsubscribing players:

- **Fade-out**, with *ever-decreasing* daily playtime and login frequency
- **Sudden-out**, no noticeable tendency in daily playtime or login frequency

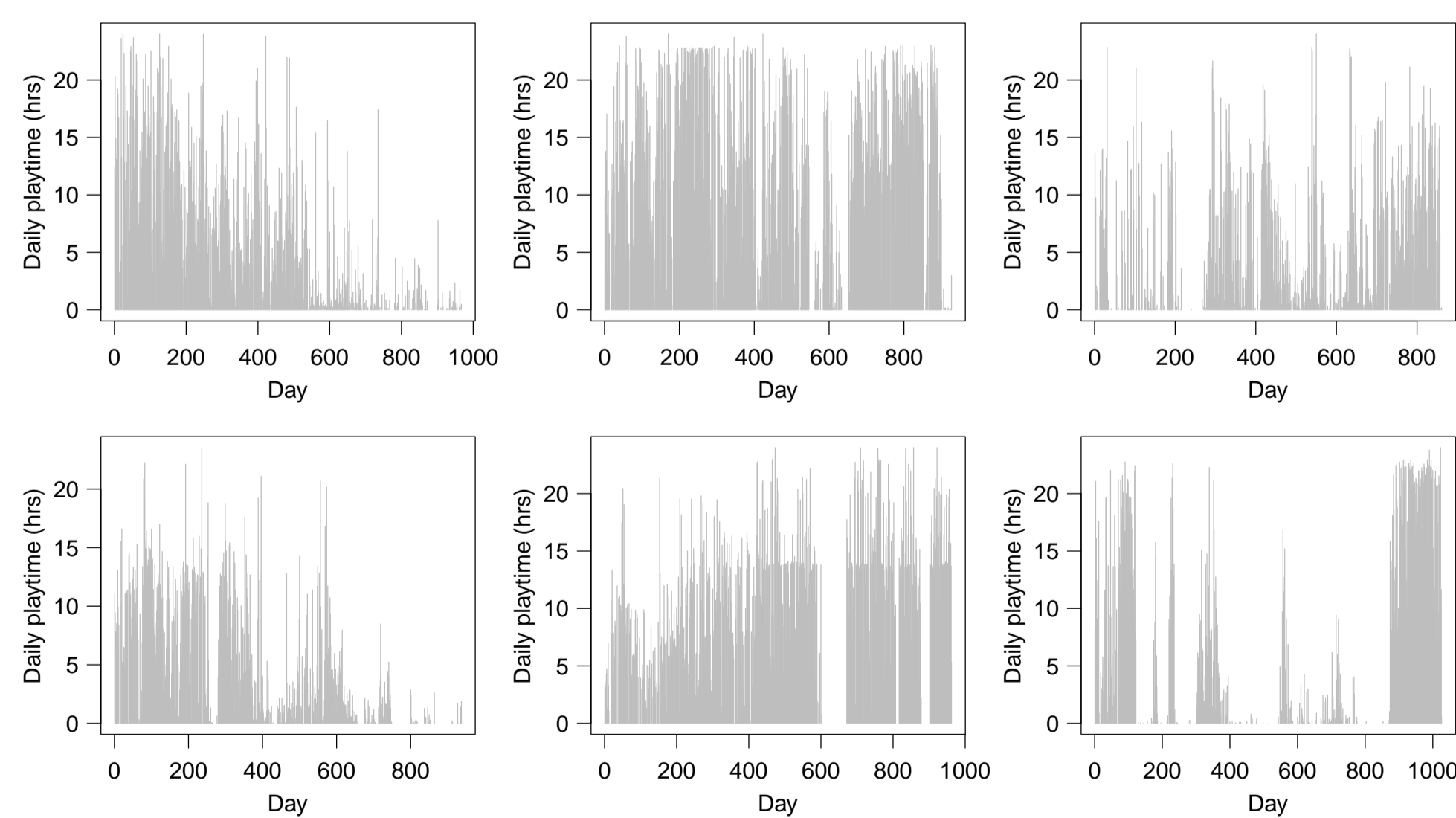


FIGURE 2: The playing history of six sample gamers

How to perform automated classification?

1. Randomly choose 2,000 gamers, classify them with the human eye
2. Divide each gamer's history into  $k$  periods of equal length

3. Evaluate the *average daily playtime* and *playing density* in each period
4. SVM as classifier, treat  $k$ -period features and predetermined categories as the training data set.

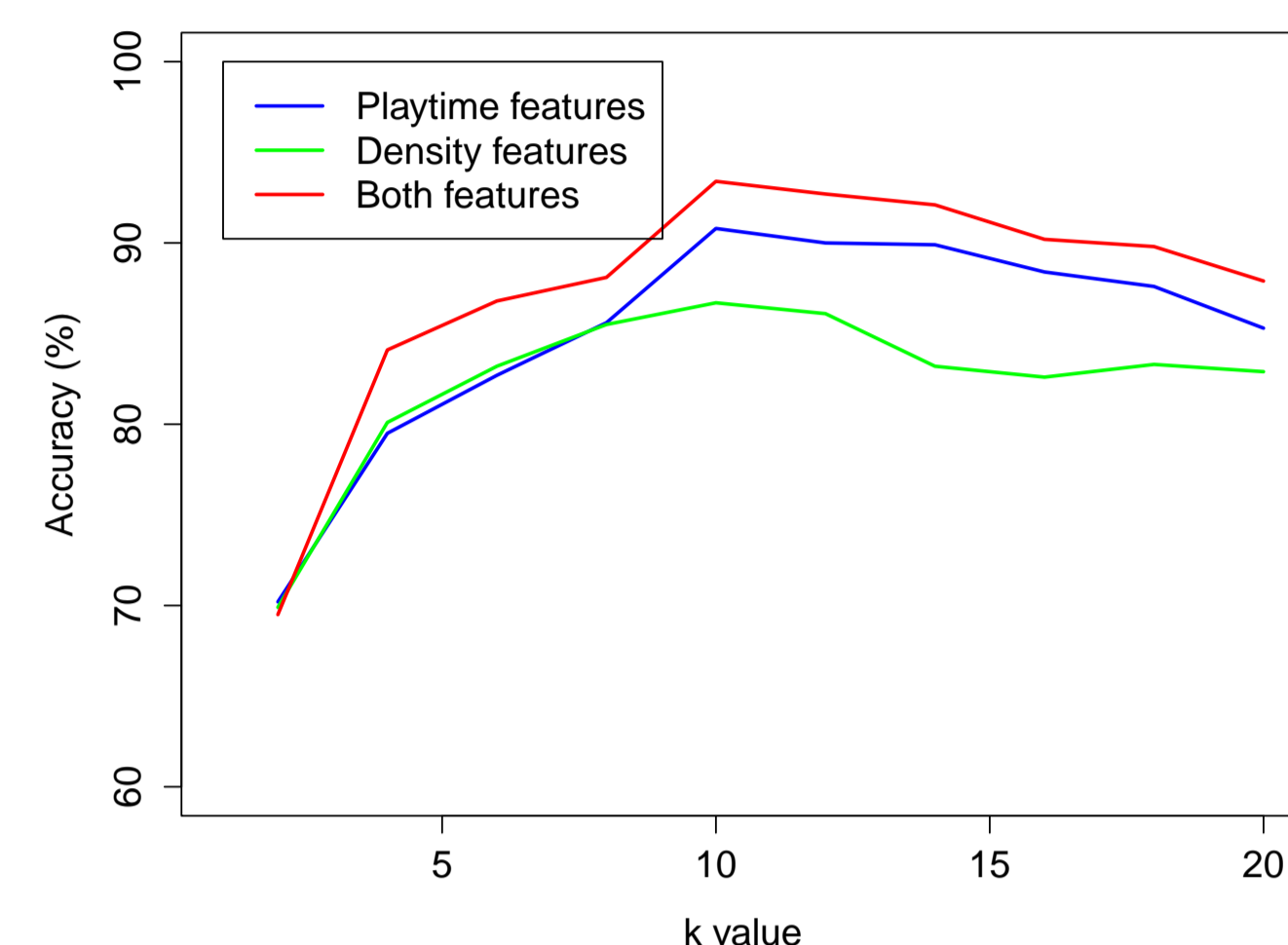


FIGURE 3: The classification accuracy of different values of  $k$ .

To find the optimal  $k$  value, we experiment within the range of [2, 20], ten-fold cross-validating for each value. From Fig.3, we find that the optimal value is 10.

Only *incomplete* data is available in real-life prediction – gamers' traces, with last  $n$  days cut off ( $n$  in [3, 60]), are fed into the SVM model. Fig.4 shows the result.

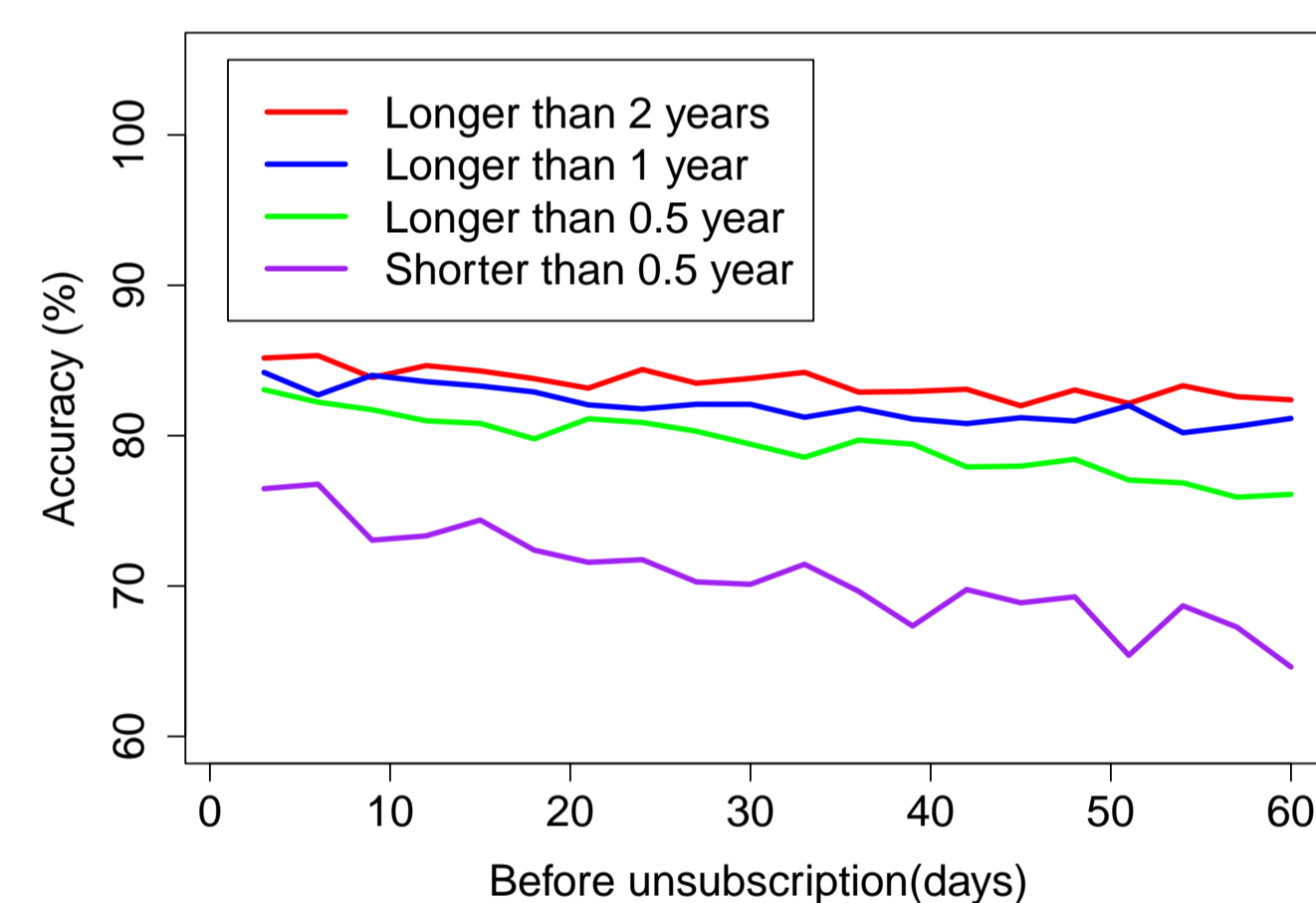


FIGURE 4: Predictivity of our classification method.

## Model for Predicting Unsubscription

How to predict whether a gamer is leaving in  $d$  days? ( $d$  in [3, 60])

Similar to our classification method, for each gamer:

1. Assign *prediction point* at  $d$  days before his quitting
2. Derive two random observation windows, counting from the gamer's first login day
3. **Leaving** window – contains the prediction point, unsubscribe within  $d$  days after window; **staying** window – not contain the prediction point, still stay at least  $d$  days after window
4. Extract 10-period features from each window
5. Fed to the SVM along with corresponding window type

The prediction accuracy for each  $d$  value is shown in Fig.5

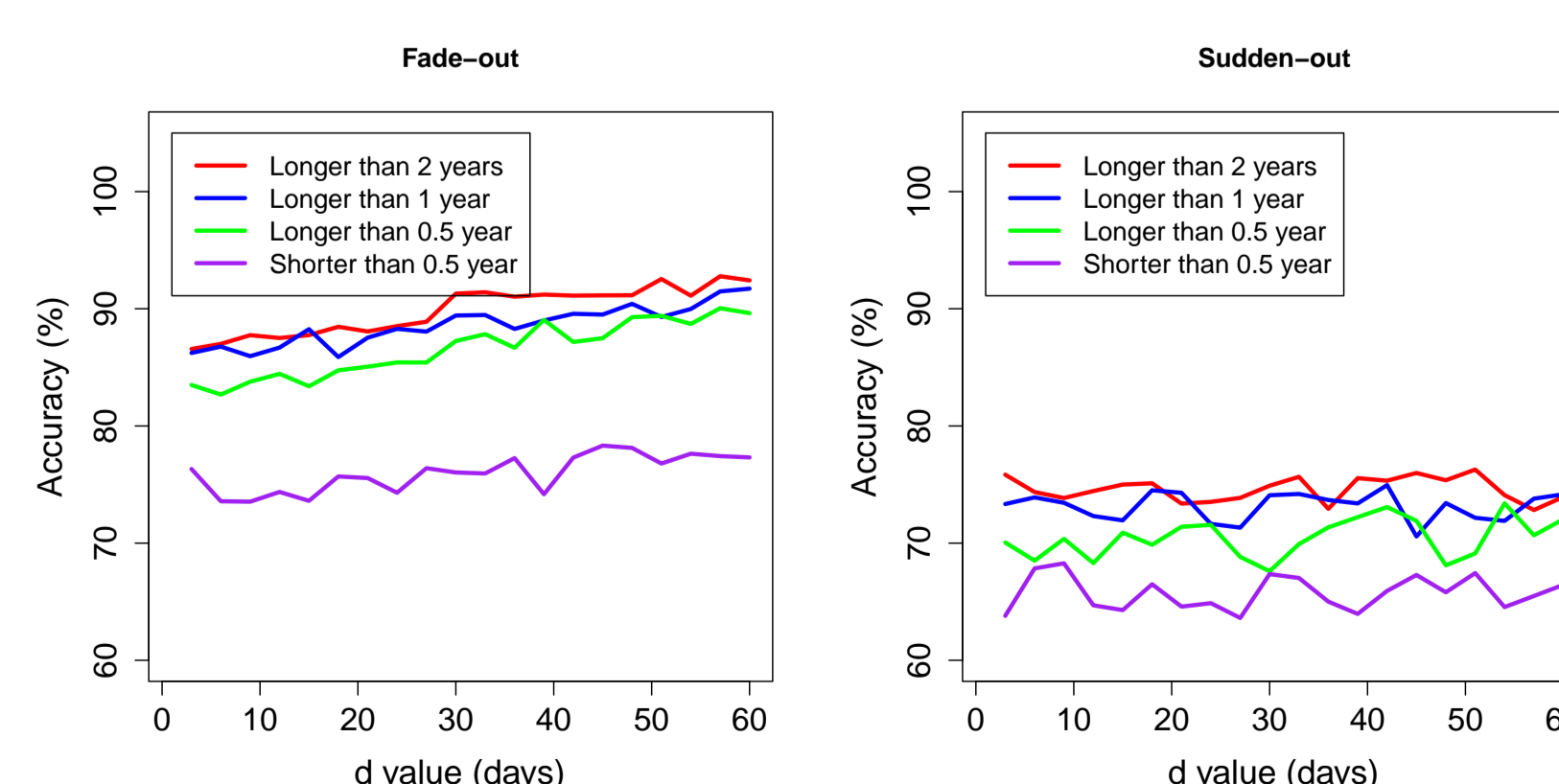


FIGURE 5: Unsubscription prediction accuracy

## Complete Scheme

The combination of our classification method and prediction model:

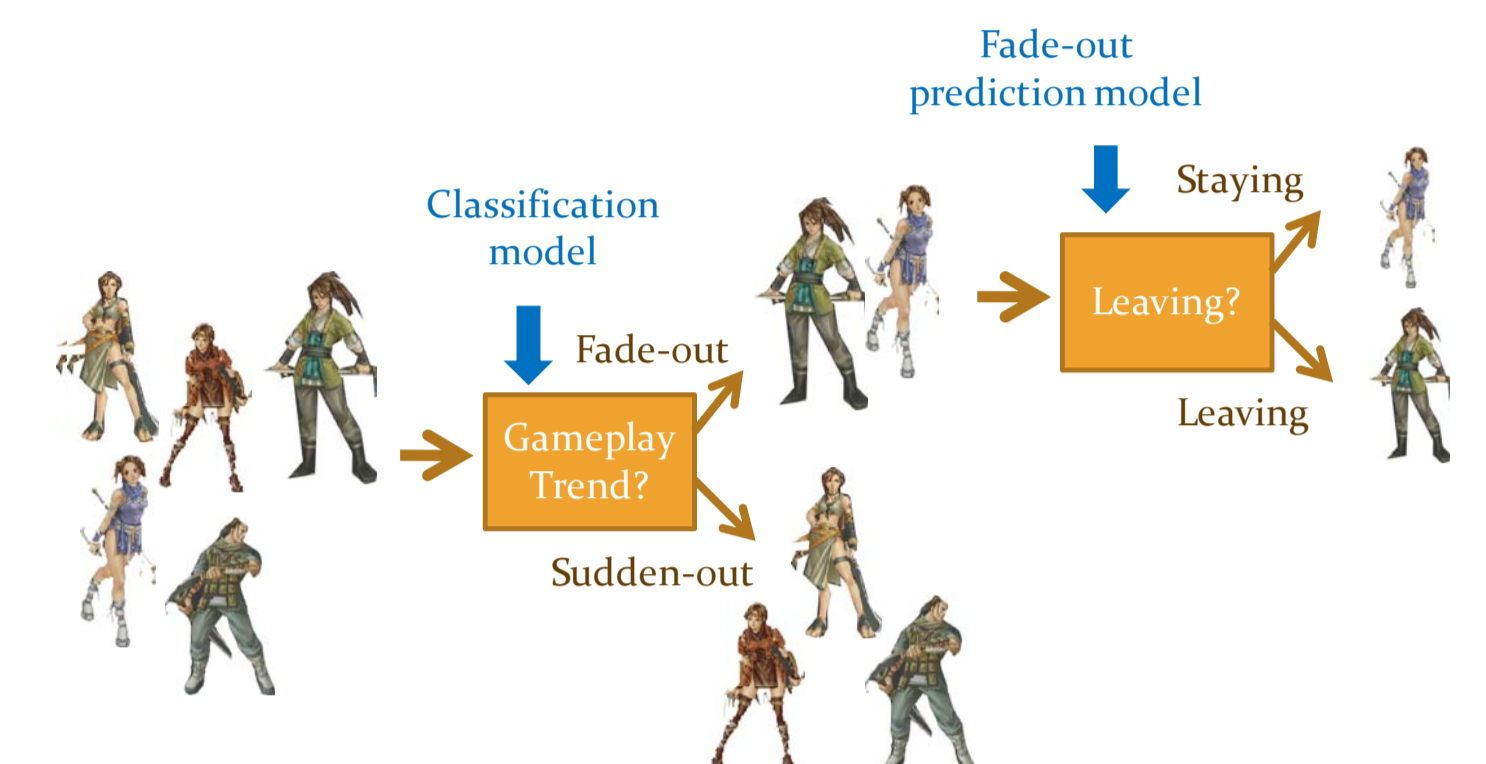


FIGURE 6: The complete unsubscription prediction scheme

**Input** – a player's incomplete trace

**Output** – three way output:

- Sudden-out pattern (or just unpredictable)
- Staying for the time being
- Leaving within a specific number of days.

The accuracy of our complete prediction scheme is shown in Fig.7, and Fig.8 shows the three types of errors.

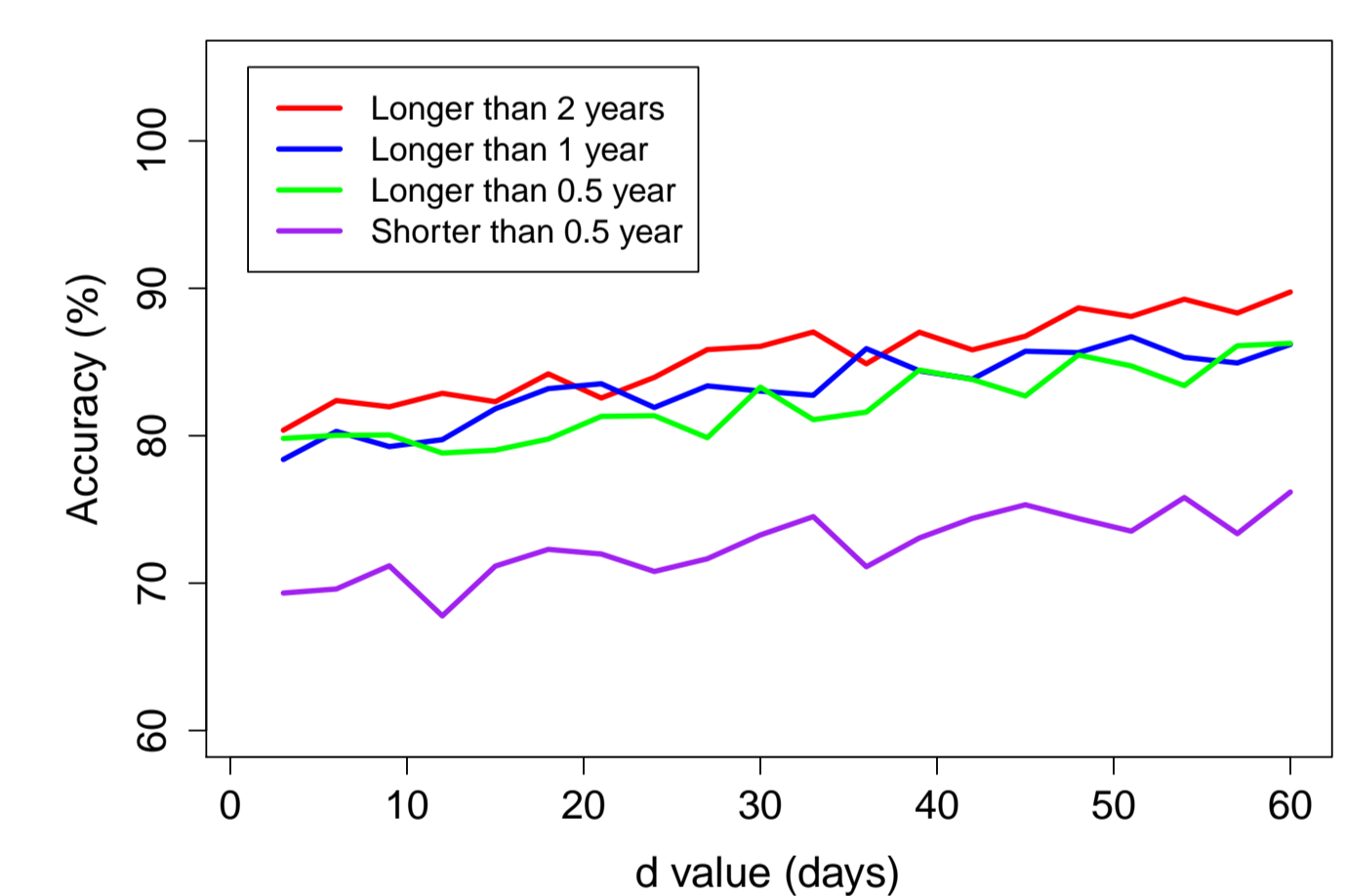


FIGURE 7: Accuracy of our complete prediction scheme

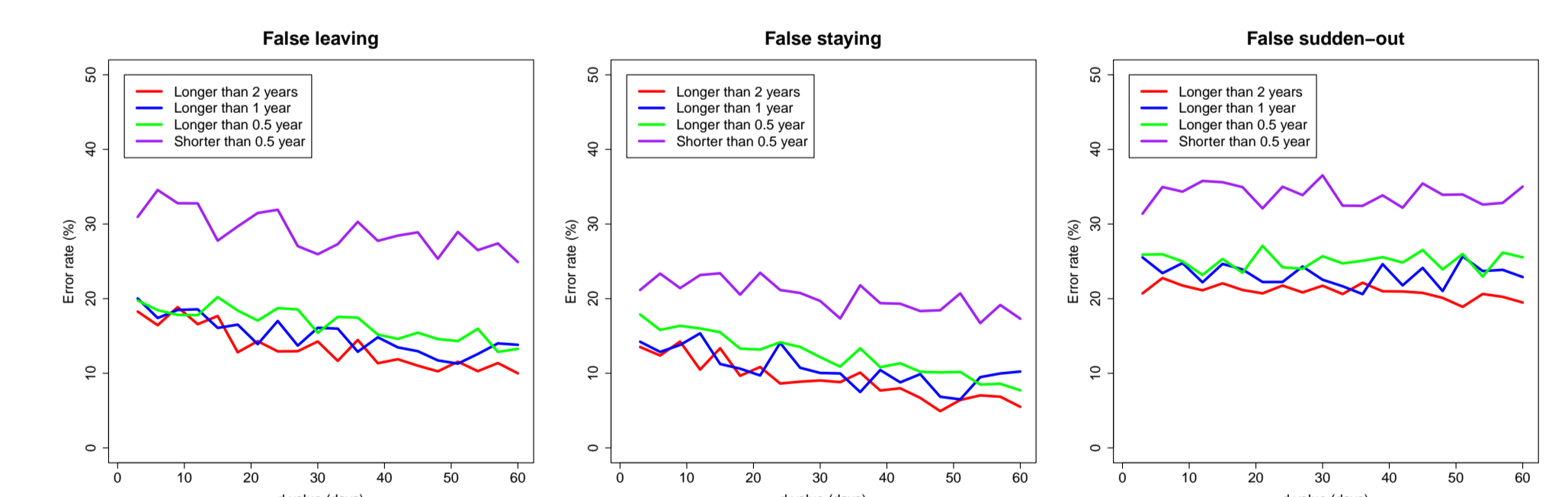


FIGURE 8: False positives and false negatives of our prediction scheme

## Conclusion

The ability to predict a gamer's departure is coveted by the MMORPG industry as it allows the game operators to target their resources on keeping subscribers motivated and to benefit from these loyal customers. To this end, we hope that our scheme will prove helpful to operators, as well as gamers who may enjoy a better gaming environment because of it.