Introduction

- Large scale evidence indicates that there are high levels of disengagement in mobile learning [1]
- However, what happens once a student disengages? Do students ever return?
- We find that over a third of students who disengage for a week or more eventually re-engage

Background

- Mobile learning platforms may be more suitable for microlearning sessions, playing to the strengths of their form-factor [2]
- Traditional definitions of engagement need to be reconceptualized for this new context

Method

- We build on earlier work in dropout prediction which has found success using clickstream features [3] and exhaustively train Random Forest models
- We apply Chi-Squared tests for proportion to examine differences in disengaging and re-engaging behavior

Implications and Future Work

- A significant amount of seemingly disengaging students re-engage with mobile learning, which can be predicted from early engagement
- Future work studying mobile learning should consider this context and cater to the strengths of mobile devices

Pipeline for modeling modes of engagement

**Shupavu 291: A text message-based mobile learning platform widely used in Kenya**

We examine activity from 87,651 students who log 21,302,582 platform interactions, including 1,196,780 quiz activities.

- Select a sample of students who have completed at least one quiz
- Derive a set of clickstream features capturing early engagement (inspired by earlier work [3])
- Design two prediction problems:
  1. Predict whether a student will disengage (7+ days of inactivity)
  2. Predict whether a student who disengages will re-engage (2+ days of activity after disengaging)
- Train Random Forest models selected via exhaustive grid search
- Understand differences between re-engagement and disengagement prediction via Gini Importance

**Daily student activity features for two days**

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>time.i</td>
<td>Time spent on day i</td>
</tr>
<tr>
<td>nlessonsfinished.i</td>
<td>Num. of lessons completed on day i</td>
</tr>
<tr>
<td>nask.i</td>
<td>Num. of questions asked on day i</td>
</tr>
<tr>
<td>n.quizzes.i</td>
<td>Num. of quizzes completed on day i</td>
</tr>
<tr>
<td>avg.solve.time.i</td>
<td>Avg. time to complete quizzes on day i</td>
</tr>
<tr>
<td>n.unique.quizzes.i</td>
<td>Num. of unique quizzes completed on day i</td>
</tr>
<tr>
<td>nsummary.i</td>
<td>Num. of quiz results viewed on day i</td>
</tr>
<tr>
<td>nhw.tools.i</td>
<td>Num. of homework tools (e.g. dictionary) used on day i</td>
</tr>
</tbody>
</table>

**Key Results**

- 72% of students disengage for a period of seven or more days
- Of disengaging students, 36% eventually re-engage
- Re-engaging students interact significantly more with quizzes (56.0% v. 47.6%) and lessons (11.5% v. 10.3%)
- Students who remain disengaged have a larger proportion of registration events (13.3% v. 7.3%)
- We predict disengagement with an 81.21% F1-score and 83.06% Recall
- We predict re-engagement with an 80.91% F1-score and 84.19% Recall
- Number of quizzes completed, time spent on day 1, and number of platform features used are more important in predicting re-engagement

**Feature importance organized by prediction problem**

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