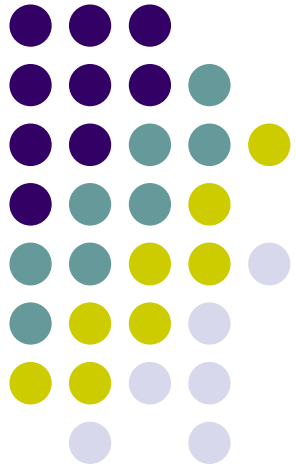
Ubiquitous and Mobile Computing
CS 528: *LIVE CHART*



Team 1

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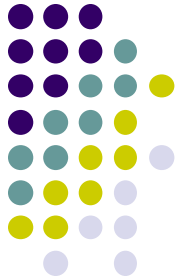
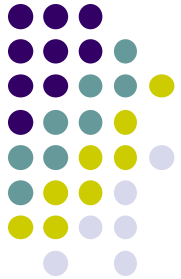
Problem Statement



Implement real-time tracking App LIVE-CHART that monitors student progress in a synchronous assignment (classwork) in a virtual or hybrid classroom that is using ASSISTments.

What is ASSISTments?

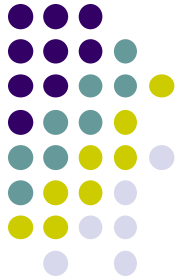


ASSISTments is a web-based platform for mathematics assignments and testing.

Teachers can assign problems from popular math curricula that they already use and get actionable data.

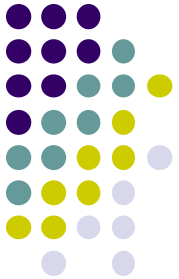
Additionally, students get immediate feedback as they complete their work.

Introduction



- Why this Problem?
  - Difficult to monitor students as they work on problems at their own pace
  - COVID-19 has made this lack of functionality more important
- Solving this will enable teachers to monitor students in real-time and ensure students get the help they need and stay on task

Why Mobile/Ubicomp?



- Mobile/ubicomp is convenient for teachers to use both in and out of classrooms
  - Virtual class: Mobile app to track student progress allows computer screen real estate to be devoted to student conversations.
  - In-person class: Mobile app allows teacher to easily walk around while receiving student progress data to guide where they spend their time.
- ASSISTments does not currently have a mobile solution

Related Work

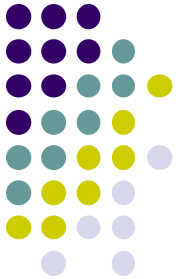
Self-Paced computer-based learning platforms

- IXL
- Mathia(Cognitive Tutor) efficacy studies[2], WWC certified
- Ken Holstein[3], Virtual glasses

Tutor Paced computer-based learning platforms

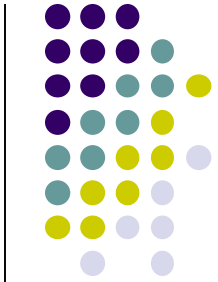
- Google Slides, current business as usual in many schools across America
- ASSISTments

Wireframe Demo



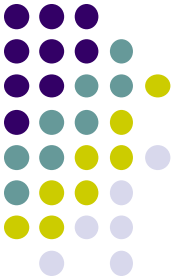
Link to WireFrame

Methodology



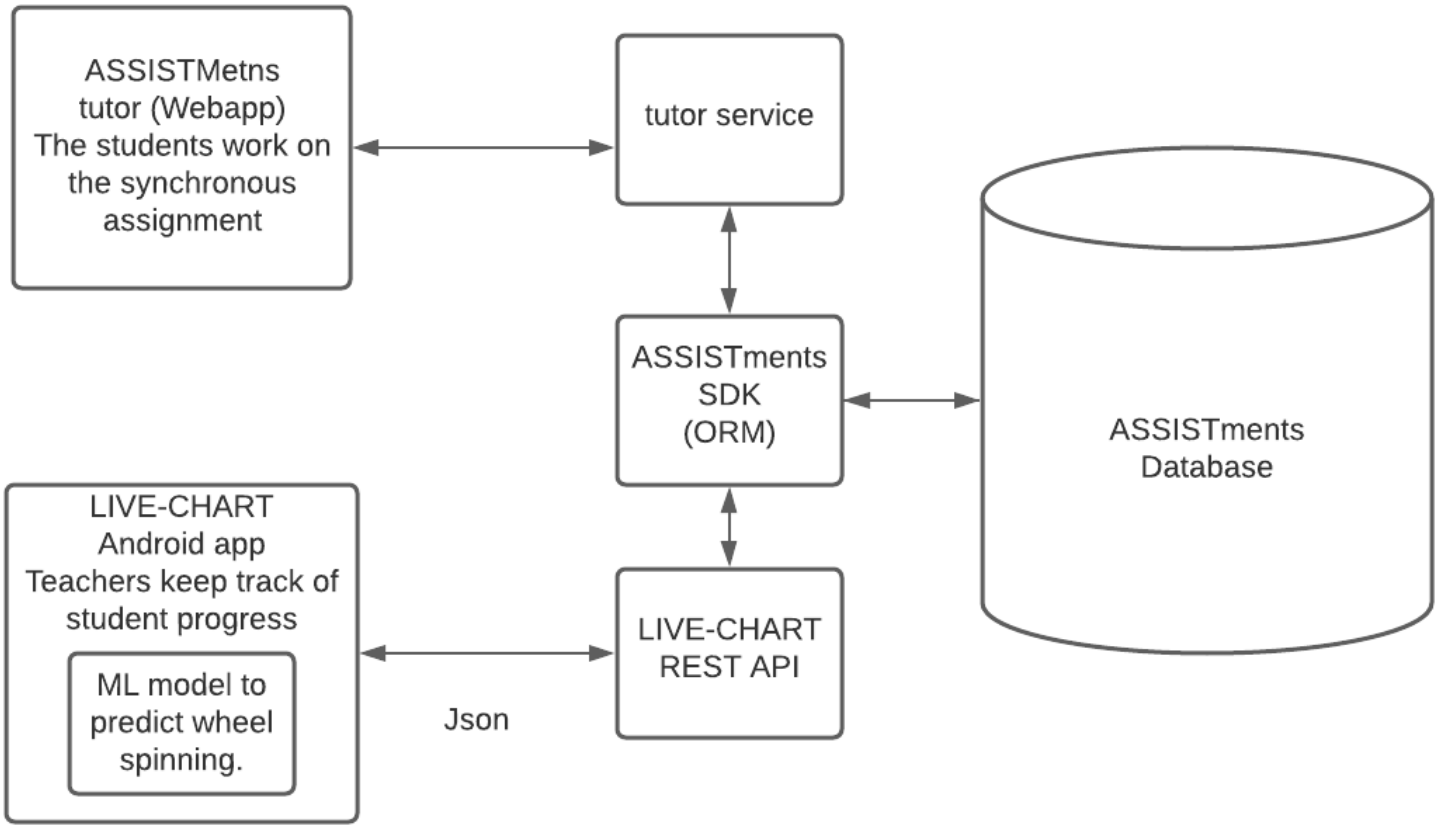
- Teachers assign synchronous assignment using ASSISTments
- Students work on the assignment on their own
- LIVE-CHART keeps track of the student progress in real-time and update the teacher
- The machine learned detector detects students who require attention and students who are putting in effort

Android Modules

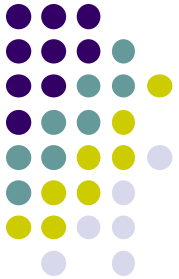


- OAuth2 – User login
- MediaPlayer – Audio/Video Playback
- LocationServices – User location
- SQLLite – Local Storage Cache

Software Architecture

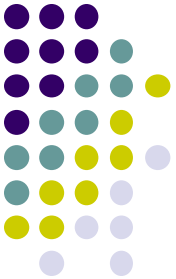


Machine Learning



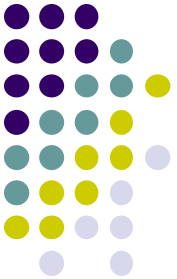
- Dataset
  - Random sample of 20K assignment logs from the ASSISTments platform.
  - Features: number of attempts made, length of hints/explanations, time taken to answer
- Modelling
  - Train Logistic regression
  - Predict wheel-spinning[1] behavior in students
    - Wheel-spinning is the term given to describe students who struggle to master a skill in a timely manner

Timeline



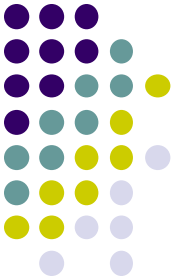
- 10/30/2020 - Gather Dataset for ML model and complete system and wireframe design.
- 11/04/2020 - Implement REST API to communicate with ASSISTments platform (Ashish, Aaron H)
- 11/11/2020 - Implement ML model to predict wheel spinning (Priyanka, Aaron A)
- 11/18/2020 - Develop Live-Chart App User Interface (All)
- 11/25/2020 - Integrate individual components. (All)
- 12/02/2020 - Test and if time permits run a user study. (All)
- 12/09/2020 - Final Presentation (All)

Evaluation Plan



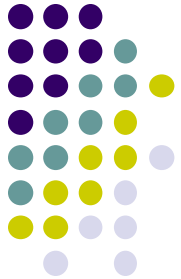
- Smooth functioning of the App (No crashes)
- Accuracy of Logistic Regression model (wheel spinning detector)
- Teacher User Study/Survey for UI friendliness and App usage.

Difficulty Points (26 points)



- Machine Learning:
  we are going to usea random sample of 20K assignment log data from the ASSISTments system and train a model to detect if wheel spinning [2] and check if students are exhibiting effort in their synchronous assignments.
- Location Sensing:
  keep track of where teachers are. to gain some insight into urban and rural demographic of the classes and study the correlation

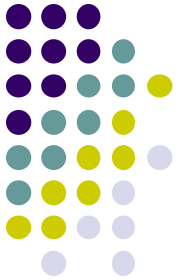
Difficulty Points (ctd.)



- REST API: we are designing a RESTful API that is going to interface with the ASSISTments system and provide the app with student log data as they move along in the synchronous work.
- There are >5 Android screens in the app
- On our “About” & “Login” page we have an intro video about ASSISTments for our users

References

1. Beck, J. E., & Gong, Y. (2013, July). Wheel-spinning: Students who fail to master a skill. In *International conference on artificial intelligence in education* (pp. 431-440). Springer, Berlin, Heidelberg.
2. Pane, J. F., McCaffrey, D. F., Slaughter, M. E., Steele, J. L., & Ikemoto, G. S. (2010). An experiment to evaluate the efficacy of cognitive tutor geometry. *Journal of Research on Educational Effectiveness*, *3*(3), 254-281.
3. Holstein, K., McLaren, B. M., & Aleven, V. (2018, June). Student learning benefits of a mixed-reality teacher awareness tool in AI-enhanced classrooms. In *International conference on artificial intelligence in education* (pp. 154-168). Springer, Cham.



Thank You!