Learning Analytics Tools

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Lecture 11.1

Intro Multimodal Learning Analytics

Welcome back to LA tools course. In this week we will talk about Introduction to Multimodal Learning Analytics. Multimodal Learning Analytics itself can be a separate course because we collect data from different channels or different modalities, then we need to sync them and apply learning analytics on them. But this week, I will try to motivate you about multimodal learning analytics or at least how to collect data from different channels and use them to provide feedback or personalized content to the learners.

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Data from sensors

- You have seen how to collect data from
  - Classroom
  - Online
  - TEL environment

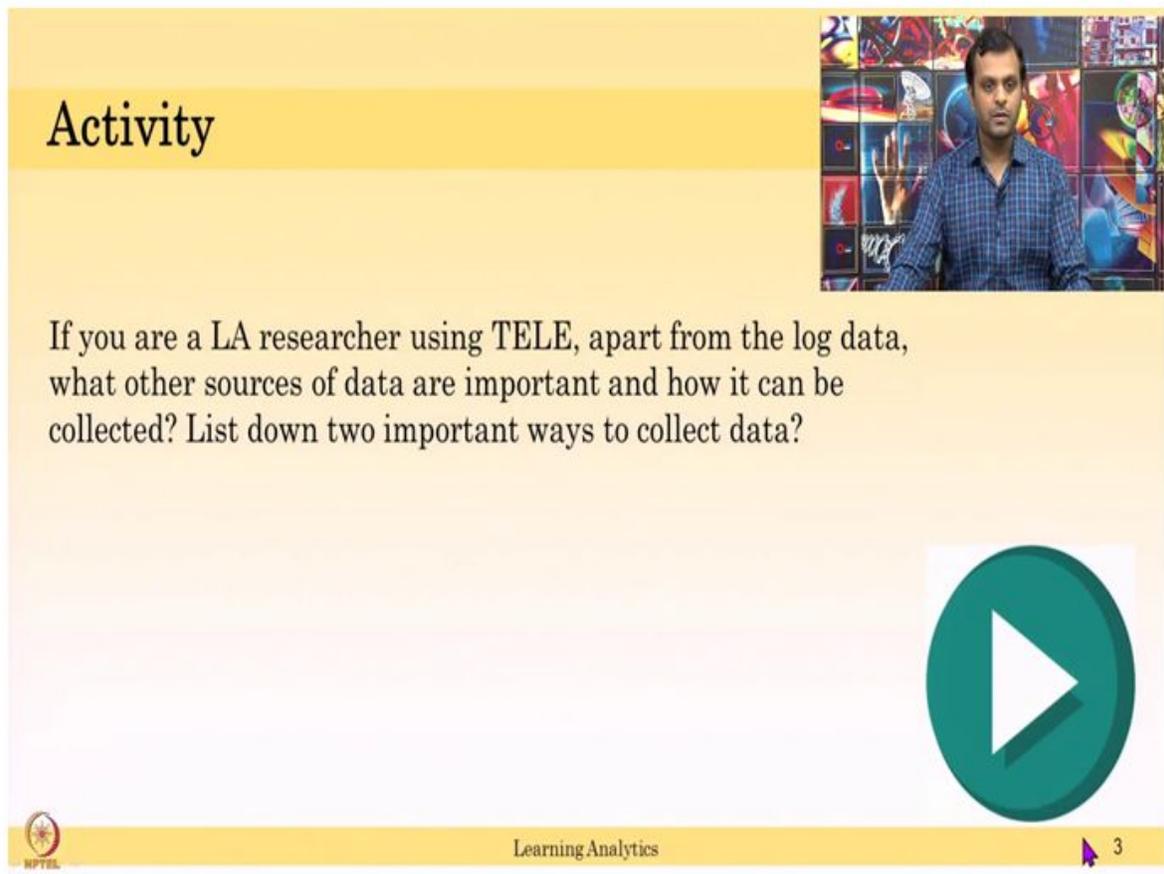- Data are collected from learner's behaviour in the environment

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So, you have seen how to collect data from different learning environments like a classroom, online or technology-enhanced learning environments. In week 2, you know you would have used those data for solving some assignments or while reading to apply machine learning models on the data. Now, the question is the data we collected from this log data or any data, Is that enough?

Can we use that data to completely give a holistic approach to learner's behaviour, Is that possible? Because what data we collected in a classroom or online LE is student's interaction with some particular system for example, in last week we discussed about data collection from Moodle. You might be collecting data from Moodle or if you are collecting data through students observation or human observation that is perfect, that is good.

But is there any more data we can collect to understand the student's behavior other than log data?

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So, assume that you are working on TELE based research environment and you can collect log data in TELE like "MettLE". What are other sources of data we can collect other than the student's interactions the system like the student's clicks? Can we collect some other data to talk about learner's behaviour to model them?

If yes, what are the other data we can collect? And how do you collect it? For example, I will say that we can collect learners facial expressions by using a web camera. So think of it, think about it other possible data channels and what data you can collect, pause this video, write down your answers at least write down 3 or 2 channels of data, then resume the video to continue.

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Activity: Response

Multichannel data analytics and sensors

- Brain waves - EEG Signals analysis
- Facial expressions – emotion detection
- Microphone to capture environment noise and collaborative learning
- Wall mounted biological sensors
- Eye-Gaze Data – Eye tracker
- Skin conductance – GSR
- Gesture, posture – Kinect

Learning Analytics

So, multi-channel data is the data coming through multiple channels or sensors, then I call the multi-channel data analytics. So, we can use EEG signal analysis to measure the learner's cognition(through the brainwaves) or you can use, you know webcam or the camera to detect students facial expressions, by using facial expressions we can see their emotions or we can capture the discussion with the collaborator if the student is engaged in "thinking aloud" and those can be used to you know, code them and you can do the discourse analysis on that.

Or you can use wall-mounted biological sensors like if we enter a room, there are a lot of sensors in the side panels(in the walls), that tells the classroom environment like the temperature of all the students. All these things can be observed or we can use Eye-Gaze data for example, if the student is interacting with computer or laptop or with some of the object to identify where are they looking at?

What is their focus? Are they looking at a particular place\? Are they looking at a figure to understand it better? Are they really reading something or just skimming through it? We can get those data from eye trackers. Log data can provide information such as the student is on which particular page.

We are not sure what actually the students are doing with Eye-Gaze data we can tell that the students spend the most time on trying to understand from the figure and also reading this sentences and instead of reading something else. The student might be like skimming to read, going fast and checking it out, not really reading.

So, these data will add information about student's behaviour, this is very important. And you can also use GSR through which the skin conductance like the student's attention (cognition) can be detected. And we can use Kinect kind of devices. So, and it tries to model your posture and gesture. So, yeah, these are the other ways to do that.

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Sample Eye-Gaze and GSR
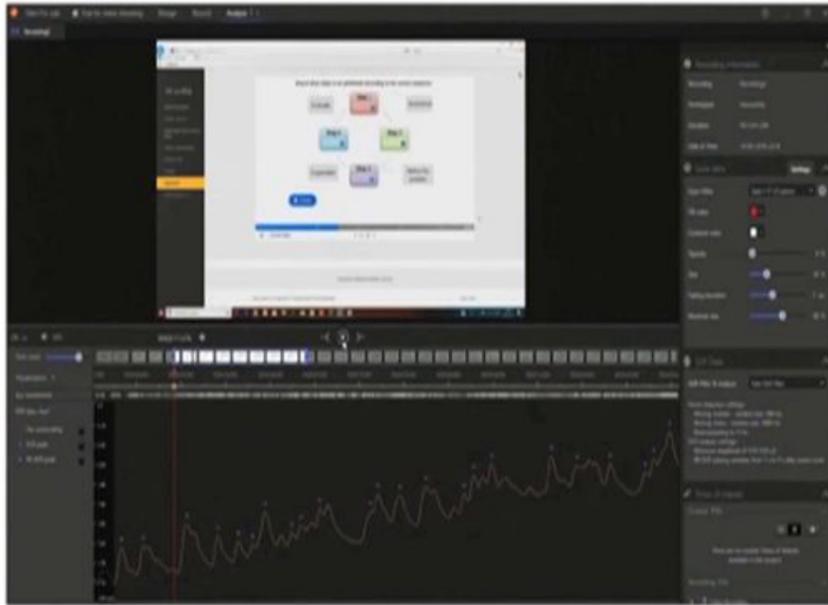
Here are the sample Eye-Gaze and GSR data that is collected in a TELE environment. The student is looking at different parts of the environment. And you can see the Eye-Gaze is overlaid on the video. Below the students GSR data.

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So, in this slide, what I try to do is to motivate that more data can be collected from different channels and collecting this data from different channels will help you to model the learner better. Thank you.