

Lesson 13: Automating Data Decisions

Overview

Question of the Day: How can computers help us make decisions about data?

In this lesson students look at a simple example of how a computer could be used to complete the decision making step of the data problem solving process. Students are given the task of creating an algorithm that could suggest a vacation spot. Students then create rules that a computer could use to make this decision automatically. Students share their rules and what choices their rules would make with the class data. They then use their rules on data from their classmates to test whether their rules would make the same decision that a person would. The lesson concludes with a discussion about the benefits and drawbacks of using computers to automate the data problem solving process.

Purpose

This lesson demonstrates to students that the last step in the data problem solving process, making a decision, is something that a computer can do automatically if it's given an algorithm. It builds off the previous lesson which demonstrates the importance of designing the way you collect data in order for it to be usable for interpretation. This is especially true for computers which are much better suited for the multiple choice style data they will see in this lesson.

Assessment Opportunities

1. Design and implement an algorithm for making decisions using data as inputs

Activity Guide: The points assigned to each vacation spot on the first page are consistent with how the algorithm is implemented on the second page.

2. Explain the benefits and drawbacks of using computers for automated decision making

Wrap Up: Students should identify multiple advantages and disadvantages to automated decision making.

3. Interpret collected data to identify patterns

Activity Guide, page 1: The points assigned to each vacation spot should reasonably reflect the given data. (see exemplar)

Objectives

Students will be able to:

- Design and implement an algorithm for making decisions using data as inputs
- Explain the benefits and drawbacks of using computers for automated decision making
- Interpret collected data to identify patterns

Links

Heads Up! Please make a copy of any documents you plan to share with students.

For the teachers

- **CSD Unit 5 - Data & Society** - Slides

For the students

- **Automating Data Decisions** - Resource
- **Automating Data Decisions** - Activity Guide

Standards

Full Course Alignment

CSTA K-12 Computer Science Standards (2017)

- ▶ **AP** - Algorithms & Programming
- ▶ **DA** - Data & Analysis
- ▶ **IC** - Impacts of Computing

Agenda

Warm Up (5 minutes)

Journal

Activity (35 minutes)

Making The Algorithm

Testing the Algorithm

Wrap Up (5 minutes)

Teaching Guide

Warm Up (5 minutes)

Journal

Prompt: Imagine you were going to program a computer to automatically select clothing from your closet for you in the morning. What kinds of data would this computer need? What kinds of rules would you want it to use?

Discussion Goal

Goal: This discussion may be hard to keep small but the point is just to get students thinking about the fact that computers need data (inputs) and rules (i.e. an algorithm) for making a decision (output). So long as students have had a chance to see an example of those three components of the input-output-store-process model of the computer it's fine to move on. That said, here's some ideas students might mention

- Inputs: The temperature, the weather, what kinds of events you have today, etc.
- Rules: If temperature less than 60 bring a jacket, if fancy event put out fancy clothes, if sunny bring sunglasses, etc.

Discuss: Students should silently develop responses in their journals, then share in small groups, then discuss with the whole class.

Remarks

For a computer to make a decision it needs data as input and an algorithm to process it. This is just the input-output-store-process model we learned about before. In the last class we learned how to interpret data to understand more about the world. Today we're going to look at how to design algorithms so that a computer can use what we understand to make decisions automatically.

Question of the Day: How can computers help us make decisions about data?

Activity (35 minutes)

Distribute: Copies of **Automating Data Decisions** and **Automating Data Decisions** to each student.

Automating Data Decisions Activity Guide

Making The Algorithm

Remarks

Imagine you wanted to use a computer to analyze someone's answers and make a recommendation automatically. A computer doesn't know what "the beach" or "the big city" is and doesn't have an opinion of its own. It will just be able to see which answer someone chose, not the significance of that answer. It needs a person to tell it what to do to turn the answer choices into a recommendation.

Introduce Activity: Read through the instructions as a class, ensuring that students understand how the algorithm works.

Prompt: Based on what you see in the cross-tabulation tables, why do you think that someone created the first rule of the algorithm? Can you think of a different rule?

Discussion Goal

Ensure that students understand that the rule is based on the first row of the "Vacation and Food" table. There is no one "correct" rule based on the data, but someone who prefers ice cream seems very likely to prefer the beach and somewhat likely to prefer an amusement park.

Do This: Have students individually decide on the rules for their algorithms. For each possible answer choice, the students should add points to at least one of the four options of the beach, amusement park, national park, or big city.

Circulate: Monitor student progress. Students only need to complete the first page of the activity guide for now. As most students finish, the class can transition to the next section of this activity.

Testing the Algorithm

Group: Assign students into groups of 3-4

Do This: Have students in groups poll each other record their answers on the second page of the worksheet. They then use their algorithms to recommend a vacation spot for that person.

Share Out: Ask students to share out some of the vacation spots they were recommended and if they agree with the recommendations. This discussion connects the reflection questions where students consider changes they could make to improve their recommendations.

Reflect: Have students individually complete the reflection questions at the bottom of the activity guide, then share with their groups to compare responses.

Wrap Up (5 minutes)

Prompt: Students can respond either in the Reflection section of the activity guide or in their journals:

Students should understand that automating decisions is convenient in many situations but may lose some elements that humans would consider in a decision. For example

- Collecting data that's already clean limits what you might collect.
- Automating decisions means sometimes you get a decision you wouldn't have made on your own

There are cases where we might want to automate a decision though. For example

- Where a human might forget / get bored (e.g. automatically re-ordering food when your fridge is low, turning on / off A/C as temperature changes)
- When there's lots of data to consider for a simple decision (e.g. looking through lots of products to find the one with the lowest price)

- What is a disadvantage of using an algorithm to make decisions?
- What types of decisions would you not want a computer to make automatically?