

Data Detectives: A Tabletop Card Game about Training Data

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ABSTRACT

Youth regularly interface with AI technology that leverages supervised machine learning. However, it is well-known that biased training data can result in harmful algorithmic bias. Thus, it is important that youth and families understand training data in machine learning. We present *Data Detectives*, a child-friendly tabletop card game about training data. Based on three research-based design principles: low-stakes experimentation to support curiosity, games facilitating conversation, and tangible and embodied learning for abstract concepts, the game supports learning the high-level mechanics of training data in supervised machine learning, as well as practicing critical discussion of training data related to algorithmic bias. Contributing to AI literacy opportunities, this game aims to facilitate playful peer-peer and child-parent learning.

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1 INTRO & MOTIVATION

Youth and families often have direct exposure to and are affected by artificial intelligence (AI). Unfortunately, unfairness and bias stemming from the training data used in supervised machine learning (ML), a ubiquitous approach to AI, has been well-documented. Children’s frequent interfacing with ML-driven technology, and thus its potential harms and biases, creates a need to have a working understanding of such AI from both a technical and critical social perspective. Yet, some aspects (e.g., how exactly training data works in ML) are often challenging to learn [2]. To address this, we apply research-based design principles to create *Data Detectives*, a child-friendly game to support understanding general technical aspects and practicing critical discussion of training data in supervised ML.

2 GAME DESCRIPTION & DESIGN PRINCIPLES

Data Detectives is a multiplayer (2-6) pattern deduction game with two teams: the Training Data Team and the Algorithm Team. The game is centered around a deck of cards with images. The Training Data Team separates Training Data image cards into two piles, one that fits their rule and one that does not. Based on what they see, the Algorithm Team must guess the rule to sort the Test Set cards in their shared hand. After getting feedback from the Training Data Team, they can make a final guess about the rule. Throughout the game, players are prompted to consider patterns they recognize, if they agree with the Training Data Team’s decisions, and what additional data could be useful for communicating the rule. We have conducted play tests with 6 adults with varying levels of AI literacy, iterating the game materials and rules between play tests.

Specifically, we aim for *Data Detectives* to facilitate three main learning goal outcomes, which are: players are able to (1) understand how training data plays a role in the output of an algorithm, (2) understand that algorithmic bias can stem from training data (what training data is used, how it is labeled, and how much training data is used), and (3) critically question training data decisions in the context of supervised ML. In our preliminary work, we have already seen play testers articulate the main concepts connecting mechanics and algorithmic bias.

Data Detectives employs three main design principles. First, it offers low-stakes experimentation, an approach that helps scaffold learning and expressing curiosity [3]. Further, by utilizing deductive mechanics and team-based play, we normalize player uncertainty to create a space encouraging of critical conversation and question-asking outside of one’s comfort zone [3]. The role-playing aspect, with teams acting as the Algorithm and the Training Data selectors, is based on benefits of embodied learning to understanding abstract ideas [1]. Lastly, we chose a tabletop game, since tangible experiences can be particularly effective with younger learners [1]. In the future, we will be play testing with more youth and families.

REFERENCES

- [1] George Palaigeorgiou, Dimitra Tsapkini, Tharrenos Bratitsis, and Stefanos Xefteris. 2017. Embodied learning about time with tangible clocks. In *Interactive Mobile Communication, Technologies and Learning*. Springer, 477–486.
- [2] Jaemarie Solyst, Alexis Axon, Angela Stewart, Motahhare Eslami, and Amy Ogan. forthcoming. Investigating Girls’ Perspectives and Knowledge Gaps on Ethics and Fairness in Artificial Intelligence in a Lightweight Workshop. *International Conference of the Learning Sciences Annual Meeting 2022* (forthcoming).
- [3] Alexandra To, Jarrek Holmes, Elaine Fath, Eda Zhang, Geoff Kaufman, and Jessica Hammer. 2018. Modeling and designing for key elements of curiosity: Risking failure. *Transactions of the Digital Games Research Association* 4, 2 (2018).