**Understanding and exploring data bias**

**Example of a left handed person writing :**

“A left-handed person writes with their left hand, holding the pen in a way that feels comfortable to them. The hand might move across the page from left to right, but some left-handed individuals may experience difficulty with smudging ink, especially with ballpoint pens, due to the way they hold the pen. Their handwriting style can be slightly different from right-handed people, and they may need to adjust their grip to avoid smudging or crossing over the words they just wrote.”

**Identifying Biases in this Response:**

1. **Assumption of Right-Handed Normativity**:

* The text assumes that the "default" or "norm" is for people to be right-handed. This is a form of bias where the model positions right-handedness as the baseline, and left-handedness is considered an exception. For example, phrases like "slightly different from right-handed people" imply that right-handedness is the standard or "correct" way to write.

1. **Overemphasis on Challenges:**

* The explanation focuses on potential difficulties faced by left- handed individuals (e.g., ink smudging). While these are valid concerns, the language could unintentionally reinforce the stereotype that left-handedness is an inconvenient or inferior trait, rather than simply a different way of doing things.

**3. Stereotypical Representation:**

* The mention difficulty with smudging ink" and "adjusting grip" might unintentionally portray left-handedness as a disability or challenge rather than a natural of " variation in human traits. This reflects a common stereotype that left-handed people are inherently at a disadvantage in a world designed for right-handed individuals.

**Other common AI biases :**

**1. Cultural Bias**

**Description:** This occurs when an AI model reflects the cultural or societal norms inherent in the data it was trained on. In many societies, right-handedness is the dominant norm, and most tools, designs, and systems are built with right-handed individuals in mind.

**Impact:** AI models trained with a right-handed perspective might fail to account for the differences in writing style, posture, and other nuances specific to left-handed writers**.**

**Example**: A handwriting recognition system may have trouble interpreting cursive written by left-handed people, who often write from the opposite direction, leading to smudging or slant issues that right-handed people typically don’t face.

**2. Interaction Bias**

**Description**: Interaction bias occurs when the data collection or interaction with the AI system itself favors certain user behaviors over others. For instance, if an AI system collects data from users in a way that unintentionally favors right-handed users (e.g., designing interfaces or tools for right-handed people), the model may be trained with skewed information.

**Impact:** In the case of AI-driven applications that involve physical or digital writing, left-handed users may not interact with the interface in the way that the model expects, leading to incorrect predictions or poor performance.

**Example**: a handwriting input system might have buttons or features designed for right-handed users, making it harder for left-handed users to interact comfortably.

**3. Task Representation Bias**

**Description**: Task representation bias arises when AI models are trained with a narrow definition of what "normal" or "correct" behavior looks like. In the context of left-handed writing, this could mean that the model is trained mostly on right-handed writing samples, which have different characteristics**.**

**Impact:** If the system is trained on primarily right-handed samples, the AI may not recognize the specific writing patterns of left-handed individuals. For instance, left-handed people often hold their pens at a different angle or may have a distinct slant in their handwriting.

This could lead to poor performance when recognizing or generating handwriting from left-handed individuals, reducing the accessibility of the system for them.

**4. Measurement Bias**

**Description:** This bias occurs when the data collection method or measurement tools do not accurately capture the diversity of real-world scenarios. For instance, many existing datasets of handwriting may be designed around right-handed individuals, inadvertently neglecting the specific features of left-handed writing.

**Impact:**A handwriting recognition system trained on a dataset that doesn’t account for left-handedness may miss out on key features such as the different hand posture and pen movement patterns.

**Example**: an AI model trained to recognize letters may not be as accurate for left-handed users because their writing style may cause different letter formations or positions compared to right-handed users.

**5. Selection Bias**

**Description:** Selection bias occurs when the data used to train the model is not representative of the entire population. In the case of left-handed individuals, most handwriting recognition datasets orstudies might overrepresent right-handed users, as they make up the majority of the population**.**

**Impact:**If left-handed individuals are underrepresented in the dataset, the AI model may not perform well for them. For instance, the system may not generalize to left-handed writing styles, or it may prioritize right-handed features such as pen angle, pressure, or slant.

This results in an unequal performance of AI systems, with left-handed users experiencing lower accuracy or usability.

**Expected Output :**

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| **Bias Type** | **Description** | **Potential Impact** |
| Representation Bias | Occurs when left-handed writing is underrepresented in training data. | AI may fail to recognize or generate left-handed writing styles, leading to poor accuracy or misinterpretation. |
| **Sampling Bias** | |  | | --- | | Happens when the dataset overrepresents right-handed individuals or underrepresents left-handed ones. | | The AI model may perform better for right-handed individuals, reducing accuracy for left-handed users. |
| **Cultural Bias** | Occurs when the AI system reflects dominant cultural norms (e.g., right-handedness as the default). | Left-handed individuals may face difficulty interacting with or using AI models, as they are optimized for right-handed users. |
| **Interaction Bias** | Bias introduced by the design of AI systems, favoring right-handed user behavior in data collection. | Left-handed users may struggle with AI interfaces designed primarily for right-handed individuals, leading to errors |
| **Task Representation Bias** | Occurs when AI models are trained with an incorrect or narrow definition of handwriting. | Models may not perform well with left-handed handwriting, due to differences in posture, slant, or movement. |
| **Measurement Bias** | Introduced when the measurement tools or data collection methods do not accurately capture left-handed writing. | The model may not properly account for the unique characteristics of left-handed writing, leading to inaccurate results. |
| **Selection Bias** | Occurs when the data used for training the model is not representative of the entire population. | Left-handed writing may be underrepresented, resulting in poor model performance for left-handed individuals. |

**References and Further Reading :**

Google's AI Principles:[**https://ai.google/responsibility/principles/**](https://ai.google/responsibility/principles/%20)

OpenAI’s Bias Research**:** [**https://openai.com/research/**](https://openai.com/research/%20)

MIT AI Ethics:[**https://www.media.mit.edu/groups/ai-ethics-and-governance/overview/**](https://www.media.mit.edu/groups/ai-ethics-and-governance/overview/)