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EDSURVEY TEAM

EdSurvey-GPT

Generative AI Chatbot for Supporting LSA Analysis

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Meet our Amazing EdSurvey Team!

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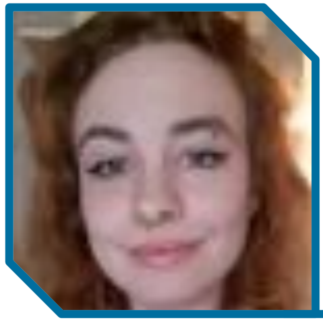
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Why develop EdSurvey-GPT?

- It can be hard to learn a new package – we want to help users navigate the wide array of EdSurvey materials, including function documentation, trainings, vignettes, and the EdSurvey user guide
- Complex analysis requires complex functions - EdSurvey-GPT is intended to make analysis of large scale assessment data more accessible to researchers
- Provide on-demand support to users that doesn't rely on the availability of EdSurvey developers
- R code is underrepresented in the training corpuses of current LLMs, and even still is limited to the context of packages used by a broad audience (e.g. tidyverse, ggplot). Consequently, baseline bots aren't well suited to answering package specific questions.

Note. Placeholder for notes, sources, and permissions (if needed). "*Note.*" (including a period) is italicized.

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Building EdSurvey-GPT

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- Existing EdSurvey materials were distilled into text optimized for creating vector embeddings
- We here define a “document” as a portion of text (to include both natural language and code) that may or may not have some associated metadata (e.g. for a document from a PDF, the page number may be stored as metadata)
- Content is divided into 5 separate corpuses:
  - Documents from EdSurvey training materials
  - Documents from EdSurvey vignettes
  - Documents from the EdSurvey user guide
  - Documents from manually prepared text files for each function. These include: function name, description, parameters along with their default values and descriptions, details (as applicable), and a description of the return object and its components
  - Documents from manually prepared JSON files for each function, containing several excerpts of example code alongside a detailed explanation of what the code is doing

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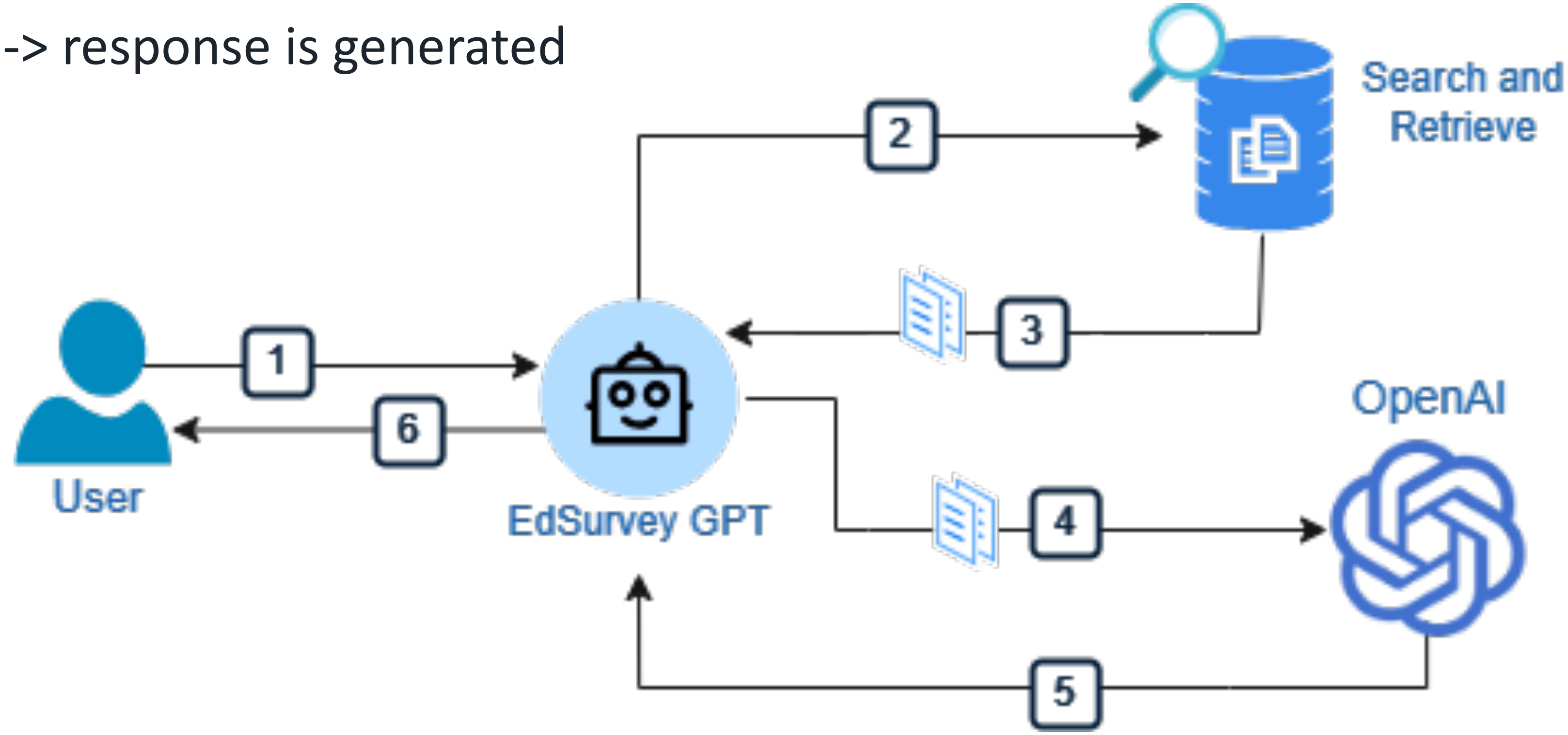
Building EdSurvey-GPT

- EdSurvey GPT uses a **R**etrieval **A**ugmented **G**eneration (**RAG**) pipeline
- User submits a query -> top documents are retrieved -> query and documents are sent to LLM -> response is generated



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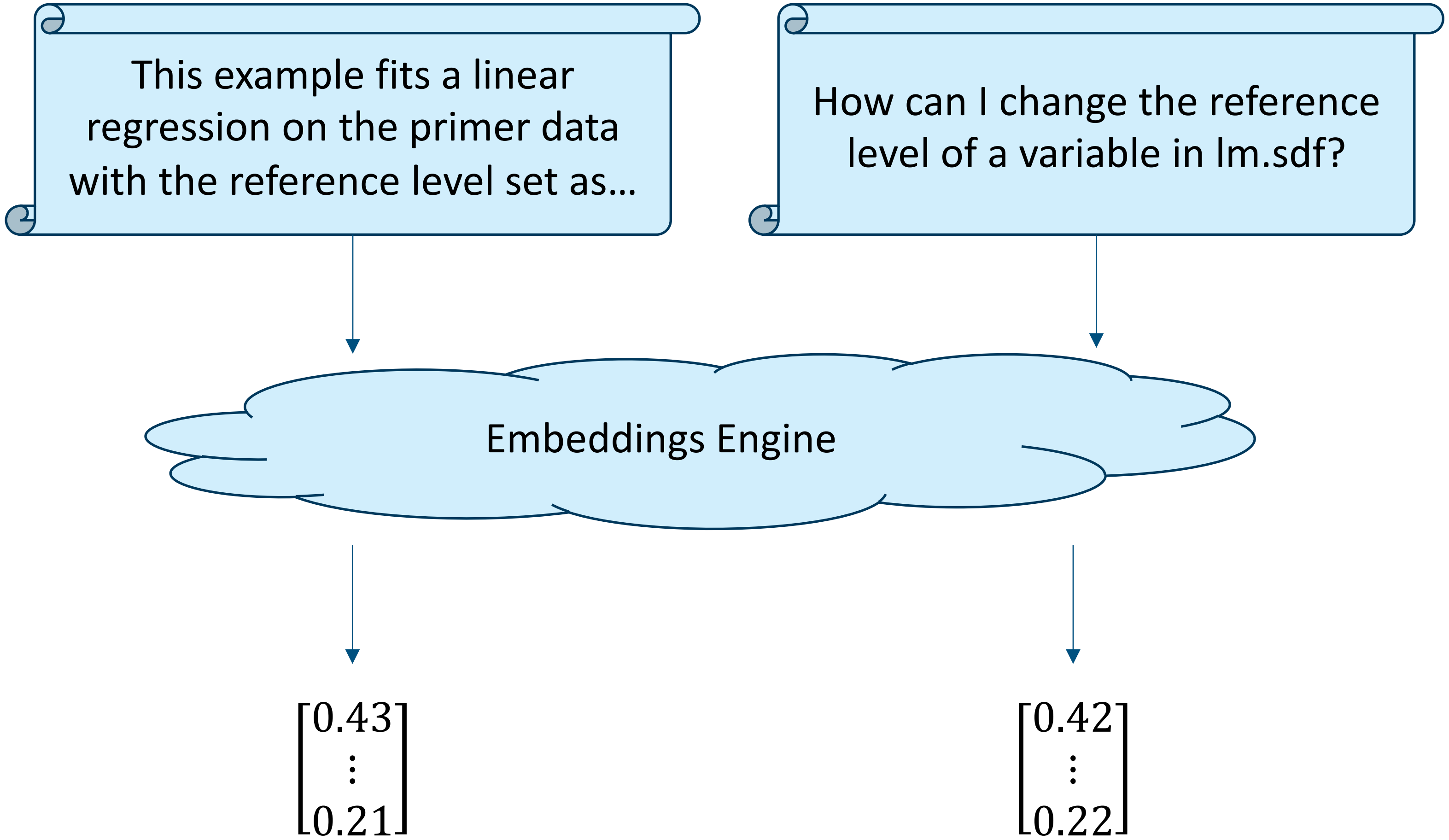
Proximity of Text

- Projection is the math term for taking something from one space to another – in this case, text is projected into a numeric vector
- The documents whose text contents are closest to the query, as measured by the cosine similarity of their embeddings vectors, are used



This example fits a linear regression on the primer data with the reference level set as…

How can I change the reference level of a variable in lm.sdf?

Embeddings Engine

$$\begin{bmatrix}0.43\\ \vdots \\ 0.21\end{bmatrix}$$

$$\begin{bmatrix}0.42\\ \vdots \\ 0.22\end{bmatrix}$$

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EdSurvey-GPT vs ChatGPT

EdSurvey-GPT vs ChatGPT

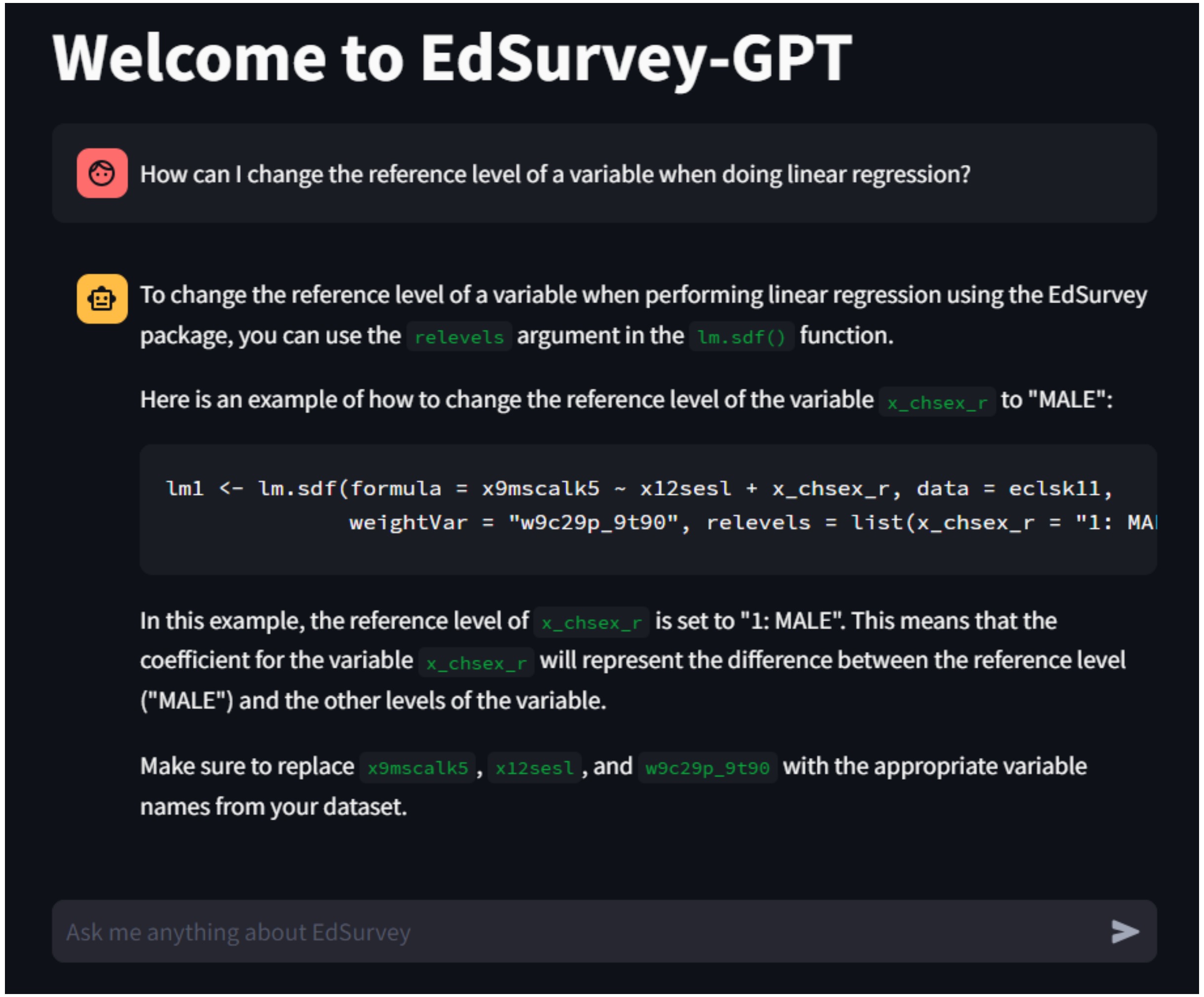
EdSurvey-GPT:

- Context aware (no need to specify “EdSurvey” in your queries)
- Tailored knowledge base
- Concise answers

ChatGPT:

- Not context aware - have to pad all queries with additional context (e.g. specifying the EdSurvey package and names of functions)
- Broad knowledge base, resulting in hallucinations (e.g. made up function names)
- Lengthy answers that can feel overwhelming given the scope of the question

EdSurvey-GPT vs ChatGPT



Welcome to EdSurvey-GPT

How can I change the reference level of a variable when doing linear regression?

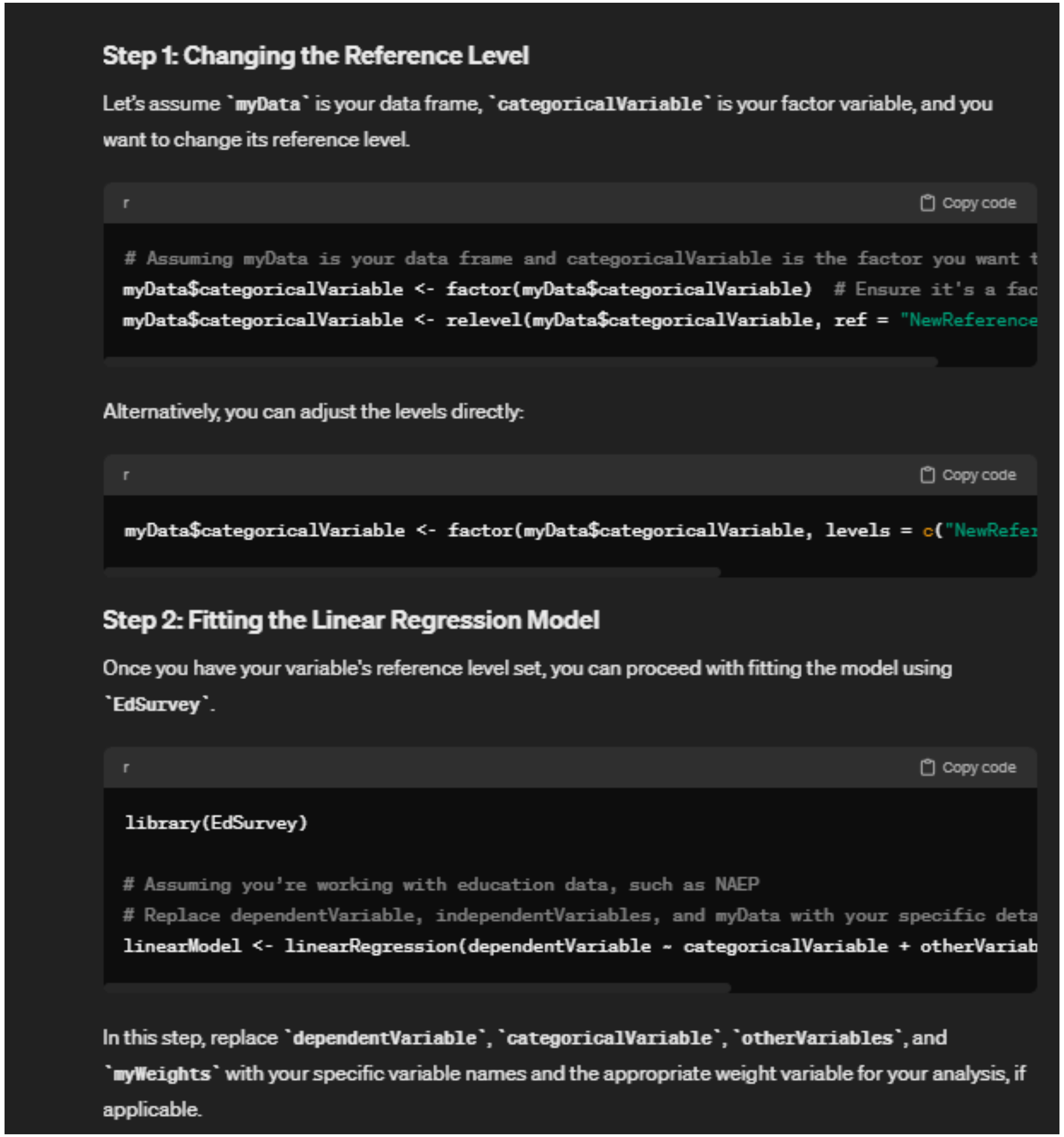
To change the reference level of a variable when performing linear regression using the EdSurvey package, you can use the `relevels` argument in the `lm.sdf()` function.

Here is an example of how to change the reference level of the variable `x_chsex_r` to "MALE":

```
lm1 <- lm.sdf(formula = x9mscalk5 ~ x12sesl + x_chsex_r, data = eclsk11,
              weightVar = "w9c29p_9t90", relevels = list(x_chsex_r = "1: MA
```

In this example, the reference level of `x_chsex_r` is set to "1: MALE". This means that the coefficient for the variable `x_chsex_r` will represent the difference between the reference level ("MALE") and the other levels of the variable.

Make sure to replace `x9mscalk5`, `x12sesl`, and `w9c29p_9t90` with the appropriate variable names from your dataset.



Step 1: Changing the Reference Level

Let's assume `myData` is your data frame, `categoricalVariable` is your factor variable, and you want to change its reference level.

```r
# Assuming myData is your data frame and categoricalVariable is the factor you want t
myData$categoricalVariable <- factor(myData$categoricalVariable)  # Ensure it's a fac
myData$categoricalVariable <- relevel(myData$categoricalVariable, ref = "NewReference
```

Alternatively, you can adjust the levels directly:

```r
myData$categoricalVariable <- factor(myData$categoricalVariable, levels = c("NewRefer
```

Step 2: Fitting the Linear Regression Model

Once you have your variable's reference level set, you can proceed with fitting the model using `EdSurvey`.

```r
library(EdSurvey)

# Assuming you're working with education data, such as NAEP
# Replace dependentVariable, independentVariables, and myData with your specific deta
linearModel <- linearRegression(dependentVariable ~ categoricalVariable + otherVariab
```

In this step, replace `dependentVariable`, `categoricalVariable`, `otherVariables`, and `myWeights` with your specific variable names and the appropriate weight variable for your analysis, if applicable.

Capabilities and Limitations

Within scope:

- Provide examples of using a function
- Explain function arguments and outputs
- Simple code debugging
- Recommend functions for a type of analysis

Outside of scope (for now!):

- Generate code for any EdSurvey supported assessment that correctly incorporates the survey-specific variables
- Complex code debugging
- Seamless integration with other R packages for data manipulation and visualization

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Demo

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