Existing natural language interfaces (NLIs) for data exploration focus on providing answers to questions, with few offering explanations or presentations of the data analysis pipeline used to uncover the answer. Such presentations are important in exploratory data analysis (EDA), improving interpretability, reliability, and aiding users in understanding the analysis process and gaining insights.

We introduce Urania, an NLI that visualizes data analysis pipelines for answering input questions. It utilizes a novel language model to generate an analysis pipeline that solves a user’s question, and then presents the pipeline and the answer as a datamation, with animated operations and data changes.

### Workflow

1. **Upload Data**
2. **Question-Data Linking**
3. **Question Decomposition**
4. **Datamation Generation**
5. **Visualization**

### Urania

- **Input Question**
- **Data View**
- **Datamation View**
- **Key-Frame View**

### Algorithm

- We introduce a data-aware question decomposition algorithm that is able to incorporate the data-question links in the question decomposition process to generate more accurate data analysis pipelines.

### Evaluation

We conducted interviews with three domain experts. They are asked to explore a dataset with two NLI systems, Urania and Tableau Ask Data.

Experts agree that:
1. **Urania** offers an intuitive and reliable way to perform EDA, with verification and protection against false discoveries.
2. Its interactive features streamline exploration, and personalized sessions make users feel in control.
3. Urania strikes a balance between manual and automatic exploration.

**Example of Urania (1-5) and Ask Data (A) responded to experts’ questions**