

# User Study Concept --- Enhanced Polar Diagrams

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[1] Tory, M. (2014). User Studies in Visualization: A Reflection on Methods. In: Huang, W. (eds) Handbook of Human Centric Visualization. Springer, New York, NY. [https://doi.org/10.1007/978-1-4614-7485-2\\_16](https://doi.org/10.1007/978-1-4614-7485-2_16)

## The Purpose

Using [1] we classify our user study as an "Evaluation", and more specifically a type of evaluation where we want to "Compare visualization techniques, tools, or interaction techniques".

We plan to utilize a users study known as "Usability study" and collect data via a Questionnaire.

In essence, we compare the original polar-diagrams library with the new enhanced version that contains overview+detail, small multiple, aggregation, filtering, and Cartesian linking. We want to see if clutter reduction is mitigated and comprehension improved.

## Research Aims

We aim to answer the following two questions and address multiple context details within each of them:

1. Compared to the existing implementation do overview+diagram, aggregation, filtering, and Cartesian linking allow users to easier read and understand the summary polar diagrams while ensuring better information retention?
  1. The improved diagrams should be domain-agnostic and target both practitioners and scientists.
  2. The users should be able to solve tasks such as: Model similarity assertion Cluster detection Exclude models that are of no interest Statistical vs. information-theoretic metric comparison
  3. The tasks are deemed successful if the users are able to:
    1. Easily rank models according to their similarity with the reference model
    2. Detect model clusters and number them
    3. Select or de-select and highlight models that are of interest
    4. Compare the sensitivity of metrics by checking for outliers and patterns in both Taylor and MI diagrams. The users should be able to see if the models are linearly related to the reference model or not
2. Compared to the existing implementation does small multiple technique help users better exploit the dynamics-tracking feature of the summary polar diagrams?
  1. The improved diagrams should be domain-agnostic and target both practitioners and scientists.
  2. The users should be able to solve tasks such as:
    1. Track model performance across multiple versions or time points
    2. Exclude models that are of no interest
    3. Statistical vs. information-theoretic metric comparison
  3. The tasks are deemed successful if the users are able to:

1. Detect if model performance increases or decreases in each small multiple
2. Select or de-select and highlight models that are of interest
3. Compare the sensitivity of metrics by checking for outliers and patterns in both Taylor and MI diagrams. The users should be able to see if the models and their multiple versions are linearly related to the reference model or not

## Research Methods and Experimental Designs

The data for the study is collected using an online questionnaire. The questions are designed to allow easy comparison between the polar-diagrams library and its new enhanced version. The users are supposed to answer multiple-choice questions after trying to solve a specific task. Time is measured for solving each task, both for the old polar-diagrams library and the new enhanced version.

We used the following tool to interview participants:

The questions are as follow:

1. First
2. Second

## Ethical Considerations

The questionnaire collects only study-related and demographics data, hence ensuring maximum privacy protection of the participants.

Study-related data is in the form of questions listed in the previous section.

Demographics data is consisted of the following features:

1. Gender (multiple options)
2. Age group (each age group is given in ten years increments, starting with 20-30 and ending with 70-80)
3. Field of experience (multiple options)
4. Experience with charts in polar coordinate system (yes or no)
5. Experience with the summary polar diagrams such as the Taylor and Mutual Information diagrams (yes or no)