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# Visualizations memorability through visual attention and image features

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## Abstract

Years ago, data visualizations were almost exclusively used for decision making and data analysis. However, recently visualizations are more utilized for marketing sales tools and many other tasks; and therefore more memorable visualizations are desirable. Thus, studying memorability and automatically assessing visualizations or images memorability is becoming a challenging topic in computer vision. This topic purpose is to list and analyze the characteristics of memorable visualizations/images, in order to establish a predictive model for memorability. Previous methods mainly use techniques to analyze visualizations memorability. In this paper, we use data related to visual attention combined with image features to significantly study visualizations memorability and construct a representative model of visualization memorability. We test our proposed method on MASSVIS data set, by using different classification methods and we significantly reach performed classification rates.

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*Keywords:* visualization memorability; classification; visual attention; local features

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## 1. Introduction

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In our days, we are surrounded by many elements like charts, graphs, and infographics; in fact, data visualization is the visual representation of data by using these elements. Data visualization is increasingly becoming interactive by allowing viewers to engage with the representation for deeper analysis and insights or a shifted perspective. Actually, data visualization is the graphical display of abstract information for data analysis and communication [1]. But, what makes a data visualization memorable? What visual elements do people precisely pay attention to when examining visualizations? What exactly do people recall about visualizations? Researchers in [2] conducted a large user study on visualizations, by integrating multiple research methods, including eye-tracking, text recall, and memory tests.

Visual attention is the process by which the Human Visual System (HVS) is able to select, from a given scene, regions of interest that contain salient information, and thus, reduce the amount of information to be processed [3]. Our perception of an image is developed by a combination of attention, eye movements, and memory. Visualization is a combination of different elements which can attract human perception for further processing to reach human memory and then memorability. In this work, we study the utility of using features related to visual attention and others extracted from visualization in order to establish a representative model of visualizations memorability. Actually; we employ eye tracking datasets to get some features related to visual attention and others related to visualization content. Also; we use SIFT and SURF features extracted from visualizations. Later; we collect these features to get a vector of descriptors which will be employed for visualizations memorability assessment based on classification. Thus, memorability classes are obtained according to visualizations scores calculated in a memory game [4]. Fig. 1 represents an overview of our approach.

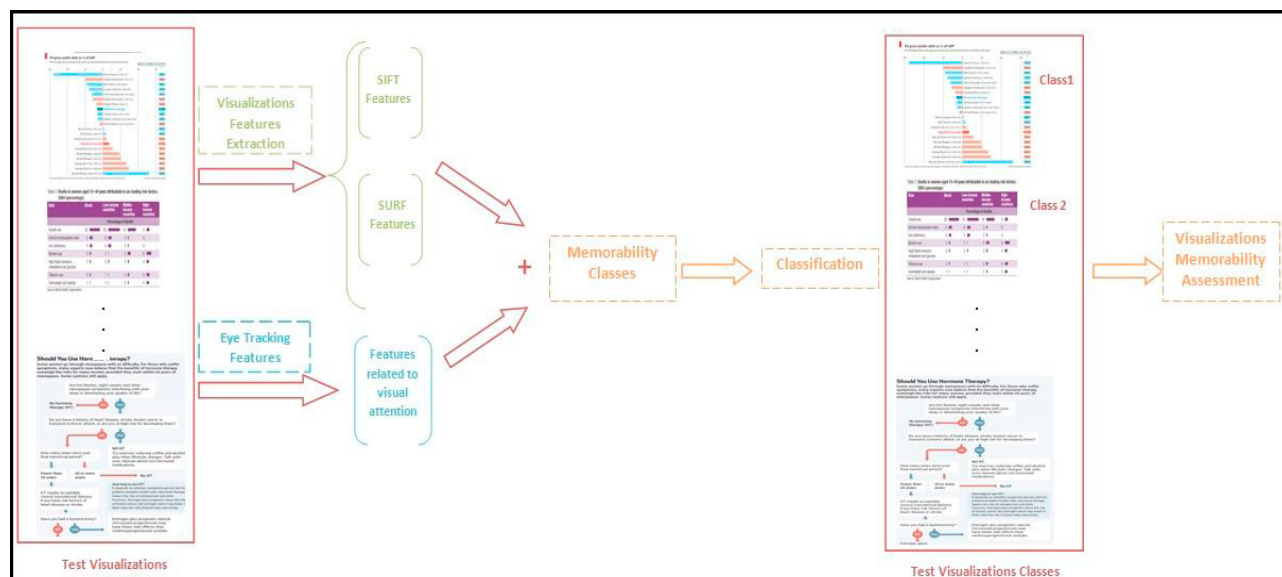


Fig. 1. An overview of our approach.

The rest of this paper is organized as follows: Section 2 gives related work. Then, Section 3 presents an overview for the two different features we have employed in our paper. In Section 4, we expose classification methods used to evaluate our proposed approach. In Section 5, we investigate the proposed features and memorability scores based on classification. Section 6 concludes the paper and gives some perspectives.

## 2. Related work

In a recent study [4], Borkin et al. demonstrate that memorability is a measurable index and it is specific to each visualization. First, the authors collected 2,070 single-panel visualizations from different sources, categorized into visualization types (e.g., bar chart, line graph, etc.). Participants in this study were shown series of visualizations and then were asked to indicate which visualizations they saw more than once. Later, they assign memorability scores for hundreds of these visualizations (Fig. 2), and they find that these score are consistent between observers. Memorability score is defined as the percentage of correct detection by participants.

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