Visual Analytics for Big Data with the focus on Mixed Reality - an Exploration -

Marina Tropmann-Frick

marina.tropmann-frick@haw-hamburg.de

HAW HAMBURG

Professor for Data Science
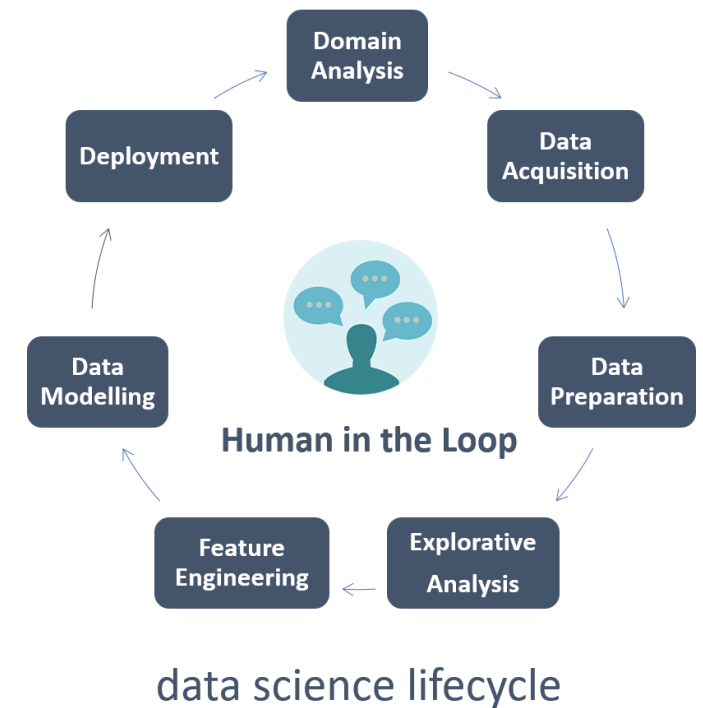
University of Applied Sciences Hamburg

Technical Faculty

Department of Computer Science

Research Topics

- Data Management, Engineering and Analysis
- Predictive and Visual Analytics
- Explainable AI / Machine Learning
- Human in the Loop
- Privacy and Ethics in Data Science

data science lifecycle

Visual Analytics

- Often defined as the science of analytical reasoning facilitated by interactive visual interfaces

- By combining methods from Interactive Visualization with Machine Learning and other automated techniques, Visual Analytics seeks to improve the process of knowledge discovery of complex structured, unstructured data, heterogeneous high velocity data

- Visual Analytics focuses on the whole analytical process and is not limited to visualization and automated analysis. It also includes the entire infrastructure for creating visual analytics tools.

- Processing power and capacity of existing technologies allow to implement visual analytic techniques to huge amounts of heterogeneous and dynamic data (Big Data)

Mixed Reality

- There are several stages between real and virtual worlds
- The transition from one environment to the other cannot always be divided into some clear steps
- The term XR describes the whole bandwidth between reality and virtuality, including augmented reality and augmented virtuality
- Due to the complex concepts behind mixed reality, it is more appropriate to implement them to domains with highly dimensional and unstructured data where other techniques cannot be used
- This approach is gaining more and more importance due its abilities of integrating human knowledge into computational data processing

Visual Analytics for Big Data

- Most of the time we use our cognitive perception and visual intelligence to generate meaning from signals (and/or data) from our surroundings

- Interactive technologies not only make it possible to visualize data, but at the same to perform some data manipulations

- At the same time systems can use feedback from users or experts during the analytical process → *Human in the Loop* – Concept

- Classic Visualizations that show as much information as possible at once mostly have a problem with data that is both spatial and temporal

Using the advantages of Mixed Reality

- An additional dimension
- Ability to realize more complex animations
- Especially useful displaying spatial data
- Stereoscopy as a part of virtual and mixed reality allows to visualize three-dimensional data without dimension reduction
- 3D displays usually use the binocular parallax cue (disparity) to create an impression of depth
- The representation of depth is in this case a simulation of the depth perception process through our visual system

- Often such applications contain a mixture of animation, spatial representation, diverse interaction and suitable visualization of useful parameters

Discussion

- Our paper presents an overview of approaches in the direction of how Mixed Reality techniques can be used for better visualization and support analyzing Big Data

- The form of visualization of the data can be optimized in such a way that multidimensional data can be presented in a more understandable way

- One of the nice examples is the Google Earth VR application, which enables a user to travel in virtual space to any place on Earth

- The combination of big data with augmented reality in the form of assistants for navigation can simplify our everyday life in the future

M. Tropmann-Frick

Thank you!

Marina Tropmann-Frick

marina.tropmann-frick@haw-hamburg.de

HAW
HAMBURG