

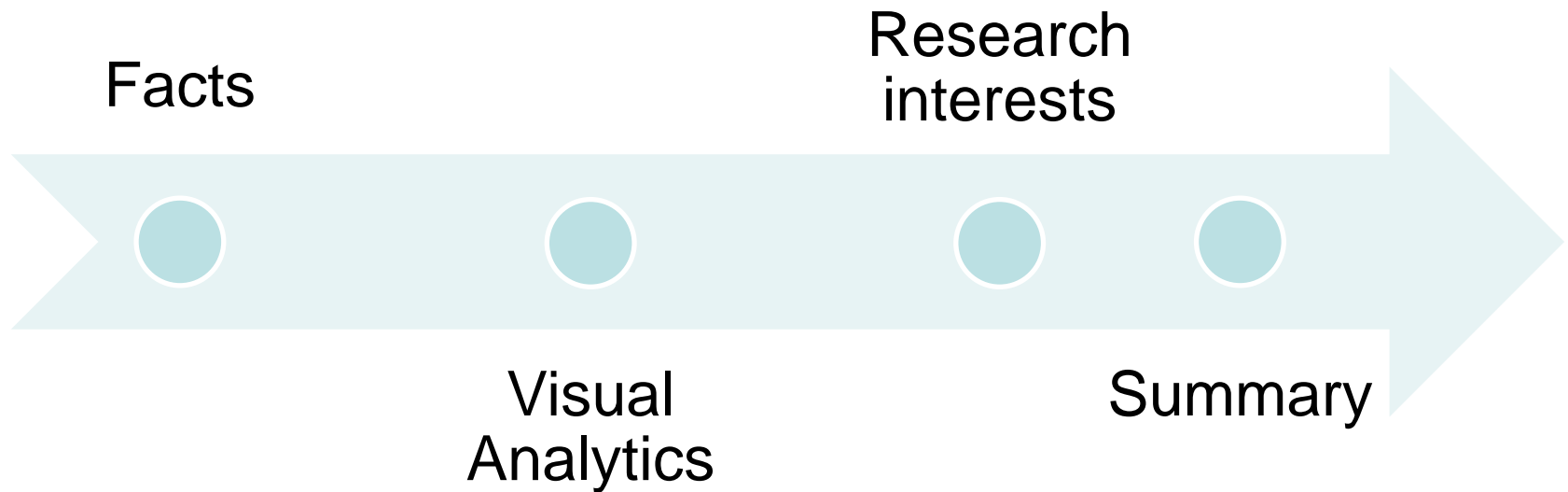
# Visual Analytics

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# Outline



## About: Me

- Ph.D. studies started in January 2011
- Working topic: “Visual Analytics”
- Format: collection of papers
- Supervisors: Tommi Kärkkäinen, Anneli Heimbürger, Sami Äyrämö
- Dissertation by the end of 2015

# Research plan

- Several phases:
  - Litterature review
  - Identification of key methods
  - Application of choosen methods
  - Modifications to choosen methods
  - Test
- One accepted article, second under work

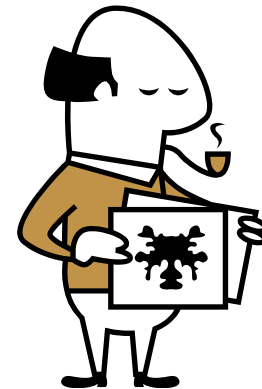
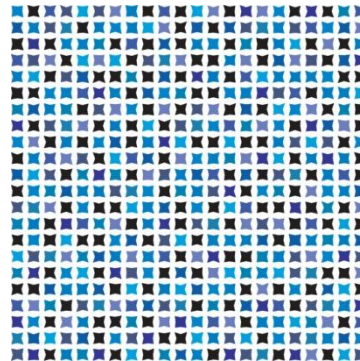
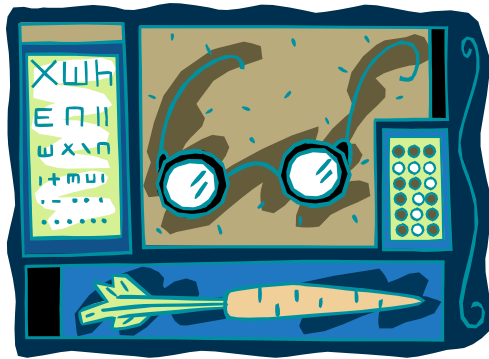
# Visual Analytics: Motivation

- Huge amount of digital data available from many sources.
- Data is often inconsistent, containing outliers and noise.
- There is plenty of efficient methods and computational power.
  - How to use them to solve a problem?

<http://www.youtube.com/watch?v=K9PvskathGI>

# Visual Analytics: Introduction

- Visual analytics is *not*:
  - Computer vision
  - Image recognition
  - Psychoanalysis of the researcher



# Visual Analytics: Introduction

- Way of solving problems
- Many application areas:
  - Health care, Astronomy, Information security, Monitoring the climate, Literature, Financial market, etc.
- Definition:
  - Visual analytics is the science of analytical reasoning, facilitated by interactive visual interfaces.<sup>1</sup>

<sup>1</sup> A. Thomas and K. Cook, *Illuminating the path: The Research and Development Agenda for Visual Analytics*, National Visualization and Analytics Center, 2004.

# Three main categories

- Human-computer interaction
  - Collaboration between researchers
  - Design of the interface
- Visualization
  - Visualization of the results
  - Implementation of the interface
- Data mining
  - Automated data processing



# Human interaction

- Visual interface grants the highest data transfer rate between human and computer
- Collaboration between researchers of different fields
- Design of graphical user interface is important
  - Cognition science
- Keywords:
  - Usability
  - Understandability
  - Scalability
  - Shareability

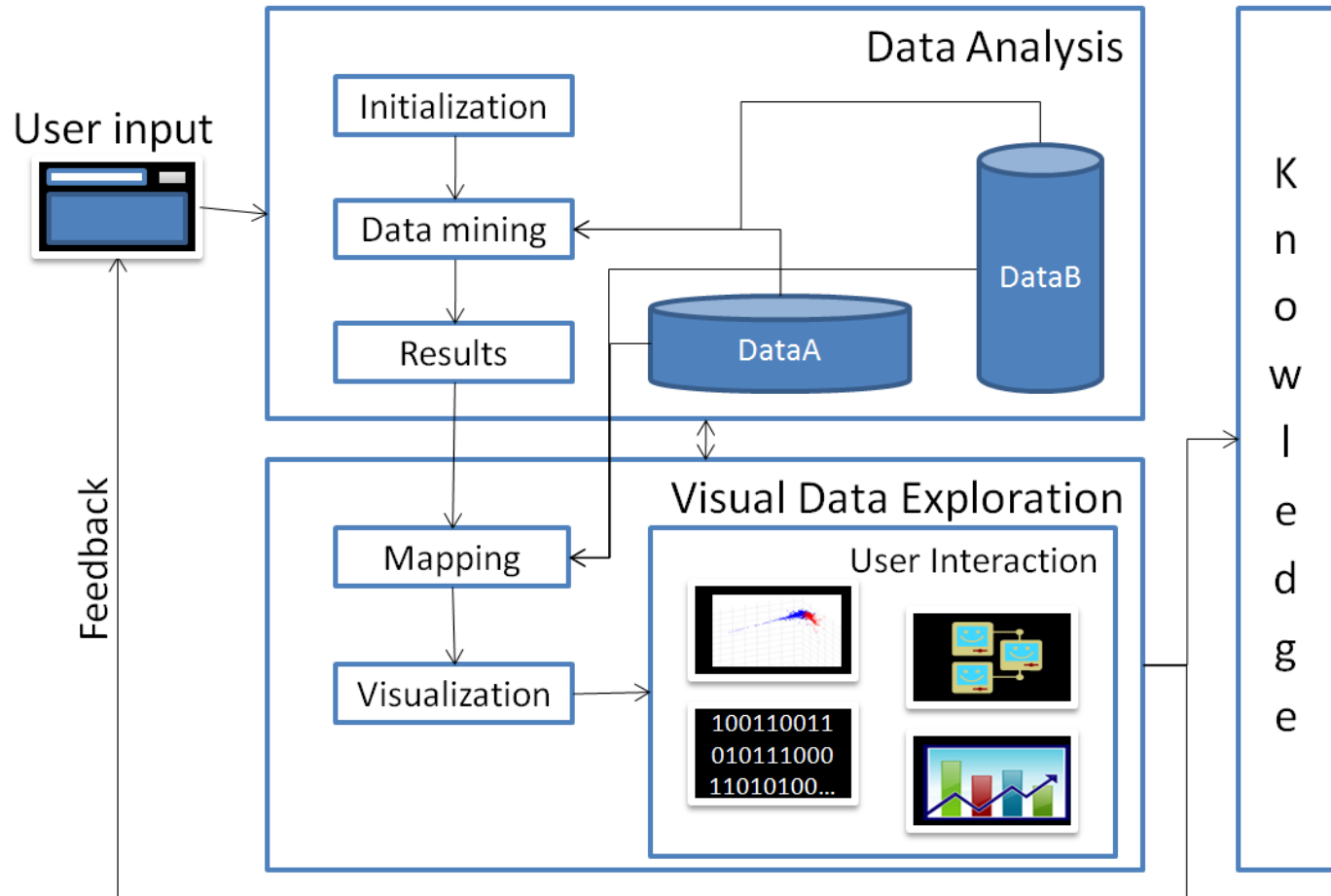
# User Interface

- Scalable interface is important in solving problems
- Different layouts
- Versatile interaction possibilities
  - Scrolling, panning, zooming, etc.
- Visualization methods
- Real-time performance
- Projecting high dimensional data to 3D

# Data Transformation

- Data mining methods
  - Dimension reduction, clustering, classification, ...
- Data from the real world is difficult
  - Outliers, noise, missing data
  - Robust methods required
- Different data types
  - Time series, spatio-temporal data
- Produces numerical results

# Model of Visual Analytics



# Research interests

- Energy production
  - System to control the input and predict the output
- Information security
  - Scalable intrusion detection and monitoring system with different UI
- Context in Visual analytics
  - From data and user point of view

# Summary

- For solving big problems
  - A lot of data required
- Visual analytics provides tools for multidisciplinary projects
- Humans are “integrated” into the system
- Heavy computing
- Lot of work in the area of Visual analytics

Ad: subjects for Bachelor and Master’s thesis

# Questions & Comments



Thank you!