Discovering, Visualizing and Sharing Knowledge through Personalized Learning Knowledge Maps
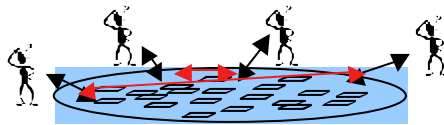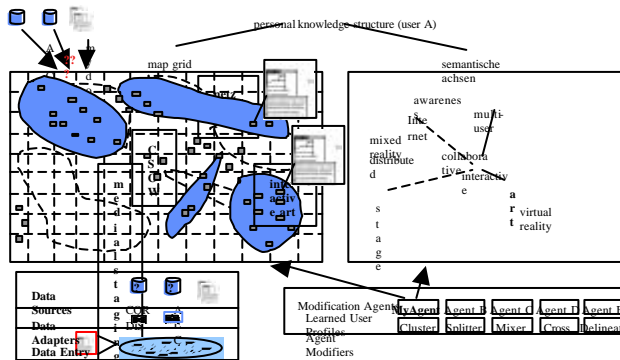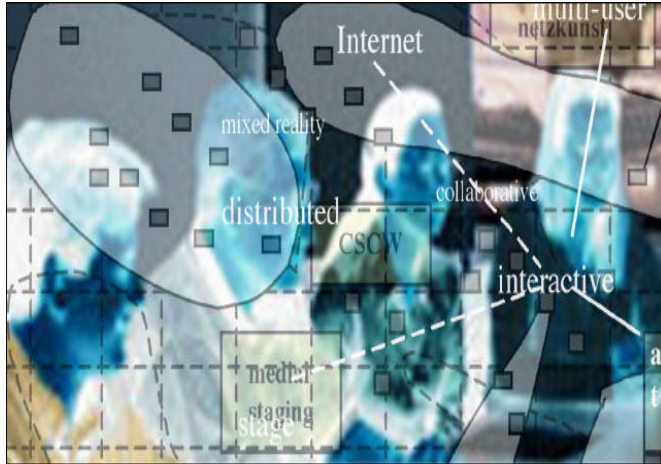
The AWAKE Project

Jasminko Novak,
Michael Wurst

Context and Challenge

Support for heterogeneous expert communities

Discovering connections across different domains

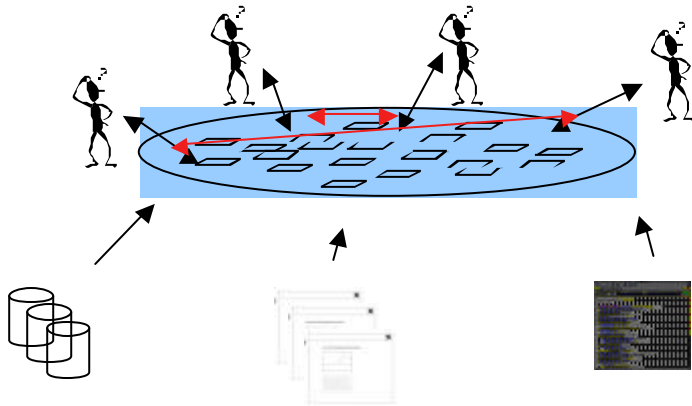Exchange of knowledge between individual experts

Challenge:

Capture, visualize and exchange existing knowledge of user groups

Practical Approach

Situation: Group of users explores an information space

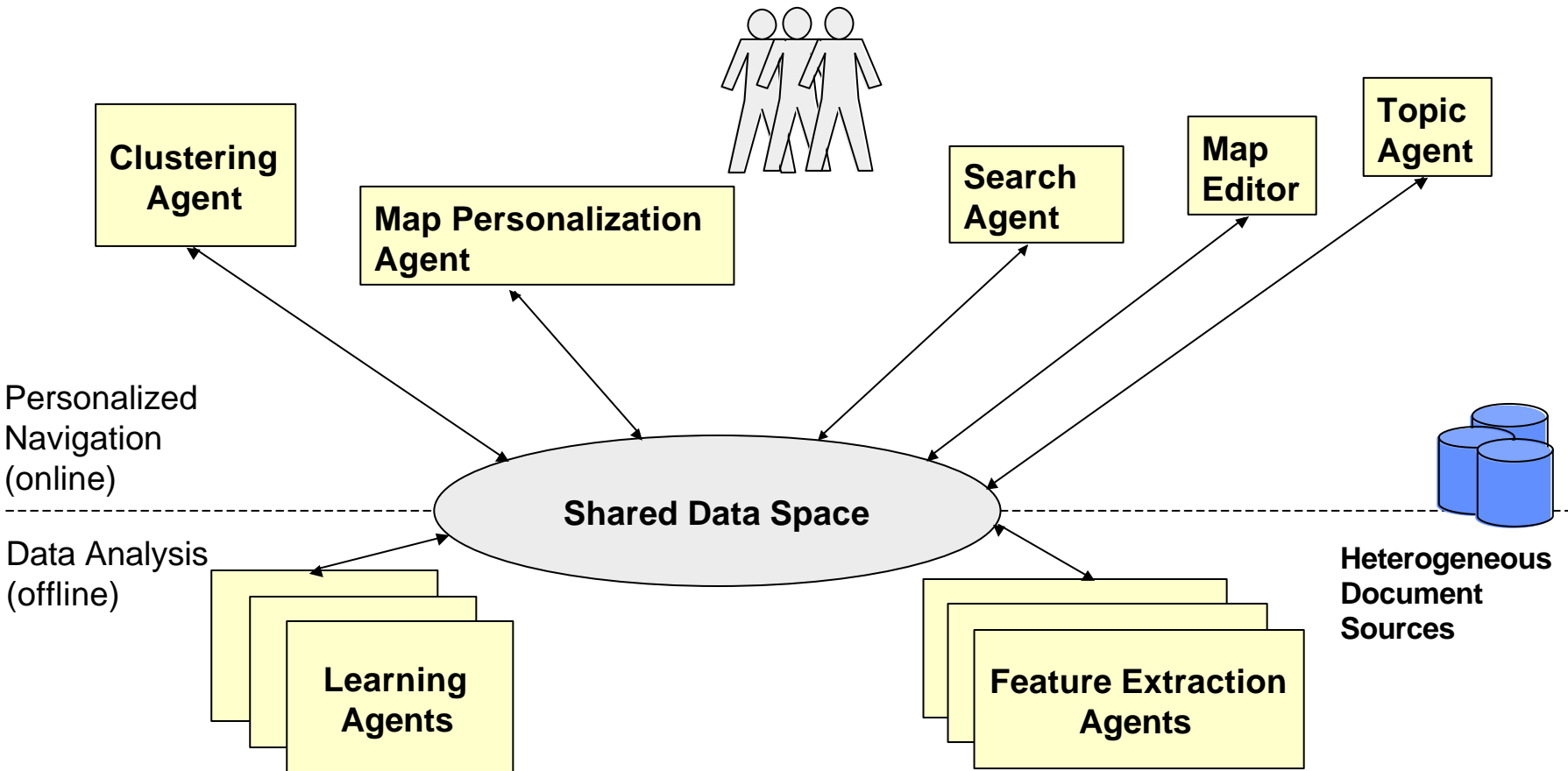**Goal:** Capture user knowledge reflected in their interaction with information

1) Creating a context for the interpretation of users' structuring actions

2) Acquisition and visualization of similarity relations between users, documents and topics
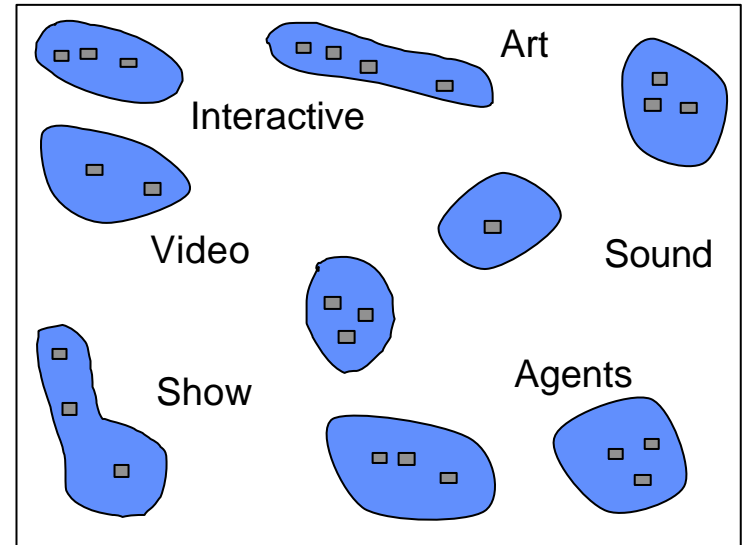
Knowledge Maps

Agent Architecture

Clustering Agent

Map Personalization Agent

Search Agent

Map Editor

Topic Agent

Personalized Navigation (online)

Data Analysis (offline)

Shared Data Space

Learning Agents

Feature Extraction Agents

Heterogeneous Document Sources

Personal Agents

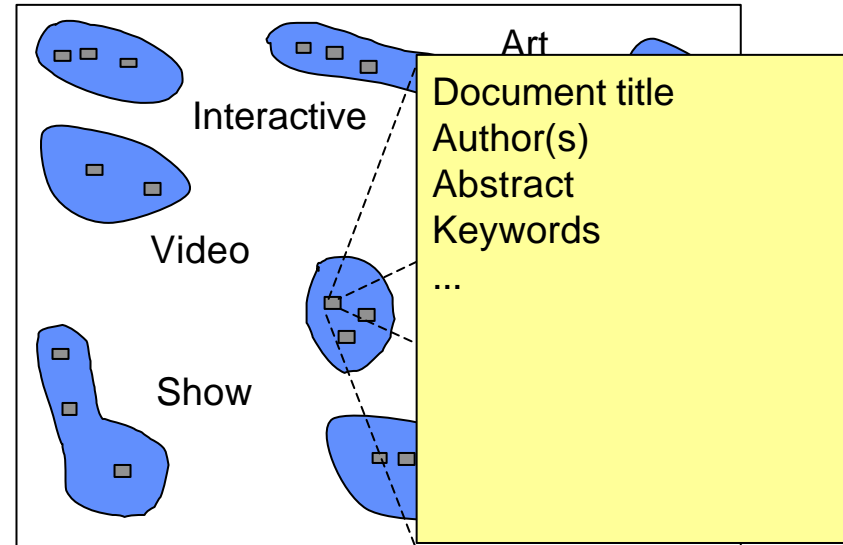## System generated Knowledge Maps

- System generated Knowledge Maps
- Detailed document information
- Related (similar) documents
- Personal Map Editor
- Search for Personal Maps
- Document pool personalization
- Topic network

Art

Interactive

Video

Sound

Show

Agents

Personal Agents

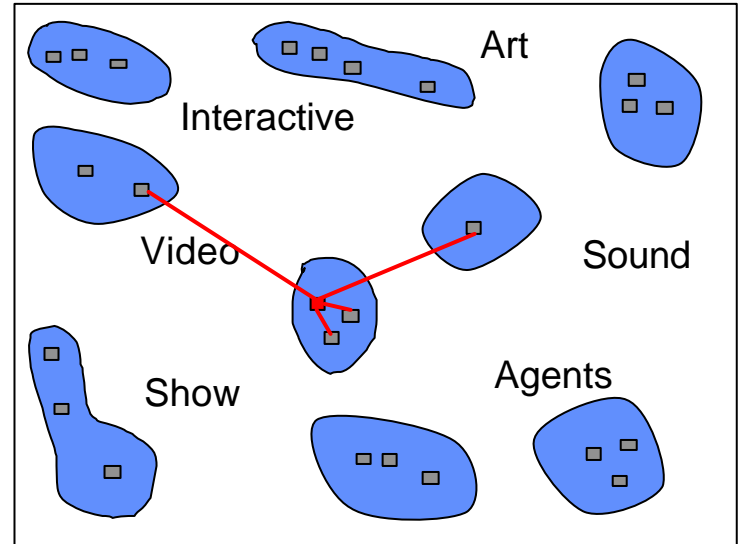## System generated Knowledge Maps

- System generated Knowledge Maps

- Detailed document information

- Related (similar) documents

- Personal Map Editor

- Search for Personal Maps

- Document pool personalization

- Topic network

Art

Interactive

Video

Show

Document title
Author(s)
Abstract
Keywords
...

Personal Agents
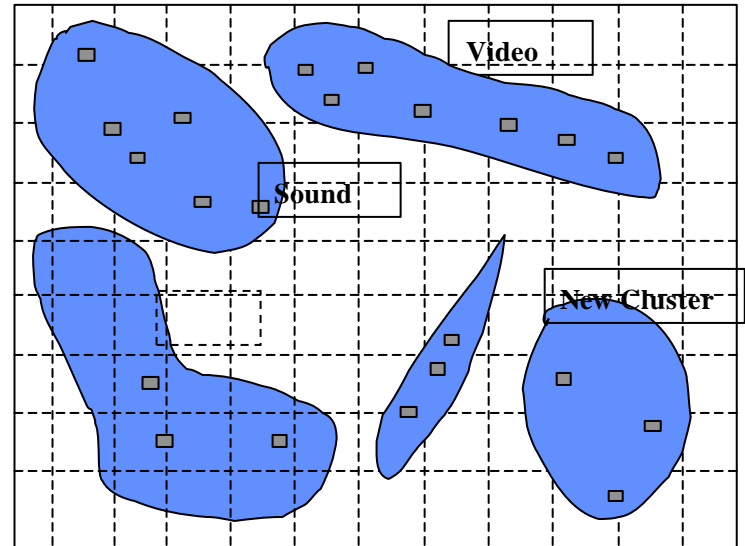
System generated Knowledge Maps

- System generated Knowledge Maps

- Detailed document information

- Related (similar) documents

- Personal Map Editor

- Search for Personal Maps

- Document pool personalization

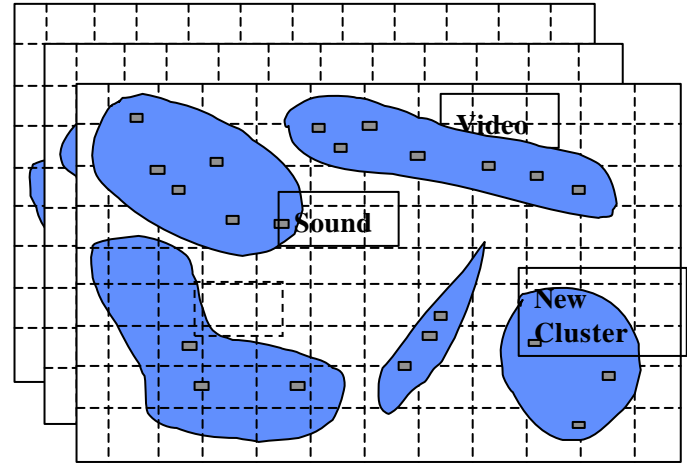- Topic network

Personal Agents

Personal Knowledge Maps

- System generated Knowledge Maps

- Detailed document information

- Related (similar) documents

- Personal Map Editor

- Search for Personal Maps

- Document pool personalization

- Topic network

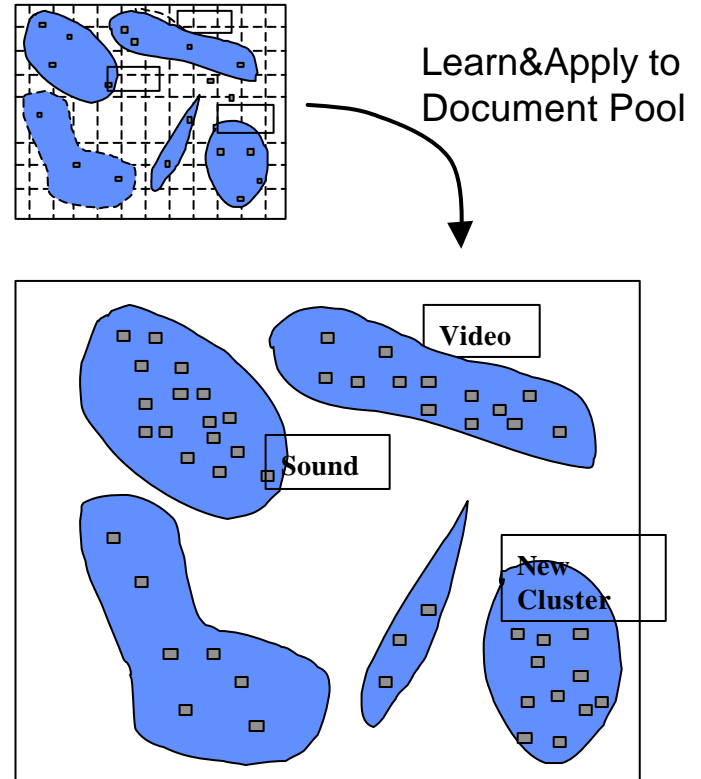# Personal Agents

Search for Personal Knowledge Maps

- System generated Knowledge Maps

- Detailed document information

- Related (similar) documents

- Personal Map Editor

- Search for Personal Maps

- Document pool personalization

- Topic network

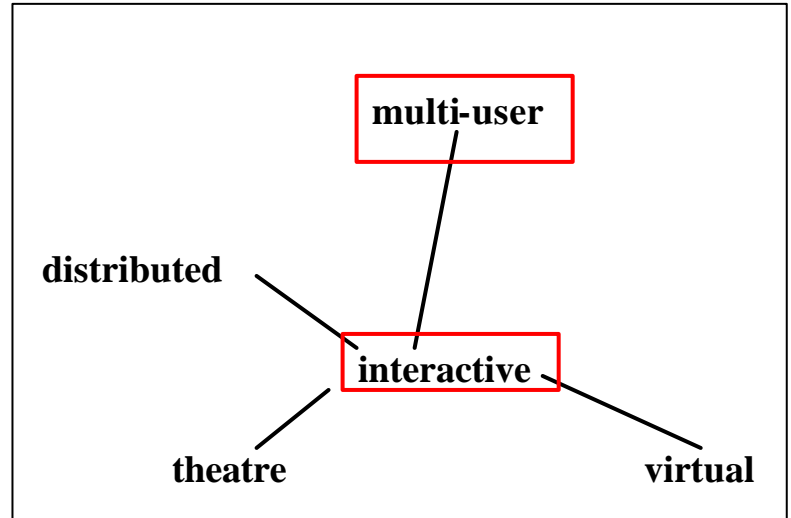# Personal Agents

Personalized Knowledge Maps

- System generated Knowledge Maps
- Detailed document information
- Related (similar) documents
- Personal Map Editor
- Search for Personal Maps
- Document pool personalization
- Topic network

Learn&Apply to
Document Pool

Video

Sound

New
Cluster

Personal Agents

Creating a Collaborative Topic Net

- System generated Knowledge Maps

- Detailed document information

- Related (similar) documents

- Personal Map Editor

- Search for Personal Maps
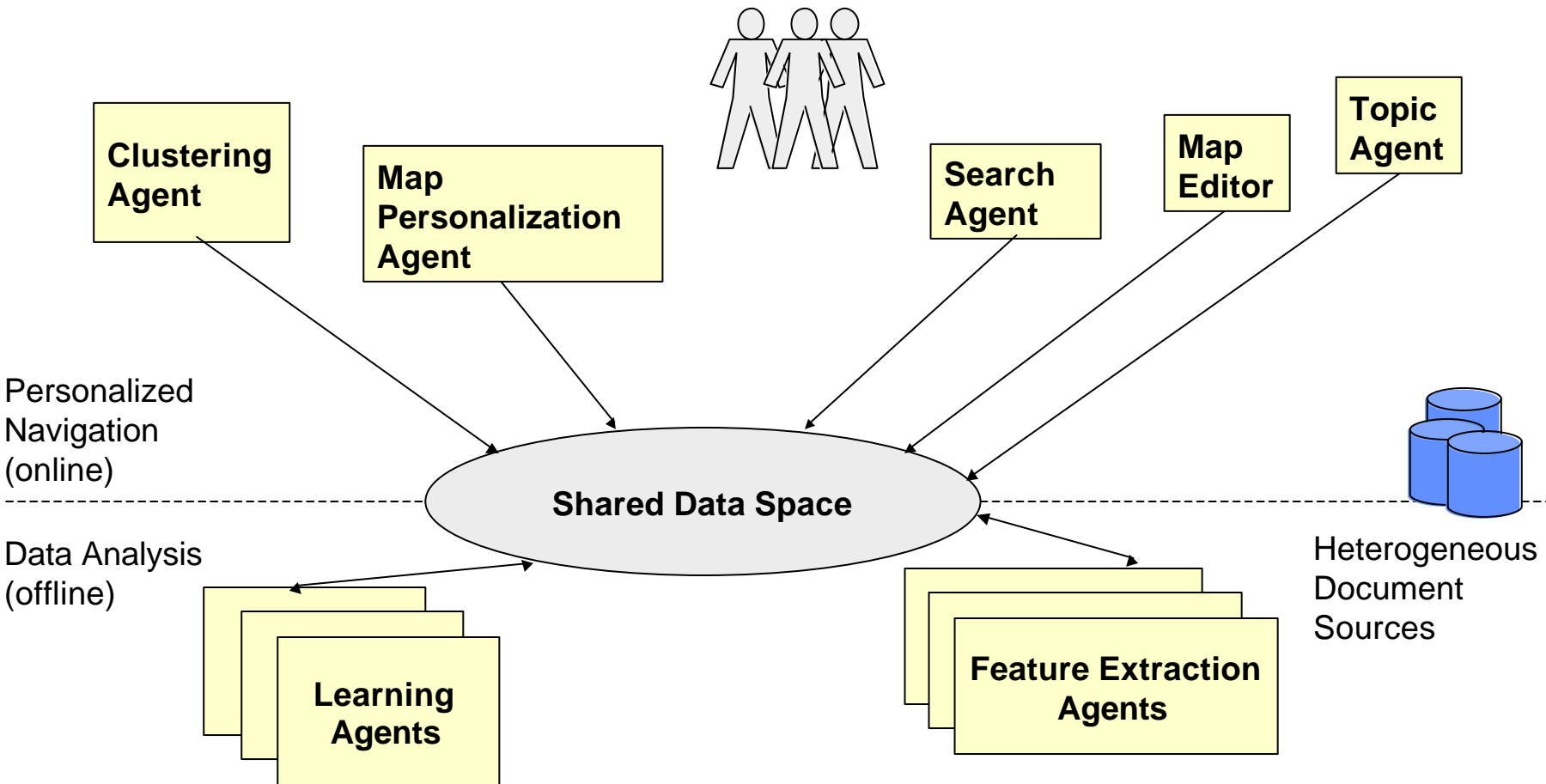
- Document pool personalization

- Topic network

Personal Agents

Agent Architecture

Clustering Agent

Map Personalization Agent

Search Agent

Map Editor

Topic Agent

Personalized Navigation (online)

Shared Data Space

Data Analysis (offline)

Heterogeneous Document Sources

Learning Agents

Feature Extraction Agents

Shared Data Space

Relationships between documents, topics and users
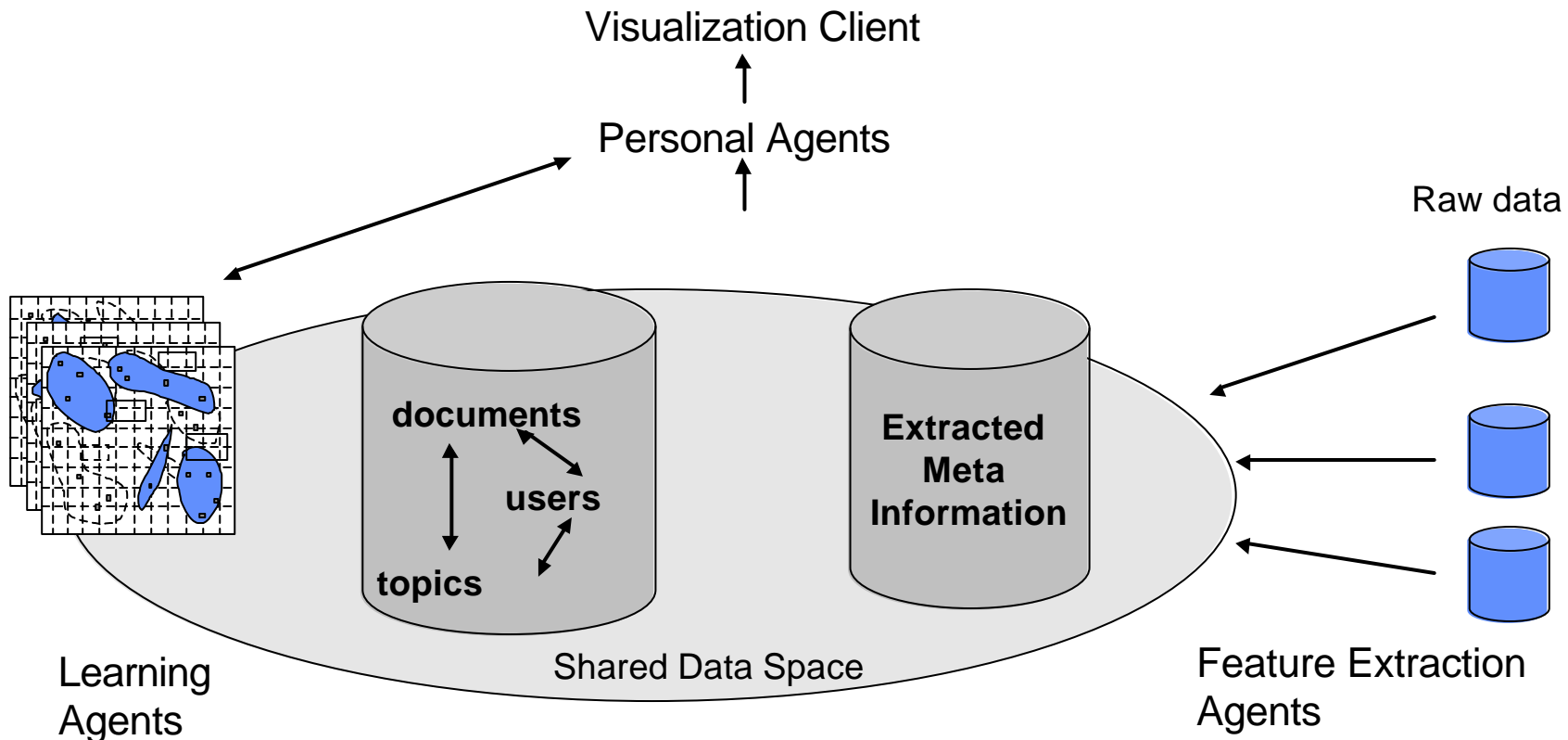
Visualization Client

Personal Agents

Raw data

documents

users

topics

Extracted
Meta
Information

Learning
Agents

Shared Data Space

Feature Extraction
Agents

Content and Context Analysis

Learning (similarity) relations between documents, topics and users

Learned relationships

Combined Similarity Measure

Reference Analysis Agent

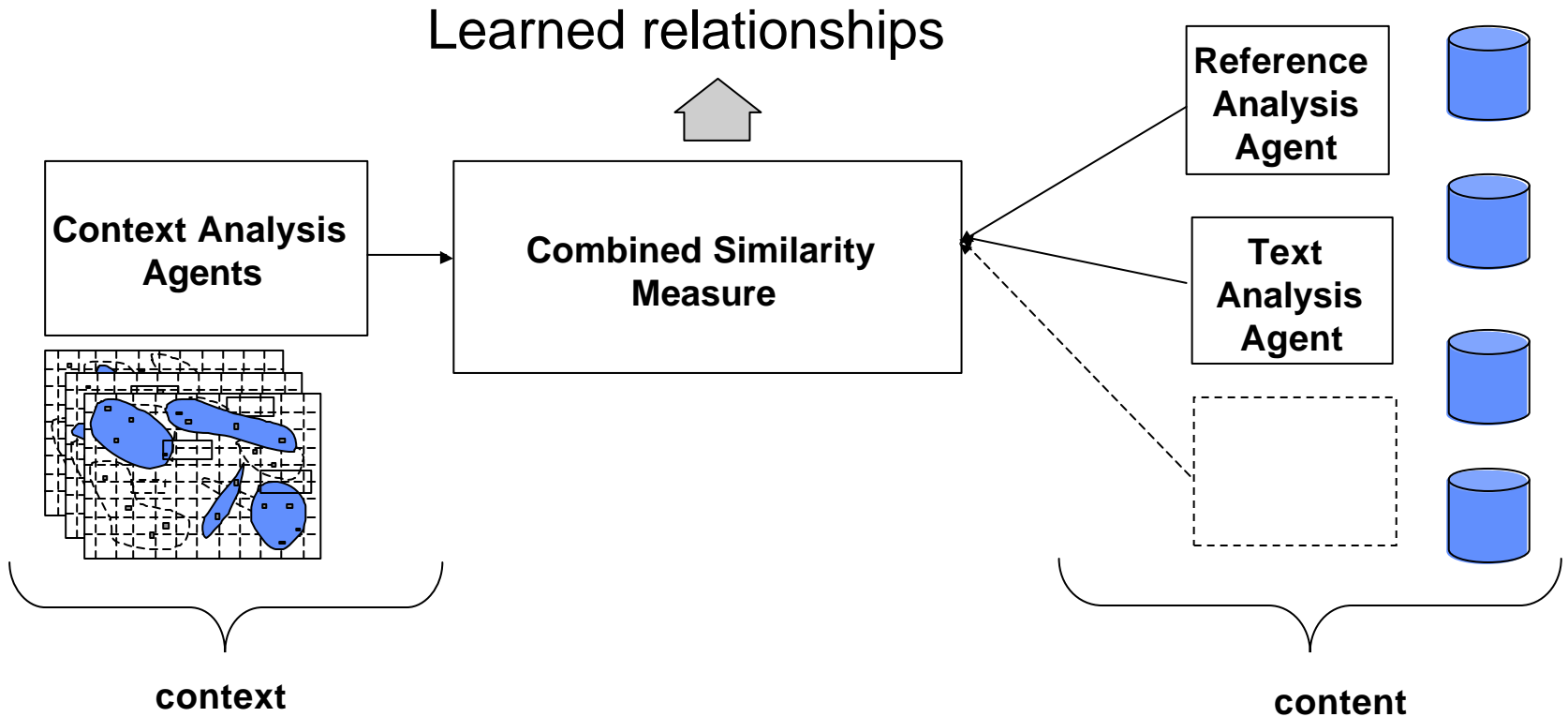Text Analysis Agent

content

Content and Context Analysis

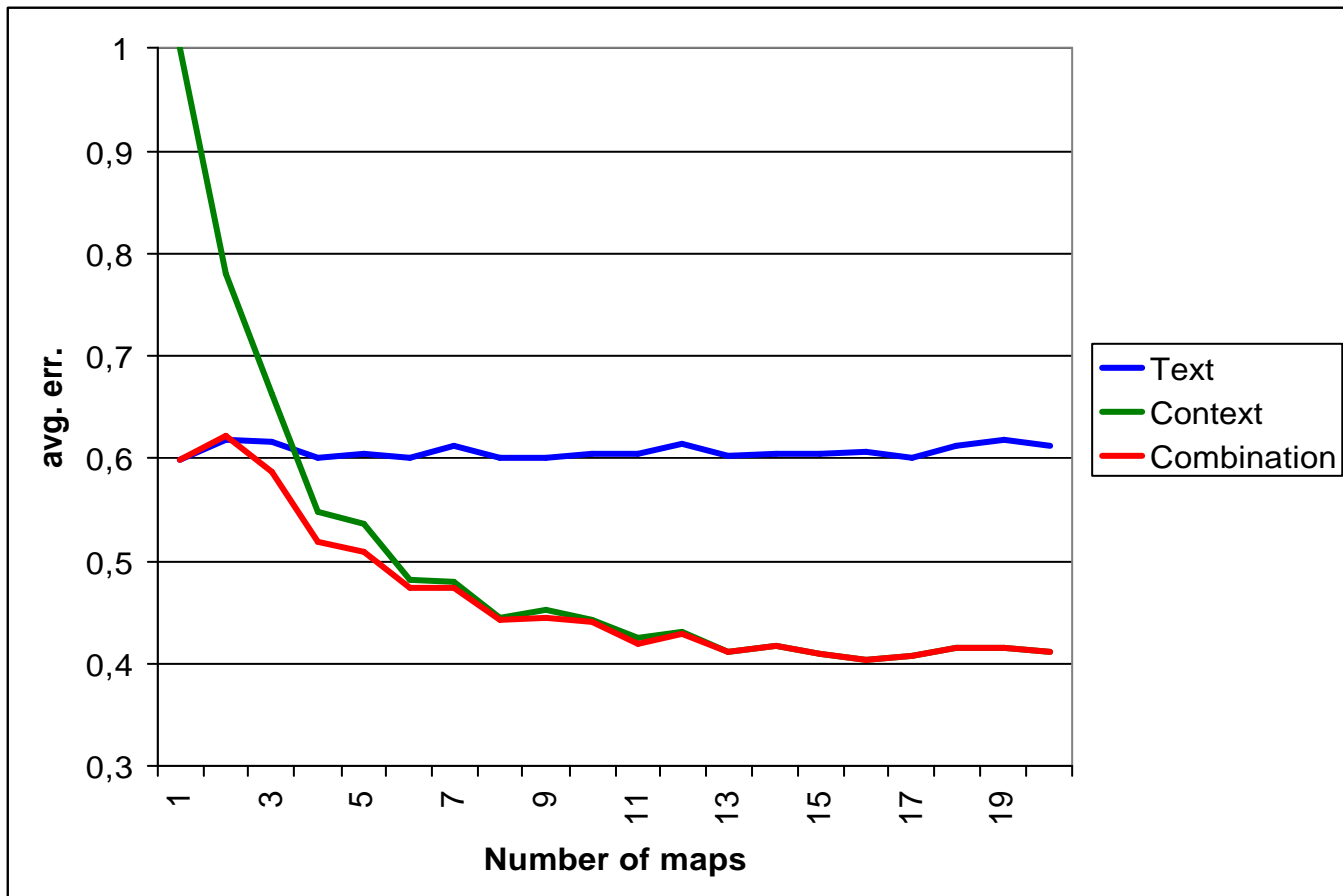**Learning (similarity) relations between documents, topics and users**

Learned relationships

| Context Analysis Agents	Combined Similarity Measure	Reference Analysis Agent
		Text Analysis Agent
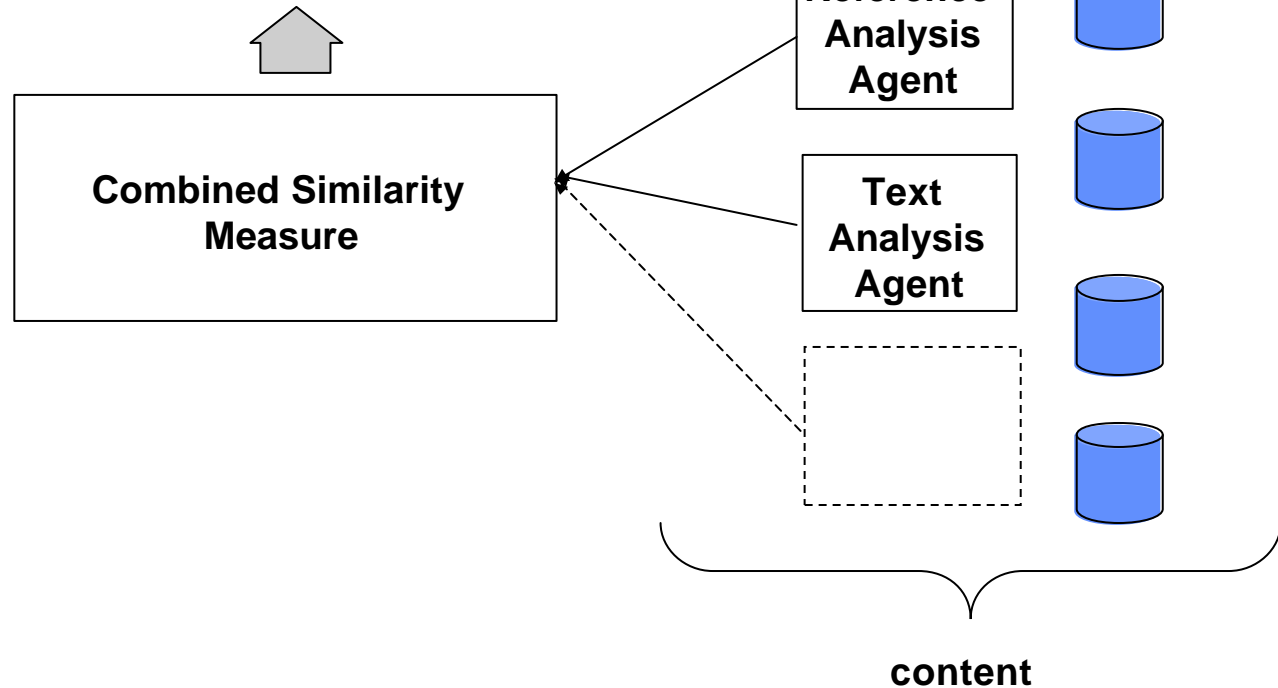
context

content

Content and Context Analysis

Content and Context Analysis

Some Relevant questions from a Machine Learning Viewpoint

- *Amount of user interaction data* needed to learn the desired concepts?

- *Robustness* of the extracted knowledge against noise or malicious manipulation

- *Local/Global Pattern* (e.g. how are minor opinions reflected in the resulting structures?)

Application Domain
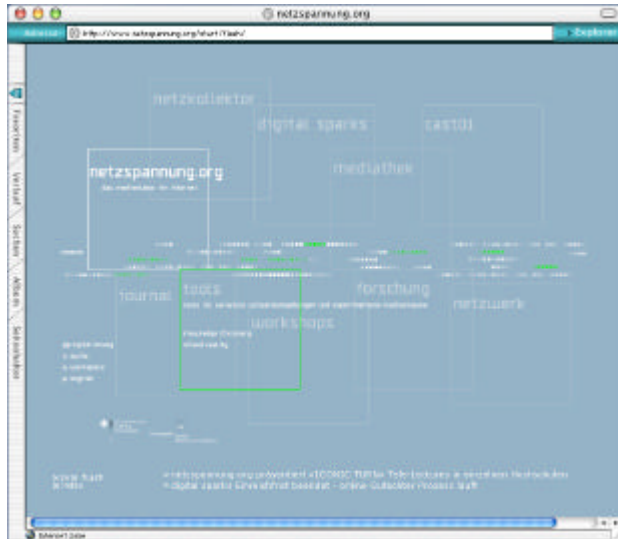
netzspannung.org

- Knowledge portal connecting media art, design and technology

- Collaborative information pool (projects, events...)

- Very heterogeneous content

  - different categorization schemes

  - constantly growing

Summary and Future Work

Summary

- Model and prototype for capturing, visualizing and exchanging knowledge
- Agent technology as software architecture and data integration model
- Machine Learning methods for combining context and content data

Future work

- Evaluation and user testing
- Improvement of visualization and data analysis methods
- Support for the Topic Map Format

Project & Partners

Project partners

- **Fraunhofer Institute for Media Communication**
  MARS Exploratory Media Lab   (Project Leader)

- **Fraunhofer Institute for Industrial Engineering**
  Competence Center Softwaretechnologie & interactive Systems

- **University of Dortmund**
  Artificial Intelligence Unit

- **University of Siegen**
  Dept. for Parallel Systems

Thank you for your attention!