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# Using Visual Analytics for Decision Making

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Background and challenges

Visual analytics

Summary

## **Background and challenges**

E-government — ...



E-democracy — ...



E-participation — ...



Participatory planning and decision processes

(E. g., participation in building projects, city budgeting, ...)

- ICT gain more and more importance

# Participants

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Group

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Citizens

Planners

Moderators

Environmentalists

Public agencies

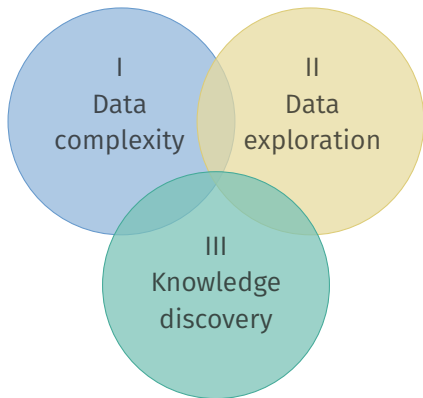
Public administrations

IT service providers

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- Many different skills, tasks, interests, and needs
- (Planning) decisions needed in this domain

# Major issues

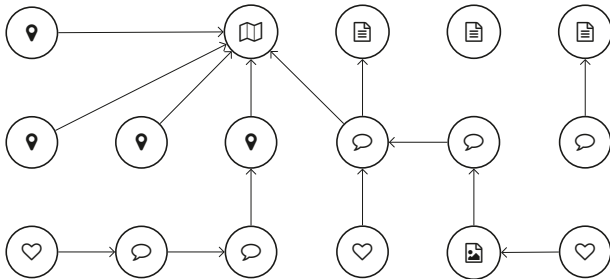


# I Handling the complex data situation



- Structured, semi-structured and unstructured data
- Natural language text (e. g., documents with 5 to 500 pp.)
- Geospatial data (e. g., 1 to 70 map server clients)
- Time-oriented data (e. g., timestamps of comments)
- References (e. g., to legislative texts)
- Rating information (e. g., likes or votes)

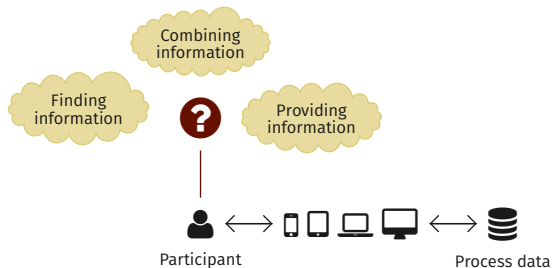
# I Handling the complex data situation



- Evolving network of interconnected data of various facets

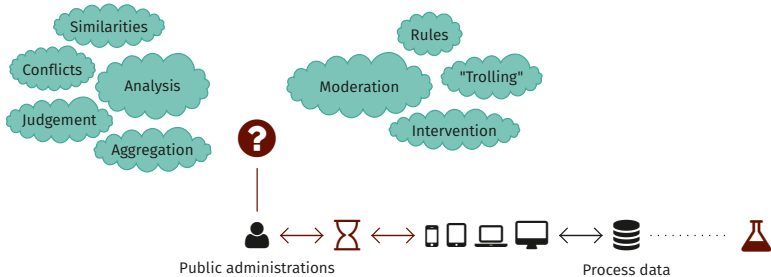


## II Exploring process data



- Exploration of space of process information is a burden
- Challenging to grasp overall context and view
- High cognitive demands for data understanding

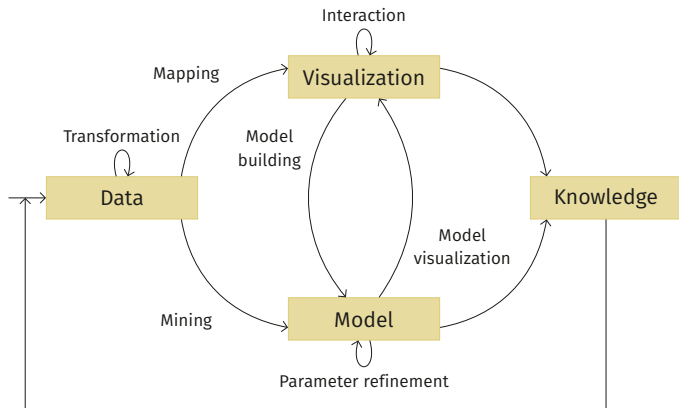
# III Discovering practical knowledge



- Making sense and decisions is challenging
- Time-consuming process due to manual analyses
- Implicit information remain hidden

# **Visual analytics**

# Visual analytics process model



- More than just pure **visualization** or pure **analysis**
- Integrate the best of both worlds → **visual analytics**

# Use case

**Setting** Beginning phase of informal planning process

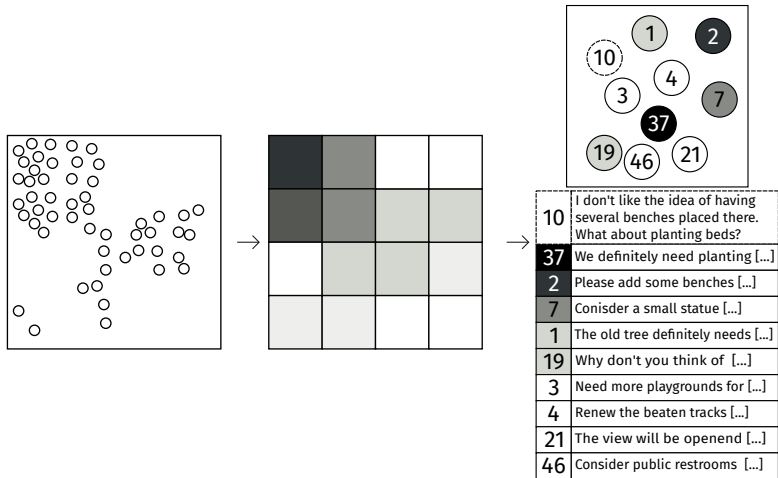
**Given** List of contributions pinned to spatial locations

**User** Public administrator

**Task** Development of a concept plan based on ideas/contributions

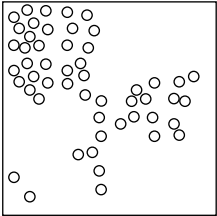
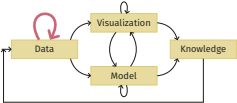
Id	Author	Content	XY-coordinates
1	John Doe	The old tree definitely needs to [...]	(341.12, 123.84)
2	Jana Doe	Please add some benches! They [...]	(330.77, 140.57)
...	...	...	...
52	John Doe	You can't be serious. Why [...]	(10.77, 669.11)

# Visual analytics workflow

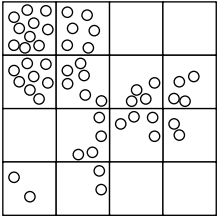


- Combination of spatial "hotness" and content-related similarity

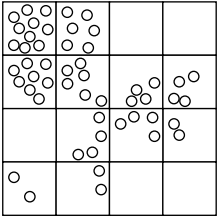
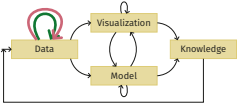
# Visual analytics workflow



Data transformation  
→  
Grid application



# Visual analytics workflow

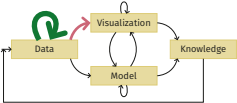


*Data transformation*  
→  
*Bin counting*

10	6	0	0
8	6	4	4
0	4	4	2
2	2	0	0

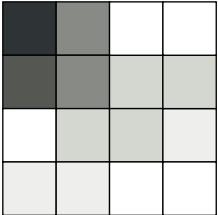


# Visual analytics workflow

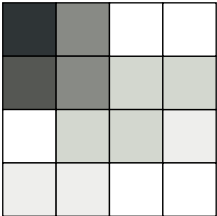
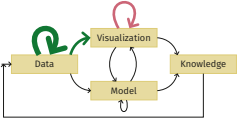


10	6	0	0
8	6	4	4
0	4	4	2
2	2	0	0

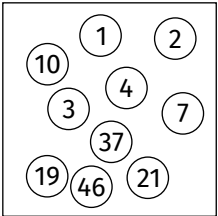
*Data mapping*  
→  
*Heatmap visualization*



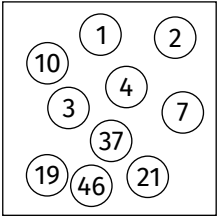
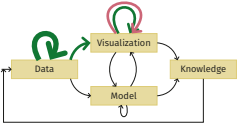
# Visual analytics workflow



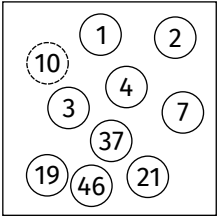
Interaction  
Heatmap exploration



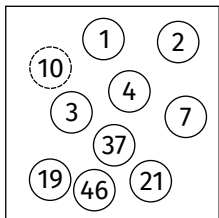
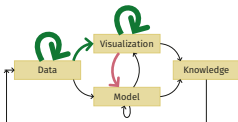
# Visual analytics workflow



Interaction  
→  
Contribution  
selection



# Visual analytics workflow



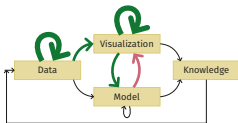
*Model  
building*

→

*Ranking*

```
"id": "1",  
"query_contribution_id": 10,  
"result_list": [{  
  "contribution_id": 37,  
  "score": 0.91  
}, {  
  "contribution_id": 2,  
  "score": 0.74  
}, ..., {  
  "contribution_id": 46,  
  "score": 0.0  
}]  
}
```

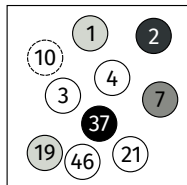
# Visual analytics workflow



```
"id": "1",  
"query_contribution_id": 10,  
"result_list": [{  
  "contribution_id": 37,  
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```

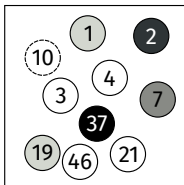
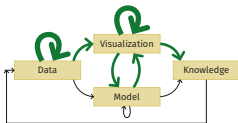
*Model  
visualization*

*Score  
encoding*



10	I don't like the idea of having several benches placed there. What about planting beds?
37	We definitely need planting [...]
2	Please add some benches [...]
7	Consider a small statue [...]
1	The old tree definitely needs [...]
19	Why don't you think of [...]
3	Need more playgrounds for [...]
4	Renew the beaten tracks [...]
21	The view will be openend [...]
46	Consider public restrooms [...]

# Visual analytics workflow



10	I don't like the idea of having several benches placed there. What about planting beds?
37	We definitely need planting [...]
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19	Why don't you think of [...]
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4	Renew the beaten tracks [...]
21	The view will be openend [...]
46	Consider public restrooms [...]

*Knowledge processing*



- Aggregation of contributions for concept plan
- Near duplicates for one concept
- Controversial ideas for different concepts

# Summary

## Final remarks

- Challenging data complexity, exploration, knowledge discovery
- More sophisticated tools needed in participatory processes
- Idea of visual analytics can guide engineering of IT systems
- *Interactive workflows with data analysis and visualization*



**Thank you very much!**  
**Questions?**

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