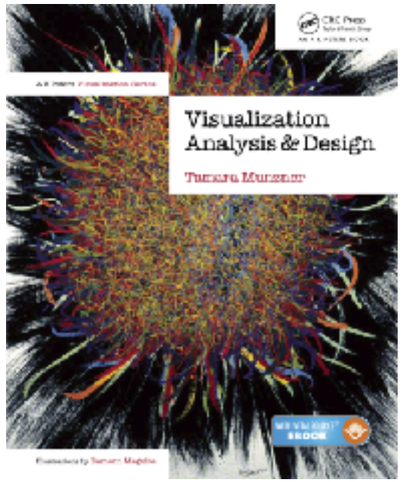
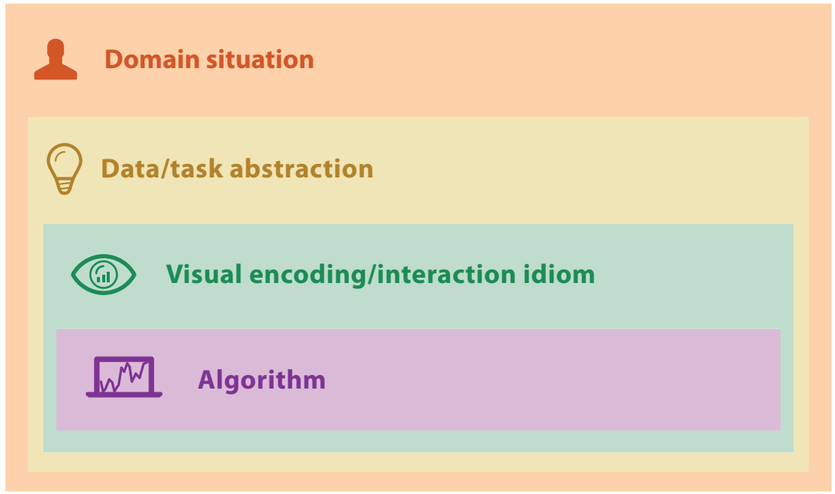


Visualization Analysis & Design

Task Abstraction (Ch 3)

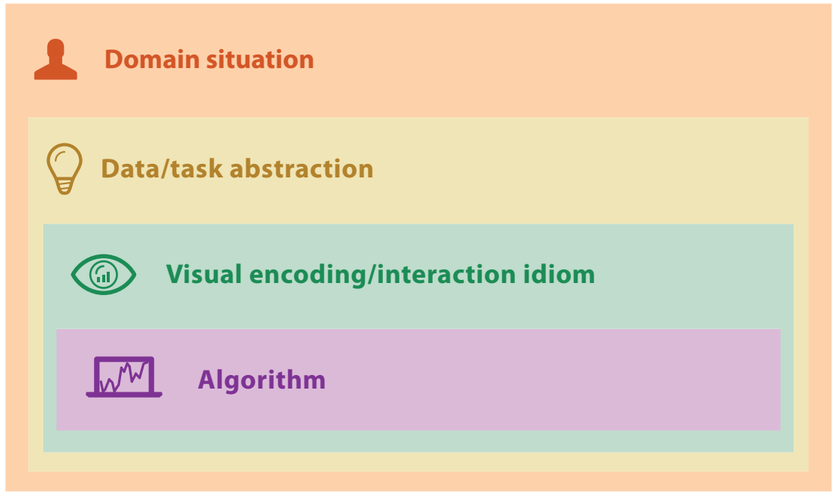
Tamara Munzner
Department of Computer Science
University of British Columbia
@tamaramunzner

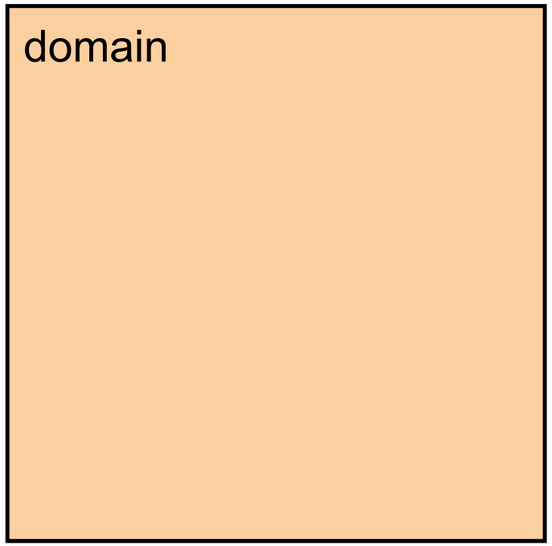
From domain to abstraction



From domain to abstraction

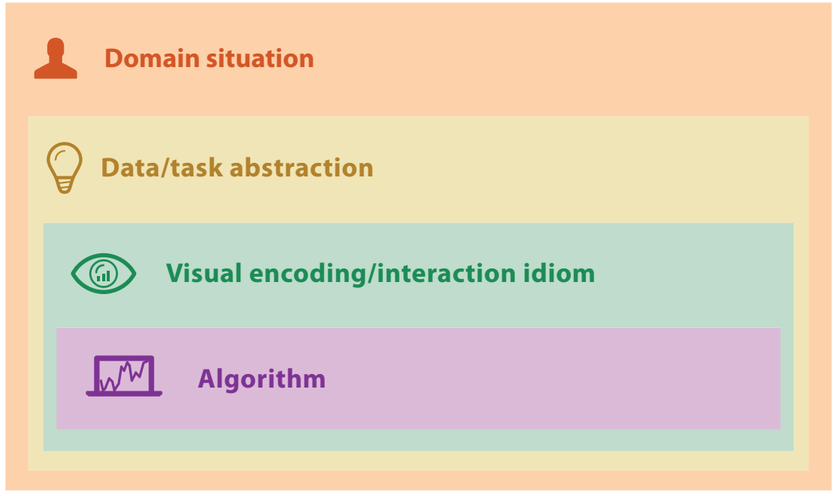
- domain characterization: details of application domain

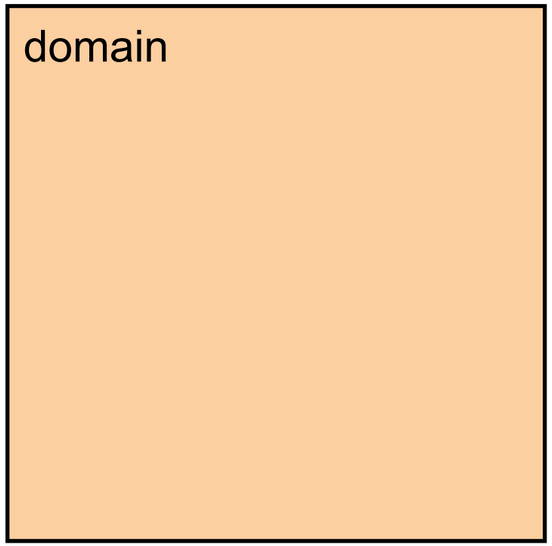




From domain to abstraction

- domain characterization:
  details of application domain
  - group of users, target domain, their questions & data
    - varies wildly by domain
    - must be specific enough to get traction





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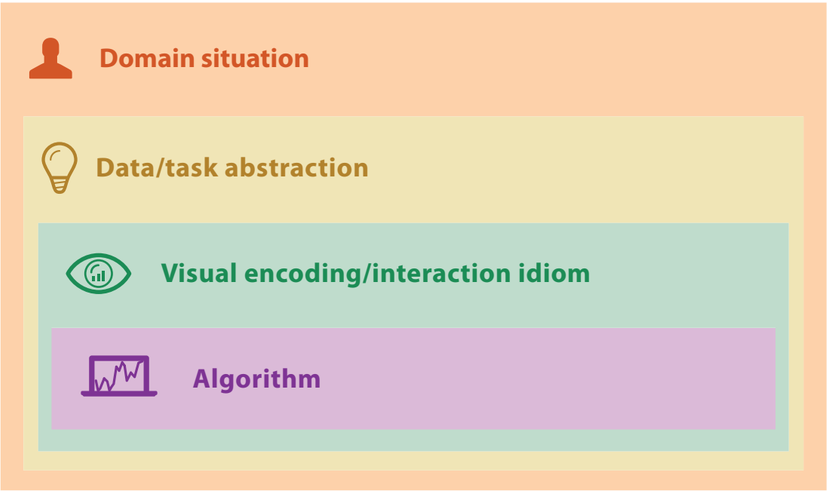
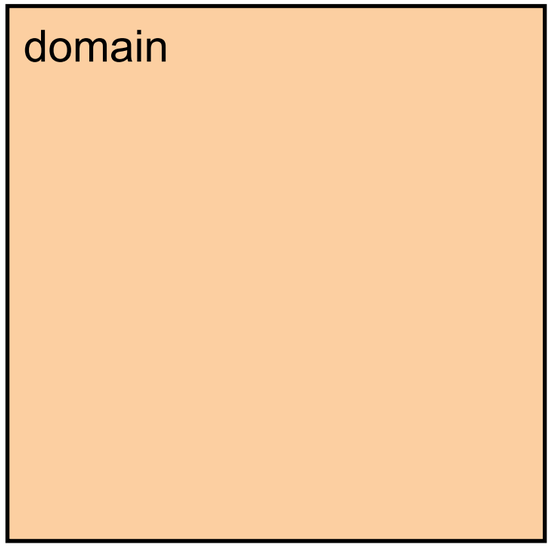
    - break down into simpler abstract tasks





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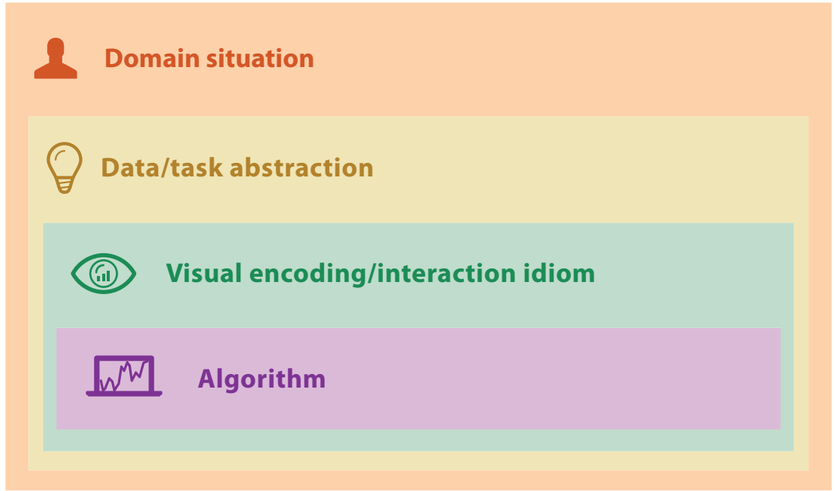
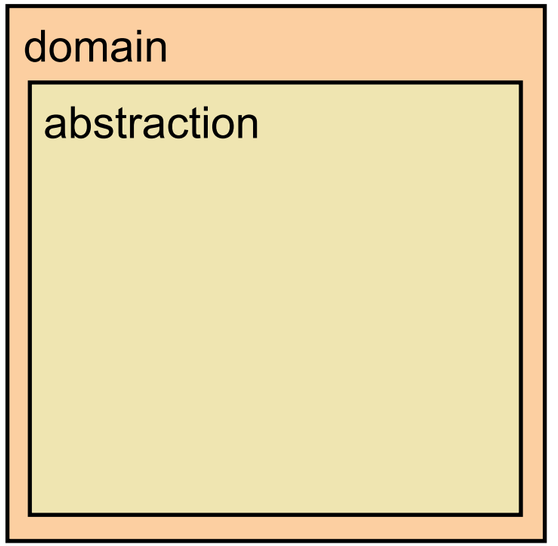
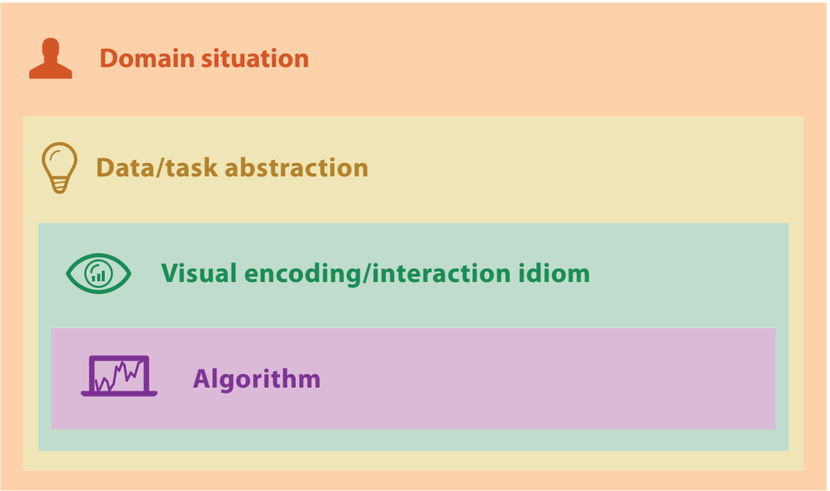
    - break down into simpler abstract tasks
- abstraction: data & task
  - map *what* and *why* into generalized terms

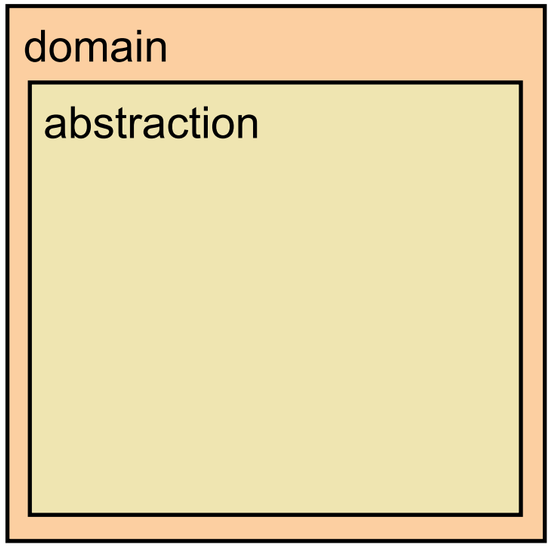




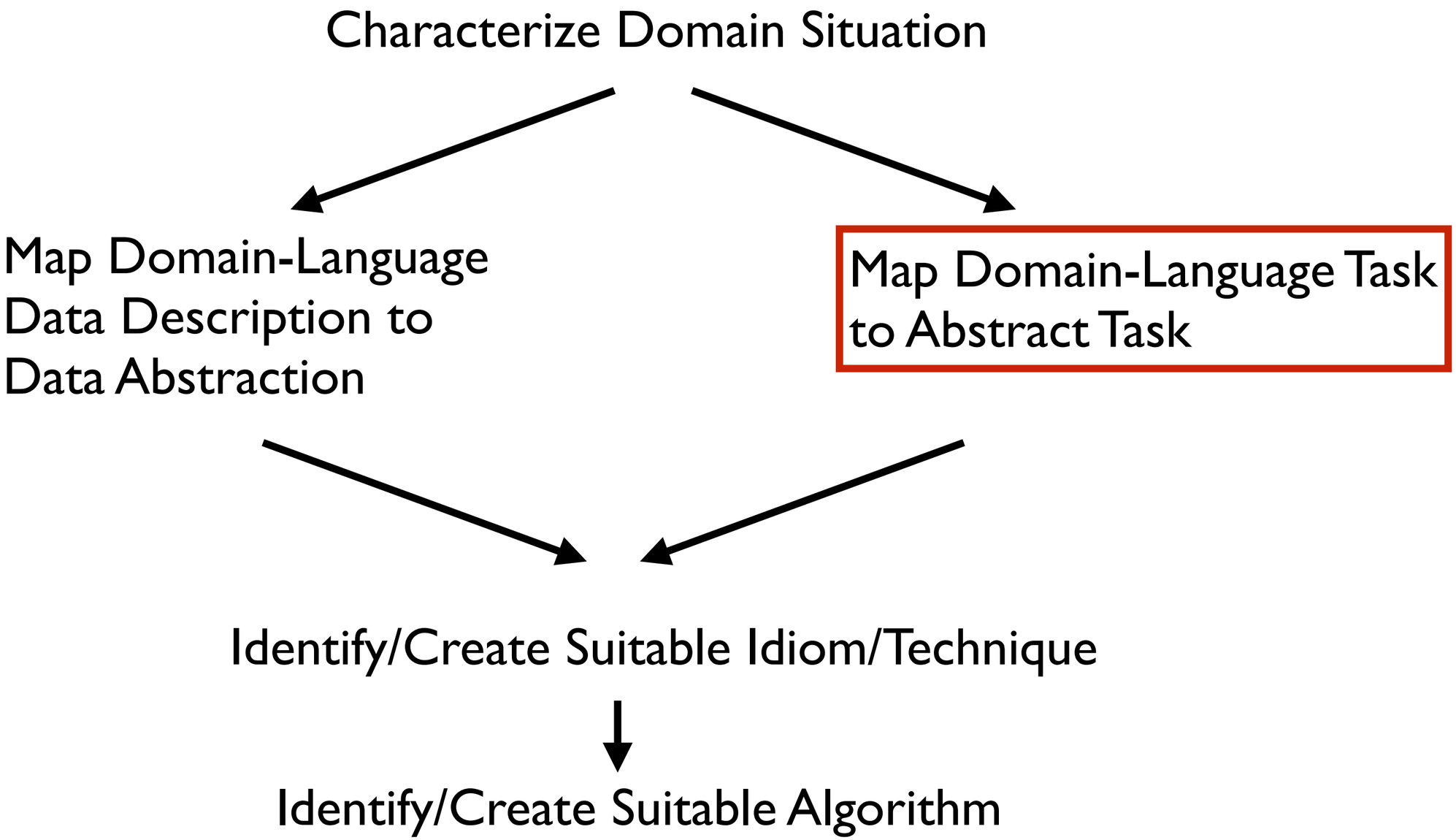
From domain to abstraction

- domain characterization:
  details of application domain
  - group of users, target domain, their questions & data
    - varies wildly by domain
    - must be specific enough to get traction
  - domain questions/problems
    - break down into simpler abstract tasks
- abstraction: data & task
  - map *what* and *why* into generalized terms
    - identify tasks that users wish to perform, or already do
    - find data types that will support those tasks
      - possibly transform /derive if need be





Design process



Task abstraction: Actions and targets

- very high-level pattern

- {action, target} pairs
  - *discover distribution*
  - *compare trends*
  - *locate outliers*
  - *browse topology*

Task abstraction: Actions and targets

- very high-level pattern

- actions
  - analyze
    - high-level choices
  - search
    - find a known/unknown item
  - query
    - find out about characteristics of item

- {action, target} pairs
  - *discover distribution*
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  - *browse topology*

Task abstraction: Actions and targets

- very high-level pattern

- actions
  - analyze
    - high-level choices
  - search
    - find a known/unknown item
  - query
    - find out about characteristics of item

- targets
  - what is being acted on

- {action, target} pairs
  - *discover distribution*
  - *compare trends*
  - *locate outliers*
  - *browse topology*

Actions: Analyze

- consume
  - discover vs present
    - classic split
    - aka explore vs explain
  - enjoy
    - newcomer
    - aka casual, social
- produce
  - annotate, record
  - derive
    - crucial design choice

➔ **Analyze**

➔ Consume

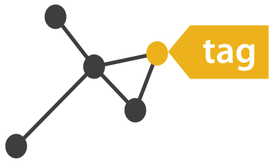
➔ *Discover*

➔ *Present*

➔ *Enjoy*

➔ Produce

➔ *Annotate*



➔ *Record*

➔ *Derive*

Actions: Search

Actions: Search

- what does user know?
  - target, location

Search

	Target known	Target unknown
Location known	 *Lookup*	 *Browse*
Location unknown	 *Locate*	 *Explore*

Actions: Search

- what does user know?
  - target, location
- lookup
  - ex: word in dictionary
    - alphabetical order

Search

	Target known	Target unknown
Location known	 *Lookup*	 *Browse*
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Actions: Search

- what does user know?
  - target, location
- lookup
  - ex: word in dictionary
    - alphabetical order
- locate
  - ex: keys in your house
  - ex: node in network

Search

	Target known	Target unknown
Location known	*Lookup*	*Browse*
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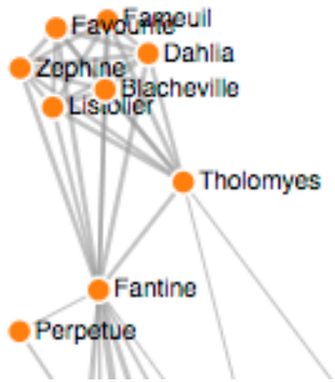

https://bl.ocks.org/heybignick/3faf257bbbbc7743bb72310d03b86ee8

Actions: Search

- what does user know?
  - target, location
- lookup
  - ex: word in dictionary
    - alphabetical order
- locate
  - ex: keys in your house
  - ex: node in network
- browse
  - ex: books in bookstore

Search

	Target known	Target unknown
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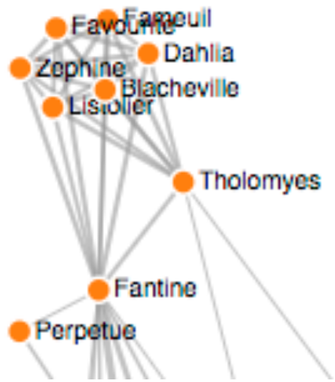

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Actions: Search

- what does user know?
  - target, location
- lookup
  - ex: word in dictionary
    - alphabetical order
- locate
  - ex: keys in your house
  - ex: node in network
- browse
  - ex: books in bookstore
- explore
  - ex: find cool neighborhood in new city

Search

	Target known	Target unknown
Location known	*Lookup*	*Browse*
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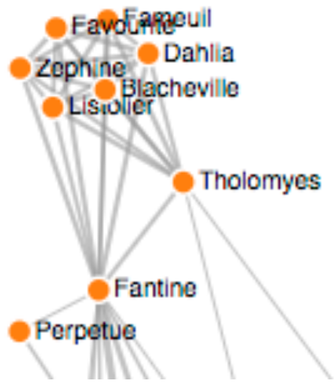


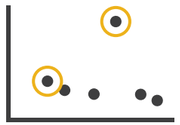
https://bl.ocks.org/heybignick/3faf257bbbbc7743bb72310d03b86ee8

Actions: Query

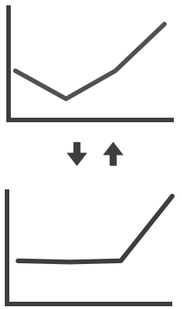
- how much of the data matters?
  - one: identify
  - some: compare
  - all: summarize

Query

→ Identify



→ Compare



→ Summarize

Actions

- independent choices for each of these three levels
  - analyze, search, query
  - mix and match

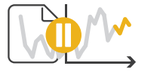
Actions

Analyze

- Consume
  - *Discover*
  - *Present*
  - *Enjoy*



- Produce
  - *Annotate*
  - *Record*
  - *Derive*

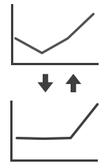



Search

	Target known	Target unknown
Location known	*Lookup*	*Browse*
Location unknown	*Locate*	*Explore*

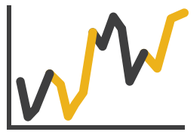
Query

- Identify
- Compare
- Summarize


Task abstraction: Targets

Task abstraction: Targets

- **All Data**
  - Trends
    
  - Outliers
    
  - Features
    

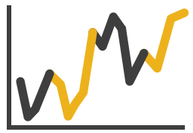
Task abstraction: Targets

All Data

- Trends

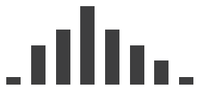
- Outliers

- Features

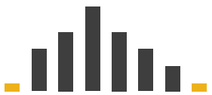


Attributes

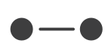
- One
  - *Distribution*



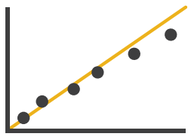
  - *Extremes*



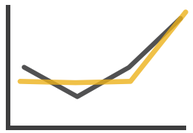
- Many
  - *Dependency*



  - *Correlation*



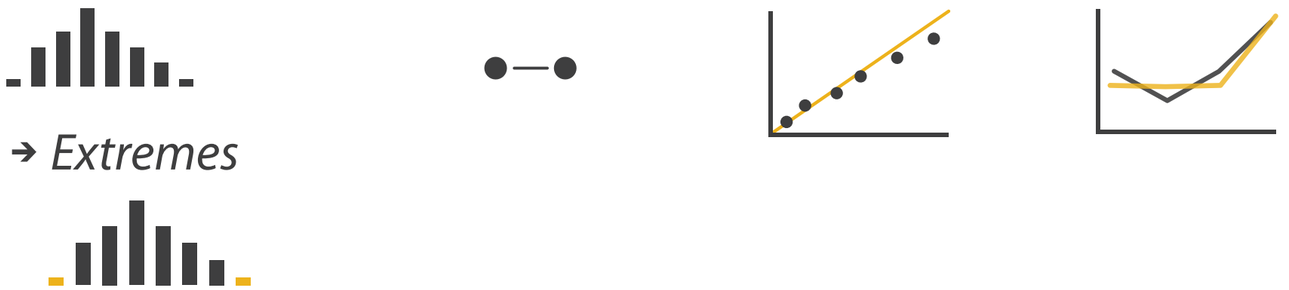
  - *Similarity*



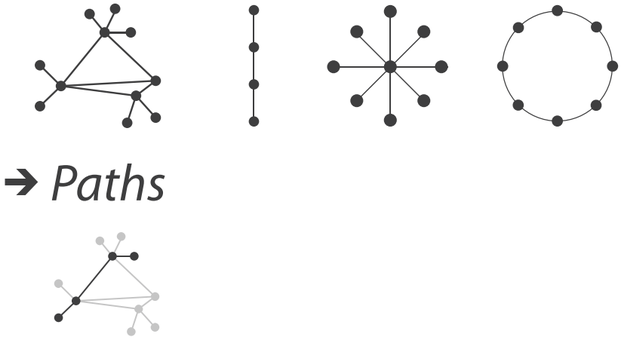
Task abstraction: Targets

- **All Data**
  - Trends
  - Outliers
  - Features

- **Attributes**
  - One
    - *Distribution*
    - *Extremes*
  - Many
    - *Dependency*
    - *Correlation*
    - *Similarity*



- **Network Data**
  - Topology
  - *Paths*



Task abstraction: Targets

All Data

- Trends
- Outliers
- Features

Attributes

- One
  - *Distribution*
  - *Extremes*
- Many
  - *Dependency*
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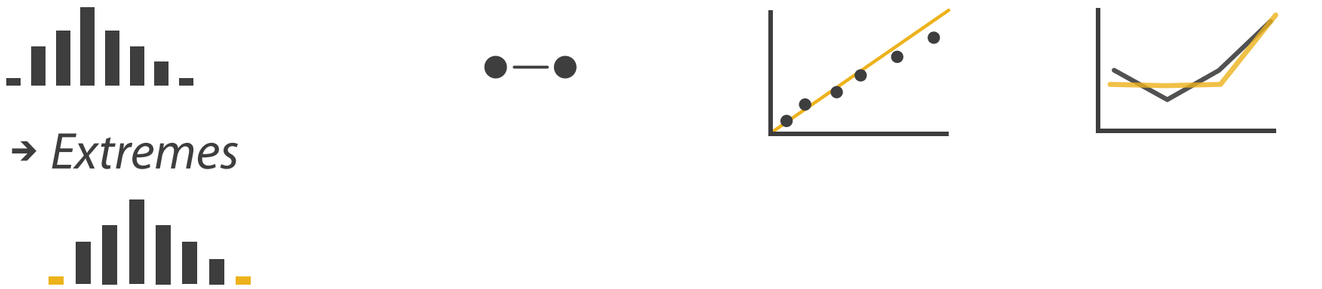
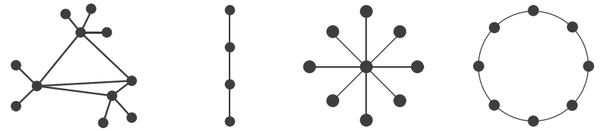
  - *Similarity*



Network Data

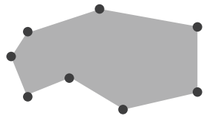
- Topology



- *Paths*

Spatial Data

- Shape

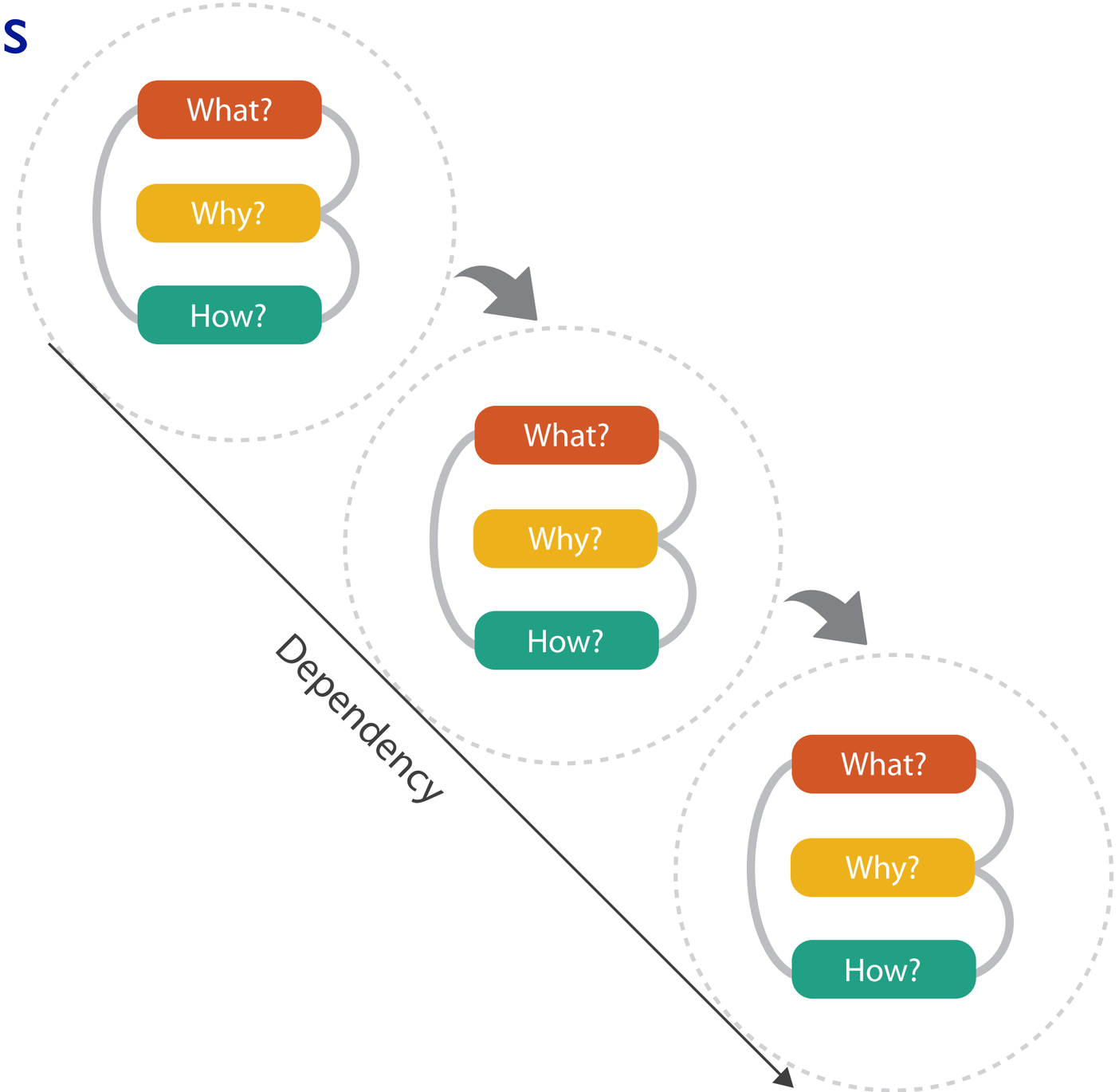


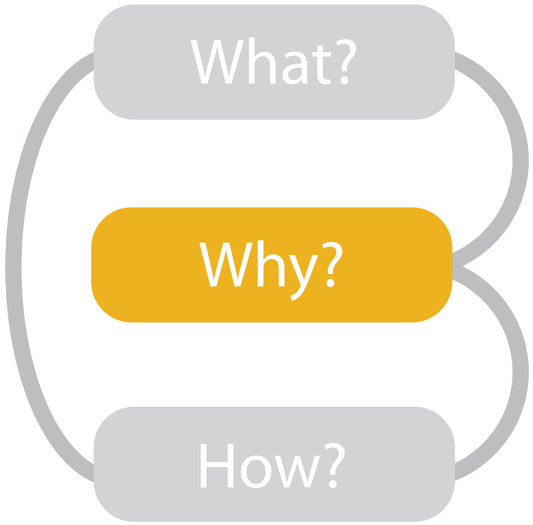
Abstraction

- these {action, target} pairs are good starting point for vocabulary
  - but sometimes you'll need more precision!
- rule of thumb
  - systematically remove all domain jargon

- interplay: task and data abstraction
  - need to use data abstraction within task abstraction
    - to specify your targets!
    - but task abstraction can lead you to transform the data
  - iterate back and forth
    - first pass data, first pass task, second pass data, ...

Means and ends





- {action, target} pairs
  - *discover distribution*
  - *compare trends*
  - *locate outliers*
  - *browse topology*

Why?

Actions

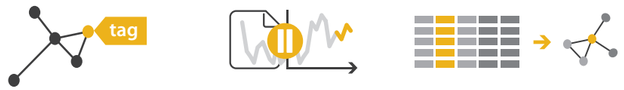
Analyze

→ Consume

→ *Discover* → *Present* → *Enjoy*

→ Produce

→ *Annotate* → *Record* → *Derive*

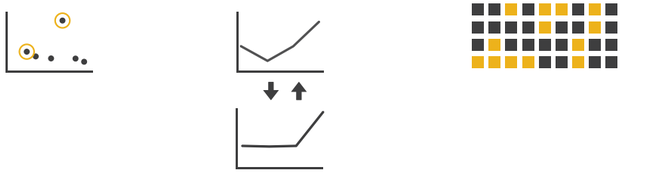


Search

	Target known	Target unknown
Location known	*Lookup*	*Browse*
Location unknown	*Locate*	*Explore*

Query

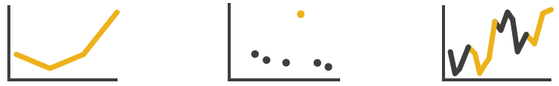
→ Identify → Compare → Summarize



Targets

All Data

→ Trends → Outliers → Features



Attributes

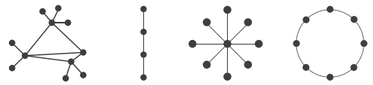
→ One → Many

→ *Distribution* → *Dependency* → *Correlation* → *Similarity*

→ *Extremes*

Network Data

→ Topology



→ *Paths*

Spatial Data

→ Shape