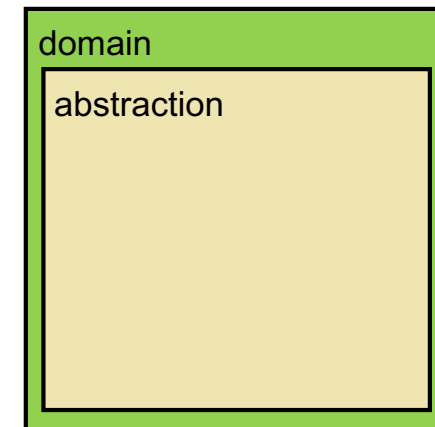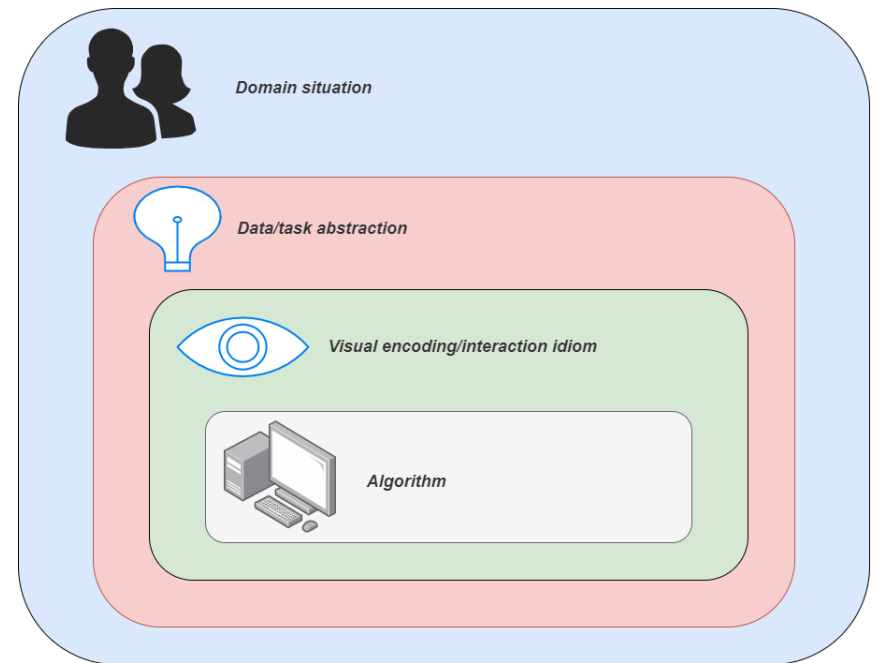**Abstraction**

Task   Task   *Task*

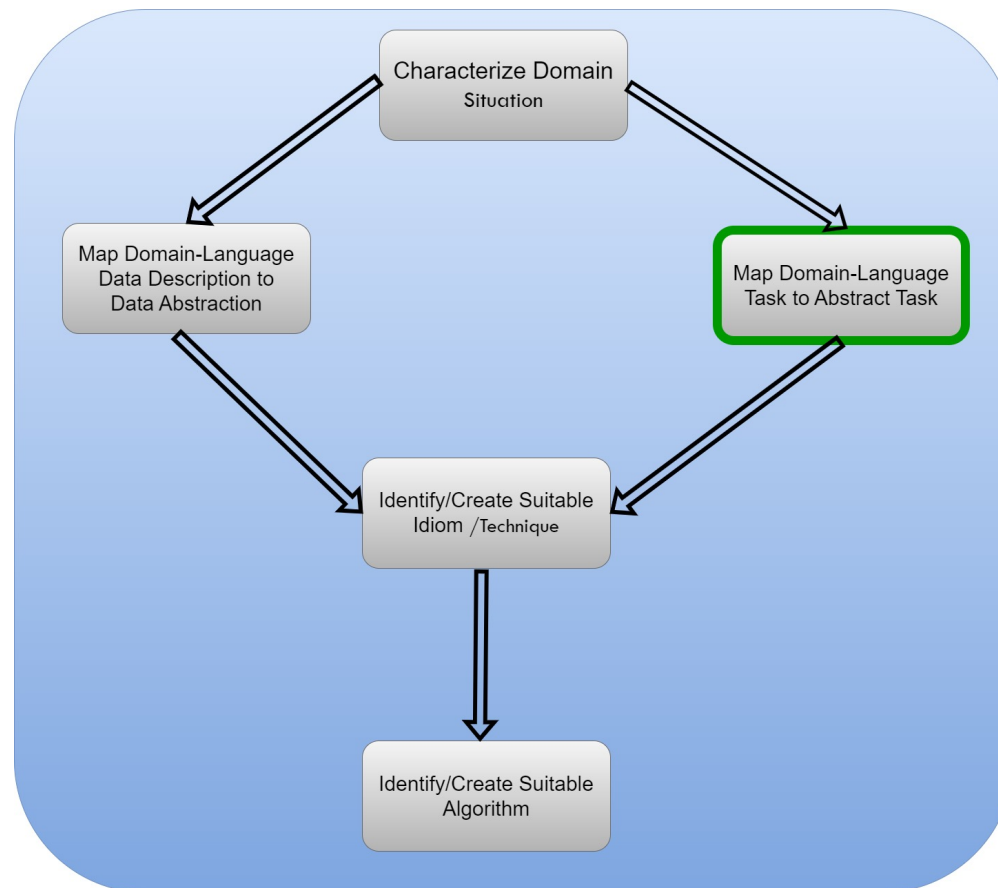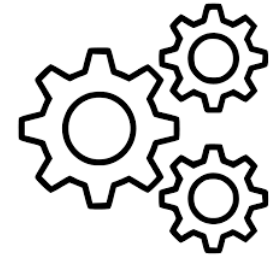VISUALIZATION ANALYSIS & DESIGN

TASK ABSTRACTION (CH 3)

WHY?

1

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
    - o possibly transform /derive if need be

DESIGN PROCESS

```
                    ┌──────────────────────┐
                    │  Characterize Domain │
                    │       Situation      │
                    └──────────────────────┘
                    ╱                      ╲
                   ╱                        ╲
   ┌──────────────────────┐      ┌──────────────────────┐
   │  Map Domain-Language │      │  Map Domain-Language │
   │  Data Description to │      │  Task to Abstract Task│
   │   Data Abstraction   │      └──────────────────────┘
   └──────────────────────┘                 │
                   ╲                        ╱
                    ╲                      ╱
                    ┌──────────────────────┐
                    │ Identify/Create Suitable │
                    │     Idiom /Technique  │
                    └──────────────────────┘
                               │
                               ▼
                    ┌──────────────────────┐
                    │ Identify/Create Suitable │
                    │       Algorithm      │
                    └──────────────────────┘
```

TASK ABSTRACTION: ACTIONS AND TARGETS

TASK ABSTRACTION: ACTIONS AND TARGETS

❑ Very high-level pattern

❑ Actions
  ➢ analyze
    o high-level choices
  ➢ search
    o find a known/unknown item
  ➢ query
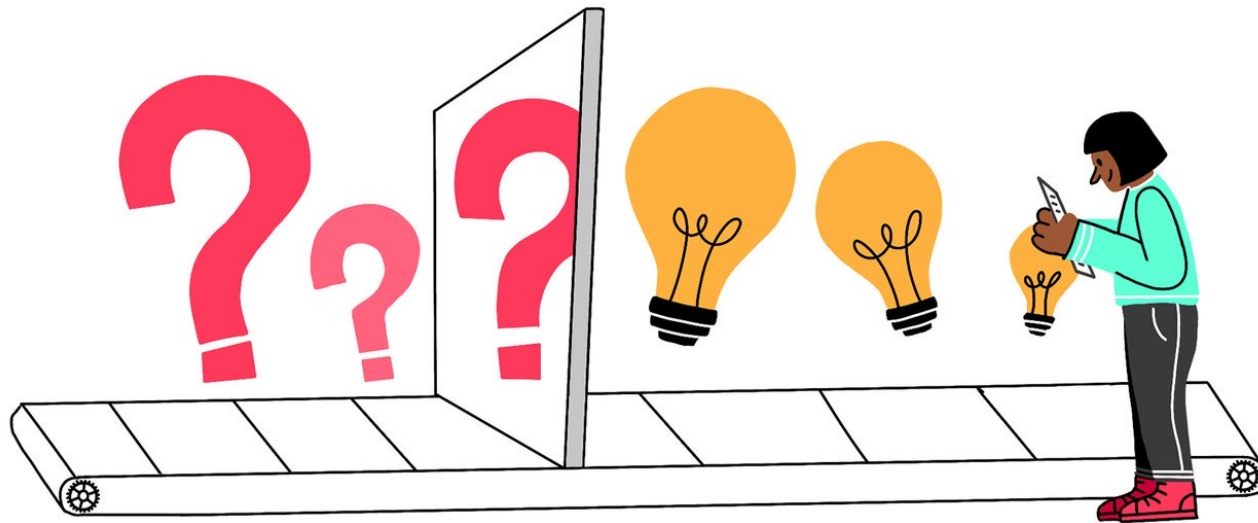   o find out about characteristics of item

❑ Targets
  ➢ what is being acted on

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

ACTIONS: ANALYZE

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
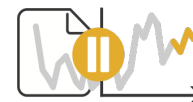
→ *Annotate* → *Record* → *Derive*

ACTIONS: SEARCH

ACTIONS: SEARCH

- ❑ What does user know
  - target, location
- ❑ Lookup
  - ex: word in dictionary
    - o 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
Location unknown	Locate	Explore

9
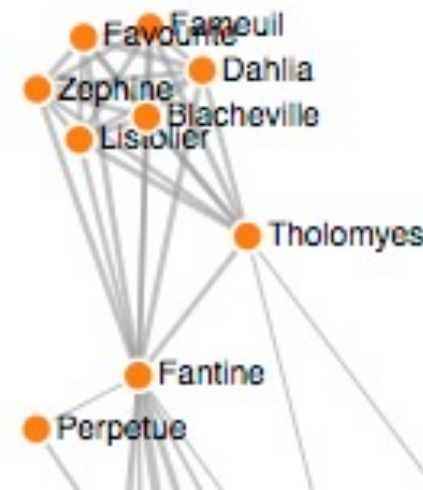
ACTIONS: SEARCH

❑ How much of the data matters
- one: identify
- some: compare
- all: summarize

→ **Query**
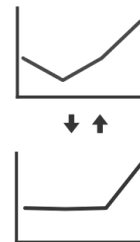
→ Identify   → Compare   → Summarize

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
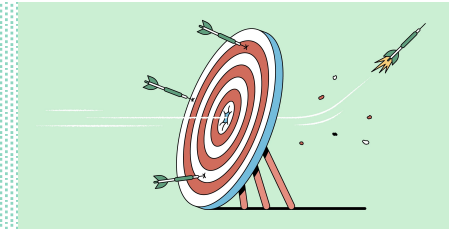
→ **All Data**
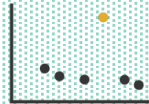
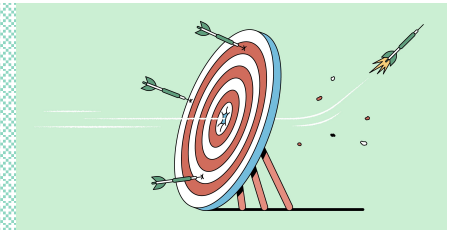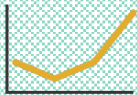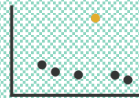→ Trends   → Outliers   → Features

TASK ABSTRACTION: TARGETS

→ All Data

→ Trends   → Outliers   → Features

→ Attributes

→ One   → Many
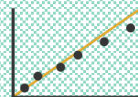
→ *Distribution*   → *Dependency*   → *Correlation*   → *Similarity*

→ *Extremes*

TASK ABSTRACTION: TARGETS

→ **All Data**

→ Trends   → Outliers   → Features

→ **Attributes**

→ One   → Many

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

→ *Extremes*

→ **Network Data**

→ Topology

→ *Paths*

TASK ABSTRACTION: TARGETS

→ All Data

→ Trends   → Outliers   → Features

→ Attributes

→ One   → Many
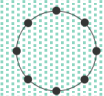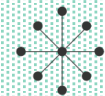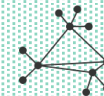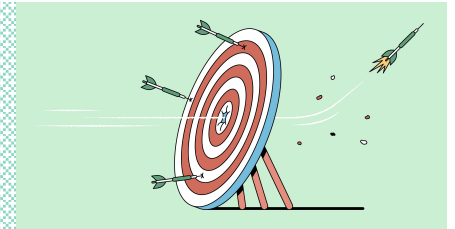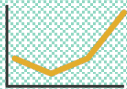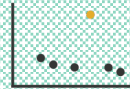
→ *Distribution*   → *Dependency*   → *Correlation*   → *Similarity*

→ *Extremes*

→ 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

Dependency

What?

Why?

How?

❑ {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
- ➔ *Distribution*
- ➔ *Extremes*

➔ Many
- ➔ *Dependency*
- ➔ *Correlation*
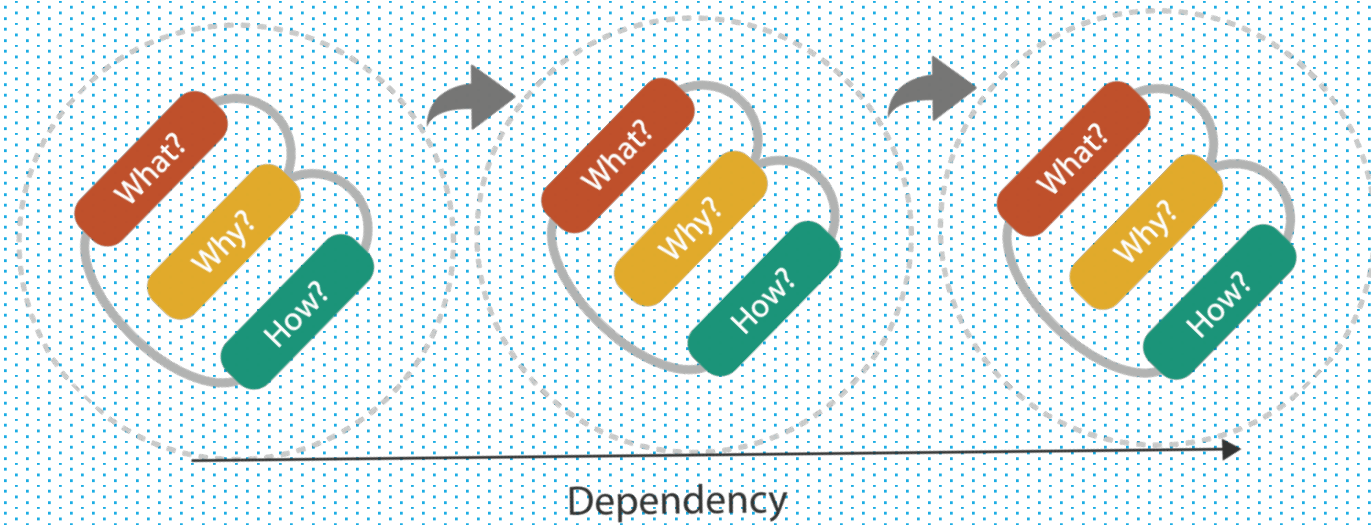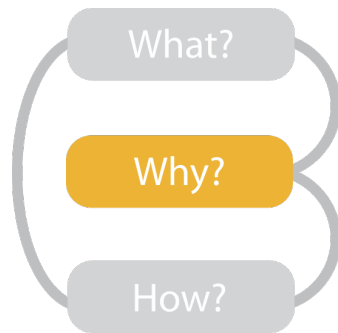- ➔ *Similarity*
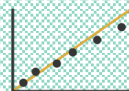
➔ Network Data

➔ Topology
- ➔ *Paths*

➔ Spatial Data

➔ Shape