

### Nested Models

|   |   |
|---|---|
| <b>Domain</b>                             | Understand the user, the data and tasks   |
|   | Use domain specific vocabulary  |
|   | Produce a set of tasks/questions of target users on the data, on different levels |
| <b>Data/task abstraction</b>              | Data described in generic (Visualization) terms                                   |
|   | Tasks described in generic (Visualization) terms                                  |
| <b>Visual encoding/-interaction idiom</b> | Design space, select visual encodings, define interactions, etc.                  |
| <b>Algorithm</b>                          | layout algorithm, ordering, rendering, etc.                                       |

### Dangers at each level

|  |                                     |
|--|-------------------------------------|
| <b>Domain situation</b>                  | You misunderstood their needs       |
| <b>Data/task abstraction</b>             | You're showing them the wrong thing |
| <b>Visual encoding/interaction idiom</b> | The way you show it doesn't work    |
| <b>Algorithm</b>                         | Your code is too slow               |

A mistake at the higher level cannot be corrected on the lower

### Nested model - Validation

|  |  |
|--|--|
| <b>Domain situation</b>                  | Observe target users using existing tools  |
| <b>Data/task abstraction</b>             |  |
| <b>Visual encoding/interaction idiom</b> | Justify design with respect to alternatives  |
| <b>Algorithm</b>                         | Measure system time/memory<br>Analyze computational complexity   |
|  | Analyze results qualitatively<br>Measure human time with lab experiment ( <i>lab study</i> )<br>Observe target users after deployment ( <i>field study</i> )<br>Measure adoption |

### Visual encoding design

|  |                                |
|--|--------------------------------|
| <b>Data abstraction</b>                | What is shown?                 |
| <b>Task abstraction</b>                | Why is the user looking at it? |
| <b>Visual encoding and interaction</b> | How is it shown?               |

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By [bilgin7](https://cheatography.com/bilgin7/)  
cheatography.com/bilgin7/

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Page 1 of 1.

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