Characterizing Guidance in Visual Analysis

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What is Guidance?

Problem

What is Guidance aiming to solve?

Solution

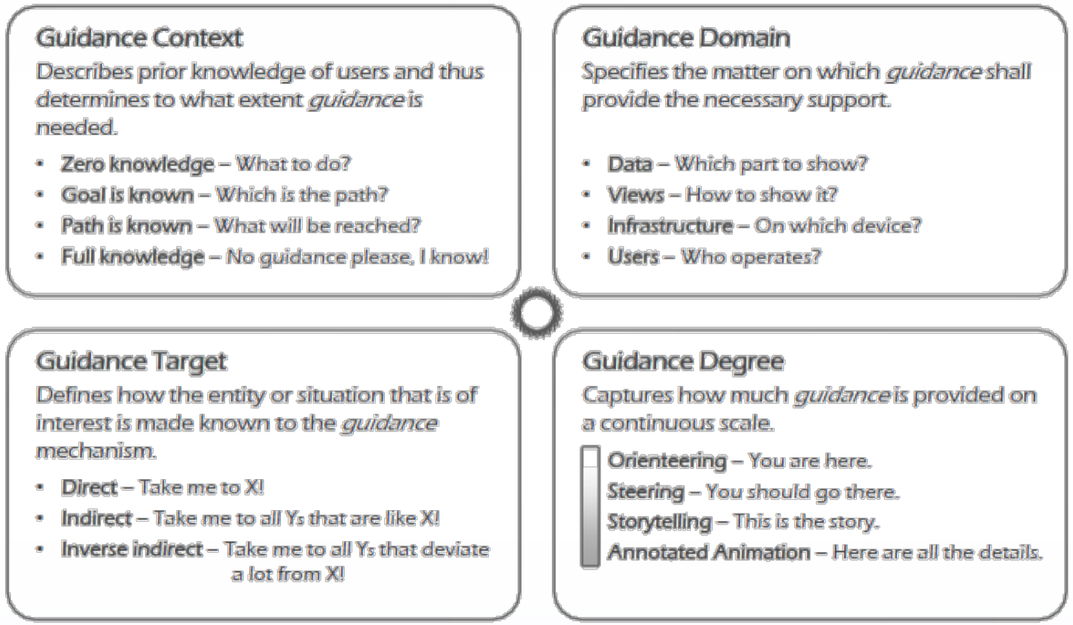
Which principal forms does Guidance take?

What is Guidance in VA?
The Short Answer

Guidance is a *computer-assisted process* that aims to actively resolve a *knowledge gap* encountered by users during an interactive VA session.

Based on [Smith and Mosier 1986] [Engels 1996] [Dix et al. 2004]

Characterizing Knowledge Gap and Process



Towards a Characterization of Guidance in Visualization (Schulz et al. 2013)

REF	DG	Knowledge Deficit		Input			
		Path Unknown	Target Unknown	Domain	Data	Vis	User
		[X]	[X]	knowledge conventions workflow	raw meta-data topology	mapping visual artifact	interaction DOI
	Steering	X		X			
JGE12	Steering						
vdEvW13	Orienteering						
GGL*14	Orienteering		X		X		
LSS*12	Orienteering						
~~AMST11~~	Orienteering						
MA14	Orienteering		X	X			
KNS	Orienteering	X?					X
DR00	Orienteering	X?					X

90+ Papers

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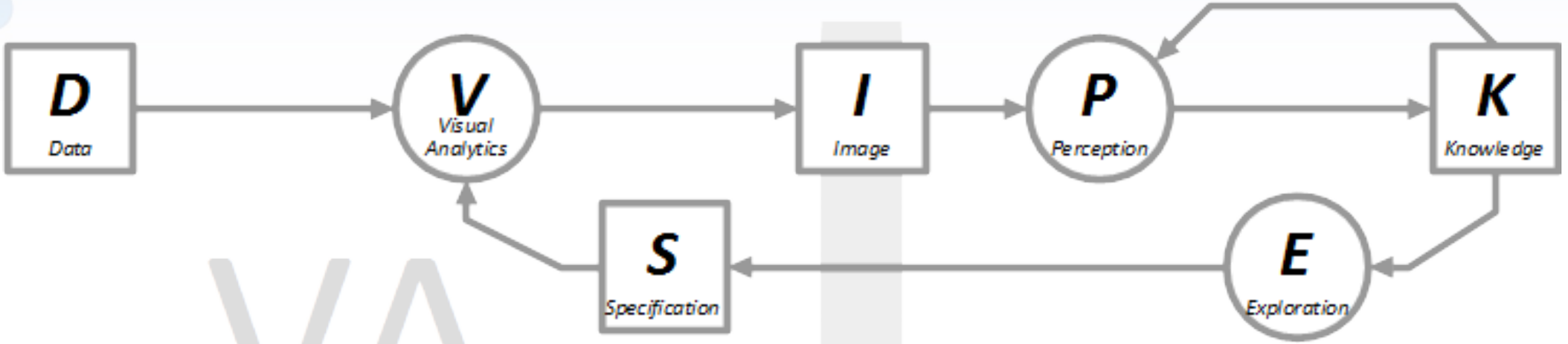
The Knowledge Gap: Guidance Type

- **target unknown**
  - What‘s a desired result?
- **path unknown**
  - How to reach a desired result?
- **target and path unknown**
  - no goal, no direction, no nothing…

The Knowledge Gap: Guidance Domain

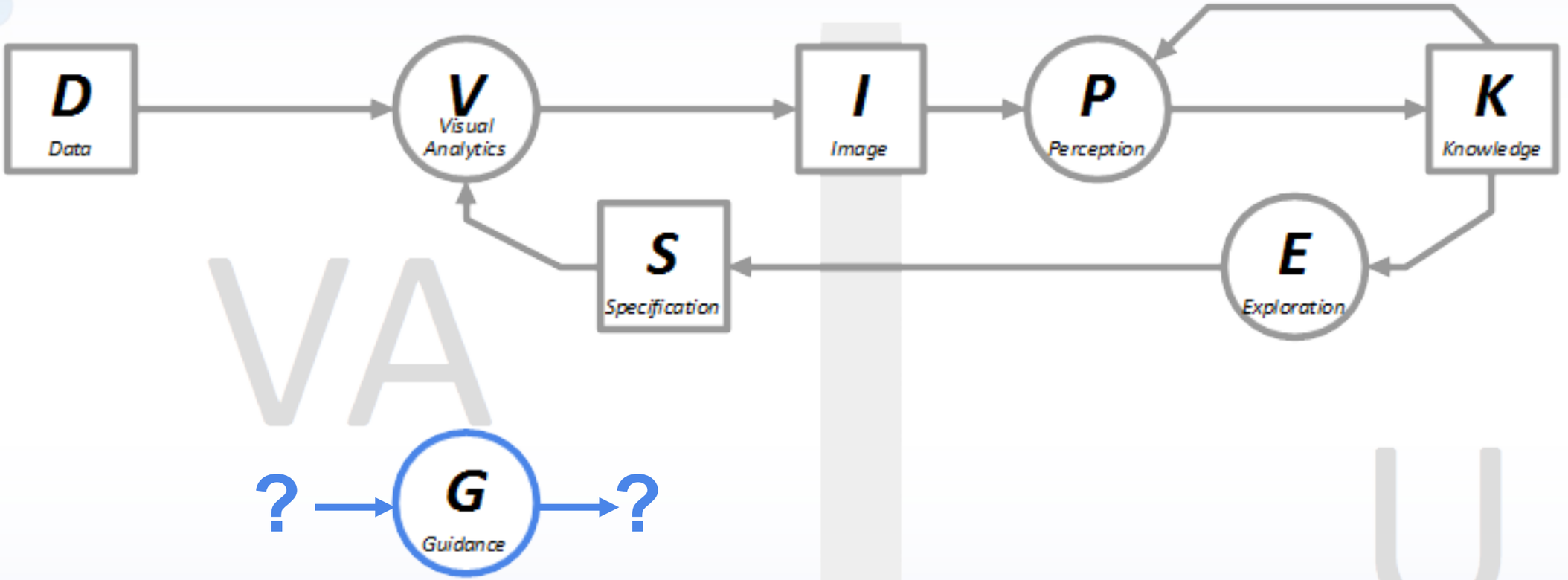
- **Data – Where to look?**
  Example: degree-of-interest functions
- **Tasks – What to do?**
  Example: analytic workflows
- **VA Methods – How to do it?**
  Example: recommender systems
- **Infrastructure – Which hardware/software to use?**
  Example: smart view management
- **Users – Who should do it?**
  Example: expert finding

The Computer-Assisted Process

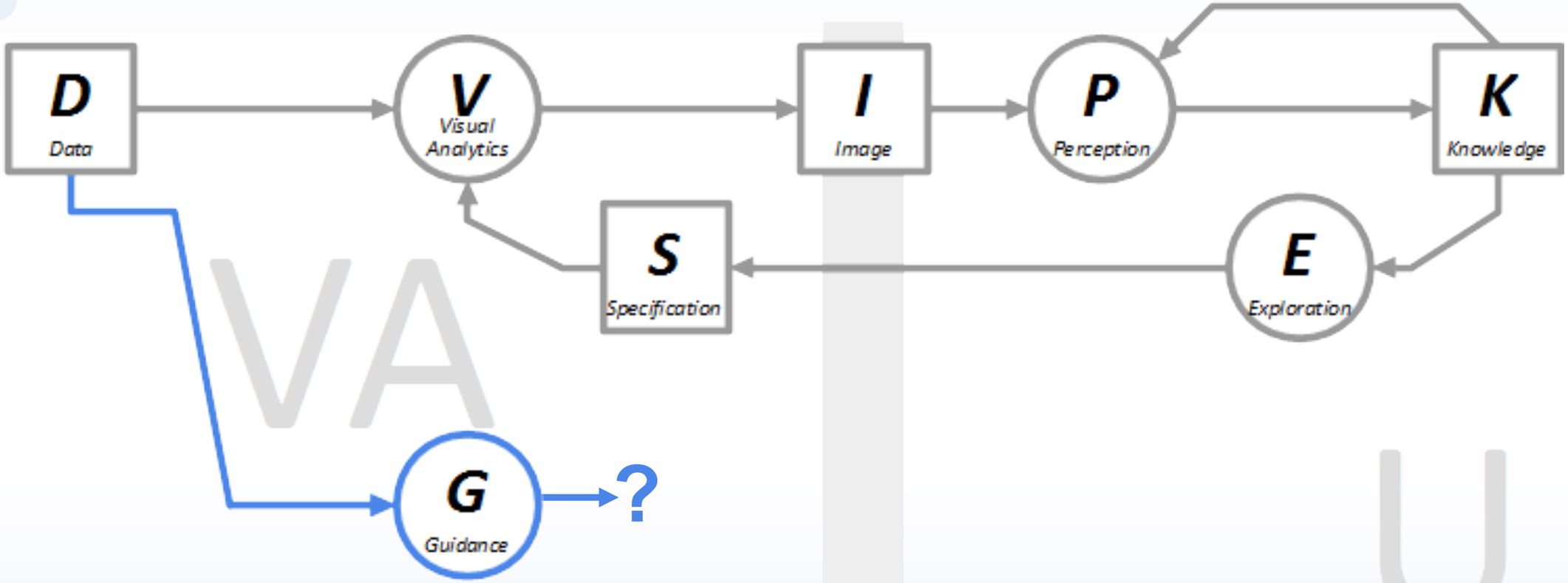


modeled after [v.Wijk 2006]

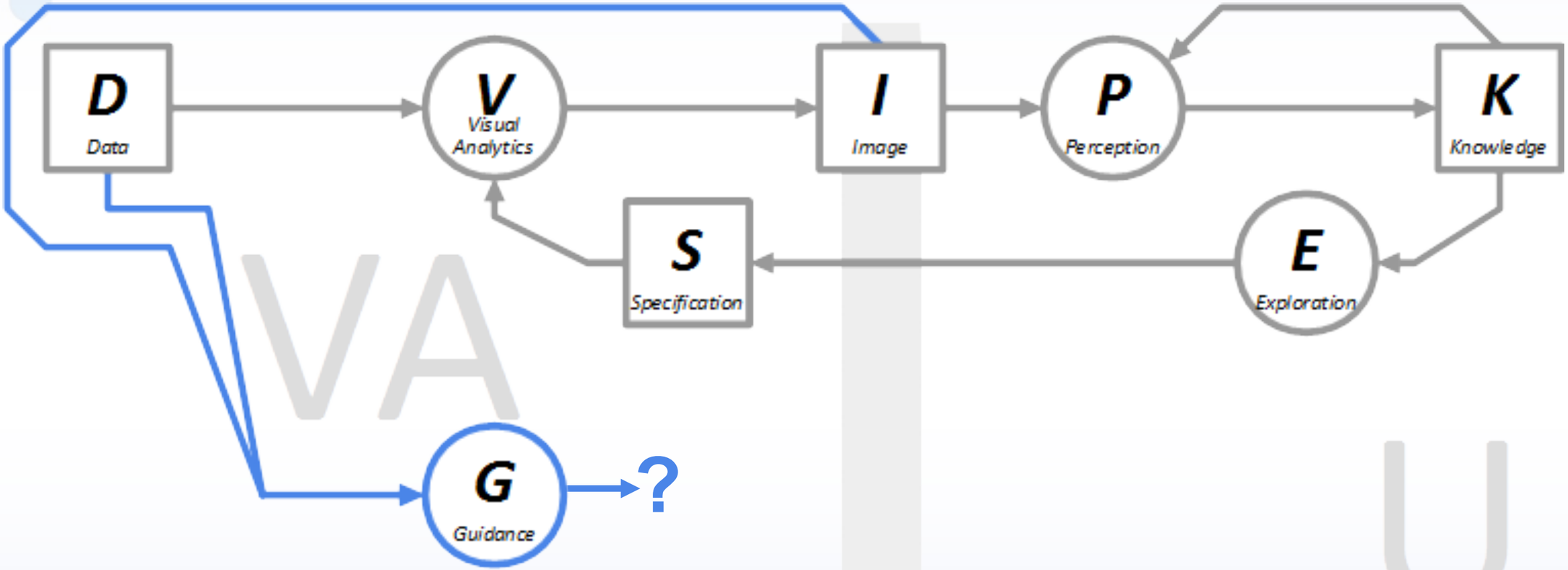
The Computer-Assisted Process



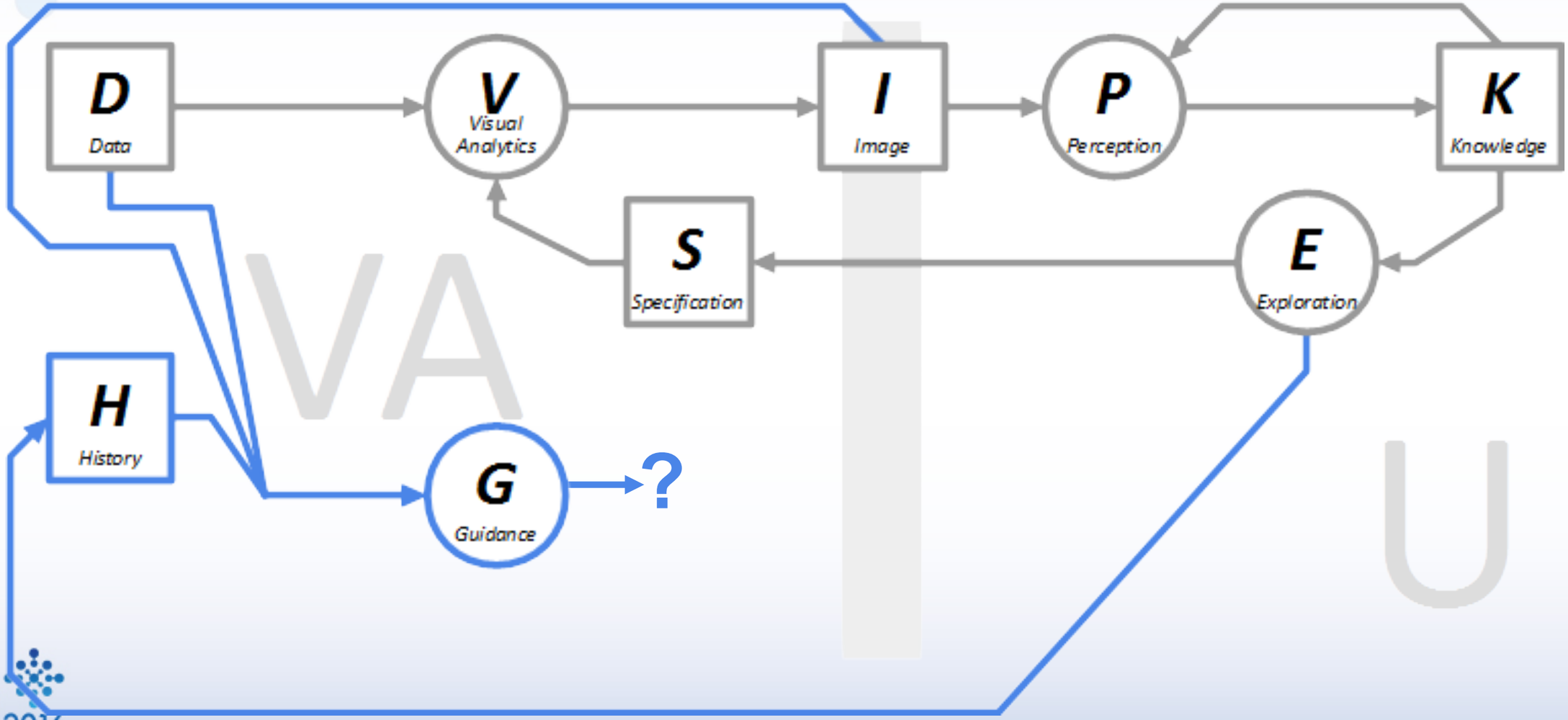
The Computer-Assisted Process Guidance Inputs: The Data



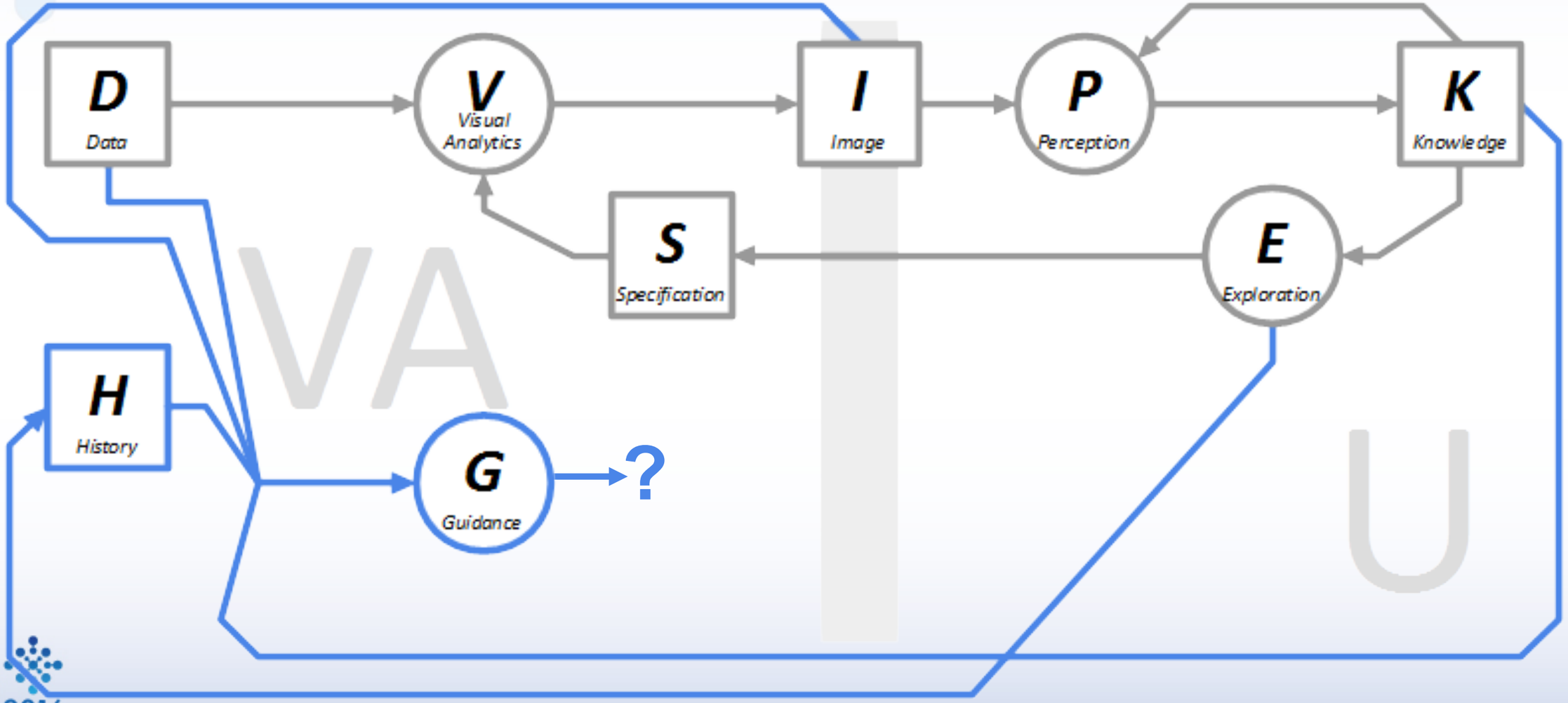
The Computer-Assisted Process
Guidance Inputs: The Visualization Image



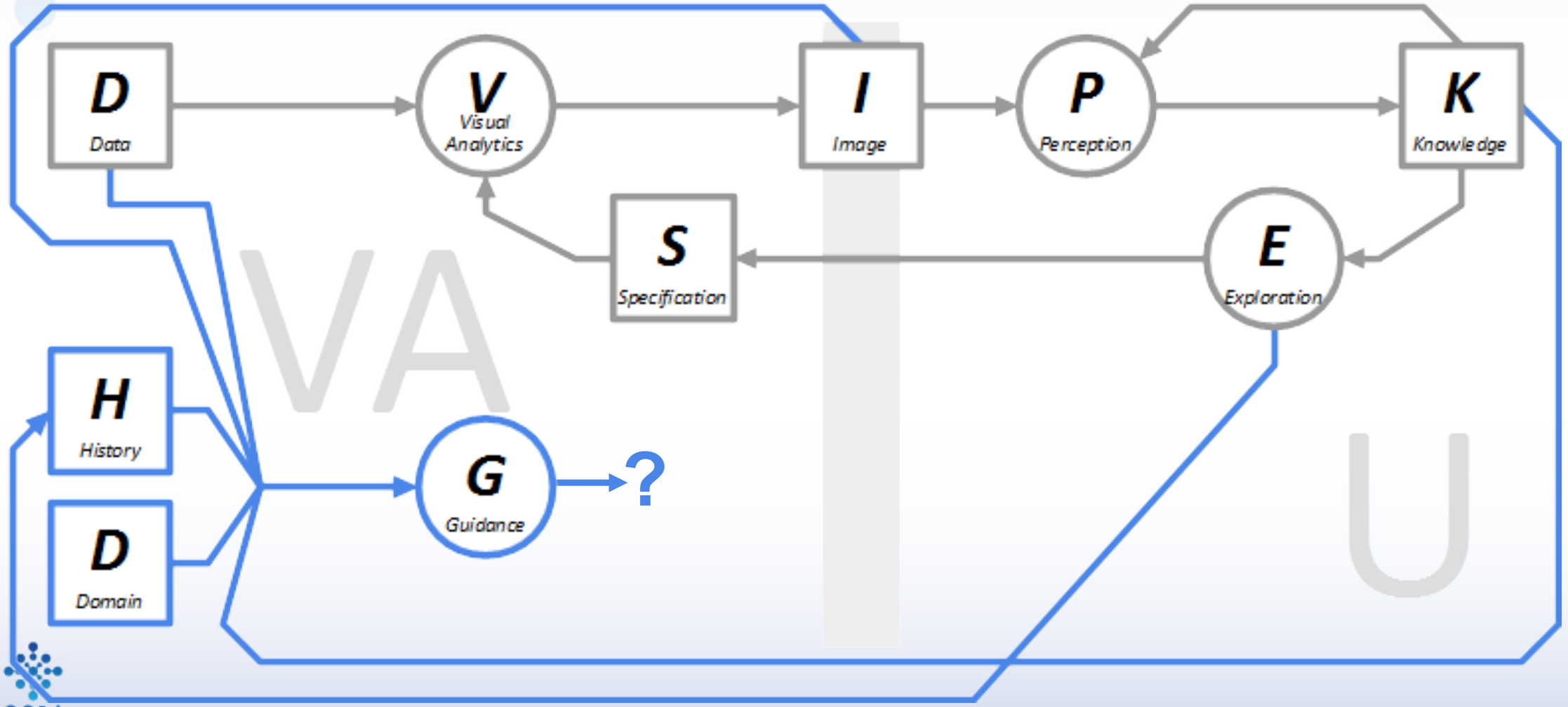
The Computer-Assisted Process
Guidance Inputs: The Interaction History



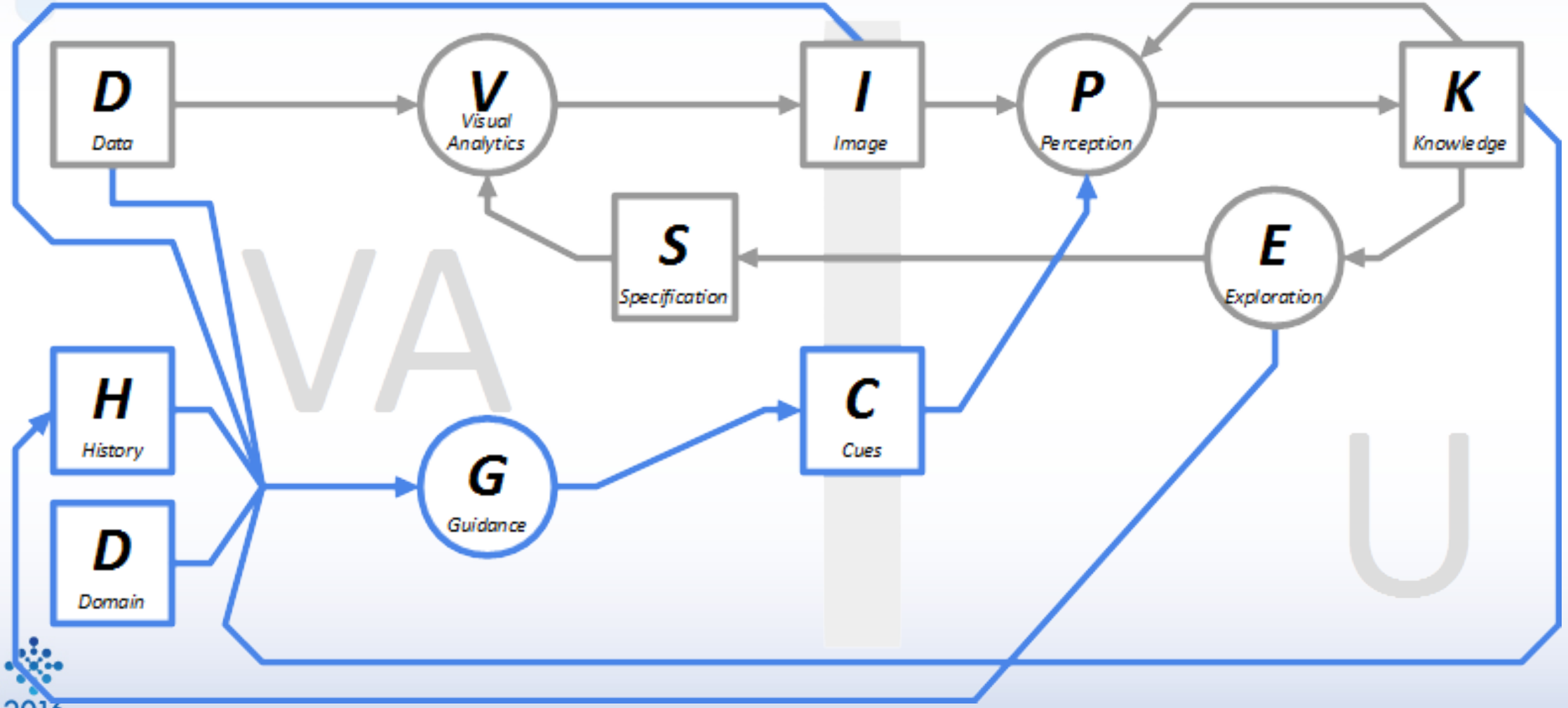
The Computer-Assisted Process
Guidance Inputs: The User Knowledge



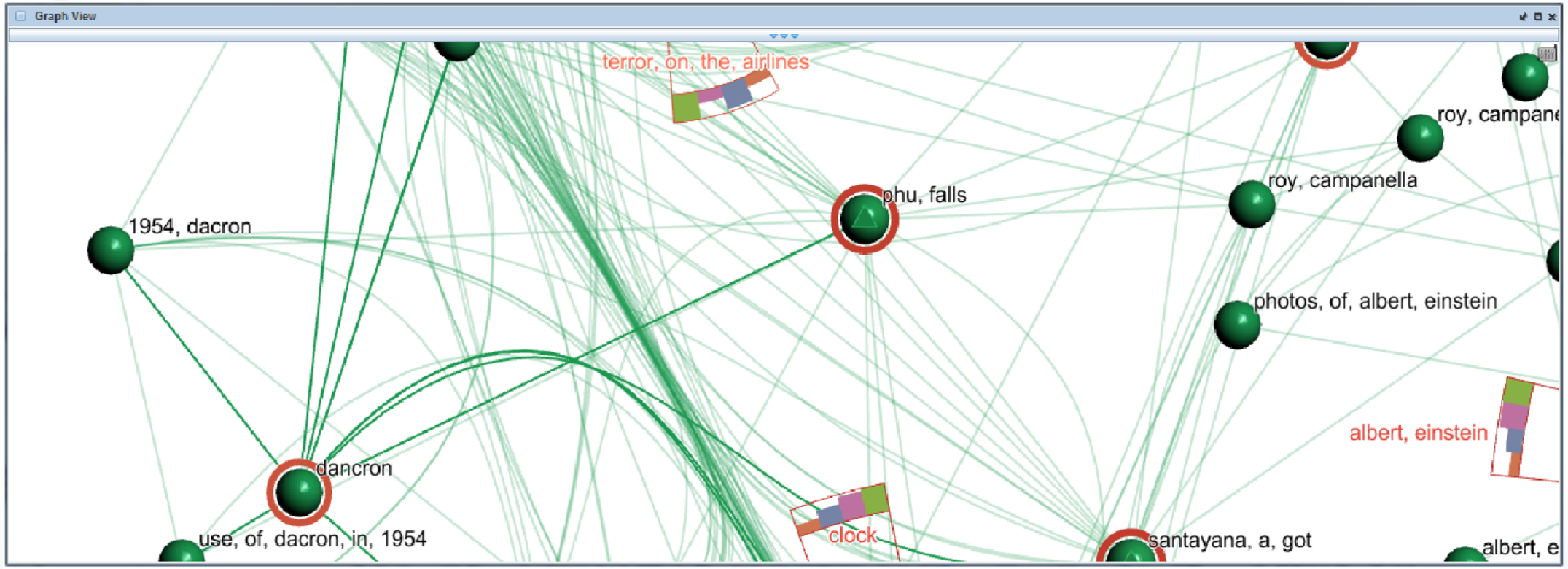
The Computer-Assisted Process
Guidance Inputs: The Domain Knowledge



The Computer-Assisted Process
The Guidance Outputs: Cues in the Visualization

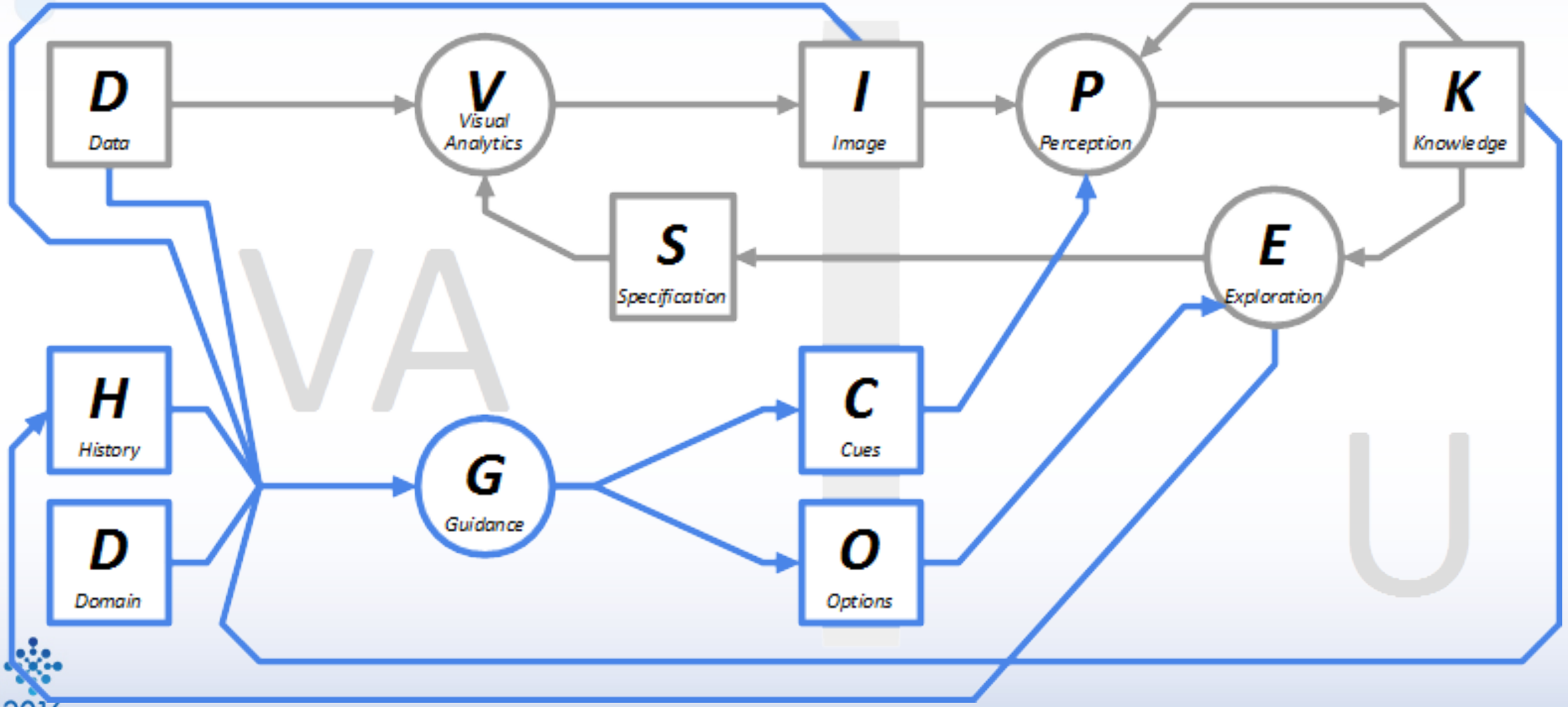


The Computer-Assisted Process
The Guidance Outputs: Cues in the Visualization

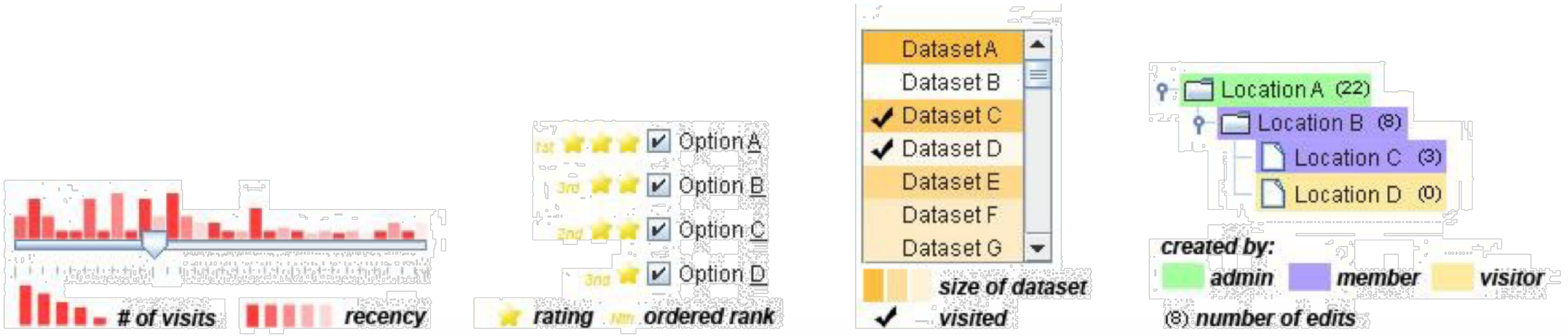


Navigation Recommendations [Gladisch et al. 2013]

The Computer-Assisted Process
The Guidance Outputs: Annotated Options in the UI

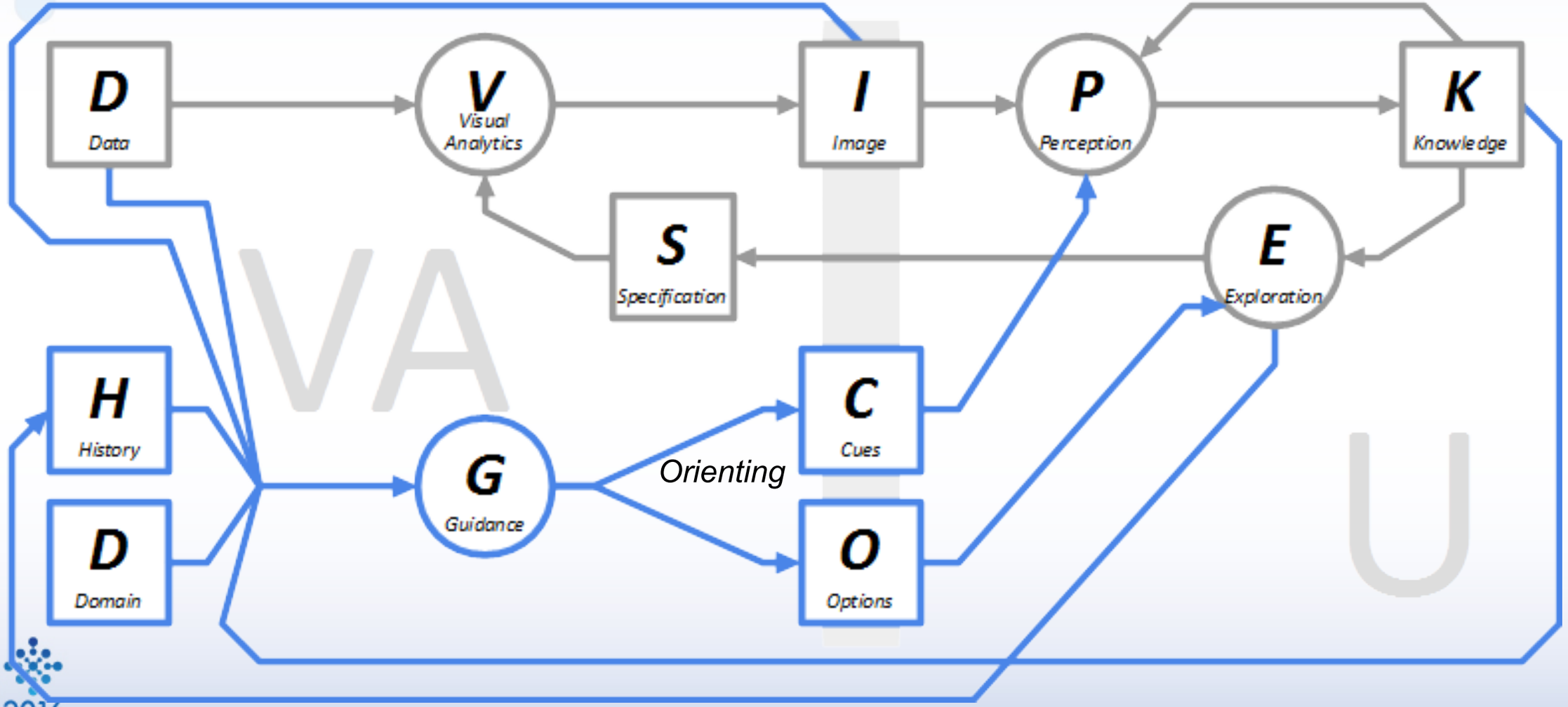


The Computer-Assisted Process
The Guidance Outputs: Annotated Options in the UI

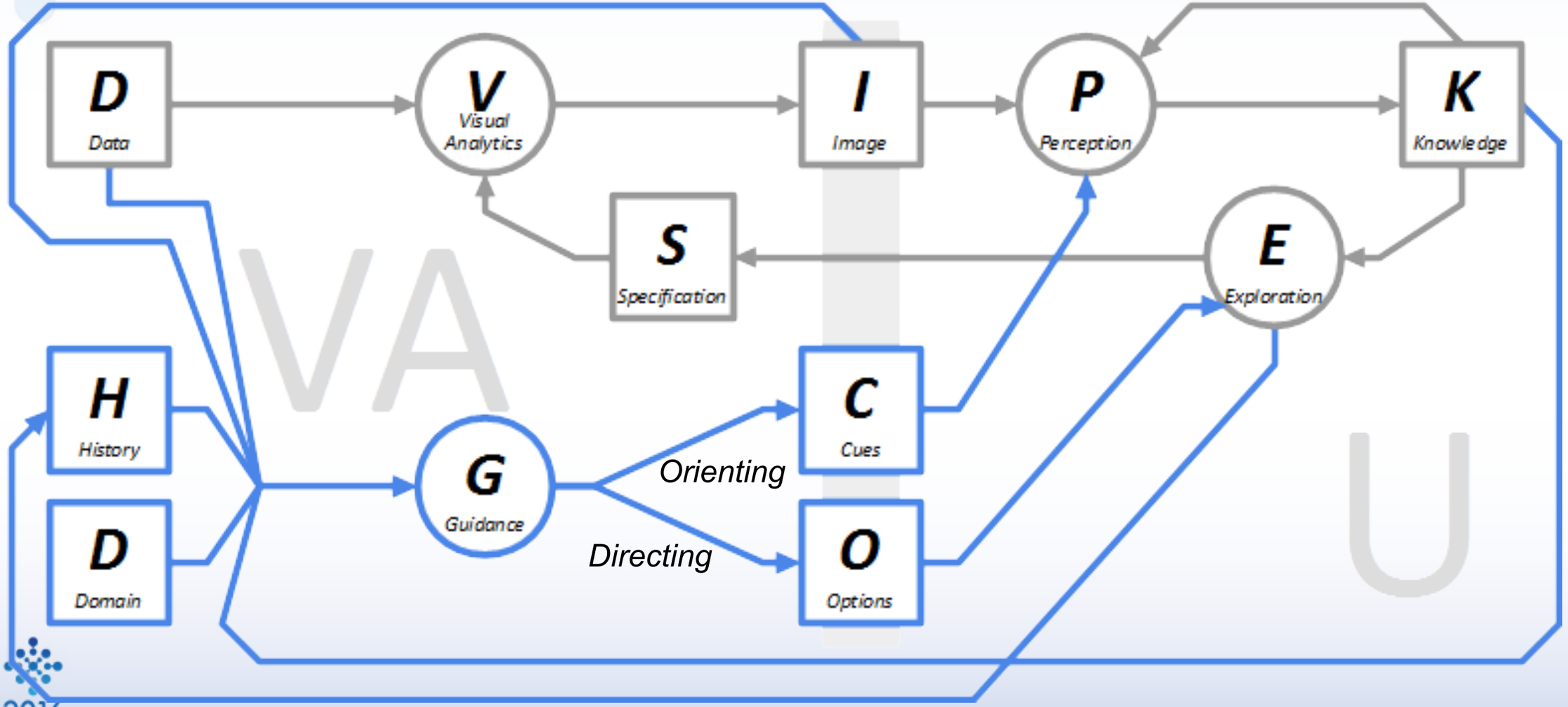


Scented Widgets [Willett et al. 2007]

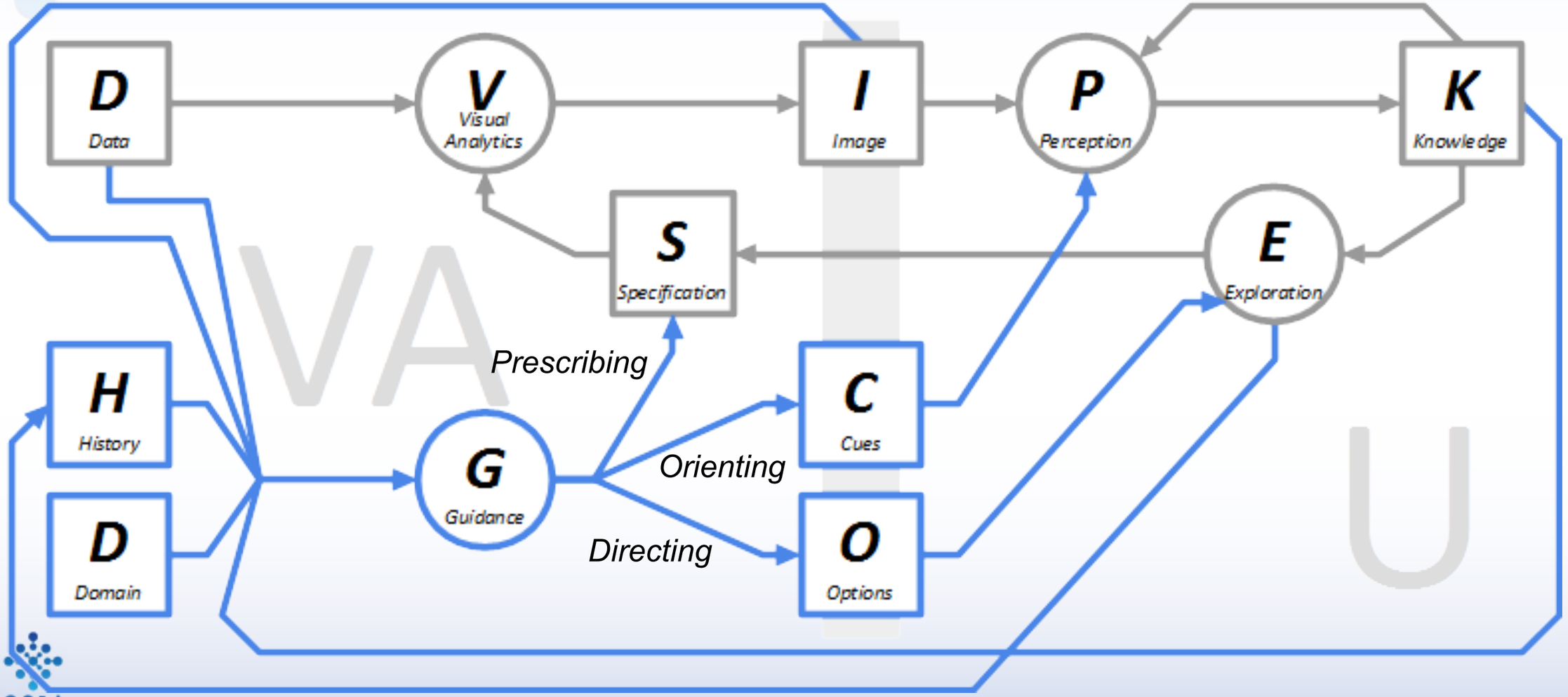
The Computer-Assisted Process
The Guidance Degree: Orienting – Where can I go?



The Computer-Assisted Process
The Guidance Degree: Directing – Where should I go?



The Computer-Assisted Process
The Guidance Degree: Prescribing – Take me to …!



So this is what Guidance is! Now what?

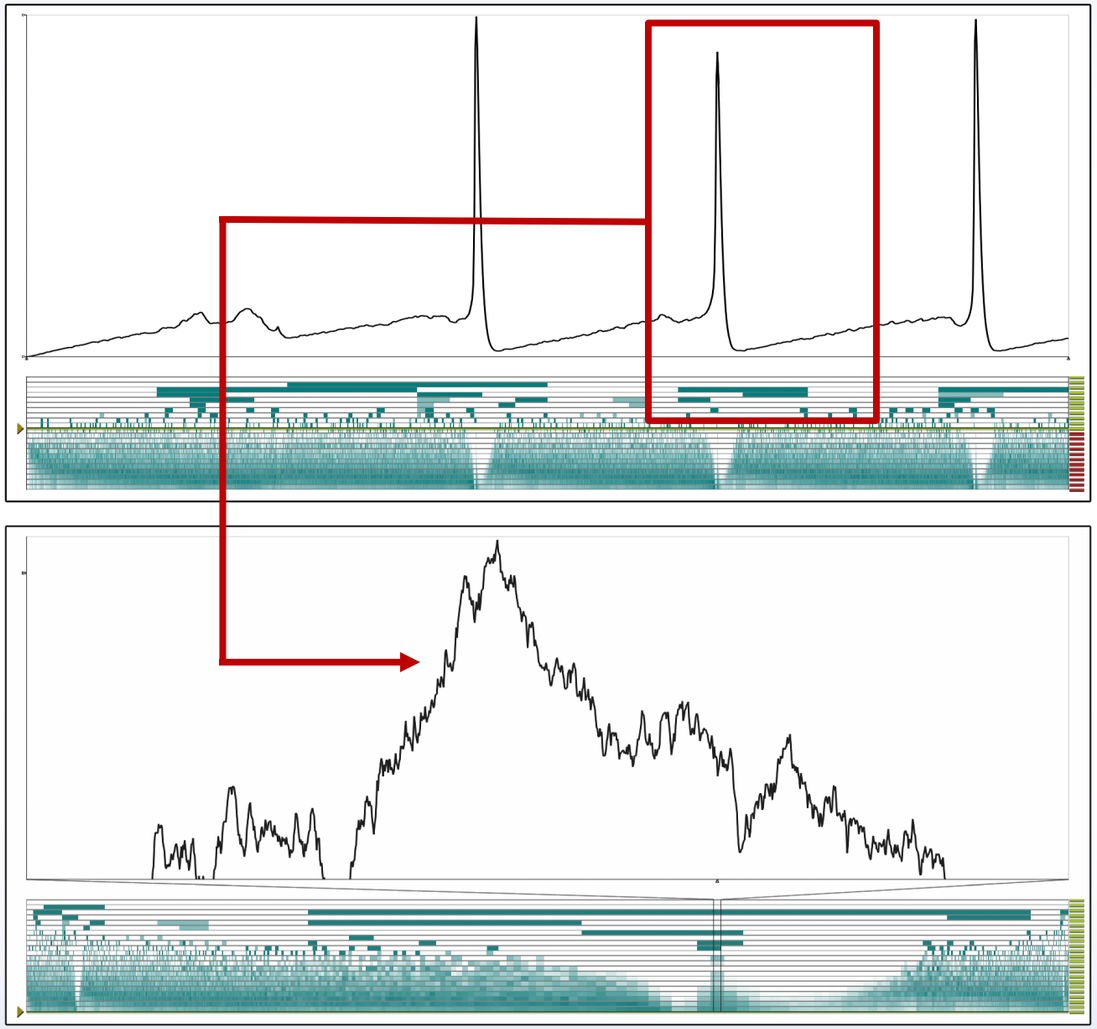
Our characterization can be used:

- as a framework for capturing guidance requirements
- to match-up guidance methods for user studies
- to couple guidance methods that complement each other
- for characterizing existing guidance methods independent of their respective domains or implementations

Guidance in literature

Heterogeneity-based guidance for exploring multiscale data

Knowledge Gap: Unknown target/Data.
Input: Data
Output: Indication of interesting data regions
Degree: Orienting



[Luboschik et al. 2012]

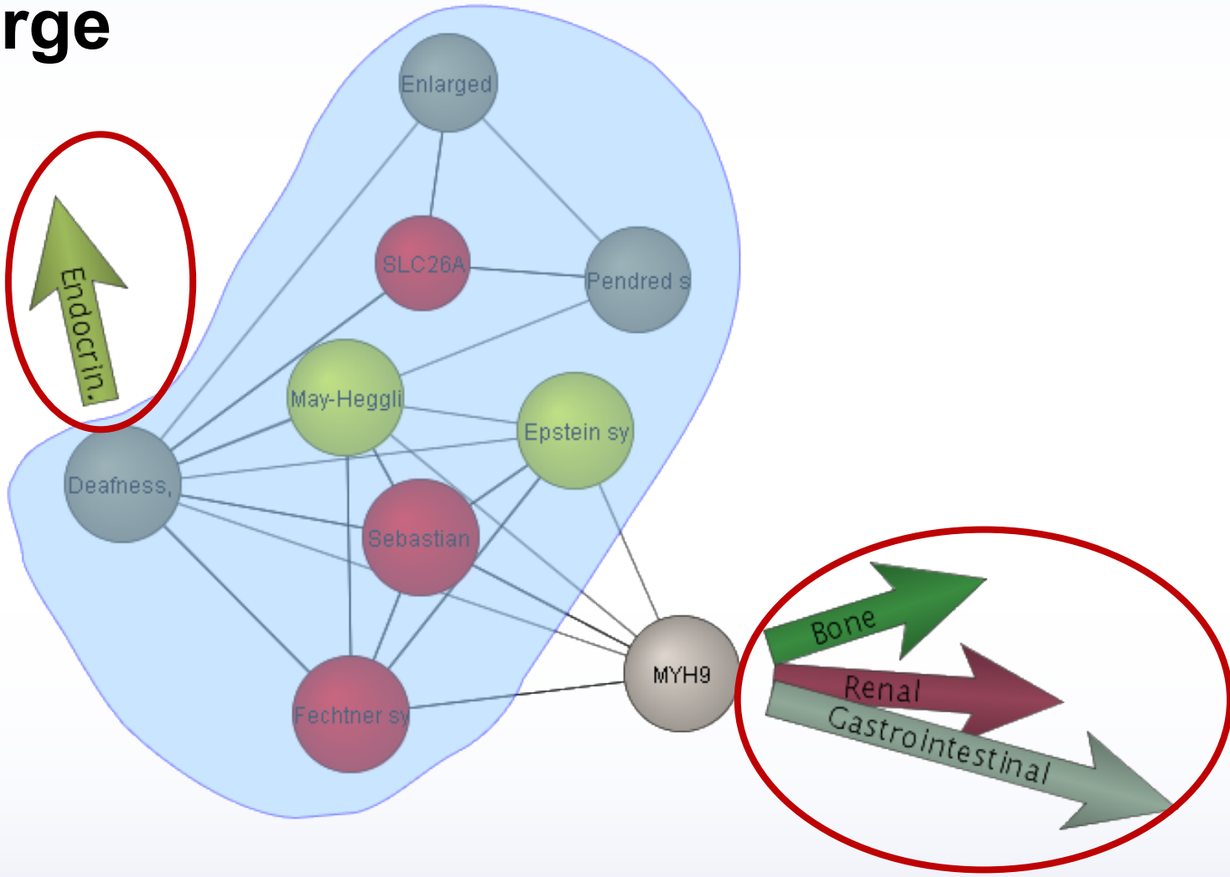
Guidance in literature

Using Signposts for Navigation in Large Graphs

Guidance Type: Unknown path
Guidance Domain: Data

Guidance Input: Data

Guidance Output: Visual Cue
Guidance Degree: Orienting

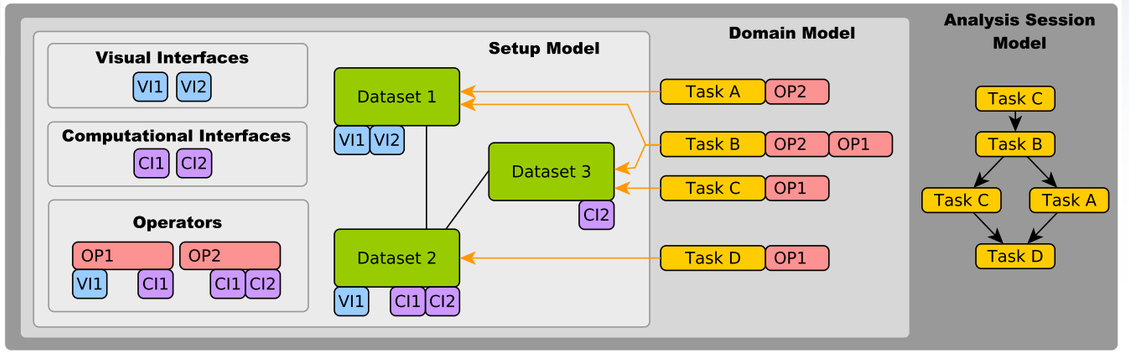


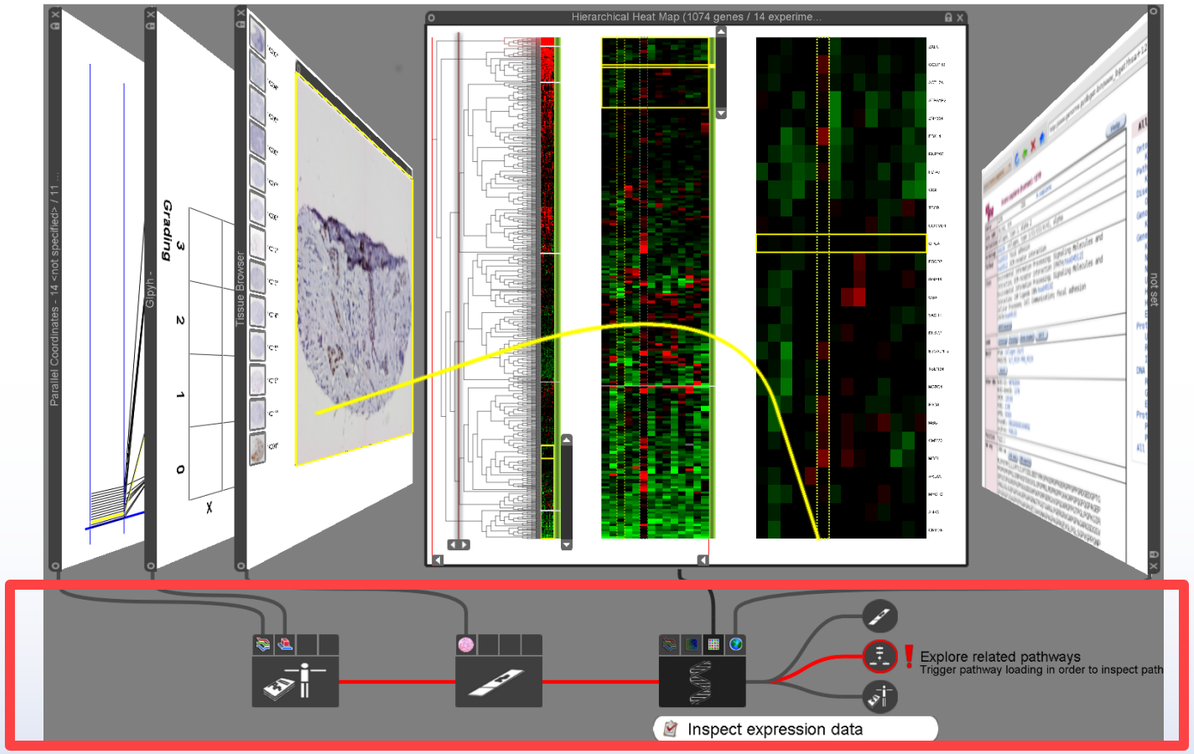
[May et al. 2012]

Guidance in literature

Model-Driven Design for the Visual Analysis of Heterogeneous Data

Knowledge Gap: Data, Tasks
Input: Model/Data/Domain Knowledge
Output: tree-shaped meta visualization
Degree: Orienting/Directing





[Streit et al. 2013]

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Main contributions

- A definition of guidance in VA
- A characterization of guidance in VA
- A conceptual model of guidance, including the main aspect of guidance in VA
- A review of guidance approaches

Future research

Refining the model

How guidance is generated?

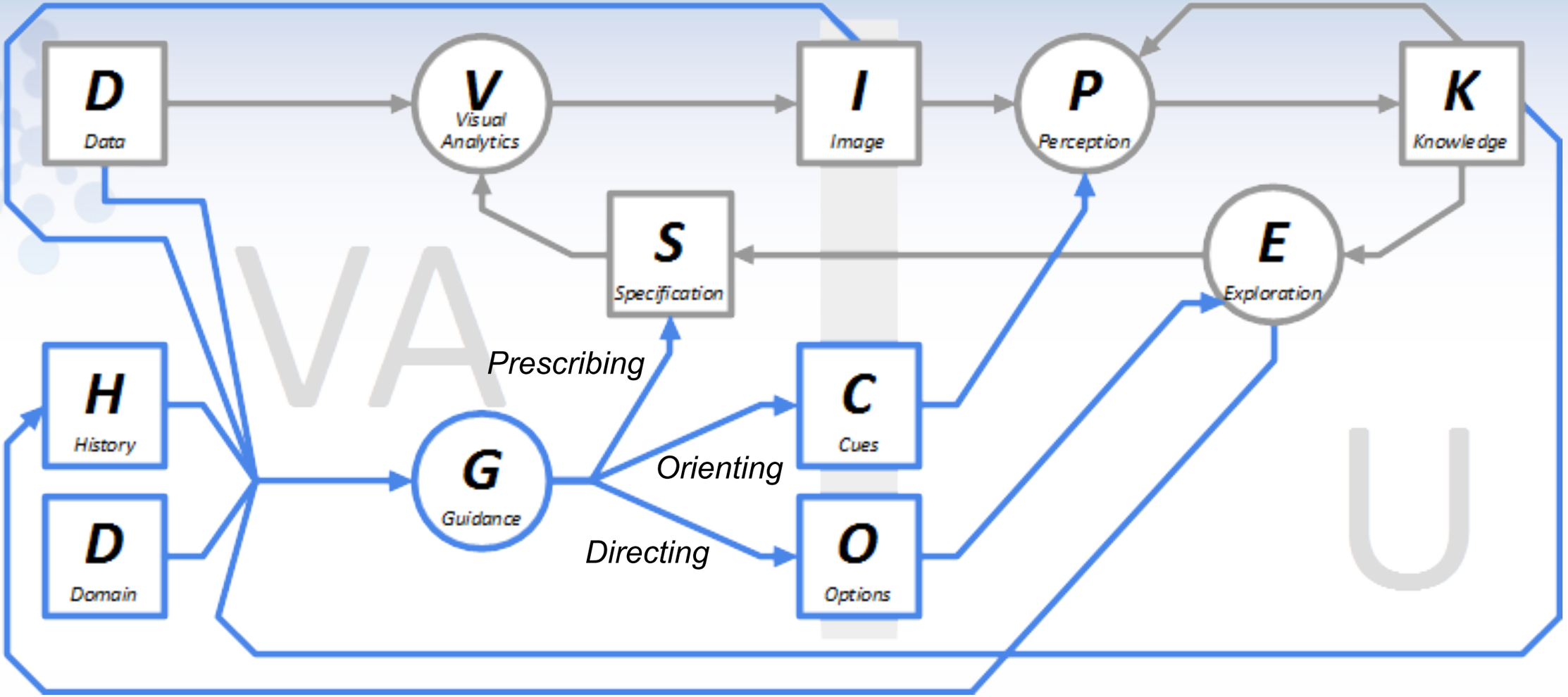
How is it possible to evaluate guidance?

Guidance and guidelines

Missing guidelines to apply guidance to the VA process

From guidance to mixed initiative visual analytics

Include users assisting the computer in the guidance equation



Funding provided by:

Laura Bassi Centre of Expertise
Centre for Visual Analytics Science & Technology

DAAD
Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

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Guidance Output:
The Answer that fills or bridges the knowledge gap

- **Direct Answer: given in the same domain as the knowledge gap**
  Example: What to do next?
  → use analytic workflow to suggest task

- **Indirect Answer: given in another domain than the knowledge gap**
  Example: What to do next?
  → use interaction logs to show which VA methods other users have used on which data subsets