Interactive Modeling

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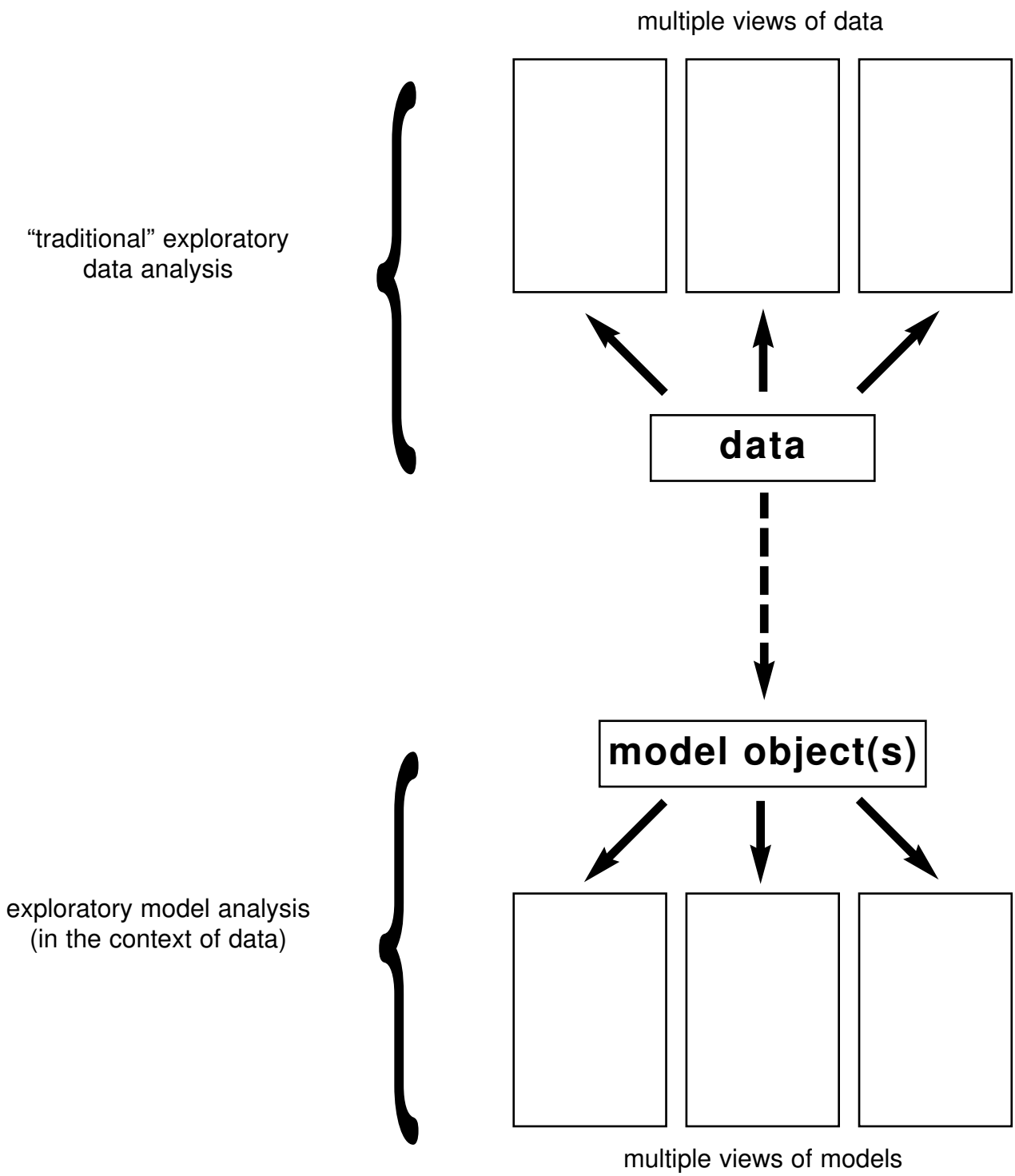
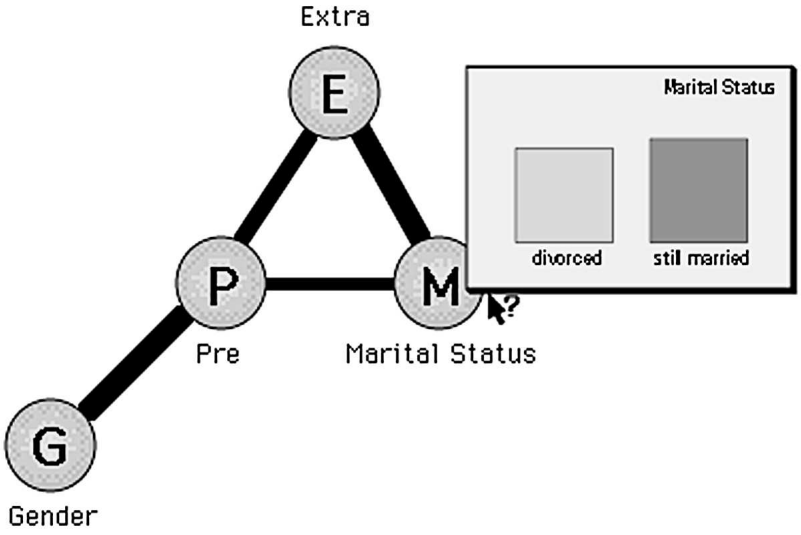


Alternatives for model visualization

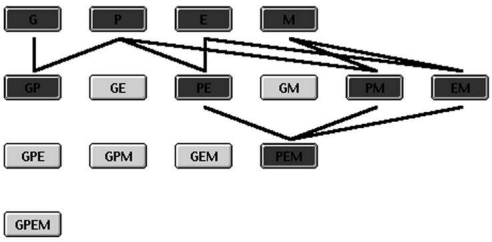
Interactive graphical models:

- linewidths indicate significance of interaction terms
- graphical interrogation of variables, interactions, etc.

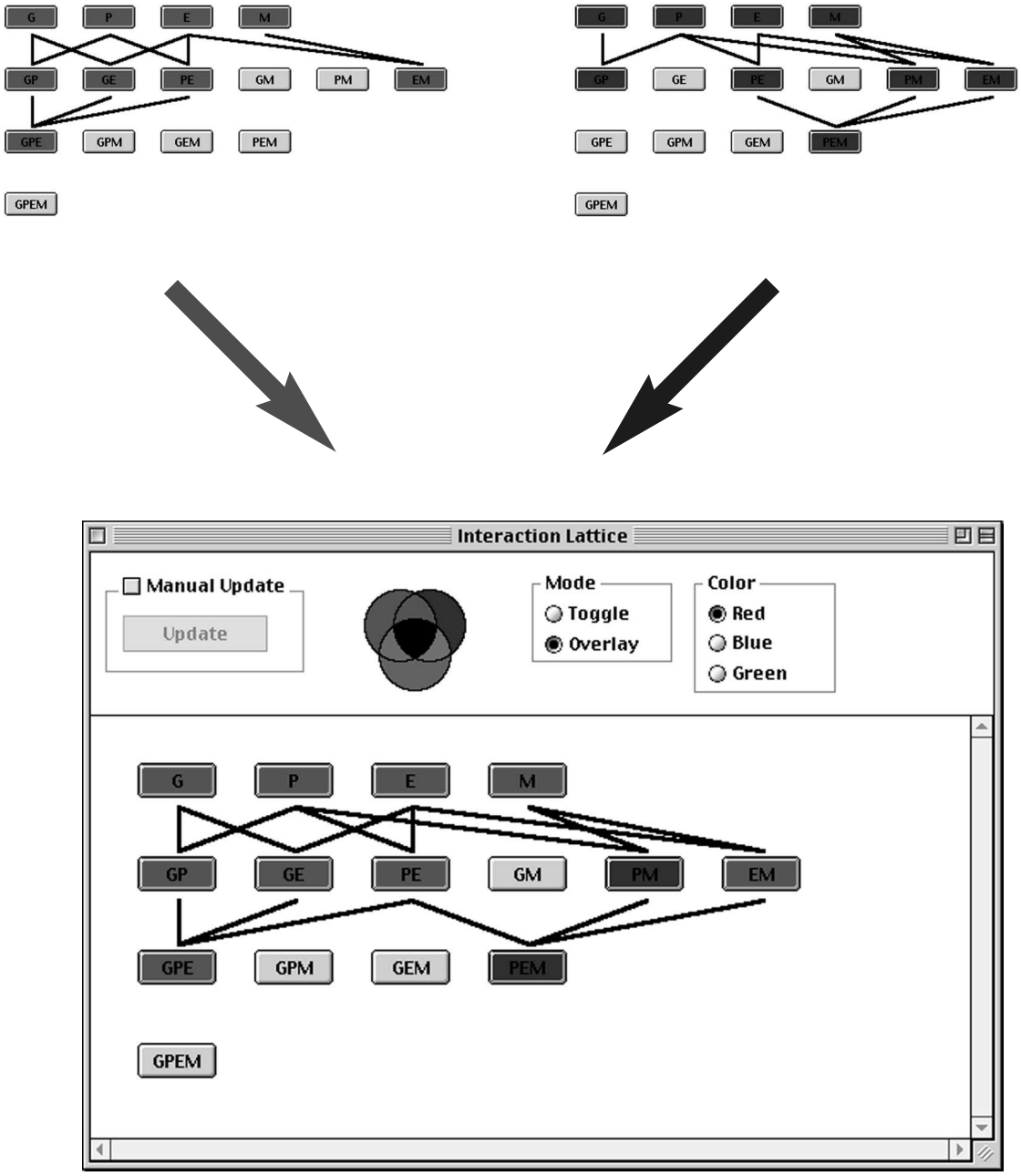


Interaction lattices:

- nodes enumerate all interaction terms, first row are main effects, second row two-way interactions, etc.
- all interaction terms included in the model are highlighted (in the example one three-way interaction and four two-way interactions, three of them implied by the three-way interaction (for a hierarchical model)).



Model comparison with interaction lattices:

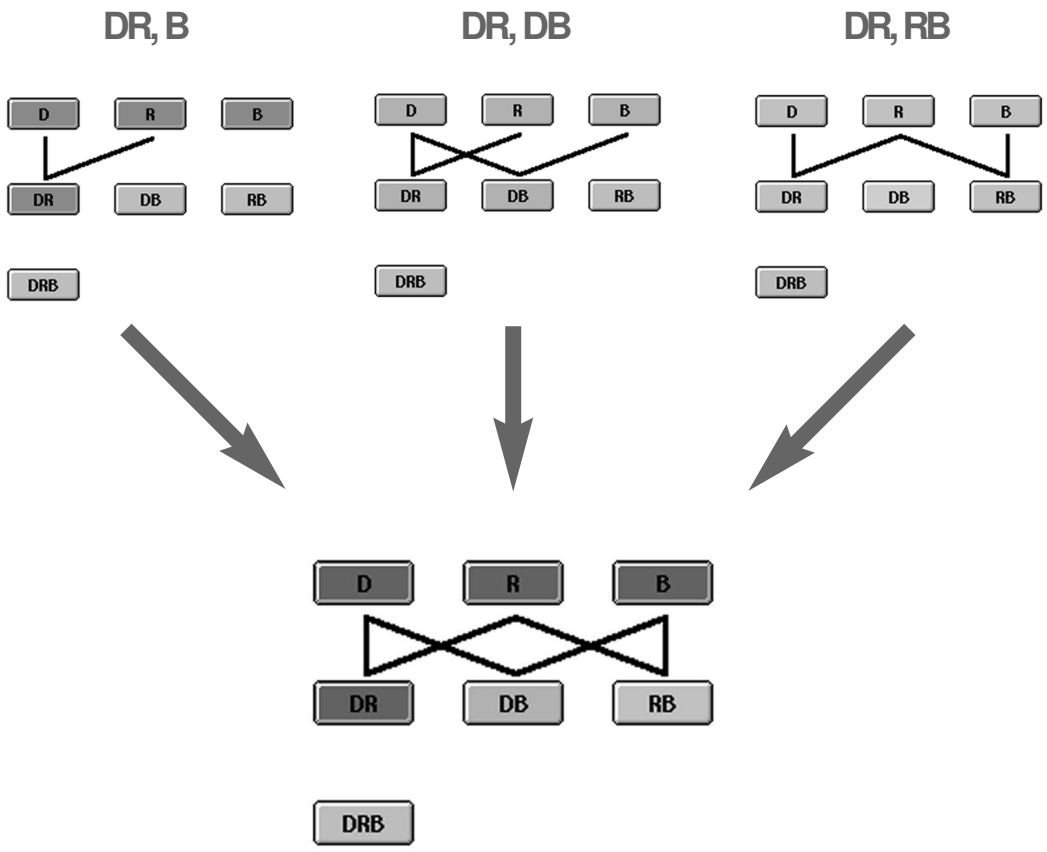


Model averaging with interaction lattices:

	R=0	R=1
B=0, D=0	?	60
B=0, D=1	49	4
B=1, D=0	247	112

Model	posteriori probability
DR, B	0.373
DR, DB	0.301
DR, RB	0.281

Spina Bifida dataset and the models with highest a-posteriori probabilities.
From: Madigan, D., York, J. (1995) Bayesian Graphical Models for Discrete Data, *International Statistical Review*, **63**, 2, pp. 215-232



Possible weights (in greenscale):

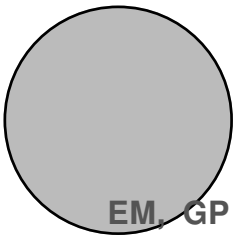
- Bayesian posterior probabilities (see above)
- likelihood ratios of the models (somehow normalized)
- p-values of the models

Interpretation of cumulated weights of single interaction terms is difficult, but the aim here is to get an overview.

Following the path of analysis with model trees:

9
degrees of freedom

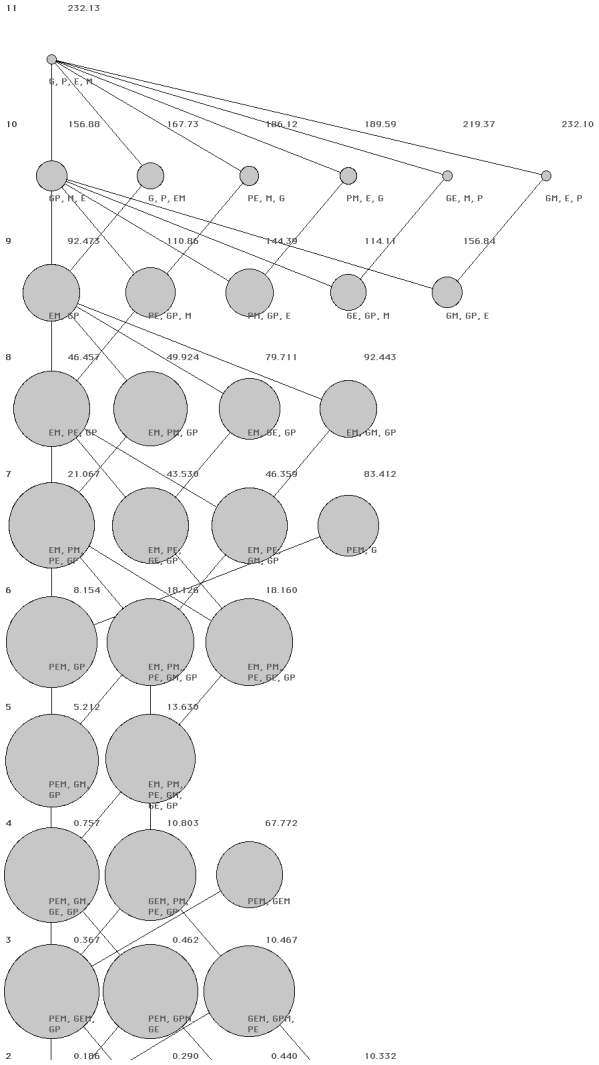
92.473
likelihood ratio



model descriptor

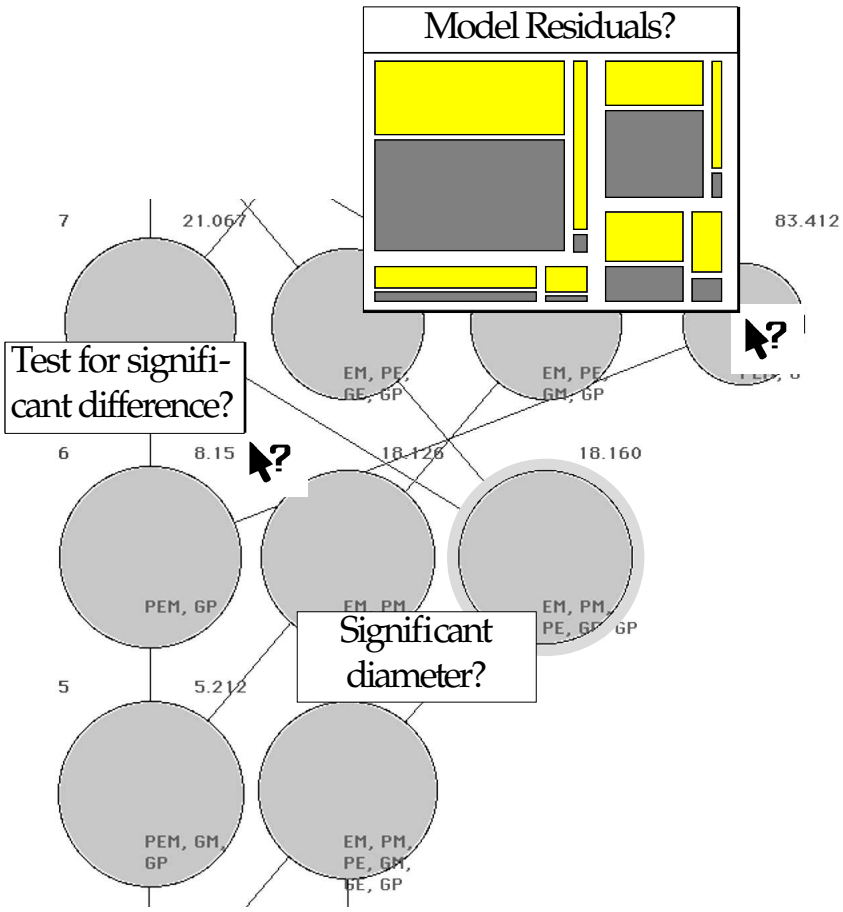
For the diameter *d* of the node holds:

$$d = \begin{cases} \left(1 - \frac{G^2}{G^2_{\max}}\right) d_{\max} & \text{if } \frac{G^2}{G^2_{\max}} \leq 0.95 \\ 0.05\, d_{\max} & \text{otherwise} \end{cases}$$



This tree shows all models calculated so far with their hierarchy.

Again, interactivity:

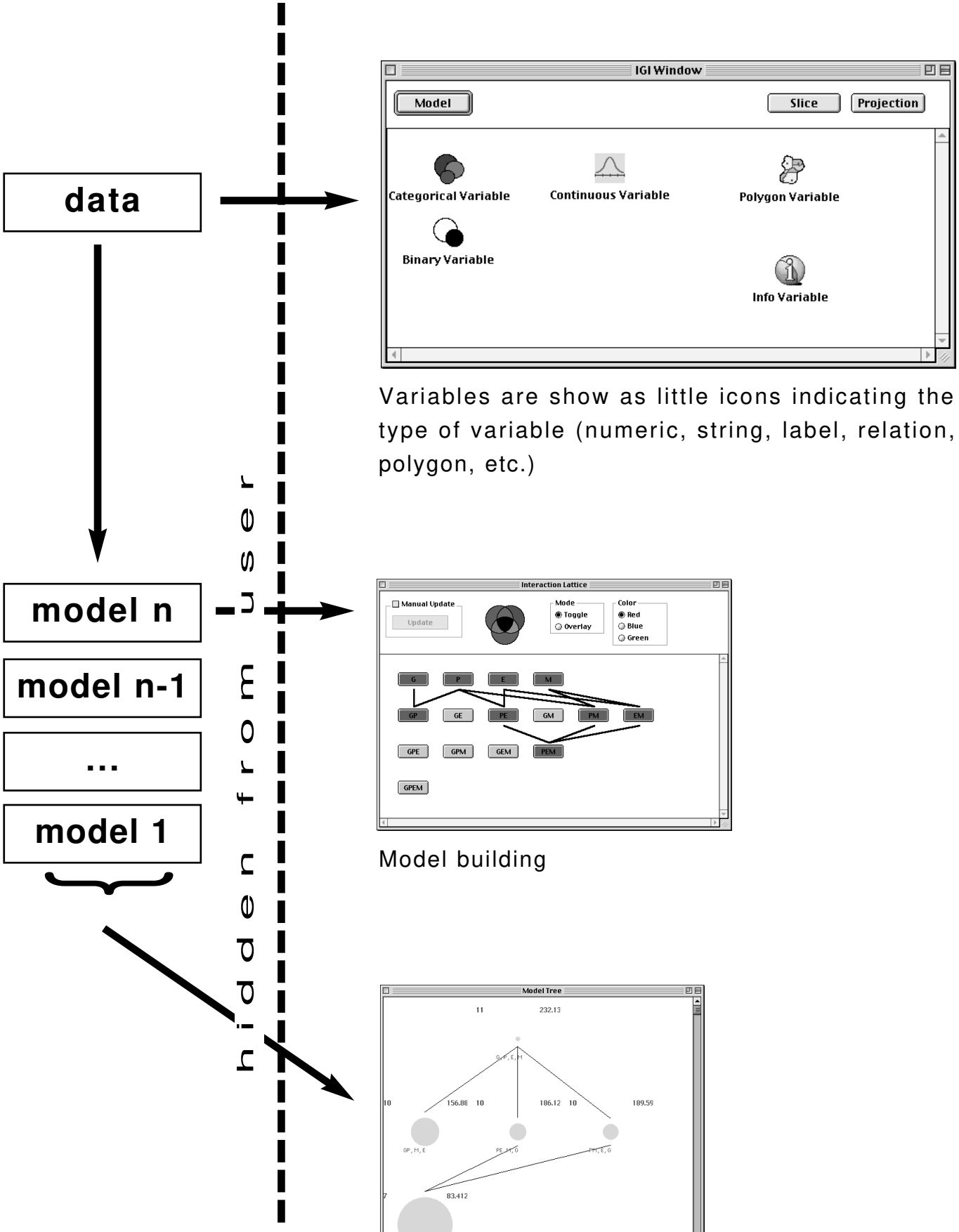


Node diameters:

- Ratio of likelihood ratios?
- Differences of likelihood ratios
- p-Values?
- Reference model(s)?

How about “non-comparable” models?

Implementation:



Variables are show as little icons indicating the type of variable (numeric, string, label, relation, polygon, etc.)

Model building

Model comparison