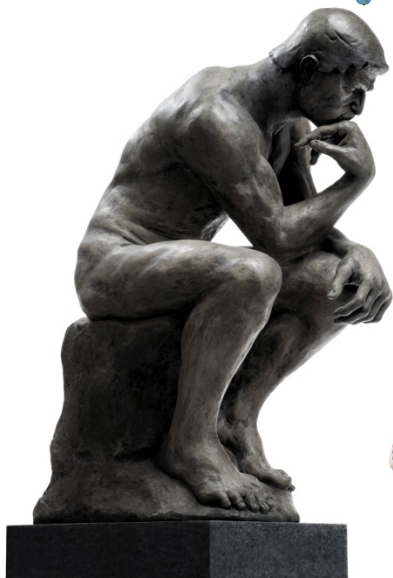


Probabilistic
Graphical
Models



Representation

Bayesian Networks

Application:
Diagnosis

Medical Diagnosis: Pathfinder (1992)

- Help pathologist diagnose lymph node pathologies (60 different diseases)
- Pathfinder I: Rule-based system
- Pathfinder II used naive Bayes and got superior performance

Heckerman et al.

Medical Diagnosis: Pathfinder (1992)

- Pathfinder III: Naïve Bayes with better knowledge engineering
- No incorrect zero probabilities
- Better calibration of conditional probabilities
 - $P(\text{finding} \mid \text{disease}_1)$ to $P(\text{finding} \mid \text{disease}_2)$
 - Not $P(\text{finding}_1 \mid \text{disease})$ to $P(\text{finding}_2 \mid \text{disease})$

Heckerman et al.

Medical Diagnosis: Pathfinder (1992)

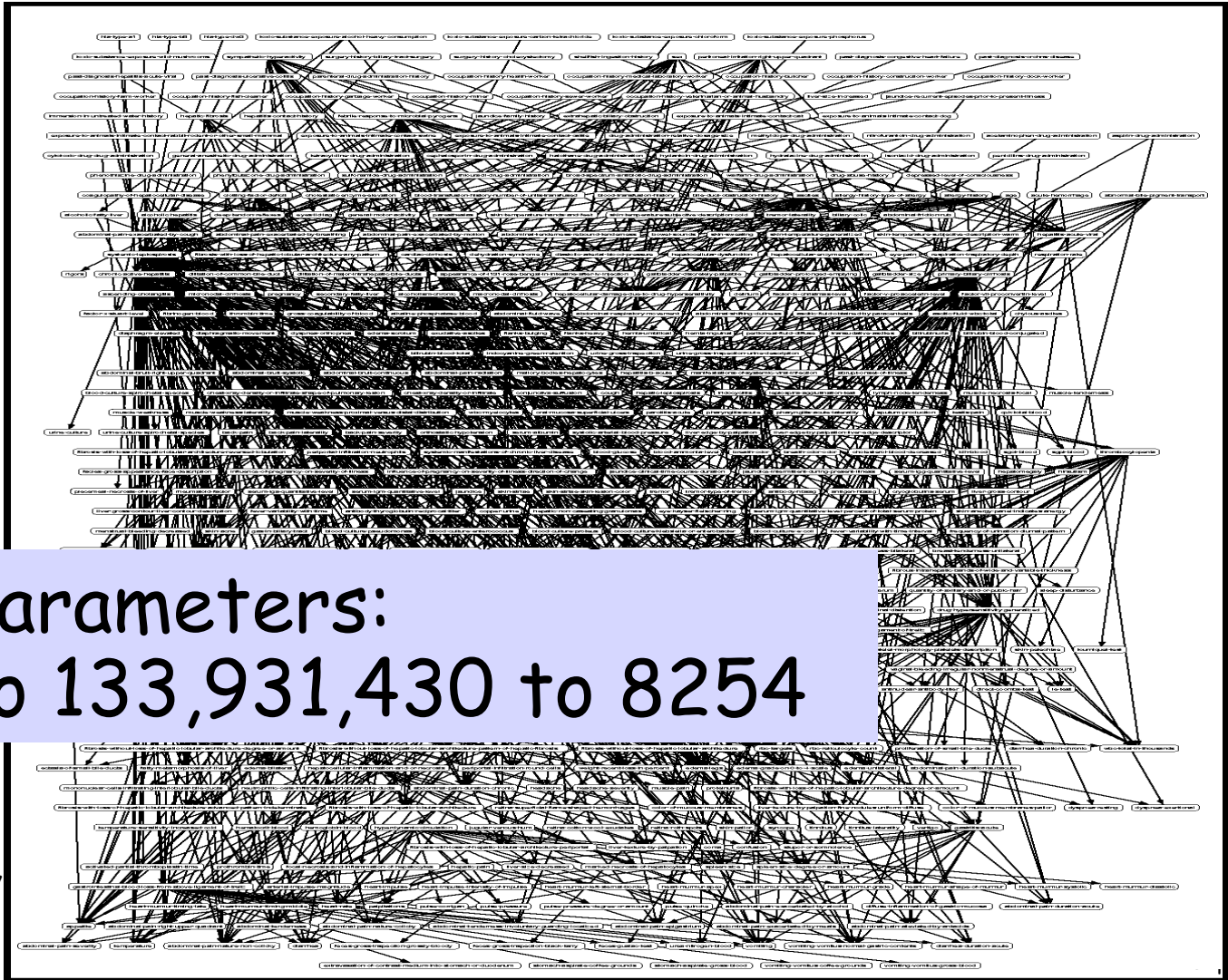
- Pathfinder IV: Full Bayesian network
 - Removed incorrect independencies
 - Additional parents led to more accurate estimation of probabilities
- BN model agreed with expert panel in 50/53 cases, vs 47/53 for naïve Bayes model
- Accuracy as high as expert that designed the model

Heckerman et al.

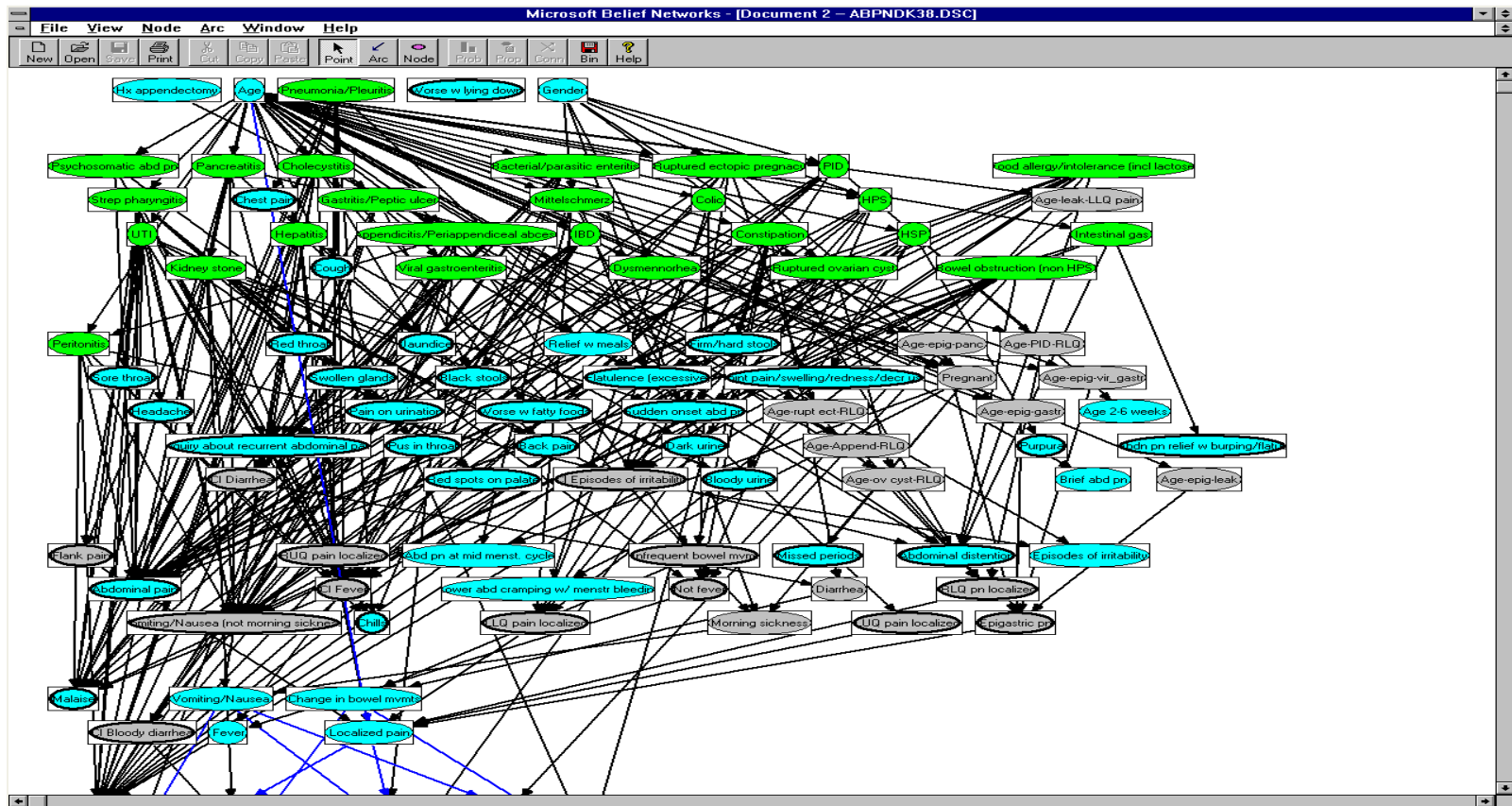
CPCS

of parameters:
 2^{1000} to 133,931,430 to 8254

M. Pradhan , G. Provan ,
B. Middleton , M. Henrion,
UAI 94



Medical Diagnosis (Microsoft)



Thanks to: Eric Horvitz, Microsoft Research

Daphne Koller

Medical Diagnosis (Microsoft)

Applet started

ON STAGE ESSENTIALS COMMUNICATE FIND

OnParenting May 14 - May 20, 1997

Fidelity Investments
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Find by Symptom ▶

Describe the child
in the drop-down boxes at the right. Relevant information will appear below.

Age: Sex:

Complaint:

Localized pain: Can the child localize, or point to, the site of the pain?

- No, unable to localize
- Below the navel to the child's left
- Above the child's navel
- Either of the child's sides
- Below the navel to the child's right
- Above the navel to the child's right
- Above the navel to the child's left
- Don't Know

Results so far

Disorder	Relevance
Viral gastroenteritis	<input type="text" value=""/>
Psychosomatic pain	<input type="text" value=""/>
Urinary tract infection	<input type="text" value=""/>
Other	<input type="text" value=""/>

Start Over **Review**

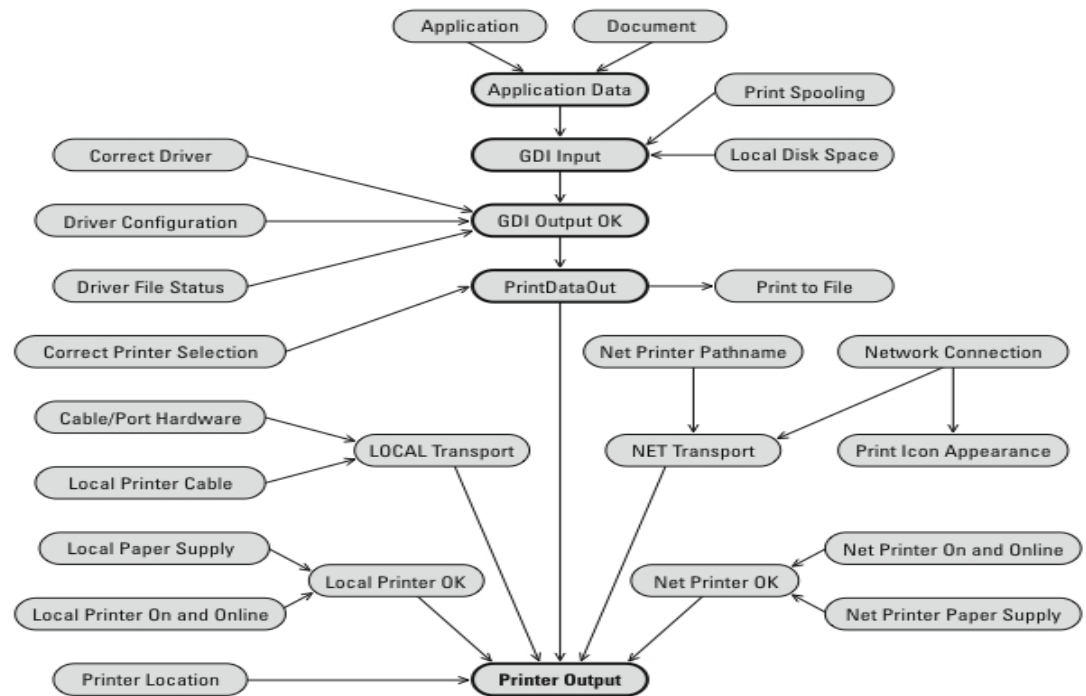
Next>> **Finish**

Thanks to: Eric Horvitz, Microsoft Research

Daphne Koller

Fault Diagnosis

- Microsoft troubleshooters



Fault Diagnosis

- Many examples:
 - Microsoft troubleshooters
 - Car repair
- Benefits:
 - Flexible user interface
 - Easy to design and maintain ←