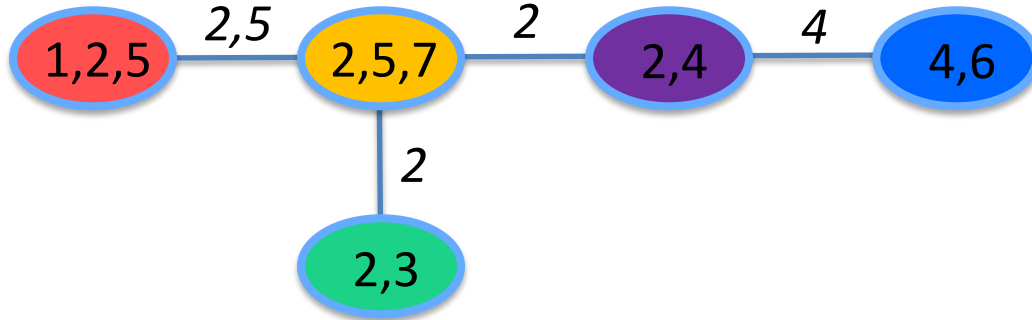


JDiff: Message-passing for differentiation on graphs

Divide and conquer

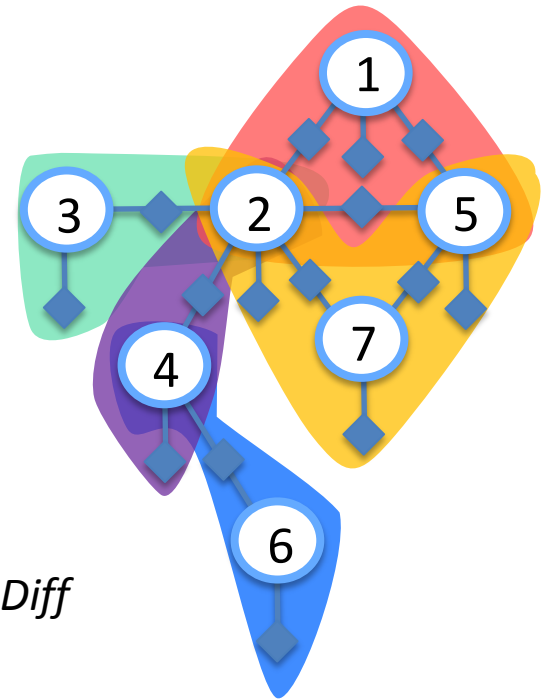
Decompose *global* differentiation into smaller *local* sub-problems



Recursive decomposition is naturally described by a junction tree (Lauritzen and Spiegelhalter, 1988)

Message-passing algorithm for differentiation on graphs: *JDiff*

Complexity: Exponential in tree-width of graph



Cumulative distribution networks

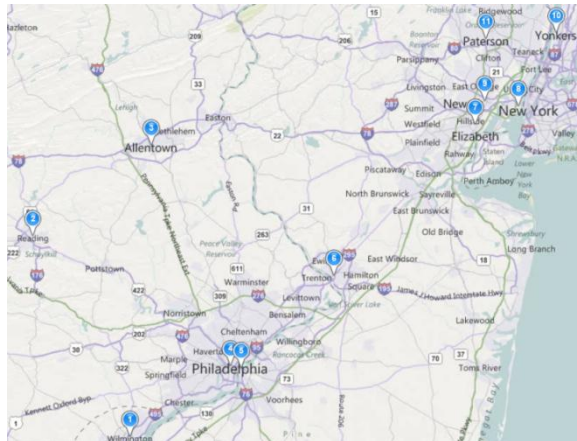
Well-suited for statistical modelling of heavy-tailed data

Given measurements at different spatial locations...

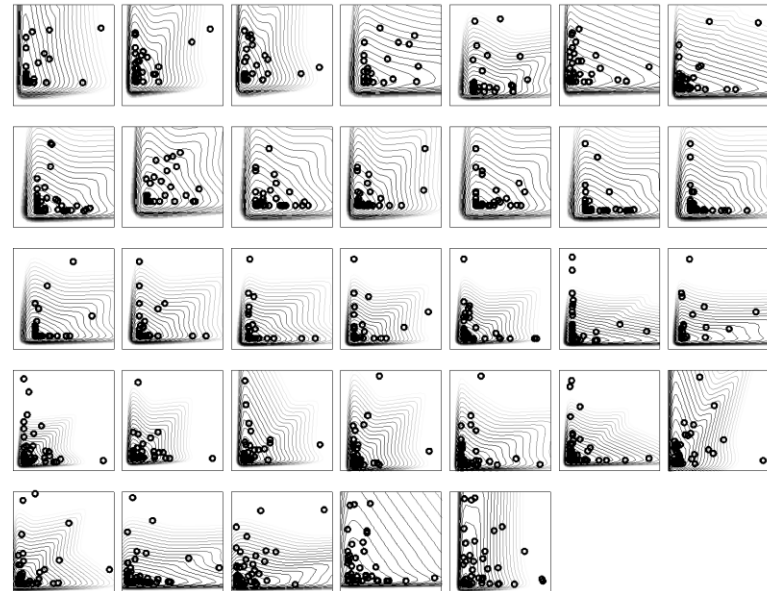
e.g.: Modelling rainfall data



e.g.: Modelling H1N1 mortality

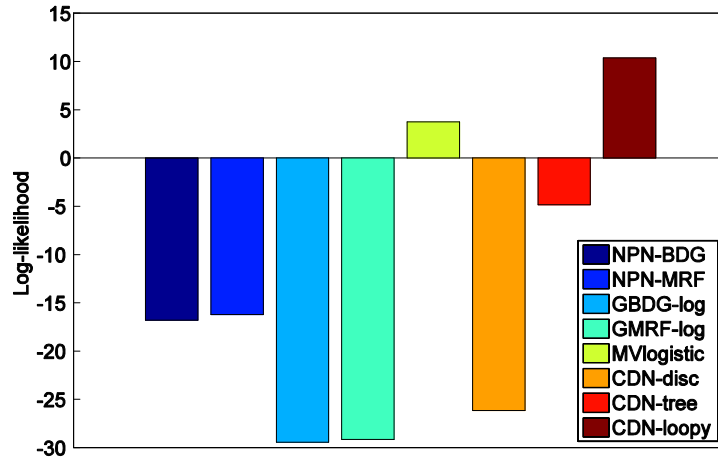


Learn a joint probability density model

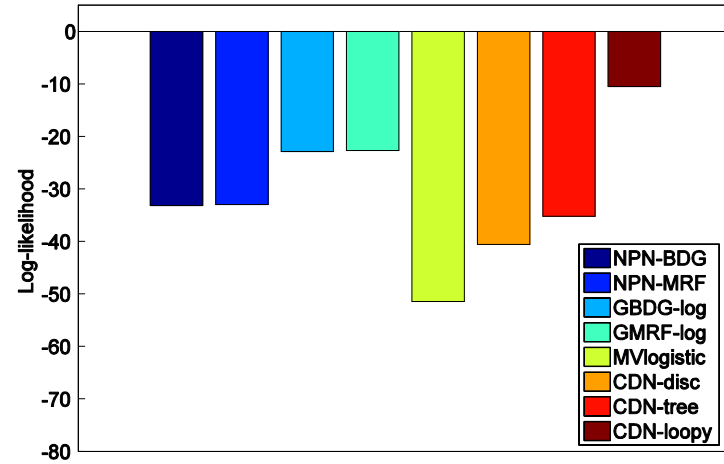


Learning loopy cumulative distribution networks

Test likelihoods on real, heavy-tailed data:



Rainfall data



H1N1 mortality

Symbolic differentiation on graphs:

	JDiff	Mathematica	D*
Grids	1 s. – 20 min.	6.2 s. - ∞	9.2 s. - ∞
Cycles	0.81 s. – 2.83 s.	1.2 s. – 580 s.	6.7 s. – 12.7 s.

Come see our poster #87 tonight!