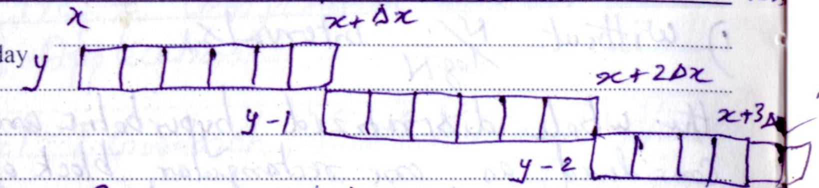
21/11/2013 Discrete Hyperbolic Factorization NC implementation

4 Wednesday



k-tile merge for above 3 tiles:

tile 1 = $(x, y, x+\Delta x, y)$
tile 2 = $(x+\Delta x, y-1, x+2\Delta x, y-1)$
tile 3 = $(x+2\Delta x, y-2, x+3\Delta x, y-2)$.

After merger position of elements get shuffled. So binary search on the merged sorted tile needs to get the coordinate information with some additional ~~fields~~ header.

For example: if $x = 3$ $y = 5$ and Δx fixed at 6, above tiles are

5 Thursday

$x=3$

y=5	15	20	25	30	35	40
y=4	36	40	44	48	52	56
y=3	45	48	51	54	57	60

tile 1 = (15, 20, 25, 30, 35, 40)
tile 2 = (36, 40, 44, 48, 52, 56)
tile 3 = (45, 48, 51, 54, 57, 60)

Sorted merged tile of above 3 is

	15	20	25	30	35	36	40	40	44	45	48	48	51	52	54	56	57	60
tile id.	5	5	5	5	5	4	5	4	4	3	4	3	3	4	3	4	3	3

In this sorted merged tile

6 Friday

if factors of 48 is needed, binary search gives two elements with tile id(s) 4 and 3. Thus 4 and 3 are factors of 48. Thus each tile needs the tile id as a non-primary key. Search key is always on the number N to be factored.

If single rectangular block is considered it is $N \times N$, and total number of tiles in the hyperbola is

$$\frac{N}{1\cdot 2} + \frac{N}{2\cdot 3} + \frac{N}{3\cdot 4} + \cdots + \le \frac{N}{1^2} + \frac{N}{2^2} + \frac{N}{3^2} \quad RZF(s=2)$$

$$\le \frac{N\pi^2}{6} \sim 1.33N$$

Merge needs $\underbrace{\log N}_{N\text{ tiles}} \times \underbrace{\log(N \times 1.33)}_{\text{sum total length of the tiles}}$

7 Saturday

$= O((\log N)^2)$ with binary search, this is $O((\log N)^2 + \log N)$

If a merge algorithm ~~has~~ needs $\frac{N}{\log N}$ processors in CRCW model, (in the complete discretized hyperbola) 1.33N memory locations need to be populated with products and ~~tags~~ tile id(s). Due to CRCW

Sunday 8

$\frac{N}{\log N}$ processors can set 1.33N memory locations in

$$\frac{1.33N}{N} \times \log N = O(\log N) \text{ time.}$$

Ka. Shrinivaasan 21/11/2013

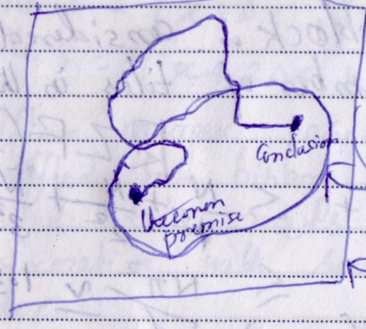
12/12/2013 (46)

9 Monday

Implication graphs and Convex Hulls

To prove:

No polynomial sized subgraph of the universal implication graph that contains the theorem premise and conclusion has a path that connects the premise and conclusion within it.



Any Polysized subgraph that doesnot have proof path within it.

Superpolynomial sized Subgraph that encompasses the polysized subgraph with proof path.

10 Tuesday

S-t connectivity is NL

NL = CoNL

s-t nonconnectivity is CoNL

Immerman-Szelepcseny theorem

S-t non connectivity = { there is no path from s to t in graph } is in NL ⊂ P

Algorithm needed to find minimum subgraph containing a path

Something similar to Convex hull

NOV 2013	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
					1	2	3	4	5	6	7	8	9	10														
	11	12	13	14	15	16	17	18	19	20	21	22	23	24														
	25	26	27	28	29	30																						

(47)

11 Wednesday

This is exactly Convexity in graphs where every proof path is a geodesic.

It suffices to prove that no polysized convex set containing a proof geodesic can be found (or) all convex sets having proof geodesic are superpolynomial in size.

Convexity number of a digraph is the maximum cardinality of proper convex set of D

Maximum convex set of a digraph D is a convex set with cardinality equal to Convexity number.

12 Thursday

Convex Hull

For a nonempty subset A of V(D) (set of vertices of graph D), the convex hull is the minimal convex set containing A.

18/12/2013

Convex Hull of Proof Geodesic (which is a subset of vertices) is the minimum learning neighborhood. Size of the Convex hull decides the complexity class of a problem. If it is polynomial size then the problem is P and if superpolynomial, in NP.

JAN 2014	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19							
	20	21	22	23	24	25	26	27	28	29	30	31																

13 Friday

To prove $P \subset NP$ it suffices to prove that all convex hulls are not of polynomial size (superpolynomial size) assuming implication is always decidable.

Discrete Hyperbolic Factorization - Sequential Stirling Upperbound.

19/12/2013

$$\log \frac{N}{1\cdot 2} + \log \frac{N}{2\cdot 3} + \ldots + \log \frac{N}{\sqrt{N}(\sqrt{N}-1)}$$

$$\lim_{N\to\infty} \log \frac{N^{(\sqrt{N}-1)}}{(\sqrt{N})!\,(\sqrt{N}-1)!} =$$

$$= (\sqrt{N}-1)\log N - \left[\log((\sqrt{N})!) + \log((\sqrt{N}-1)!)\right]$$

14 Saturday

$$= (\sqrt{N}-1)\log N - \left[\sqrt{N}\log(\sqrt{N}-1) + (\sqrt{N}-1)\log(\sqrt{N}-1)\right]$$

$$= (\sqrt{N}-1)\left[\log N - \log(\sqrt{N}-1)\right] - \sqrt{N}\log(\sqrt{N}-1)$$

15 Sunday

$$= (\sqrt{N}-1)\left[\log N - \log(\sqrt{N}-1) - \log(\sqrt{N}-1)\right] + \log(\sqrt{N}-1)$$

$$= (\sqrt{N}-1)\left[\log N - \log(\sqrt{N}-1)^2\right] + \log(\sqrt{N}-1).$$

NOV 2013	M	T	W	T	F	S	S	M	T	W	T	F	S	S
					1	2	3	4	5	6	7	8	9	10
	11	12	13	14	15	16	17	18	19	20	21	22	23	24
	25	26	27	28	29	30								

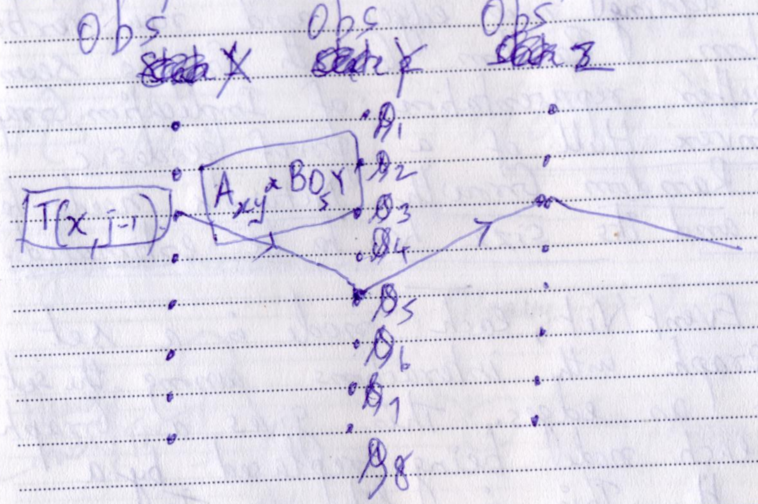
$$= \log\left[\frac{N}{(\sqrt{N}-1)^2}\right]^{(\sqrt{N}-1)} + \log(\sqrt{N}-1)$$

$= \log$

Monday 16

19/12/2013

Trellis for CRF viterbi path



20/12/2013

Tuesday 17

$$P(A/B) = \frac{P(A\cap B)}{P(B)}$$

$$P(B/A) = \frac{P(A\cap B)}{P(A)}$$

$$\boxed{P(A/B)\,P(B) = P(B/A)\,P(A)}$$

$$\Rightarrow P(A/B) = \frac{P(B/A)\,P(A)}{P(B)}.$$

23/12/2013

$$(\sqrt{N}-1)\left(\log(\sqrt{N})^2 - \log(\sqrt{N}-1)^2\right)$$

$$\log \frac{\sqrt{N}\sqrt{N}}{(\sqrt{N}-1)(\sqrt{N}-1)} \quad 2(\sqrt{N}-1)\log\frac{\sqrt{N}}{(\sqrt{N}-1)} + \log(\sqrt{N}-1)$$

JAN 2014	M	T	W	T	F	S	S	M	T	W	T	F	S	S
			1	2	3	4	5							
	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	20	21	22	23	24	25	26	27	28	29	30	31		

$\infty \ne \infty$

23/12/2013 (150)

DECEMBER 2013

18 Wednesday

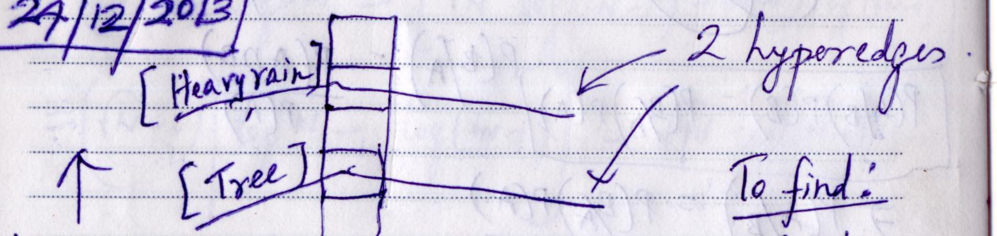
Implication Graphs as Random Growth Networks

"As learning in traditional network format, is like adding new edges and new vertices at random, Random Growth Graphs seem to be a better representation of Implication Graphs. Thus Convex Hull of a proof geodesic in a Random Growth Network needs to be found and its size has to be estimated.

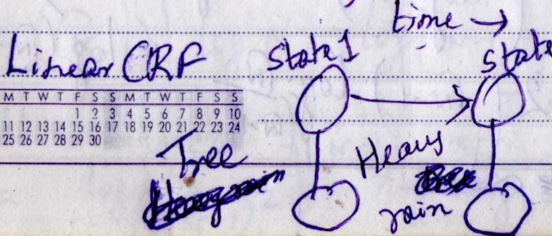
In the Event Net, each node is a set or a graph with interactions among the set members as edges. This gives a Graph G with each node being replaced by a graph H. This is like a Tensor product or Kronecker Product (Outer product) of 2 graphs.

19 Thursday

24/12/2013



To find: Most disambiguating tuple hyperedge for "fall"

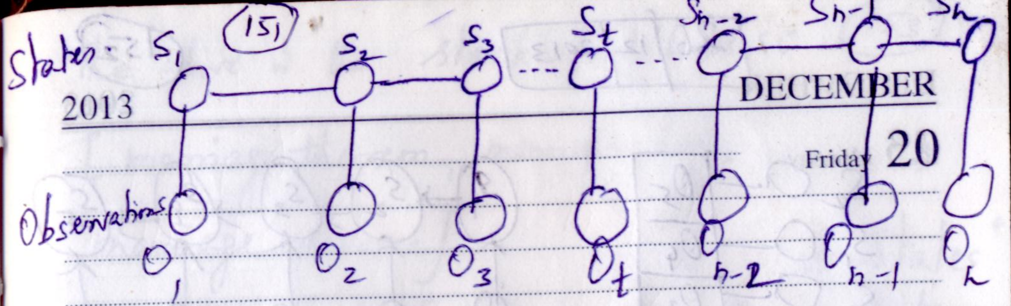


NOV 2013 M T W T F S S M T W T F S S
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30

(151)

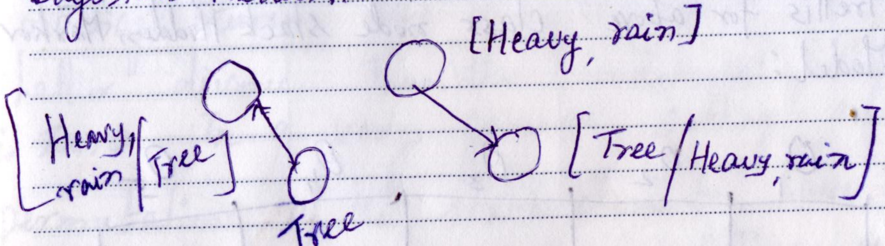
2013 DECEMBER

20 Friday



$P(S_i / O_1 O_2 \dots O_t)$, $P(O_{n-1} O_{n-2} \dots O_n / S_t)$.

Bayesian Network:



Saturday 21

$\text{argmax}\ Pr\left[\frac{State_i}{O_{1\dots t}}\right]$

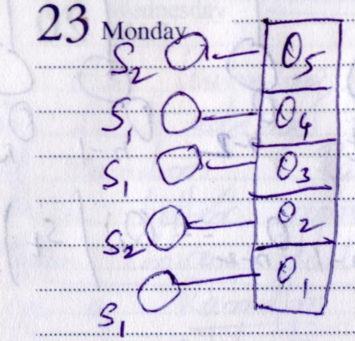
In the concept wide hypergraph the states are documents or concepts or logical statements

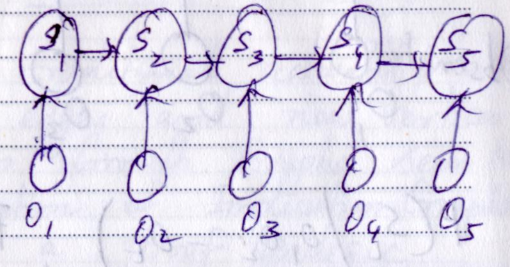
Sunday 22

The forward probability above which is $\underset{i}{\text{argmax}}\ Pr\left[\frac{State_i}{O_{1\dots t}}\right]$ outputs the document that disambiguates "fall" with highest probability.

JAN 2014 M T W T F S S M T W T F S S
1 2 3 4 5
6 7 8 9 10 11 12 13 14 15 16 17 18 19
20 21 22 23 24 25 26 27 28 29 30 31

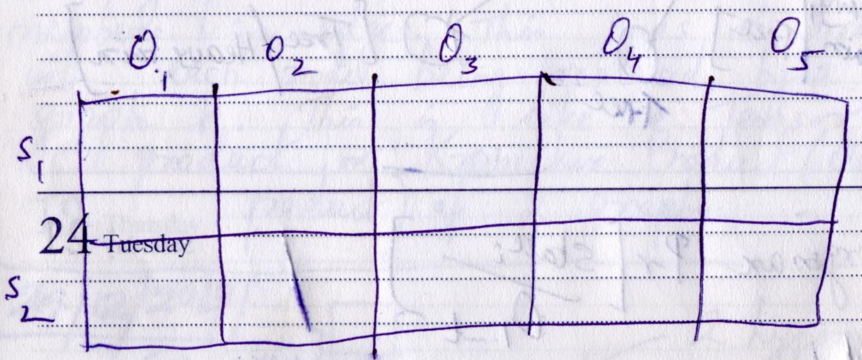
23 Monday





S_i can be $== S_j$ for $i \neq j$
O_i can be $== O_j$ for $i \neq j$.

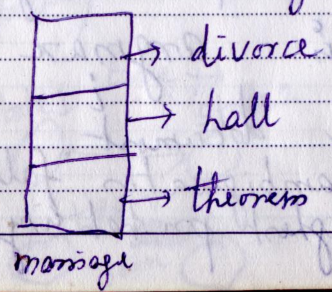
Trellis for above class node stack Hidden Markov Model:



24 Tuesday

Multiple tuples (hyperedges) can be part of same state.

Class stack node for "marriage" example:



The above is the stack for tuples: (153)

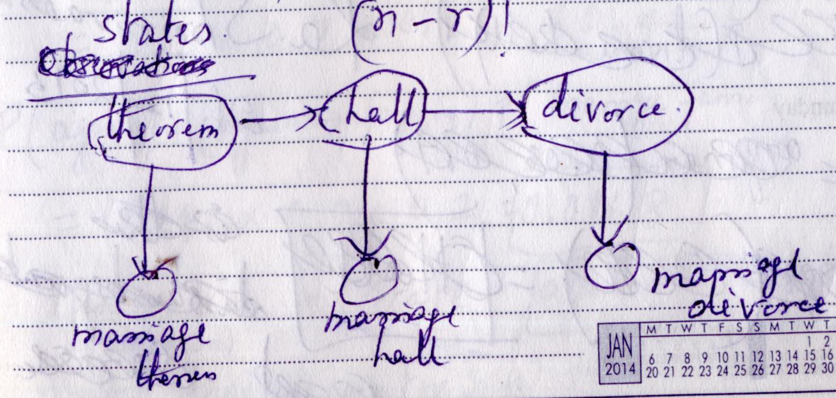
[marriage theorem, marriage hall, marriage divorce] Wednesday 25

or "States"

Thus the tuple fragments are the contents for the word marriage and the full tuple "Observations". If the time ordering is present - marriage theorem has no relation to marriage hall or divorce. Thus the conditional probability is zero. In a very generic setting, all permutations of the stack elements have to be considered for constructing Hidden Markov Model.

Thursday 26

Thus time ordering is ignored. But this construction is exponential in size of stack $({}^{n}P_{r}) = \frac{n!}{(n-r)!}$ or $n!$.

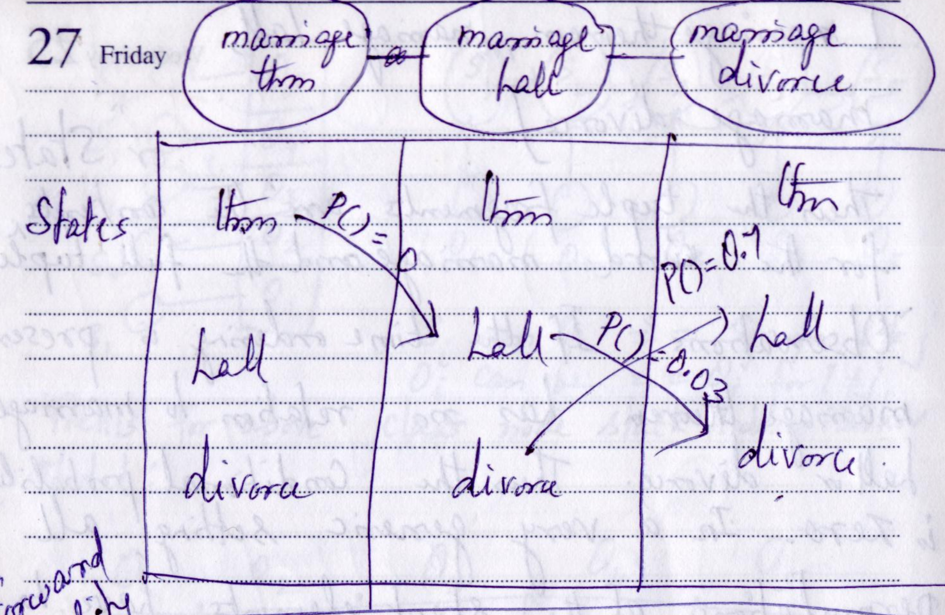


154

Trellis for the previous HMM for disambiguation

DECEMBER 2013

27 Friday



Forward Probability or computation

$$P(\text{Hall})\, P(\text{Hall} \to \text{divorce})\, P_r\left(\frac{\text{marriage divorce}}{\text{divorce}}\right)$$

28 Saturday

~~argmax (P(hall→divorce)~~

~~P(divorce hall))~~

Ka. Shrinivaasan

26/12/2013

29 Sunday

= ~~argmax (0.03, 0.4)~~

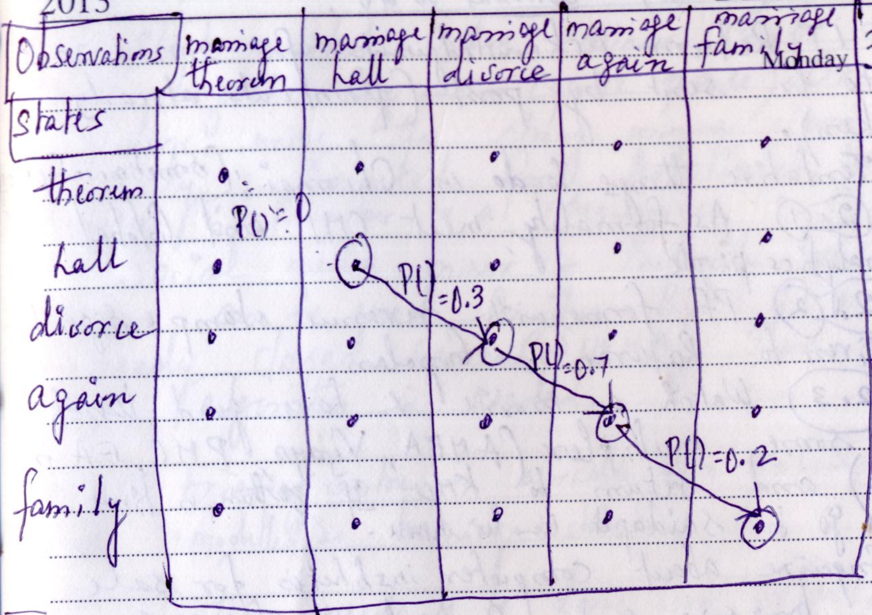
~~argmax (0.4)~~ = $\boxed{\text{~~Hall~~}}$ ~~is the disambiguated~~

NOV 2013

29/12/2013 Previous Trellis with more states added:

2013 DECEMBER 155

30 Monday



$$P(\text{Hall})\, P(\text{Hall} \to \text{divorce})\, P\left(\frac{\text{marriage divorce}}{\text{divorce}}\right) =$$

$$0.5 \times 0.3 \times 0.2$$

$$= \boxed{0.3}$$

Tuesday 31

$$P(\text{divorce})\, P(\text{divorce} \to \text{again})\, P\left(\frac{\text{marriage again}}{\text{again}}\right)$$

$$= 0.3 \times 0.7 \times 0.2 = \boxed{0.42}$$

$$P(\text{again})\, P(\text{again} \to \text{family})\, P(\text{marriage family} / \text{family})$$

$$= 0.42 \times 0.2 \times 0.2 = \boxed{0.0168}$$

Maximum is in state $\boxed{\text{again}}$ (argmax) which is the disambiguator.

JAN 2014

http://sites.google.com/site/kuja27

DIARY 2013

2

Krishna iResearch

Open Source (AsFer, USBmd, VIRGO, KingCobra)
and Closed Source (SIMHA)
Design Notes and Implementation
Notes (and)
Academic Publications Notes

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Ka.Shrinivaasan
29/12/2013

FEB '13						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

Wed.Anniversaries

29/12/2013

January 2013 1 Tuesday

Implication Graphs and Convex Hulls

If the implication graph is grown as a Random Growth Network (instead of a Dynamic Graph) which allows adding of new vertices and edges, at some point in time, the Proof path or Proof Geodesic between premise and conclusion is attained. Convex Hulls of all possible Random growth graphs that contain the proof geodesic need to be found and minimum of all these Convex hulls Containing proof geodesic should be of polynomial size in the length of proof geodesic.

Ka. Shrinivaasan
29/12/2013