

INPUT DATA (HUMAN READABLE)

Log, \mathcal{L}
Trace Payload { location = "LN", patient= "001A" }
Referral{ CA15-3 = 69 }
Mastectomy{ CA15-3 = 69, biopsy = true }
FollowUp{ CA15-3 = 10 }
Trace Payload { location = "NE", patient = "002A" }
Referral{ CA15-3 = 20 }
Trace Payload { loc_po = "YO", patientId = "003A" }
Referral{ CA15-3 = 61 }
Lumpectomy { CA15-3 = 61, biopsy = true }
FollowUp{ CA15-3 = 55 }

Data Loading + Indexing
(§4.1)

COLUMN-BASE Knowledge Base

CountingTable		
ActivityId	Trace Count	
__trace__payload	1	1
__trace__payload	2	1
__trace__payload	3	1
Referral	1	1
Referral	2	1
Referral	3	1
FollowUp	1	1
FollowUp	2	0
FollowUp	3	1
Mastectomy	1	1
Mastectomy	2	0
Mastectomy	3	0
Lumpectomy	1	0
Lumpectomy	2	0
Lumpectomy	3	1

ActivityTable					
ID	ActivityId	Trace	Event	Prev	Next
#1	__trace__payload	1	1	NULL	#4
#2	__trace__payload	2	1	NULL	#5
#3	__trace__payload	3	1	NULL	#6
#4	Referral	1	2	#1	#7
#5	Referral	2	2	#2	NULL
#6	Referral	2	2	#3	#8
#7	Mastectomy	1	2	#4	#9
#8	Lumpectomy	3	3	#6	#10
#9	FollowUp	1	4	#7	NULL
#10	FollowUp	3	4	#8	NULL

AttributeTable <i>patient</i>		
ActivityId	Value	Offset
__trace__payload	"001A"	#0
__trace__payload	"002A"	#1
__trace__payload	"003A"	#2

AttributeTable <i>location</i>		
ActivityId	Value	Offset
__trace__payload	"LN"	#0
__trace__payload	"NE"	#1
__trace__payload	"YO"	#2

AttributeTable <i>biopsy</i>		
ActivityId	Value	Off.
Mastectomy	1.0	#7
Lumpectomy	1.0	#8

AttributeTable <i>CA15-3</i>		
ActivityId	Value	Off.
Referral	69	#4
Referral	20	#5
Referral	61	#6
Mastectomy	69	#7
Lumpectomy	61	#8
FollowUp	10	#9
FollowUp	55	#10

Max-SAT Query

Declare Model (\mathcal{M})

Response(*Referral*, CA15-3 \geq 23.5, *FollowUp*, CA15-3 $<$ 23.5) where *Referral*.CA15-3 $>$ *FollowUp*.CA15-3

Succession(*Referral*, CA15-3 \geq 23.5, *FollowUp*, CA_15 $<$ 23.5) where *Referral*.CA15-3 $>$ *FollowUp*.CA15-3

Choice(*Mastectomy*, CA15-3 \geq 50 && biopsy = true, *Lumpectomy*, CA15-3 \geq 50 && biopsy = true)

Atomization Pipeline

DECOMPOSED MODEL (§4.2 i)

Atoms		
Atom	Predicates	
\mathcal{P}_1	$\infty \leq \text{Referral.CA15-3} < 23.5$	
\mathcal{P}_2	$23.5 \leq \text{Referral.CA15-3} \leq +\infty$	
\mathcal{P}_3	$-\infty \leq \text{FollowUp.CA15-3} < 23.5$	
\mathcal{P}_4	$23.5 \leq \text{FollowUp.CA15-3} \leq +\infty$	
\mathcal{P}_5	$-\infty \leq \text{Mastectomy.CA15-3} < 50$	Mastectomy.biopsy = false
\mathcal{P}_6	$-\infty \leq \text{Mastectomy.CA15-3} < 50$	Mastectomy.biopsy = true
\mathcal{P}_7	$50 \leq \text{Mastectomy.CA15-3} \leq +\infty$	Mastectomy.biopsy = false
\mathcal{P}_8	$50 \leq \text{Mastectomy.CA15-3} \leq +\infty$	Mastectomy.biopsy = true
\mathcal{P}_9	$-\infty \leq \text{Lumpectomy.CA15-3} < 50$	Lumpectomy.biopsy = false
\mathcal{P}_{10}	$-\infty \leq \text{Lumpectomy.CA15-3} < 50$	Lumpectomy.biopsy = true
\mathcal{P}_{11}	$50 \leq \text{Lumpectomy.CA15-3} \leq +\infty$	Lumpectomy.biopsy = false
\mathcal{P}_{12}	$50 \leq \text{Lumpectomy.CA15-3} \leq +\infty$	Lumpectomy.biopsy = true

Atomized Model (\mathcal{M})

Response($\mathcal{P}_2, \mathcal{P}_4$) where *Referral*.CA15-3 $>$ *FollowUp*.CA15-3

Succession($\mathcal{P}_2, \mathcal{P}_4$) where *Referral*.CA15-3 $>$ *FollowUp*.CA15-3

Choice($\mathcal{P}_8, \mathcal{P}_{12}$)

(§4.2 ii)
xTL TL_r Compiler

QUERY PLAN (§4.2 iii)

