INPUT DATA (HUMAN READABLE)

Log

①
Trace Payload { loc_po = "LN", p_id = "001A" }
Referral { CA_15-3 = 69 }
Mastectomy { CA_15-3 = 69, biopsy = true }
FollowUp { CA_15-3 = 10 }

②
Trace Payload { loc_po = "NE", p_id = "002A" }
Referral { CA_15-3 = 20 }

③
Trace Payload { loc_po = "YO", p_id = "003A" }
Referral { CA_15-3 = 61 }
Lumpectomy { CA_15-3 = 61, biopsy = true }
FollowUp { CA_15-3 = 55 }

Data Loading + Indexing (§4.1)

COLUMN-BASED Relational Database

Counting Table

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

Activity Table

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	3	2	#3	#10
#7	Mastectomy	1	3	#4	#8
#8	FollowUp	1	4	#7	NULL
#9	FollowUp	3	4	#10	NULL
#10	Lumpectomy	3	3	#6	#9

Attribute Table [patient]

ActivityId	Value	Offset
__trace_payload	"001A"	#1
__trace_payload	"002A"	#2
__trace_payload	"003A"	#3

Attribute Table [location]

ActivityId	Value	Offset
__trace_payload	"LN"	#1
__trace_payload	"NE"	#2
__trace_payload	"YO"	#3

Attribute Table [CA15-3]

ActivityId	Value	Offset
Referral	20	#5
Referral	61	#6
Referral	69	#4
Mastectomy	69	#7
FollowUp	10	#8
FollowUp	55	#9
Lumpectomy	61	#10

Attribute Table [biopsy]

ActivityId	Value	Offset
Mastectomy	true	#7
Lumpectomy	true	#10

Max-SAT Query

Declare Model ($\mathcal{M}$)

Ⓐ **Response**(*Referral*, CA_15-3 >= 23.5, *FollowUp*, CA_15-3 < 23.5) where *Referral*.CA_15-3 > *FollowUp*.CA_15-3

Ⓑ **Succession**(*Referral*, CA_15-3 >= 23.5, *FollowUp*, CA_15-3 < 23.5) where *Referral*.CA_15-3 > *FollowUp*.CA_15-3

Ⓒ **Choice**(*Mastectomy*, CA_15-3 >= 50 && biopsy = true, *Lumpectomy*, CA_15-3 >= 50 && biopsy = true)

Atomization Pipeline

Model Atomization §4.2 *i*

Atoms

Atom	Predicates(A,p)
$\mathcal{P}_1$	*Referral*($-\infty \le$ CA_15-3 < 23.5)
$\mathcal{P}_2$	*Referral*($23.5 \le$ CA_15-3 $< \infty$)
$\mathcal{P}_3$	*FollowUp*($-\infty \le$ CA_15-3 < 23.5)
$\mathcal{P}_4$	*FollowUp*($23.5 \le$ CA_15-3 $< \infty$)
$\mathcal{P}_5$	*Mastectomy*(biopsy = **false** $\wedge$ $-\infty \le$ CA_15-3 < 50)
$\mathcal{P}_6$	*Mastectomy*(biopsy = **false** $\wedge$ $50 \le$ CA_15-3 $< \infty$)
$\mathcal{P}_7$	*Mastectomy*(biopsy = **true** $\wedge$ $-\infty \le$ CA_15-3 < 50)
$\mathcal{P}_8$	*Mastectomy*(biopsy = **true** $\wedge$ $50 \le$ CA_15-3 $< \infty$)
$\mathcal{P}_9$	*Lumpectomy*(biopsy = **false** $\wedge$ $-\infty \le$ CA_15-3 < 50)
$\mathcal{P}_{10}$	*Lumpectomy*(biopsy = **false** $\wedge$ $50 \le$ CA_15-3 $< \infty$)
$\mathcal{P}_{11}$	*Lumpectomy*(biopsy = **true** $\wedge$ $-\infty \le$ CA_15-3 < 50)
$\mathcal{P}_{12}$	*Lumpectomy*(biopsy = **true** $\wedge$ $50 \le$ CA_15-3 $< \infty$)

(§4.2 *ii*) xtLTLf Compiler

LTLf Model ($\mathcal{M}$)

Ⓐ **Response**($\mathcal{P}_2$, $\mathcal{P}_3$) where *Referral*.CA_15-3 > *FollowUp*.CA_15-3

Ⓑ **Succession**($\mathcal{P}_2$, $\mathcal{P}_3$) where *Referral*.CA_15-3 > *FollowUp*.CA_15-3

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

QUERY PLAN §4.2 *iii*

Tree nodes:
- Max-SAT
  - Ⓑ → And ; Ⓐ ; Ⓒ → Or$_\Theta$
- And → Or, **Globally**, **Exists**{1,$\mathcal{P}_8$}, **Exists**{1,$\mathcal{P}_{12}$}
- Or → **Until**, **Absence**{1,$\mathcal{P}_3$}, Or
- **Until** → Or, **Exists$_T$**{1,$\mathcal{P}_2$}
- **Exists**{1,$\mathcal{P}_3$}
- Or → **AndFuture$_\Theta$**
- Or → **Exists**{1,$\mathcal{P}_2$}, **Exists**{1,{$\mathcal{P}_1$, $\mathcal{P}_4$-$\mathcal{P}_{12}$}}
- **Exists$_T$**{1,$\mathcal{P}_3$}, **Exists**{1,$\mathcal{P}_2$}, **Exists$_T$**{1,$\mathcal{P}_3$}