A RELATION DEFINTIONS

$$Implication \coloneqq \{(x, y) \in V \times V \mid l(x) \models l(y)\} \tag{1}$$

$$Alternative \coloneqq \{(x, y) \in V \times V \mid l(x) \models \neg l(y)\} \tag{2}$$

$$\begin{aligned} Independent \coloneqq \{(x, y) \in V \times V \mid\ & isSatisfiable(l(x) \wedge l(y)), \\ & isSatisfiable(l(x) \wedge \neg l(y)), \\ & isSatisfiable(\neg l(x) \wedge l(y))\} \end{aligned}$$

B RELATION COMPLETENESS PROOF & TABLE

Proof. Formally, "every pair of feature mapping nodes is either in an *Independent*, *Implication*, or *Alternative* relation" translates to the conjunction of the following SAT calls:

$$\begin{aligned} & (SAT(l(x) \wedge l(y)) \wedge SAT(l(x) \wedge \neg l(y)) \wedge SAT(\neg l(x) \wedge l(y)) \\ & \vee \neg SAT(\neg(\neg l(x) \vee l(y))) \vee \neg SAT(\neg(\neg l(y) \vee l(x))) \\ & \vee \neg SAT(\neg(\neg l(x) \vee \neg l(y))) \end{aligned}$$

We apply DeMorgan's law twice:

$$\begin{aligned} = & (SAT(l(x) \wedge l(y)) \wedge SAT(l(x) \wedge \neg l(y)) \wedge SAT(\neg l(x) \wedge l(y)) \\ & \vee \neg SAT((l(x) \wedge \neg l(y))) \vee \neg SAT(l(y) \wedge \neg l(x))) \\ & \vee \neg SAT((l(x) \wedge l(y))) \\ = & \quad (SAT(l(x) \wedge l(y)) \wedge SAT(l(x) \wedge \neg l(y)) \wedge SAT(\neg l(x) \wedge l(y)) \\ & \vee \ \neg(SAT(l(x) \wedge l(y)) \wedge SAT(l(x) \wedge \neg l(y)) \wedge SAT(\neg l(x) \wedge l(y)) \\ = & \ true \end{aligned}$$

Therefore, every pair of feature mappings is guaranteed to be in at least one of the relations *Independent*, *Implication*, and *Alternative*. □

C COMMUTATIVITY OF REDUCE AND PROJECT

Lemma C.1. *For any edge-typed variation diff D and any time $t \in \{before, after\}$ reduction and projection commute:*

$$reduce_{VT}(project_{ET}(D, t)) = project(reduce_{VD}(D), t).$$

Proof.

$$\begin{aligned} & reduce_{VT}(\ project_{ET}((V, E, r, \tau, l, \Delta, \pi), t) \\ = & \ reduce_{VT}(\ (\{v \in V \mid exists(t, \Delta(v))\}, \\ & \qquad \{e \in E \mid \pi(e) = Nesting \wedge exists(t, \Delta(e))\} \\ & \qquad \cup \{(x, y) \in E \mid \pi(e) \neq Nesting \\ & \qquad \wedge exists(t, \Delta(x)) \wedge exists(t, \Delta(y))\}, \\ & \qquad r, \tau, l, \pi)) \\ = & \qquad (\{v \in V \mid exists(t, \Delta(v))\}, \\ & \qquad \{e \in E \mid \pi(e) = Nesting \wedge exists(t, \Delta(e))\} \\ & \qquad r, \tau, l)) \\ = & \ project(\quad (V, \\ & \qquad \{e \in E \mid \pi(e) = Nesting\}, \\ & \qquad r, \tau, l, \Delta)), t) \\ = & \qquad project(reduce_{VD}((V, E, r, \tau, l, \Delta, \pi)), t) \end{aligned}$$

□

Evaluation of the SAT calls			
$SAT(l(x) \wedge l(y))$	$SAT(l(x) \wedge \neg l(y))$	$SAT(\neg l(x) \wedge l(y))$	Relation type
1	1	1	*Independent*
1	1	0	*Implication* with $l(y) \models l(x)$
1	0	1	*Implication* with $l(x) \models l(y)$
1	0	0	*Implication* with $l(x)$ equivalent to $l(y)$
0	1	1	*Alternative*
0	1	0	*Implication* where $l(y)$ is *False*
0	0	1	*Implication* where $l(x) isFalse$
0	0	0	*Implication/Alternative* where $l(x)$ and $l(y)$ are *False*)

Table 4: All potential cases the *Independent* SAT call can succeed and fail for