A RELATION DEFINTIONS

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

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

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

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:

$$\begin{aligned} & (SAT(l(x) \land l(y)) \land SAT(l(x) \land \neg l(y)) \land SAT(\neg l(x) \land l(y)) \\ & \lor \neg SAT(\neg(\neg l(x) \lor l(y))) \lor \neg SAT(\neg(\neg l(y) \lor l(x))) \\ & \lor \neg SAT(\neg(\neg l(x) \lor \neg l(y))) \end{aligned}$$

We apply DeMorgan's law twice:

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

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

Textual Proof. We conduct our textual proof by taking a closer look at the check for the Independent relation:

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

If this formula evaluates to *True*, the two nodes x and y are in the *Independent* relation. The two nodes can not be in the *Alternative* relation since $SAT(l(x) \land l(y)) = True$. Additionally, the two nodes can not be in the *Implication* relation, because $SAT(l(x) \land \neg l(y)) = SAT(\neg l(x) \land l(y)) = True$, meaning there are variable assignments that contradict either $l(x)$ modelling $l(y)$ or $l(y)$ modelling $l(x)$

Now, there are several ways the check for *Independent* can evaluate to *False*, namely each or multiple of the SAT calls fail: If $SAT(l(x) \land l(y))$ succeeds and one or both of the other SAT calls fail, the respective nodes are in an *Implication* relation with each other. Note that the nodes can not be in the *Alternative* relation, since $SAT(l(x) \land l(y))$ succeeds, i.e., there are variants in which both x and y are present. If $SAT(l(x) \land l(y))$ fails but the two other SAT calls succeed, there are variable assignments that fulfil each formula but none that fulfil both, therefore leaving us with the *Alternative* relation between the two nodes. For $SAT(l(x) \land l(y))$ failing and exactly one of the two other SAT calls succeeding, one of the respective formulas has to be *False*, giving the node an *Implication* edge, which is analogous to the empty set being a subset of every other set. If all three SAT calls fail, both $l(x)$ and $l(y)$ must be *False*, which would fulfil both *Implication* and *Alternative*. A complete table with all cases any of the SAT calls can fail or succeed for can be found in Table 4. Since we covered every potential case the check for *Independent* can succeed or fail and since for every case at least one relation applies, every pair of feature mapping nodes has a relation from the set {*Implication*,*Alternative*,*Independent*}. □

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 Sketch.

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

□

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