SMT-based Weighted Model Integration with Structure Awareness (Supplementary material)

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$[\![y = w]\!]_{\mathcal{EUF}}$ DEFINITION

Algorithm 1 is such that, given a $\mathsf{FIUC}^{\mathcal{LRA}}$ weight function w on conditions $\mathbf{\Psi}$, $\mathsf{Convert}(w,\emptyset)$ returns $\langle w', \mathsf{defs}, \mathbf{y}\rangle$ s.t. $[\![y = w]\!]_{\mathcal{EUF}} \stackrel{\text{def}}{=} (y = w') \wedge \bigwedge_{\varphi_i \in \mathsf{defs}} \varphi_i$, on variables $\mathbf{x} \cup \mathbf{y}, \mathbf{A}$.

Algorithm 1 $\mathsf{Convert}(\mathsf{w}, \mathsf{conds})$

returns $\langle w', \mathsf{defs}, \mathbf{y}\rangle$
w': the term w is rewritten into
conds: the current partial assignment to conditions $\mathbf{\Psi}$, representing the set of conditions which w depends on
defs: a set of definitions in the form $y_i = w_i$ needed to rewrite w into w'
$\mathbf{y}$: newly-introduced variables labeling if-then-else terms
f^g: uninterpreted function naming the function/operator g

if ($\{\mathsf{w}$ constant or variable$\}$) **then**
  return $\langle \mathsf{w}, \emptyset, \emptyset\rangle$
if ($\mathsf{w} == (\mathsf{w}_1 \bowtie \mathsf{w}_2), \bowtie \in \{+, -, \cdot, /\}$) **then**
  $\langle \mathsf{w}'_i, \mathsf{defs}_i, \mathbf{y}_i\rangle = \mathsf{Convert}(\mathsf{w}_i, \mathsf{conds}),\ i \in \{1, 2\}$
  return $\langle f^{\bowtie}(\mathsf{w}'_1, \mathsf{w}'_2), \mathsf{defs}_1 \cup \mathsf{defs}_2, \mathbf{y}_1 \cup \mathbf{y}_2\rangle$
if ($\mathsf{w} == g(\mathsf{w}_1, ..., \mathsf{w}_k)$, g unconditioned) **then**
  $\langle \mathsf{w}'_i, \mathsf{defs}_i, \mathbf{y}_i\rangle = \mathsf{Convert}(\mathsf{w}_i, \mathsf{conds}),\ i \in 1, ..., k$
  return $\langle f^g(\mathsf{w}'_1, ..., \mathsf{w}'_k), \cup_{i=1}^k \mathsf{defs}_i, \cup_{i=1}^k \mathbf{y}_i\rangle$
if ($\mathsf{w} == (\mathsf{If}\ \psi\ \mathsf{Then}\ \mathsf{w}_1\ \mathsf{Else}\ \mathsf{w}_2)$) **then**
  $\langle \mathsf{w}'_1, \mathsf{defs}_1, \mathbf{y}_1\rangle = \mathsf{Convert}(\mathsf{w}_1, \mathsf{conds} \cup \{\ \ \psi\})$
  $\langle \mathsf{w}'_2, \mathsf{defs}_2, \mathbf{y}_2\rangle = \mathsf{Convert}(\mathsf{w}_2, \mathsf{conds} \cup \{\neg\psi\})$
  let y be a fresh variable
  $\mathsf{defs} = \mathsf{defs}_1 \cup \mathsf{defs}_2 \cup$
    $(\bigvee_{\psi_i \in \mathsf{conds}} \neg\psi_i \vee \neg\psi \vee (y = \mathsf{w}'_1) \cup$
    $(\bigvee_{\psi_i \in \mathsf{conds}} \neg\psi_i \vee \ \ \psi \vee (y = \mathsf{w}'_2) \cup$
    $(\bigvee_{\psi_i \in \mathsf{conds}} \neg\psi_i \vee \neg(y = \mathsf{w}'_1) \vee \neg(y = \mathsf{w}'_2))$
  $\mathbf{y} = \mathbf{y}_1 \cup \mathbf{y}_2 \cup \{y\}$
  return $\langle y, \mathsf{defs}, \mathbf{y}\rangle$

Dataset	$\lvert\mathbf{A}\rvert$	$\lvert\mathbf{x}\rvert$	# Train	# Valid
balance-scale	3	4	1875	205
iris	3	4	450	50
cars	33	7	2115	234
diabetes	1	8	4149	459
breast-cancer	12	4	1650	180
glass2	1	9	970	100
glass	7	9	1280	140
breast	1	10	4521	495
solar	25	3	2522	273
cleve	17	6	2492	266
hepatitis	14	6	940	100
heart	3	11	2268	252
australian	34	6	6210	690
crx	38	6	6688	736
german	41	10	12600	1386
german-org	13	12	15000	1650
auto	56	16	2522	260
anneal-U	74	9	21021	2301

Table 1: UCI datasets considered in our experiments. We report the number of Boolean and continuous variables, training and validation data size.

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