Algorithm 1: Modification Reachability

Input: $entity$: a Class entity with a transaction entry point.
Output: $\mathbb{M}_t$: a whitelist , i.e., the set of fields that are modification reachable from $entity$'s entry point.

procedure MAIN($entity$)
  $\mathbb{M}_t \leftarrow \{\emptyset\}$
  $\mathbb{F} \leftarrow$ { all member fields in $entity$ }
  $\mathbb{I} \leftarrow \mathbb{F} \setminus$ { unmodifiable constant fields }
  ▷ $\mathbb{I}$ contains variable of modification interest
  $entryPoint \leftarrow$ the entry point in $entity$
  HANDLEMTHD($entryPoint$)

function HANDLEMTHD($method$)
  $\mathbb{I}_{loc} \leftarrow \{\emptyset\}$ ▷ method-local variables of interest
  $\mathbb{M}_{loc} \leftarrow \{\emptyset\}$ ▷ method-local modified variables
  $methodBody \leftarrow$ all instructions in $method$
  for $instr$ in $methodBody$ **do**
    if $instr$ is an Assignment Statement **then**
      if $instr.leftSide \in \mathbb{I}$ **then**
        $\mathbb{M}_t \leftarrow \mathbb{M}_t \cup instr.leftSide$
      if $instr.leftSide \in \mathbb{I}_{loc}$ **then**
        $\mathbb{M}_{loc} \leftarrow \mathbb{M}_{loc} \cup instr.leftSide$
      if $instr.rightSide \in \mathbb{I} \cup \mathbb{I}_{loc}$ **then**
        $\mathbb{I}_{loc} \leftarrow \mathbb{I}_{loc} \cup instr.rightSide$
    if $instr$ contains a Method Invocation **then**
      $invoc \leftarrow$ method invoked by $instr$
      $\mathbb{C}, \mathbb{L} \leftarrow$ HANDLEMTHD($invoc.method$)
      ▷ propagate all variables of interest and
        modified variables up from the method
      $\mathbb{M}_{loc} \leftarrow \mathbb{M}_{loc} \cup invoc.base \mid \texttt{this} \in \mathbb{C}$
      $\mathbb{M}_{loc} \leftarrow \mathbb{M}_{loc} \cup instr.leftSide \mid \texttt{return} \in \mathbb{C}$
      $\mathbb{M}_{loc} \leftarrow \mathbb{M}_{loc} \cup invoc.param\# \mid \texttt{param\#} \in \mathbb{C}$
      $\mathbb{I}_{loc} \leftarrow \mathbb{I}_{loc} \cup invoc.base \mid \texttt{this} \in \mathbb{L}$
      $\mathbb{I}_{loc} \leftarrow \mathbb{I}_{loc} \cup instr.leftSide \mid \texttt{return} \in \mathbb{L}$
      $\mathbb{I}_{loc} \leftarrow \mathbb{I}_{loc} \cup invoc.param\# \mid \texttt{param\#} \in \mathbb{L}$
      $\mathbb{M}_t \leftarrow \mathbb{M}_t \cup \{m : \mathbb{M}_{loc} \mid m \in \mathbb{I}\}$
      $\mathbb{I}_{loc} \leftarrow \mathbb{I}_{loc} \cup \{l : \mathbb{L} \mid l \in (\mathbb{I} \cup \mathbb{I}_{loc})\}$
  return $\mathbb{M}_{loc}, \mathbb{I}_{loc}$ as `this`, `param#`, `return`