18734 Recitation

- English -> Logic -> REDUCE language
- Homework 1 clarifications
Project

- Reminder for finalizing teams and deciding on a project
Logging in

- possibility.cylab.cmu.edu
A covered entity may disclose an individual’s protected health information (phi) to law-enforcement officials for the purpose of identifying an individual if the individual made a statement admitting participation in a violent crime that the covered entity believes may have caused serious physical harm to the victim.

send(p1, p2, m): p1 sends message m to p2.
tagged(m, q, t, u): m is a message containing information with attributes t about q with purpose u.
inrole(p2, law-enforcement-official): p2 has the role ‘law-enforcement-official’.
attr_in(t, phi): t contains ‘protected health information’.
purp_in(u, id-criminal): purpose u is identifying a criminal.
state(q,m’): q states m’.
is-admission-of-crime(m’): m’ is an admission of crime.
believes-crime-caused-serious-harm(p1, q, m’): p1 believes q may have caused serious harm.
∀ p₁, p₂, m, u, q, t.
( send(p₁, p₂, m)
  ∧ tagged(m, q, t, u)
  ∧ attr_in(t, phi))
⇒
  inrole(p₁, covered-entity) ∧ inrole(p₂, law-enforcement-official)
  ∧ (purp_in(u, id-criminal))
  ∧ ∃ m'.◊ state(q,m') ∧ is-admission-of-crime(m')
  ∧ believes-crime-caused-serious-harm(p₁, q, m')
A covered health care provider providing emergency health care in response to a medical emergency, other than such emergency on the premises of the covered health care provider, may disclose protected health information to a law enforcement official if such disclosure appears necessary to alert law enforcement to:

(A) The commission and nature of a crime;
(B) The location of such crime or of the victim(s) of such crime; and
(C) The identity, description, and location of the perpetrator of such crime

\[
\begin{align*}
\text{send}(p1, p2, m) &\quad \text{tagged}(m, q, t, u) &\quad \text{attr_in}(t, \phi) \\
\text{inrole}(p2, \langle \text{roles} \rangle) &:\text{Two concrete roles to be used are ``health-care-provider'' and ``law-enforcement-official''} \\
\text{purp_in}(u, \langle \text{purpose} \rangle) &:\text{One concrete purpose is ``alert''} \\
\text{providing-emergency-healthcare}(p1, q) &:\text{p1 is providing emergency healthcare to } q. \\
\text{appears-necessary}(p1, p2, q, t, u) &:\text{p1 thinks it is necessary to alert of crime-commission-location-victims-perpetrator to } p2 \text{ with message about } q \text{ with attribute } t \text{ and purpose } u.
\end{align*}
\]
Answer?
∀ p1, p2, m, u, q, t.
  (send(p1, p2, m)
   ∧ tagged(m, q, t, u)
   ∧ attr_in(t, phi))
  ⊃

  inrole(p1, health-care-provider)
   ∧ inrole(p2, law-enforcement-official)
   ∧ (purp_in(u, alert))
   ∧ providing-emergency-healthcare(p1, q)
   ∧ appears-necessary(p1, p2, q, t, u)
Policy Composition
Norms of transmission in privacy laws

**Positive norms, \( \varphi_i^+ \):** Transmission *may occur* if condition is satisfied.
- “A covered entity may disclose protected health information for treatment activities [...]” [HIPAA §164.506(c)(2)]

**Negative norms, \( \varphi_j^- \):** Condition *must be satisfied* if transmission occurs.
- “A covered entity must obtain an authorization for any use or disclosure of psychotherapy notes.” [HIPAA §164.508(a)(2)]

A transmission is lawful if and only if it satisfies at least one of the law’s positive norms and all of the law’s negative norms.

\[
\text{maysend}(p_1, p_2, m) \triangleq \left( \bigvee \varphi_i^+ \right) \land \left( \bigwedge \varphi_j^- \right)
\]

\[
\text{G} \left( \forall p_1, p_2, m. \ (\text{send}(p_1, p_2, m) \supset \text{maysend}(p_1, p_2, m)) \right).
\]
∀ p1, p2, m, u, q, t.
( send(p1, p2, m)
  ∧ tagged(m, q, t, u)
  ∧ attr_in(t, phi))

suppose

inrole(p1, covered-entity) ∧ inrole(p2, law-enforcement-official)
  ∧ (purp_in(u, id-criminal))
  ∧ ∃ m'.◇state(q,m') ∧ is-admission-of-crime(m')
  ∧ believes-crime-caused-serious-harm(p1, q, m')

∀ p1, p2, m, u, q, t.
( send(p1, p2, m)
  ∧ tagged(m, q, t, u)
  ∧ attr_in(t, phi))

suppose

inrole(p1, health-care-provider)
  ∧ inrole(p2, law-enforcement-official)
  ∧ (purp_in(u, alert))
  ∧ providing-emergency-healthcare(p1, q)
  ∧ appears-necessary(p1, p2, q, t, u)
∀p₁, p₂, m, u, q, t.
( send(p₁, p₂, m)
 ∧ tagged(m, q, t, u)
 ∧ attr_in(t, phi))
 ⊃ (inrole(p₁, covered-entity) ∧ inrole(p₂, law-enforcement-official)
 ∧ (purp_in(u, id-criminal))
 ∧ ∃m'. ◇ state(q, m') ∧ is-admission-of-crime(m')
 ∧ believes-crime-caused-serious-harm(p₁, q, m')
 )

∨

( inrole(p₁, health-care-provider)
 ∧ inrole(p₂, law-enforcement-official)
 ∧ (purp_in(u, alert))
 ∧ providing-emergency-healthcare(p₁, q)
 ∧ appears-necessary(p₁, p₂, q, t, u)
 )
Another Example

A covered entity may disclose protected health information to a coroner or medical examiner for the purpose of identifying a deceased person, determining a cause of death, or other duties as authorized by law. A covered entity that also performs the duties of a coroner or medical examiner may use protected health information for the purposes described in this paragraph.
Answer?
inrole(p1, covered-entity)
∧ ( (inrole(p2, coroner)
   V inrole(p2, medical-examiner)
 )
∧ belongstorole(q, deceased)
∧ ( purp_in(identification(q))
   V purp_in(determining-cause-of-death(q))
   V authorized-by-law(p2;u)
 )
Prefix (Polish) Notation

- Infix: 3+4, Prefix +3 4, Postfix: 3 4 +
- REDUCE understands prefix notation

<table>
<thead>
<tr>
<th>infix</th>
<th>prefix(ish)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) and (b)</td>
<td>and (a) (b)</td>
</tr>
<tr>
<td>(a) or (b)</td>
<td>or (a) (b)</td>
</tr>
<tr>
<td>(a) imp (b)</td>
<td>imp (a) (b)</td>
</tr>
<tr>
<td>(a) plus (b)</td>
<td>plus (a) (b)</td>
</tr>
<tr>
<td>(\forall x, y. \ c(x, y) \supset B(x, y))</td>
<td>all ( [x][y] \ (c(x, y)) \ (B(x, y)) )</td>
</tr>
<tr>
<td>(\exists x, y. c(x, y) \land b(x, y))</td>
<td>ex ( [x][y] \ (c(x, y)) \ (b(x, y)) )</td>
</tr>
<tr>
<td>predicate-name(arg1, ...)</td>
<td>(predicate-name arg1 ... )</td>
</tr>
</tbody>
</table>
∀p1, p2, m, u, q, t.
( send(p1, p2, m)
∧ tagged(m, q, t, u)
∧ attr_in(t, phi))
⇒
inrole(p1, covered-entity) ∧ inrole(p2, law-enforcement-official)
∧ (purp_in(u, id-criminal))
∧ ∃ m’. state(q,m’) ∧ is-admission-of-crime(m’)
∧ believes-crime-caused-serious-harm(p1, q, m’)

Convert to prefix notation
Answer?
all p1, p2, m, u, q, t.
( and
  (send(p1, p2, m))
  (tagged(m, q, t, u))
  (attr_in(t, phi)))
( and
  (inrole(p1, covered-entity))
  (inrole(p2, law-enforcement-official))
  (purp_in(u, id-criminal))
(ex m'
  ( state(q,m'))
  ( and
    (is-admission-of-crime(m'))
    (believes-crime-caused-serious-harm(p1, q, m')))))