Jialu Bao

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Jialu Bao

- 2nd year PhD student with Justin Hsu

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• 2nd year PhD student with Justin Hsu
• Projects since i came here
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- 2nd year PhD student with Justin Hsu
- Projects since i came here
  - A logic for conditional independence

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\[
z = \text{Bernoulli}(0.5);
\]
\[
x = \text{Bernoulli}(0.5);
\]
\[
y = \text{Bernoulli}(0.5);
\]
\[
a = z \text{ or } x;
\]
\[
b = z \text{ or } y;
\]
\[
\langle a, b \cond \text{indep} \given z \rangle?
\]
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• Projects since i came here
  • A logic for conditional independence
    • How to assert cond indep? (Assertion logic) How to reason about it? (Program logic)
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  • A logic for conditional independence
    • How to assert cond indep? (Assertion logic) How to reason about it? (Program logic)
    • Separation logic, intuitionistic logic, category theory (not used eventually)

z = Bernoulli(0.5);
x = Bernoulli(0.5);
y = Bernoulli(0.5);
a = z or x;
b = z or y;
<a, b cond indep given z>?
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    • Separation logic, intuitionistic logic, category theory (not used eventually)
  • Invariant Learning for Probabilistic Programs

z = Bernoulli(0.5);
x = Bernoulli(0.5);
y = Bernoulli(0.5);
a = z or x;
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<a, b cond indep given z>?
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Projects since I came here

- A logic for conditional independence
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z = Bernoulli(0.5);
x = Bernoulli(0.5);
y = Bernoulli(0.5);
a = z or x;
b = z or y;
<a, b cond indep given z>?

z = z + 1

while (flip == 0):
d = Bernoulli(p);
if d:
    flip = 1
else:
    z = z + 1

z
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  $E$ such that $E \cdot [flip = 0] \leq z$ and

  $z = \text{Bernoulli}(0.5)$;
  $x = \text{Bernoulli}(0.5)$;
  $y = \text{Bernoulli}(0.5)$;
  $a = z \text{ or } x$;
  $b = z \text{ or } y$;
  $<a, b \text{ cond indep given } z>$?

  $<E>$?
  while (flip == 0):
    $d = \text{Bernoulli}(p)$;
    if $d$:
      flip = 1
    else:
      $z = z + 1$
  $<z>$
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  - Invariant Learning for Probabilistic Programs
    - $E$ such that $E \cdot [flip = 0] \leq z$ and
    - $E$ stays the same before each iteration in expectation

```python
z = Bernoulli(0.5);
x = Bernoulli(0.5);
y = Bernoulli(0.5);
a = z or x;
b = z or y;
<a, b cond indep given z>?

while (flip == 0):
  d = Bernoulli(p);
  if d:
    flip = 1
  else:
    z = z + 1
<br>
```

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  • Invariant Learning for Probabilistic Programs
    • $E$ such that $E \cdot [\text{flip} = 0] \leq z$ and $E$ stays the same before each iteration in expectation
    • Weakest pre-expectation, Model tree learning

$$z = \text{Bernoulli}(0.5); \quad x = \text{Bernoulli}(0.5); \quad y = \text{Bernoulli}(0.5); \quad a = z \text{ or } x;$$
$$b = z \text{ or } y; \quad \langle a, b \text{ cond indep given } z\rangle?$$

$$\langle E\rangle? \quad \text{while (flip} == 0\text{):} \quad \text{d = Bernoulli}(p);$$
$$\quad \text{if d:} \quad \text{flip = 1} \quad \text{else:} \quad \text{z = z + 1}$$

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