

# CPU instruction level

Incrementing (or decrementing)  $x$  is **not** an atomic operation

thread 1 (foo function)

```
LOAD X  
INCR  
STORE X
```

thread 2 (bar function)

```
LOAD X  
DECR  
STORE X
```

# Non-deterministic execution

Execution scenario #1

```
LOAD X
INCR
STORE X
LOAD X
DECR
STORE X
```

➡ X is equal to 0

Execution scenario #2

```
LOAD X
LOAD X
INCR
DECR
STORE X
STORE X
```

➡ X is equal to -1

Execution scenario #3

```
LOAD X
LOAD X
INCR
DECR
STORE X
STORE X
```

➡ X is equal to 1

... and many other possible scenarios with the outcome of x being equal to either 0, -1 or 1