Introduction to dynamic semantics

Session 3: Plural discourse representation theory

Wenkai Tay

1 Aug 2024

taywenkai.com

Outline

Recap

Sentences introduce **discourse referents** and **conditions** on these drefs.

Recap

Sentences introduce **discourse referents** and **conditions** on these drefs.

The contribution of a sentence can be represented as a **discourse representation structure (DRS)**.

Recap

Sentences introduce **discourse referents** and **conditions** on these drefs.

The contribution of a sentence can be represented as a **discourse representation structure (DRS)**.

(1) Evelyn marries Waymond.

Recap

Sentences introduce **discourse referents** and **conditions** on these drefs.

The contribution of a sentence can be represented as a **discourse representation structure (DRS)**.

(1) Evelyn marries Waymond.

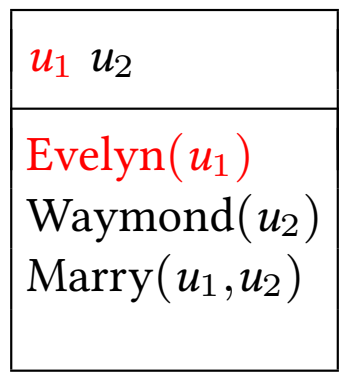
u_1 u_2
Evelyn(u_1) Waymond(u_2) Marry(u_1,u_2)

Recap

Sentences introduce **discourse referents** and **conditions** on these drefs.

The contribution of a sentence can be represented as a **discourse representation structure (DRS)**.

(1) Evelyn[1] marries Waymond.

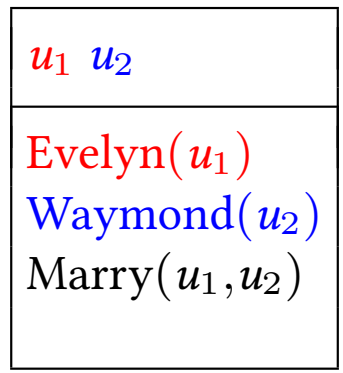


Recap

Sentences introduce **discourse referents** and **conditions** on these drefs.

The contribution of a sentence can be represented as a **discourse representation structure (DRS)**.

(1) Evelyn[1] marries Waymond[2].

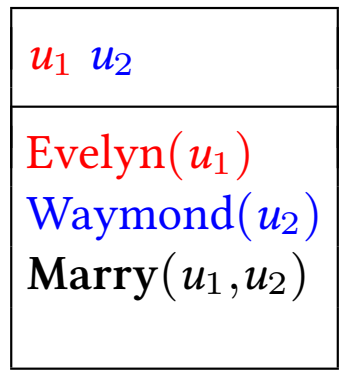


Recap

Sentences introduce **discourse referents** and **conditions** on these drefs.

The contribution of a sentence can be represented as a **discourse representation structure (DRS)**.

(1) Evelyn[1] **marries** Waymond[2].



Recap

The DRS of a sentence can be derived from its components.

Recap

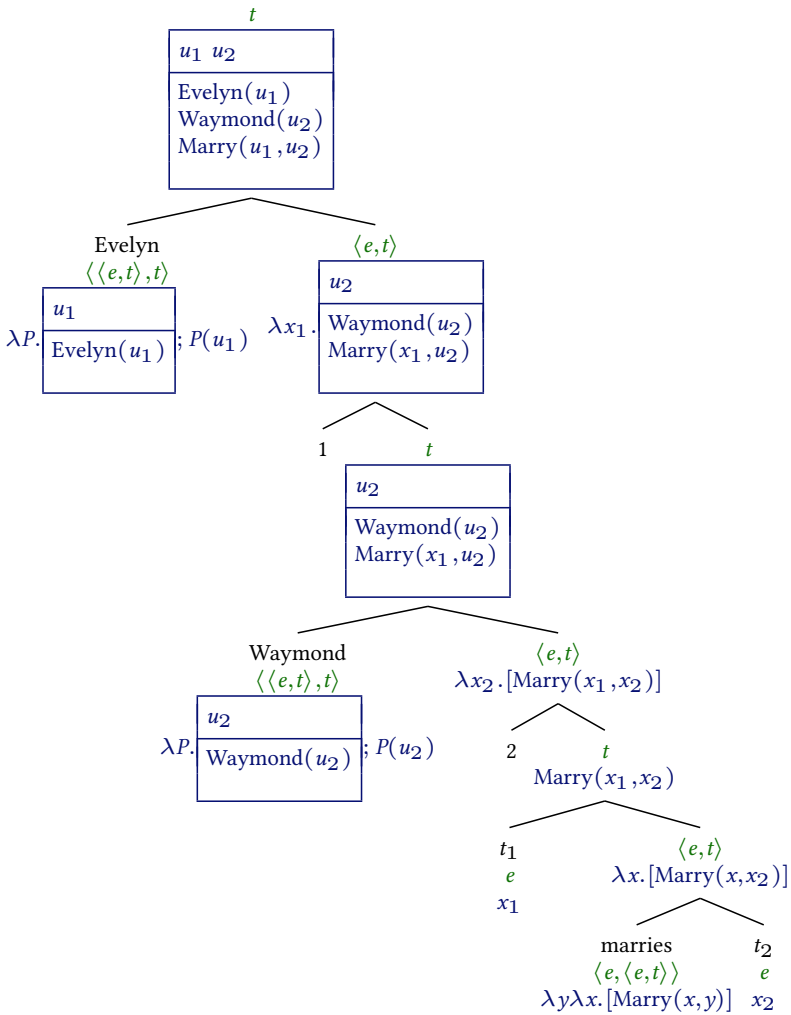
The DRS of a sentence can be derived from its components.

(2) Evelyn marries Waymond.

Recap

The DRS of a sentence can be derived from its components.

(2) Evelyn marries Waymond.



Recap

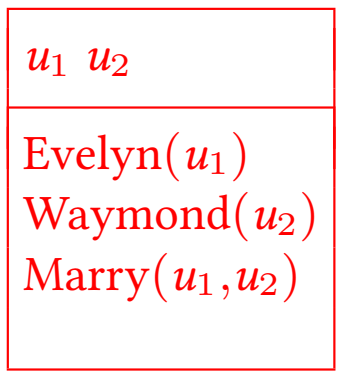
DRSs can be combined using **dynamic conjunction** (;).

(3) Evelyn marries Waymond. Evelyn owns a laundromat.

Recap

DRSs can be combined using **dynamic conjunction** (;).

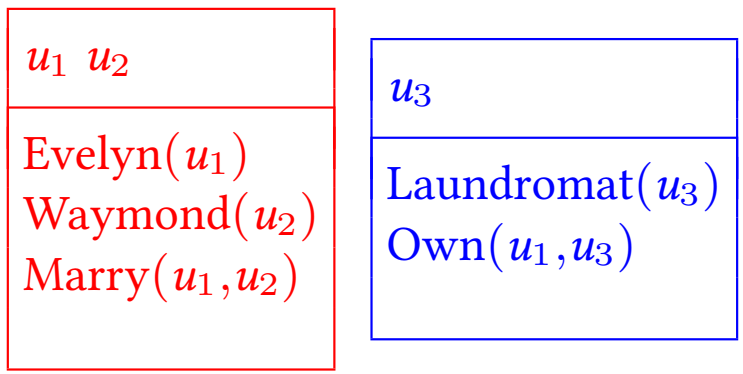
(3) Evelyn marries Waymond. Evelyn owns a laundromat.



Recap

DRSs can be combined using **dynamic conjunction** (;).

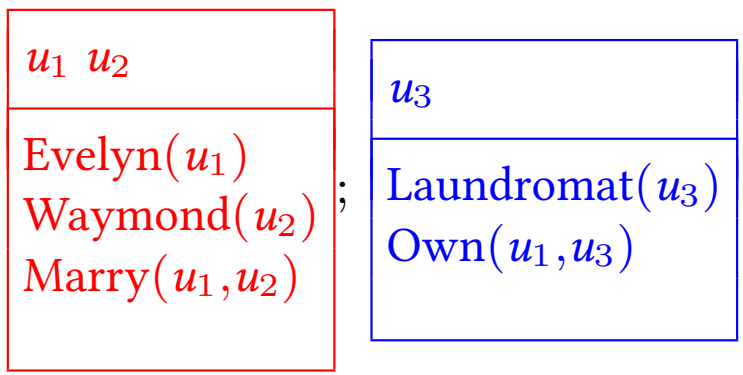
(3) Evelyn marries Waymond. Evelyn owns a laundromat.



Recap

DRSs can be combined using **dynamic conjunction** (;).

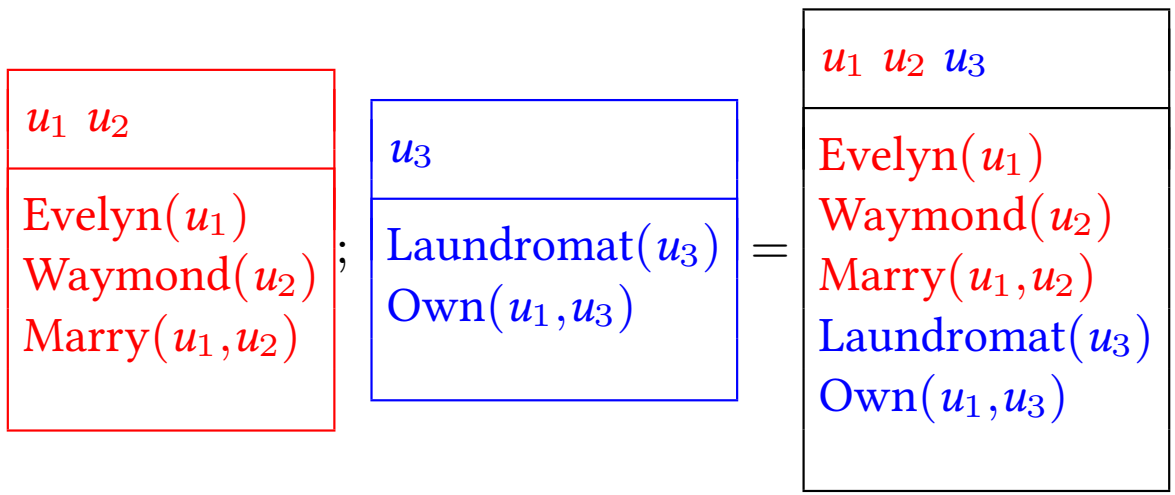
(3) Evelyn marries Waymond. Evelyn owns a laundromat.



Recap

DRSs can be combined using **dynamic conjunction** (;).

(3) Evelyn marries Waymond. Evelyn owns a laundromat.



Outline

Plurals

How do we handle plurals?

Plurals

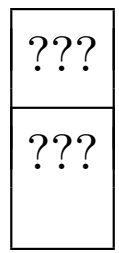
How do we handle plurals?

(4) Evelyn and Waymond smiled.

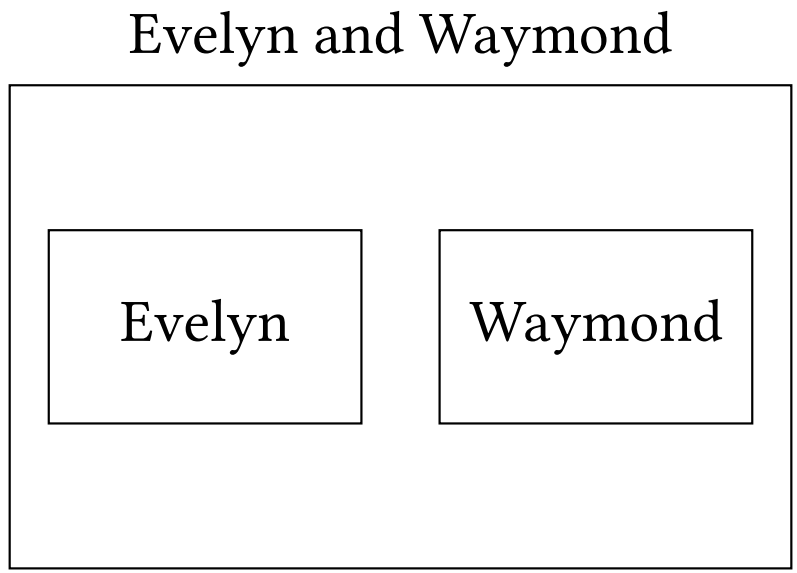
Plurals

How do we handle plurals?

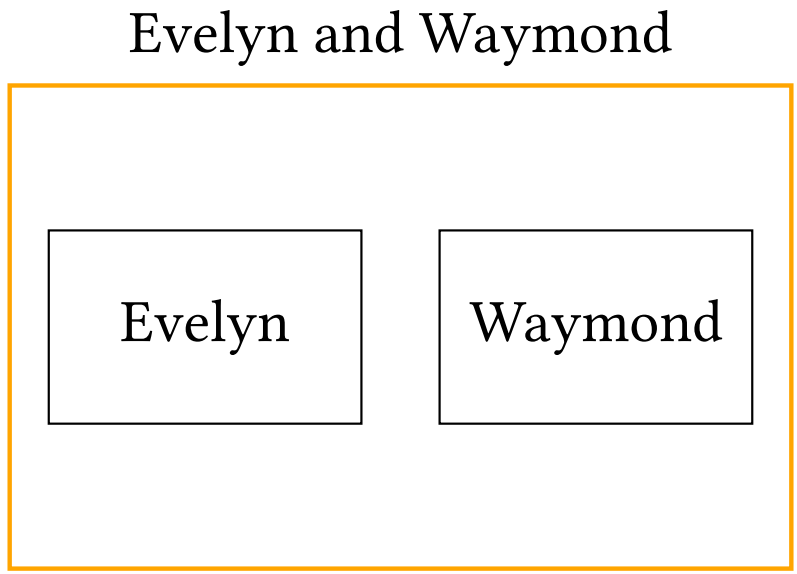
(4) Evelyn and Waymond smiled.



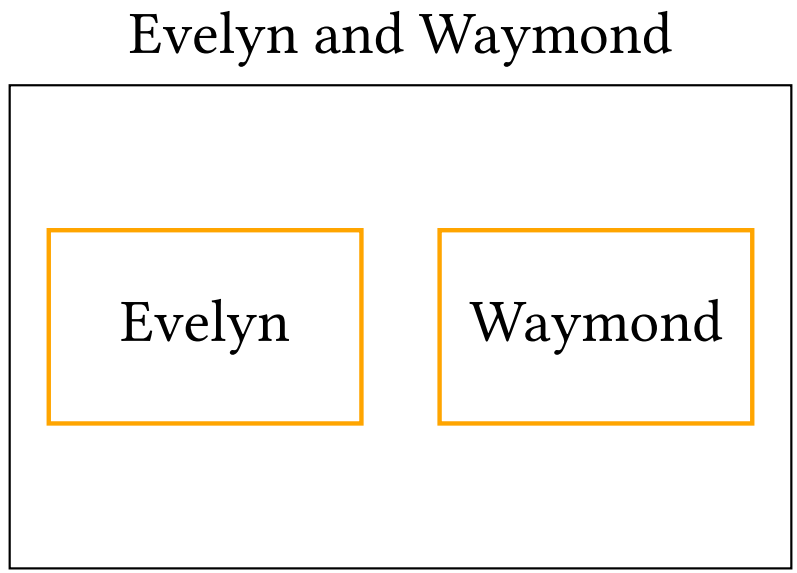
Plurals



Plurals



Plurals



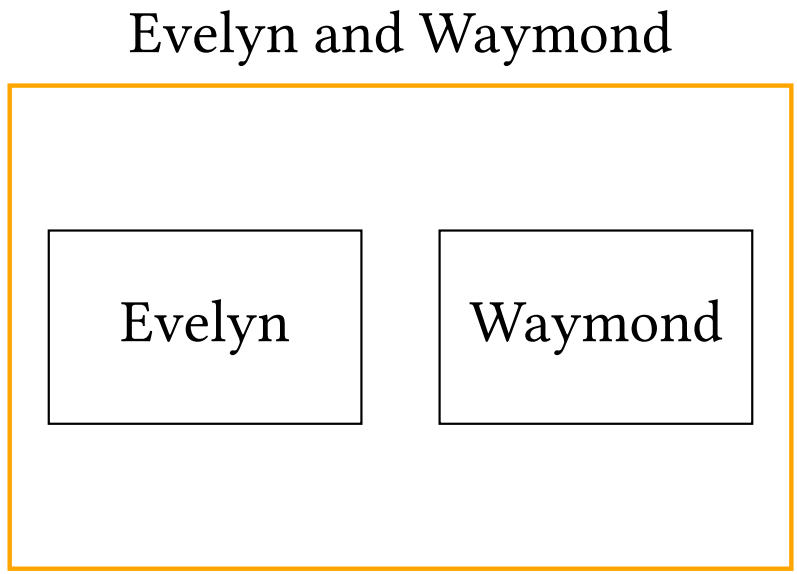
Outline

Collective reading

(5) Evelyn and Waymond met.

Collective reading

(5) Evelyn and Waymond met.

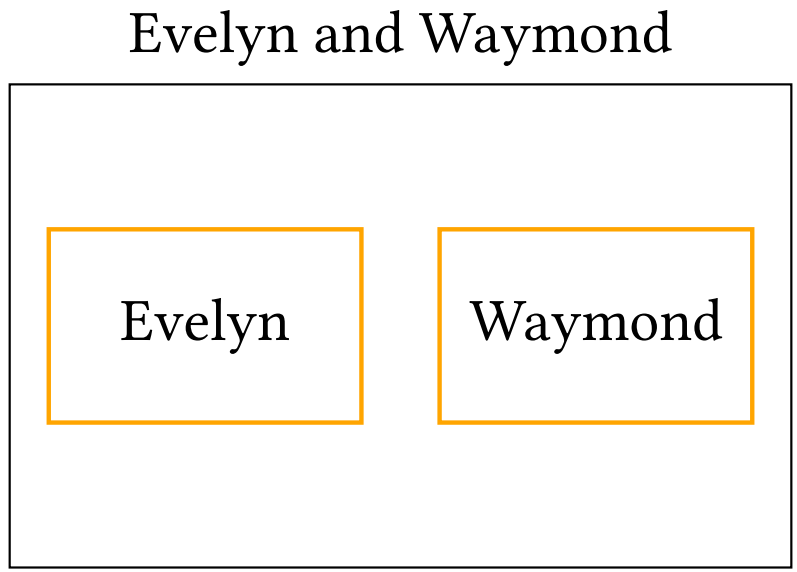


Distributive reading

(6) Evelyn and Waymond smiled.

Distributive reading

(6) Evelyn and Waymond smiled.



Activity 1: collective vs distributive readings

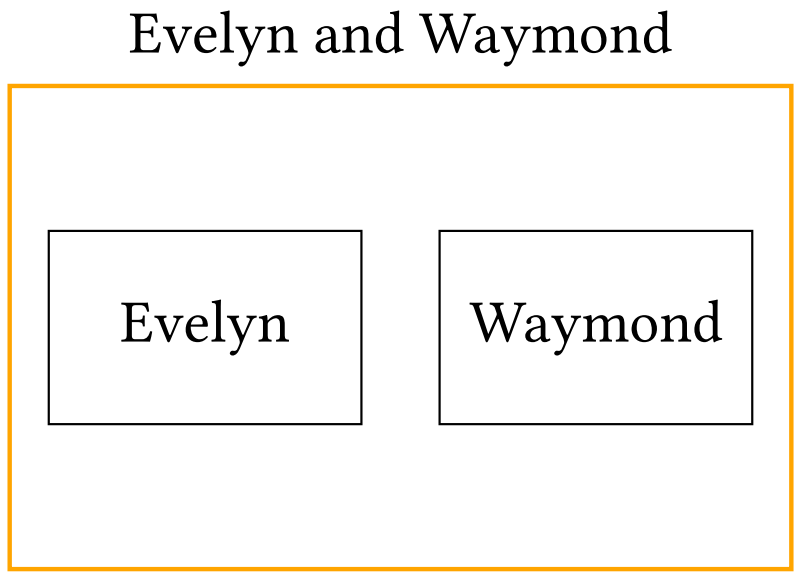
1. are numerous
2. are tall
3. ate a pizza
4. dispersed
5. gathered
6. laughed
7. read a book
8. scattered
9. watched a movie

Collective reading

(7) Evelyn and Waymond ate a pizza.

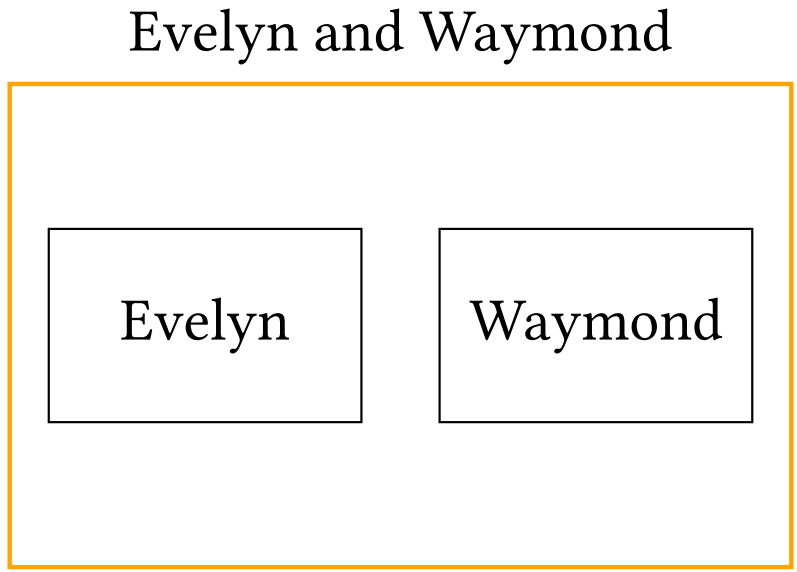
Collective reading

(7) Evelyn and Waymond ate a pizza.



Collective reading

(7) Evelyn and Waymond ate a pizza.



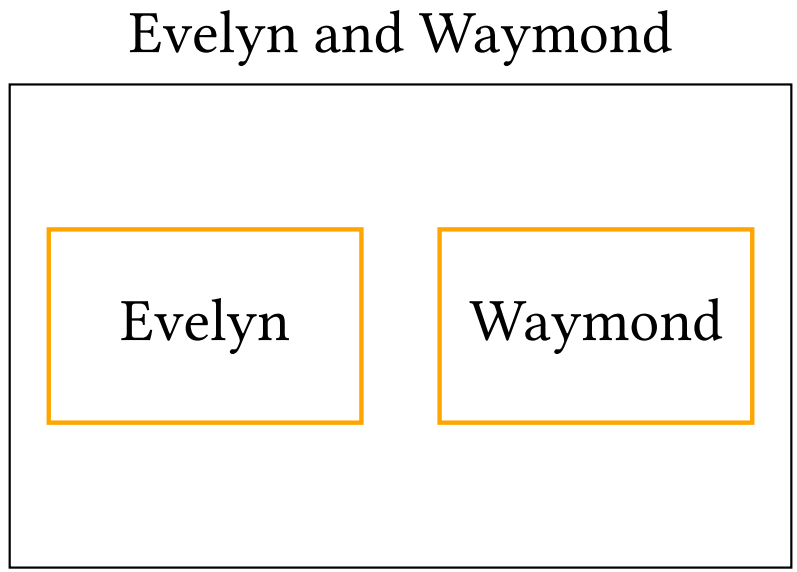
$$\text{Ate}(E \oplus W, p)$$

Distributive reading

(8) Evelyn and Waymond ate a pizza.

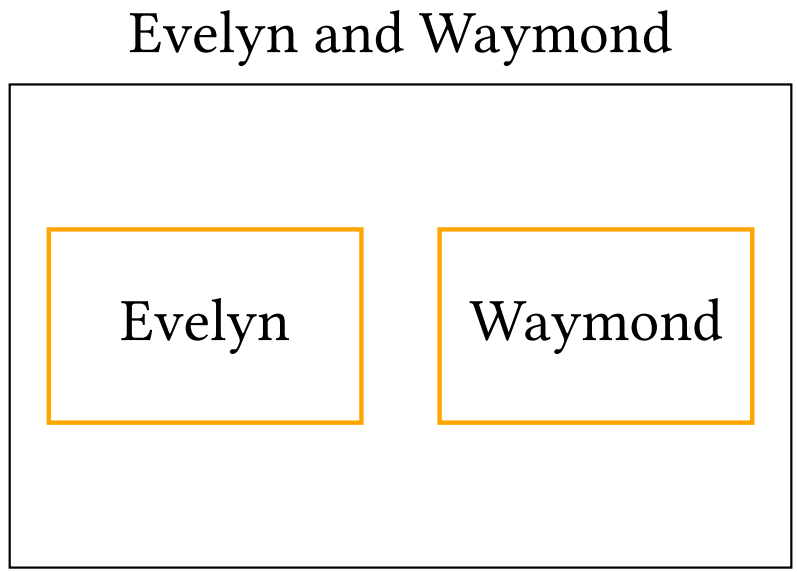
Distributive reading

(8) Evelyn and Waymond ate a pizza.



Distributive reading

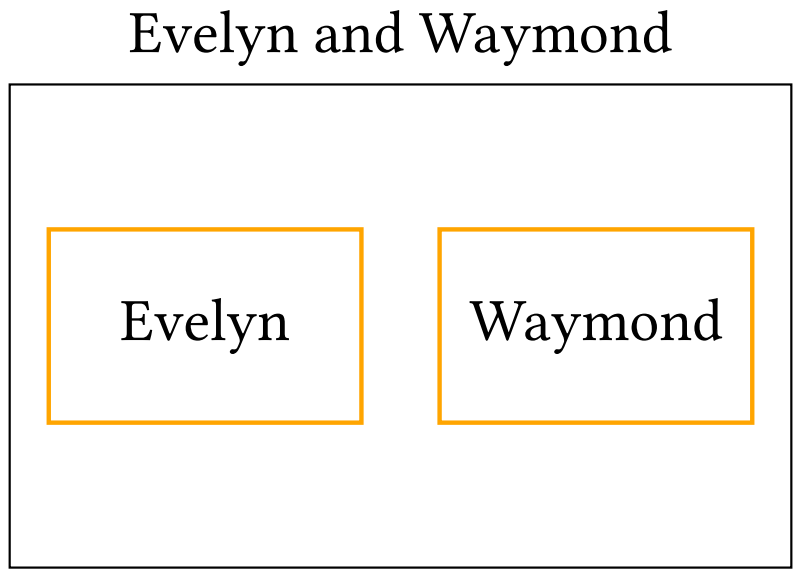
(8) Evelyn and Waymond ate a pizza.



$\approx \text{Ate}(\text{EACH}(E \oplus W), p)$

Distributive reading

(8) Evelyn and Waymond ate a pizza.



$$\approx \text{Ate}(\text{EACH}(E \oplus W), p)$$

Q: Is it the DP or the VP that "is plural"?

Distributive reading: DIST operator

- DIST is an operator that applies to the predicate (in this case *ate*).

Distributive reading: DIST operator

- DIST is an operator that applies to the predicate (in this case *ate*).
- In general, we need to specify which argument we are distributing over.

Distributive reading: DIST operator

- DIST is an operator that applies to the predicate (in this case *ate*).
- In general, we need to specify which argument we are distributing over.
- On its distributive reading, the sentence *Evelyn and Waymond ate a pizza* roughly means:
  For each x that is a part of the sum of Evelyn and Waymond, x ate a pizza.

Distributive readings

- From this point on, we will set distributive readings to one side.

Distributive readings

- From this point on, we will set distributive readings to one side.
- Refer to the Appendix for more on intermediate (distributive) readings.

Outline

Activity 2: Cumulative readings

What “readings” does the following sentence have?

(9) Evelyn, Waymond and Joy lifted three pianos.

(Ignore distributive readings.)

Cumulative readings

(10) Evelyn, Waymond and Joy lifted three pianos.

Cumulative readings

(10) Evelyn, Waymond and Joy lifted three pianos.

Collective reading:

	person	piano
s	$E \oplus W \oplus J$	$p_1 \oplus p_2 \oplus p_3$

Cumulative readings

(10) Evelyn, Waymond and Joy lifted three pianos.

Collective reading:

	person	piano
s	$E \oplus W \oplus J$	$p_1 \oplus p_2 \oplus p_3$

Cumulative reading:

	person	piano
s_1	E	p_1
s_2	$W \oplus J$	$p_2 \oplus p_3$

Cumulative reading: * operator (Link 1983 *et seq.*)

Cumulative reading:

	person	piano
s_1	E	p_1
s_2	$W \oplus J$	$p_2 \oplus p_3$

Cumulative reading: * operator (Link 1983 *et seq.*)

Cumulative reading:

	person	piano
s_1	E	p_1
s_2	$W \oplus J$	$p_2 \oplus p_3$

- * is an operator that applies to the predicate (in this case ** applies to *lift*).

Cumulative reading: * operator (Link 1983 *et seq.*)

Cumulative reading:

	person	piano
s_1	E	p_1
s_2	$W \oplus J$	$p_2 \oplus p_3$

- * is an operator that applies to the predicate (in this case ** applies to *lift*).

- Approximate meaning:
  - For each x that is a part of the sum of Evelyn, Waymond and Joy, there is a y that is a part of the pianos such that x lifted y.
  - For each y that is a part of the pianos, there is an x that is a part of the sum of Evelyn, Waymond and Joy such that x lifted y.

Outline

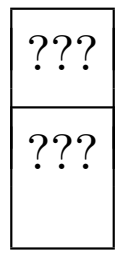
Plurals in DRT

- Plural (C)DRT treats DRSs as relations between plural information states, i.e., sets of information states.

- Conditions can be satisfied:
  - distributively within each information state or
  - collectively across all information states.

Plurals in DRT

(11) Evelyn and Waymond smiled.

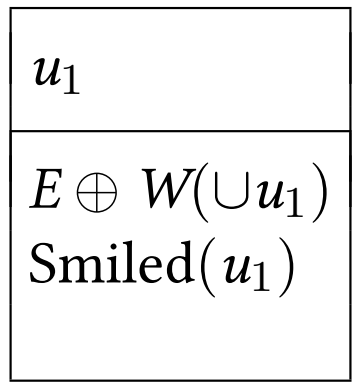


Plurals in DRT

(12) Evelyn and Waymond smiled.

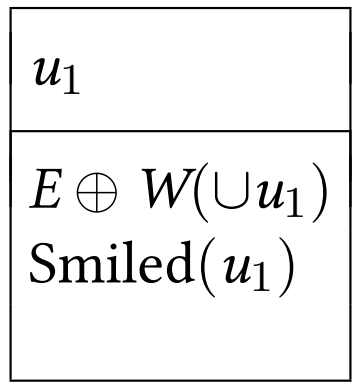
Plurals in DRT

(12) Evelyn and Waymond smiled.



Plurals in DRT

(12) Evelyn and Waymond smiled.



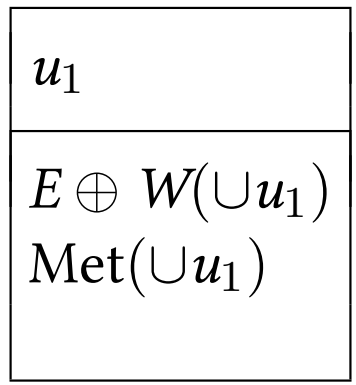
	u_1
s_1	E
s_2	W

Plurals in DRT

(13) Evelyn and Waymond met.

Plurals in DRT

(13) Evelyn and Waymond met.



Plurals in DRT

(13) Evelyn and Waymond met.

u_1
$E \oplus W(\cup u_1)$ $\text{Met}(\cup u_1)$

	u_1
s	$E \oplus W$

Plurals in DRT

(14) Evelyn, Waymond and Joy lifted three pianos.

Plurals in DRT

(14) Evelyn, Waymond and Joy lifted three pianos.

u_1 u_2
$E \oplus W \oplus \mathcal{J}(\cup u_1)$ 3-atoms$(\cup u_2)$ Piano(u_2) Lifted(u_1, u_2)

Plurals in DRT

(15) Evelyn, Waymond and Joy lifted three pianos.

u_1 u_2
$E \oplus W \oplus \mathcal{J}(\cup u_1)$ 3-atoms$(\cup u_2)$ Piano(u_2) Lifted(u_1, u_2)

Collective "reading":

	u_1	u_2
s	$E \oplus W \oplus \mathcal{J}$	$p_1 \oplus p_2 \oplus p_3$

Cumulative "reading":

	u_1	u_2
s_1	E	p_1
s_2	$W \oplus \mathcal{J}$	$p_2 \oplus p_3$

Plurals in DRT

(15) Evelyn, Waymond and Joy lifted three pianos.

u_1 u_2
$E \oplus W \oplus \mathcal{J}(\cup u_1)$ 3-atoms$(\cup u_2)$ Piano(u_2) Lifted(u_1, u_2)

Collective "reading":

	u_1	u_2
s	$E \oplus W \oplus \mathcal{J}$	$p_1 \oplus p_2 \oplus p_3$

Cumulative "reading":

	u_1	u_2
s_1	E	p_1
s_2	$W \oplus \mathcal{J}$	$p_2 \oplus p_3$

Q: Why is "reading" in quotes?

Plurals in DRT

(15) Evelyn, Waymond and Joy lifted three pianos.

u_1 u_2
$E \oplus W \oplus \mathcal{J}(\cup u_1)$ 3-atoms$(\cup u_2)$ Piano(u_2) Lifted(u_1, u_2)

Collective "reading":

	u_1	u_2
s	$E \oplus W \oplus \mathcal{J}$	$p_1 \oplus p_2 \oplus p_3$

Cumulative "reading":

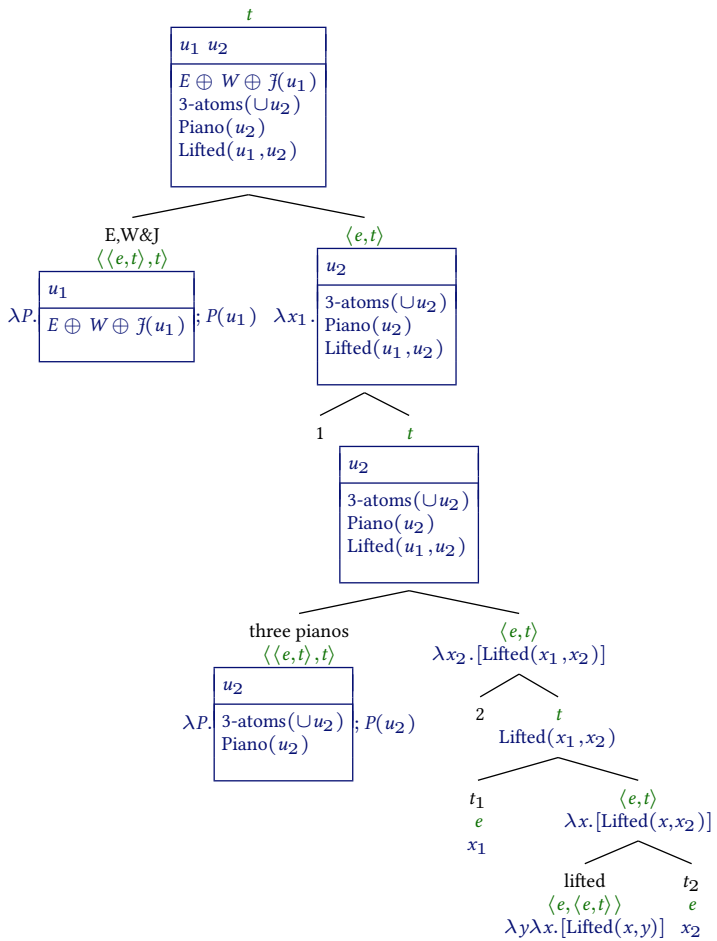
	u_1	u_2
s_1	E	p_1
s_2	$W \oplus \mathcal{J}$	$p_2 \oplus p_3$

Q: Why is "reading" in quotes?

Q: Is this simpler than an operator-based approach?

Plurals in CDRT

(16) Evelyn, Waymond and Joy lifted three pianos.



Summary

- Sentences with plurals have different “readings”: e.g. collective, distributive, cumulative...

Summary

- Sentences with plurals have different “readings”: e.g. collective, distributive, cumulative...
- Plural (C)DRT treats DRSs as relations between plural information states.

Further reading

Overviews:

1. Nouwen (2016)
2. Haug and Dalrymple (2020)

Technical details of plural (C)DRT

1. van den Berg (1996)
2. Brasoveanu (2007)

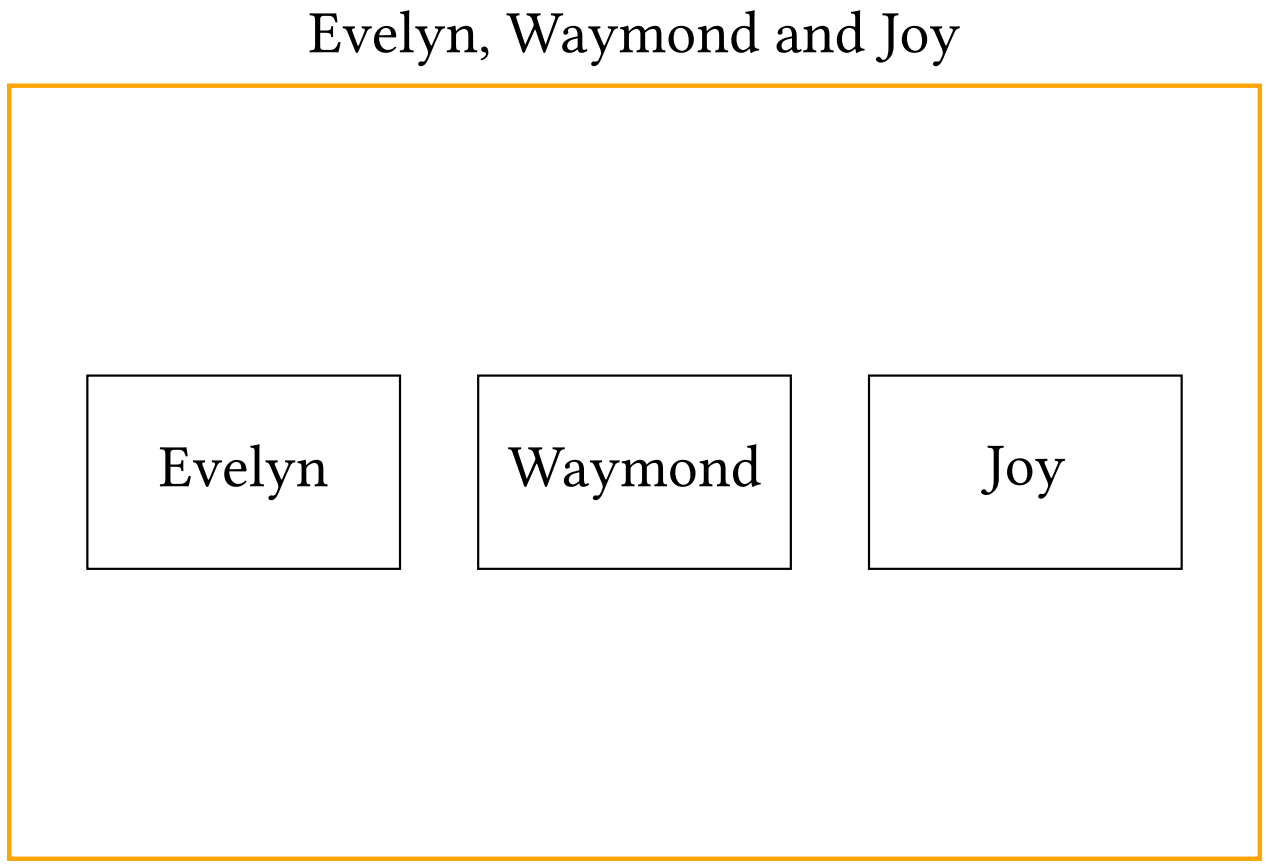
Activity: Intermediate readings

What “readings” does the following sentence have?

(17) Evelyn, Waymond and Joy ate a pizza.

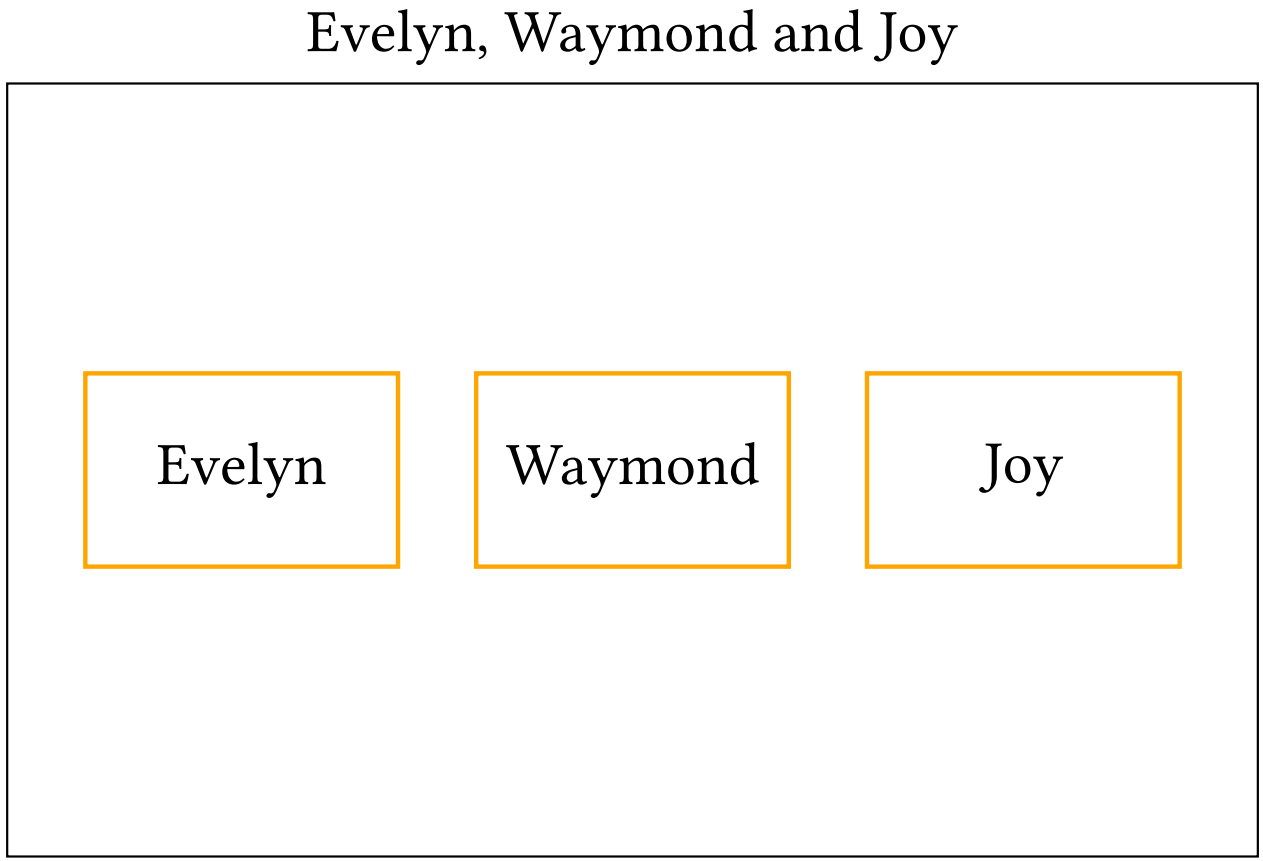
Collective reading

(18) Evelyn, Waymond and Joy ate a pizza.



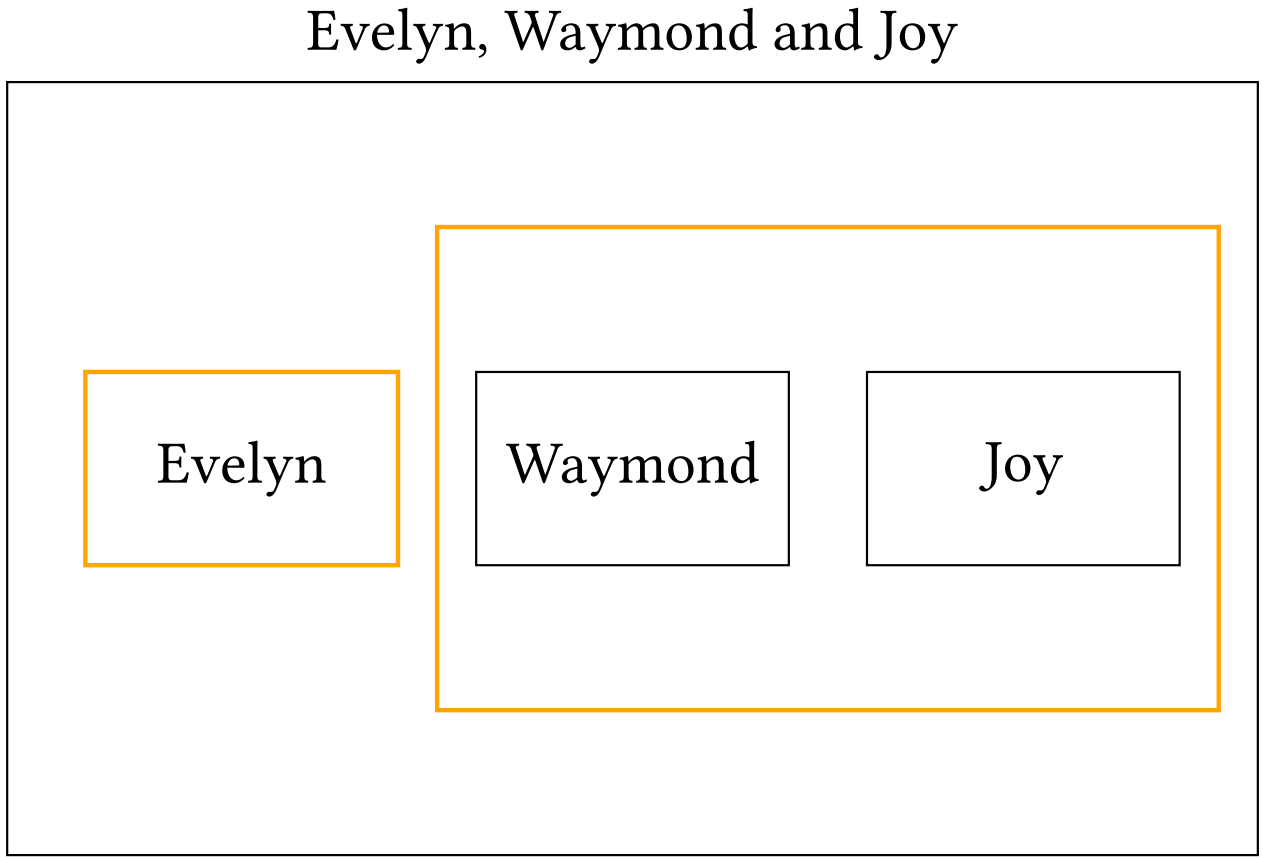
Distributive reading

(19) Evelyn, Waymond and Joy ate a pizza.



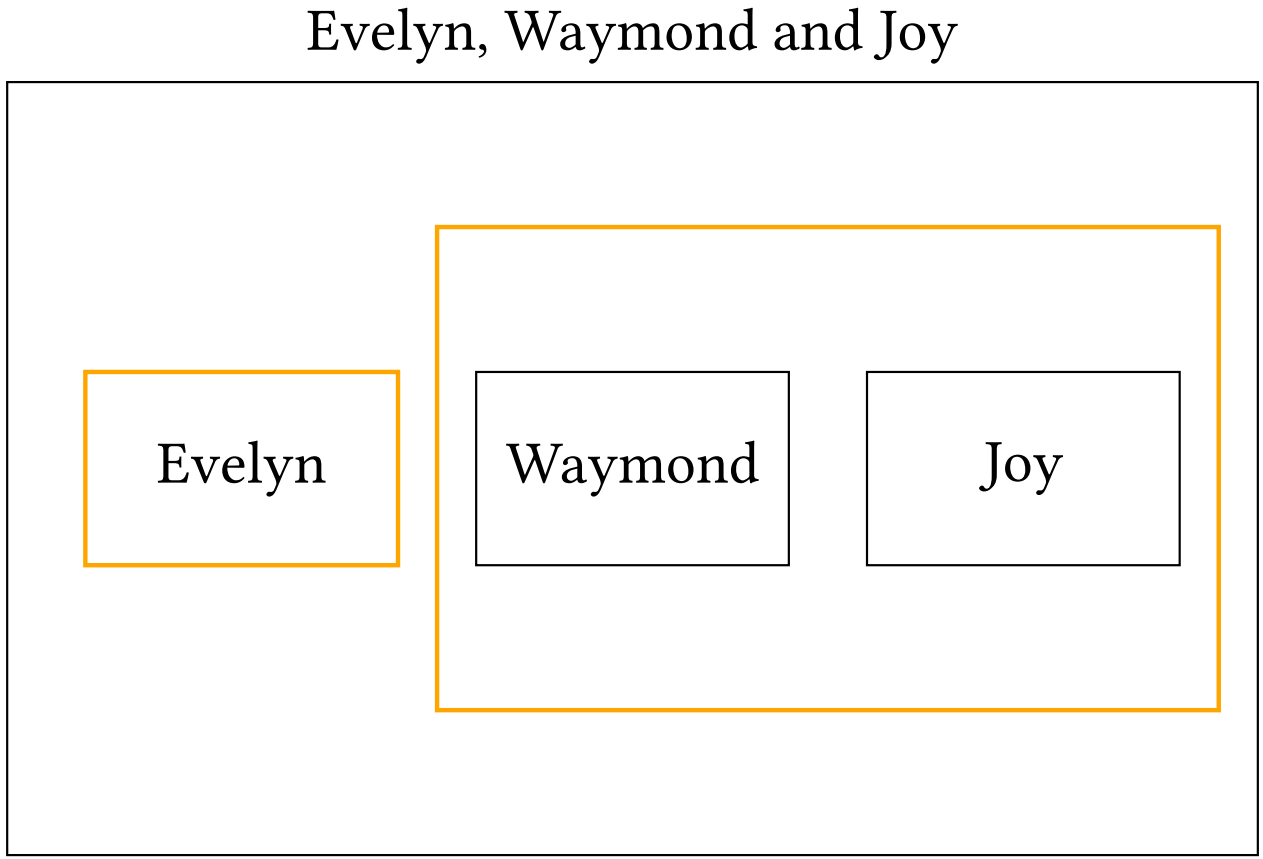
Intermediate distributive reading

(20) Evelyn, Waymond and Joy ate a pizza.



Intermediate distributive reading

(20) Evelyn, Waymond and Joy ate a pizza.



Q: Do you get this reading?

References I

Brasoveanu, Adrian. 2007. Structured nominal and modal reference. Doctoral dissertation, Rutgers University.

Haug, Dag Trygve Truslew, and Mary Dalrymple. 2020. Reciprocity: Anaphora, scope, and quantification. *Semantics and Pragmatics* 13:1–62.

Link, Godehard. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. In *Meaning, Use, and Interpretation of Language*, ed. Rainer Bäuerle, Christoph Schwarze, and Arnim Von Stechow, 302–323. Berlin: De Gruyter.

Nouwen, Rick. 2016. Plurality. In *The Cambridge Handbook of Formal Semantics*, ed. Maria Aloni and Paul Dekker, 267–284. Cambridge: Cambridge University Press.

van den Berg, Martin. 1996. Some aspects of the internal structure of discourse: The dynamics of nominal anaphora. Doctoral dissertation, University of Amsterdam.