Monotonicity again

1 Review: Monotonicity pattern of propositional operators

- Let $\pi$ be a one-place propositional operator, we can define its monotonicity pattern as follows:
  - $\pi$ is an **upward-entailing** (UE) operator iff for any two sentences $p$ and $q$ such that $p \Rightarrow q$: $\pi(p) \Rightarrow \pi(q)$;
  - $\pi$ is a **downward-entailing** (DE) operator iff for any two sentences $p$ and $q$ such that $p \Rightarrow q$: $\pi(p) \Leftarrow \pi(q)$;
  - $\pi$ is a **non-monotonic** (NM) operator iff $\pi$ is neither UE nor DE.

2 Extending to non-sentential expressions

2.1 Entailments between predicates

- The following entailment relation between sentences comes from the subset relation between the semantics of the 1-place predicates.

  (1) a. Mary is a **Chinese student**, $\Rightarrow$ Mary is a **student**.
      b. Mary is a **semanticist**, $\Rightarrow$ Mary is a **linguist**.
      c. Mary arrived early, $\Rightarrow$ Mary arrived.

- Given two one-place predicates $A$ and $B$, $A \Rightarrow B$ iff for any entity $x$: $A(x) \Rightarrow B(x)$.

  (2) a. For any individual $x$, Chinese-student($x$) $\Rightarrow$ student($x$).
      Therefore, Chinese student $\Rightarrow$ student.
      b. For any individual $x$, semanticist($x$) $\Rightarrow$ linguist($x$).
      Therefore, semanticist $\Rightarrow$ linguist.
      c. ...

2.2 Monotonicity of determiners and quantifiers

- We are not ready to determine the monotonicity pattern of an second-order function that selects a one-place predicate as its argument:

  (3) **Scope of a quantificational determiner**
      a. Some student arrived early. $\Rightarrow$ Some student arrived.
      b. Every student arrived early. $\Rightarrow$ Every student arrived.
      c. No student arrived early. $\Leftarrow$ No student arrived.

  (4) **Restrictor of a quantificational determiner**
      a. Some semanticist arrived $\Rightarrow$ Some linguist arrived.
      b. Every semanticist arrived $\Leftarrow$ Every linguist arrived.
      c. No semanticist arrived $\Leftarrow$ No linguist arrived.
Exercise: Identify the monotonicity pattern of the following generalized quantifiers or environments:

(5)  
  a. exactly three students  
  b. not every student  
  c. at most two students  
  d. Every participant who _____ got an award

Exercise: For each of the following claims, identify whether it is right or wrong.

(6)  
  a. Every is a DE operator.  
  b. Conditionals create DE environments.  
  c. Any environment containing negation is DE.

3 Why do polarity patterns matter?

• Scalar implicatures are not evoked if the scalar items occur in DE contexts (from Handout 8):

(7) Under the semantic scope of negation  
  a. John didn’t invite Andy or Billy.  
     i. \( \times \) Not that [John invited Andy or Billy but not both].  
     ii. \( \checkmark \) Not that [John invited Andy or Billy or both].  
  b. Andy or Billy wasn’t invited by John.

(8) In the antecedent of a conditional  
  a. If John read some of the books, he will get full credits.  
     i. \( \times \) If John read some but not all of the books, he will ...  
     ii. \( \checkmark \) If John read at least of the books, he will ...  
  b. If John hands in the homework by tomorrow, he will get some of the credits.

• Negative polarity items (NPIs), such as any, are licensed only in DE environments.

(9) Under the semantic scope of negation  
  a. John didn’t read any papers.  
  b. * John read any papers.

(10) Within the scope of negative quantifiers  
  a. Few/no/at most 3 students read any papers.  
  b. * Many/most students read any papers.

(11) In the left argument of universal quantifiers  
  a. Every student who has read any papers passed the exam.  
  b. * Every student who has read some papers passed any exams.  
  c. * Some student who has read any papers passed the exam.

(12) In the antecedent of conditionals  
  a. If John knows any big names, he will be invited.  
  b. * If John is invited, he will know any big names.