Parsing general CFG: \( O(n^3) \)

- **LL parsers** (left-to-right, leftmost derivation, top-down)
  - Simple to write
  - More difficult grammars

- **LR parsers** (rightmost derivation, bottom-up)
  - More powerful
  - Natural grammars

```
LL parsers \[\rightarrow\] LR parsers
```

```
\[\text{CFG} \quad \text{LR} \quad \text{LL}\]
```

int a, b, for j

id-list

id-list → id id-list-tail

id-list-tail → , id id-list-tail | j;

A, B, C:

\[ \text{top-down (LL):} \]

\[ \text{bottom-up (LR):} \]

\text{id-list}

\text{id id-list-tail}

\text{id id-list-tail}

, id id-list-tail

, id id-list-tail

, id id-list-tail

, id id-list-tail

, id id id j
$ \to \$ \mid w \mid \$S$

$w \to abbb \mid a\ w\ b\ b$

$S \to w \mid \$t\ 1\ 1$

$t\ 1\ 1 \to e \mid S$

$w \to a\ t\ 1\ 2$

$t\ 1\ 2 \to b\ b \mid w\ b\ b$