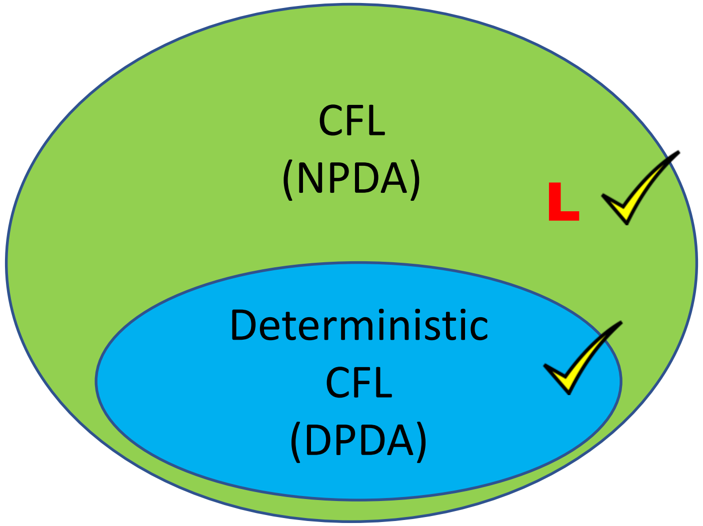
We will prove that:

"There is a language **L** that is in L(NPDA) but is not in L(DPDA)."



Let **L** = $\{a^n b^n\} \cup \{a^n b^{2n}\}$; n≥ 0

L is in CFL because there is a CFG for **L**.

$$S \to S_1 \mid S_2 \qquad \{a^n b^n\} \cup \{a^n b^{2n}\}$$

$$S_1 \to aS_1b \mid \lambda \qquad \{a^n b^n\}$$

$$S_2 \to aS_2bb \mid \lambda \qquad \{a^n b^{2n}\}$$

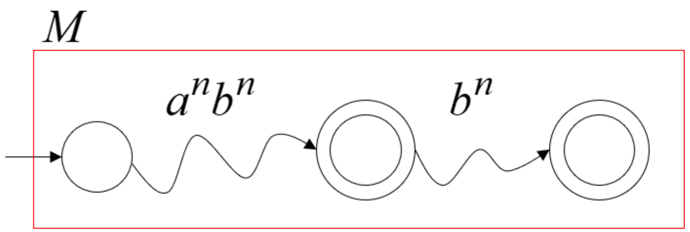
Therefore, **L** $\in L(NPDA)$.

Next, we will show that "**L** <u>is not in</u> L(DPDA)."

<u>Proof by contradiction:</u>

Assume for contradiction that

L = $\{a^n b^n\} \cup \{a^n b^{2n}\}$ <u>is in</u> L(DPDA).



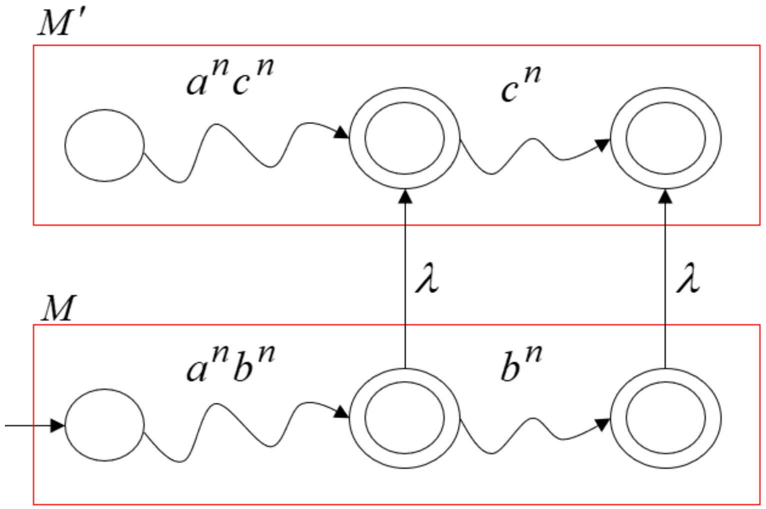
This DPDA M exists because of our assumption.

FACT:

$$\underbrace{\{a^n b^n\} \cup \{a^n b^{2n}\}}_{\textbf{L}} \cup \underbrace{\{a^n b^n c^n\}}_{\text{Non-CFL}}$$ is <u>not CFL</u>.

If we can construct NPDA that accepts the above language, we will reach a contradiction.

We construct NPDA from M to accept L.



This NPDA accepts the non-CFL $\{a^n b^n\} \cup \{a^n b^{2n}\} \cup \{a^n b^n c^n\}$.

Contradiction !!!

Our assumption is wrong.

Therefore, L is not in L(DPDA).