Progressive Neural Networks (PNN)

🏗️ PNN Network Architecture (Progressive Expansion)

Input Layer

🔒 Frozen | 🔒 Frozen | 🔓 Training

Column 1	Column 2	Column 3
Task 1	Task 2	Task 3
Weights Fixed (No Update)	Training Complete	Currently Training (Active)

Legend: ······ Lateral Connections (Knowledge Transfer) ● Frozen (Frozen) ● Training (Training)

Output 1 | Output 2 | Output 3
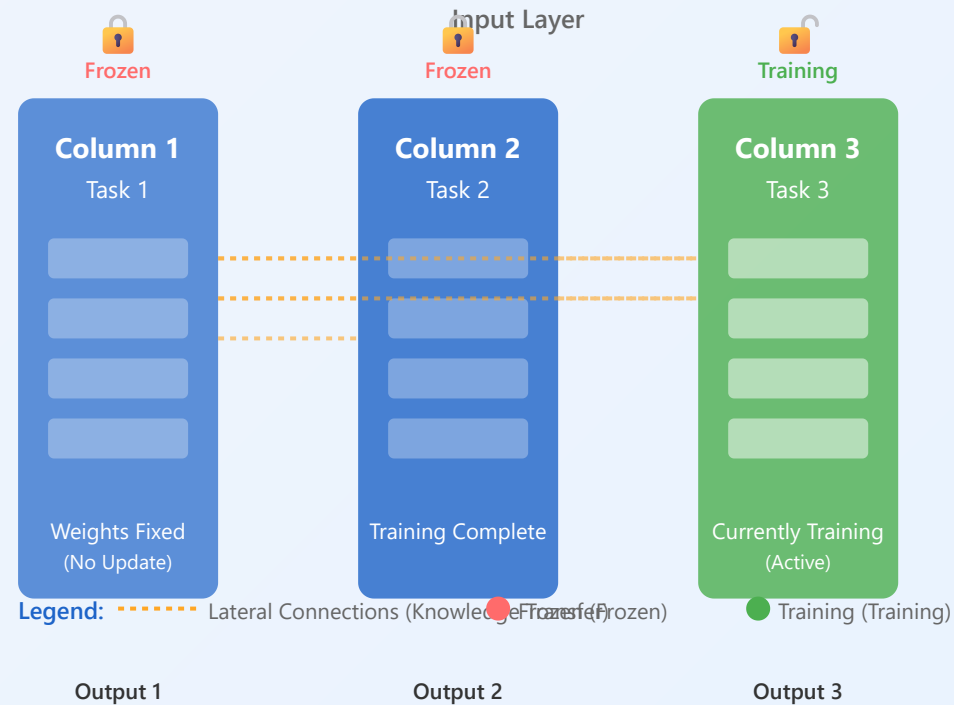
📄 PNN Architecture

- Column Architecture: Add new network column for each task

- Lateral Connections: Transfer features from previous columns

- Frozen Columns: Freeze previous task weights

- Adapter Layers: Transform features between tasks

➕ Expansion Process

- Step 1: Initial task learning (Column 1)

- Step 2: Add Column 2 for new task

- Step 3: Knowledge transfer via lateral connections

- Step 4: Continue expanding with additional columns as needed

⚖️ Pros and Cons

- Pros: Complete forgetting prevention, knowledge transfer possible

- Pros: Minimize inter-task interference

- Cons: Linear model size growth

- Cons: Increased memory and computational cost