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enormous number in Ramsey theory  
 first digit might remain unknown for all time  
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enormous number in Ramsey theory  
 first digit might remain unknown for all time  
 first 10 digits can be easily computed and are shown below:

Diagram illustrating the construction of a 64-layer GNN architecture. The graph structure  $G$  is defined as a sequence of layers:  $3 \uparrow \dots \uparrow 3$ ,  $3 \uparrow \dots \uparrow 3$ ,  $\vdots$ ,  $3 \uparrow \dots \uparrow 3$ ,  $3 \uparrow \uparrow \uparrow 3$ . The first three layers are grouped by a bracket and labeled "64 layers". Below the cube, the number of nodes at each stage is calculated:  $2 \uparrow \uparrow 4 = 2^{2 \cdot 2^2} = 65536$ ,  $2 \uparrow \uparrow \uparrow 4 = 2 \uparrow \uparrow (2 \uparrow \uparrow (2 \uparrow \uparrow 2))$ , and  $2 \uparrow \uparrow \uparrow \uparrow 4 = 2 \uparrow \uparrow \uparrow (2 \uparrow \uparrow \uparrow (2 \uparrow \uparrow \uparrow 2))$ .

$G = 3 \uparrow \cdots \uparrow 3$

64 layers

$$\begin{aligned} &2 \uparrow\uparrow 4 = 2^{2^2} = 65536 \\ &2 \uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow (2 \uparrow\uparrow (2 \uparrow\uparrow 2)) \\ &2 \uparrow\uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow 2)) \end{aligned}$$

$2 \uparrow\uparrow 4 = 2^{2^2} = 65536$   
 $2 \uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow (2 \uparrow\uparrow (2 \uparrow\uparrow 2))$   
 $2 \uparrow\uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow 2))$

$G = 3 \uparrow \dots \uparrow 3$   
 $3 \uparrow \dots \uparrow 3$   
 $\vdots$   
 $3 \uparrow \dots \uparrow 3$   
 $3 \uparrow\uparrow\uparrow\uparrow 3$

64 layers

Diagram illustrating the construction of a 64-layer GNN architecture. The graph structure is defined by the number of nodes, which is calculated as  $2 \uparrow\uparrow 4 = 2^{2^{2^2}} = 65536$ . The graph  $G$  is composed of 64 layers, each consisting of two sets of nodes, each of size  $3 \uparrow\uparrow 3$ , connected by edges.

Diagram illustrating the construction of a 64-layer GNN architecture. The architecture is defined by the sequence of layers:

$$G = 3 \uparrow \dots \uparrow 3$$

64 layers

The layers are grouped into three sections:

- Section 1:  $2 \uparrow \uparrow 4 = 2^{2^2} = 65536$
- Section 2:  $2 \uparrow \uparrow \uparrow 4 = 2 \uparrow \uparrow (2 \uparrow \uparrow (2 \uparrow \uparrow 2))$
- Section 3:  $2 \uparrow \uparrow \uparrow \uparrow 4 = 2 \uparrow \uparrow \uparrow (2 \uparrow \uparrow \uparrow (2 \uparrow \uparrow \uparrow 2))$

Diagram illustrating the architecture of the 64-layer neural network. The input size is  $2 \uparrow\uparrow 4 = 2^{2^2} = 65536$ . The architecture is defined by the sequence of layer sizes:  $2 \uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow (2 \uparrow\uparrow (2 \uparrow\uparrow 2))$  and  $2 \uparrow\uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow 2))$ . The output size is  $3 \uparrow \dots \uparrow 3$  (64 layers).

$2 \uparrow \uparrow 4 = 2^{2^{2^2}} = 65536$   
 $2 \uparrow \uparrow \uparrow 4 = 2 \uparrow \uparrow (2 \uparrow \uparrow (2 \uparrow \uparrow 2))$   
 $2 \uparrow \uparrow \uparrow \uparrow 4 = 2 \uparrow \uparrow \uparrow (2 \uparrow \uparrow \uparrow (2 \uparrow \uparrow \uparrow 2))$

$G = 3 \uparrow \dots \uparrow 3$   
 $3 \uparrow \dots \uparrow 3$   
 $\vdots$   
 $3 \uparrow \dots \uparrow 3$   
 $3 \uparrow \uparrow \uparrow 3$

64 layers

$2 \uparrow\uparrow 4 = 2^{2^2} = 65536$   
 $2 \uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow (2 \uparrow\uparrow (2 \uparrow\uparrow 2))$   
 $2 \uparrow\uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow 2))$

$G = \left. \begin{array}{c} 3 \uparrow \cdots \uparrow 3 \\ 3 \uparrow \cdots \uparrow 3 \\ \vdots \\ 3 \uparrow \cdots \uparrow 3 \\ 3 \uparrow\uparrow\uparrow\uparrow 3 \end{array} \right\} 64 \text{ layers}$

$2 \uparrow\uparrow 4 = 2^{2^2} = 65536$   
 $2 \uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow (2 \uparrow\uparrow (2 \uparrow\uparrow 2))$   
 $2 \uparrow\uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow 2))$

$G = 3 \uparrow \dots \uparrow 3$   
 $3 \uparrow \dots \uparrow 3$   
 $\vdots$   
 $3 \uparrow \dots \uparrow 3$   
 $3 \uparrow\uparrow\uparrow 3$

64 layers

$2 \uparrow\uparrow 4 = 2^{2^2} = 65536$   
 $2 \uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow (2 \uparrow\uparrow (2 \uparrow\uparrow 2))$   
 $2 \uparrow\uparrow\uparrow\uparrow 4 = 2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow (2 \uparrow\uparrow\uparrow 2))$

$G = \left. \begin{array}{c} 3 \uparrow \cdots \uparrow 3 \\ 3 \uparrow \cdots \uparrow 3 \\ \vdots \\ 3 \uparrow \cdots \uparrow 3 \\ 3 \uparrow\uparrow\uparrow 3 \end{array} \right\} 64 \text{ layers}$