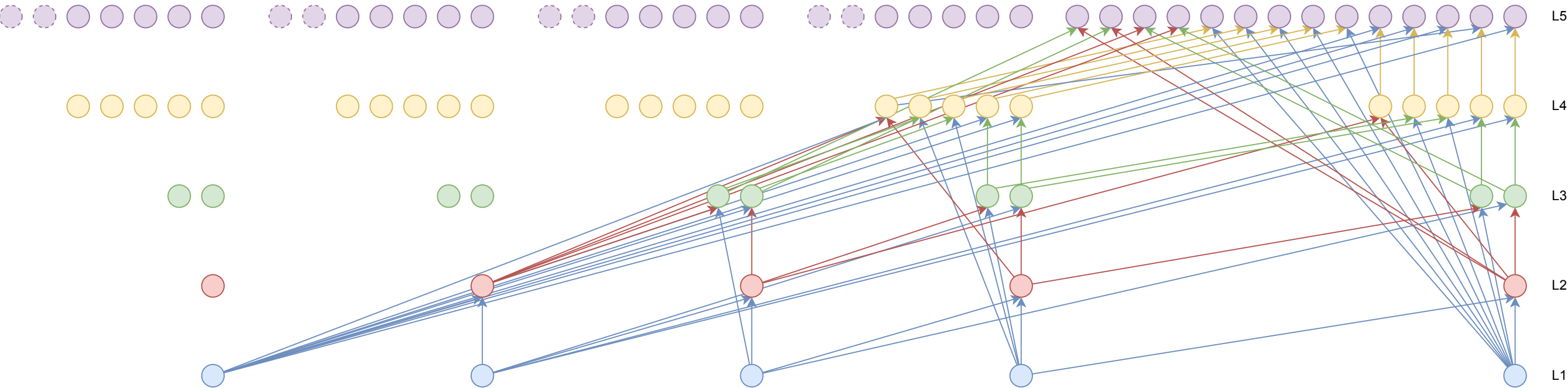


SANI Pregenerated Architecture - 23 November 2022 [DRAFT]

Structure type #1 (SANI implementation):



Permutation Count/Measurement

Layer 1: 1 nodes
Layer 2: 1 nodes
Layer 3: 2 nodes ($2^{(3-1)-3}=1$)
Layer 4: 5 nodes ($2^{(4-1)-3}=5$)
Layer 5: 13 nodes ($2^{(5-1)-3}=13$)
Layer 6: 29 nodes? ($(2^{(6-1)-3})=29$)

numberOfNodes = $2^{(L-1)-3}$

- Number of layers (L) = number of words/tokens
- Each node (state) contains q hidden units (hiddenSize ~= embeddingSize, e.g. 512)
- *Optional: each node permutation on a layer (horiz replicas) is stored in same hidden units; ie each hidden unit has multiple pairs of inputs. Required if use same architecture for entire sentence; in which case a single node for each layer is sufficient.

Therefore for 64 word/token sentence, number of nodes = $2^{(64-1)-3} = 1*10^{19}$

Conclusion:

- Can only use pregenerated SANIwavenet network for lower layers (subsentences)
- Require recursion / mix-and-match for longer sequences

Limitation:

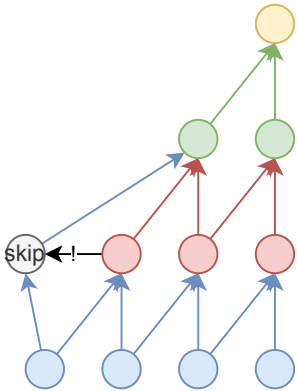
- Need to be able to respond to same semantic input independent of syntactical substructure (exact number of words of subgraph);
 - will require recursion (ie same node / sets of hidden units for every layer)
 - consider receive recursive input with skipped layers [ie from t time steps earlier] to prevent RNN memorisation/accumulation collapse

Structure type #2 (overloaded SANI implementation with wordIndex overlap): [Current implementation]

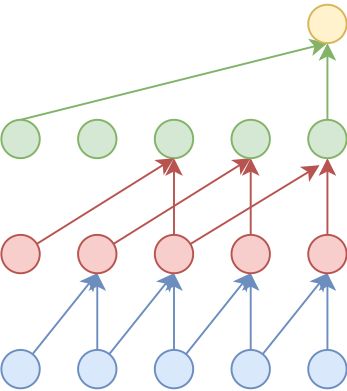
- Each node requires 2 fully satisfied input nodes (*or 1 fully satisfied input node and 1 partially satisfied input node).
- Network should learn to discard unused/discordant ends of subsequences not connected to subgraph.

- Ideally (as per SANI spec) there should be no overlap between input nodes, however it is difficult to capture all possible syntactical graph structures with this limitation enforced.

- consider add skip layer connections, with inhibition of intermediary layer



Structure type #3 (WaveNet implementation):



Rule

Rule: every SANI node can only have 2 incoming connections