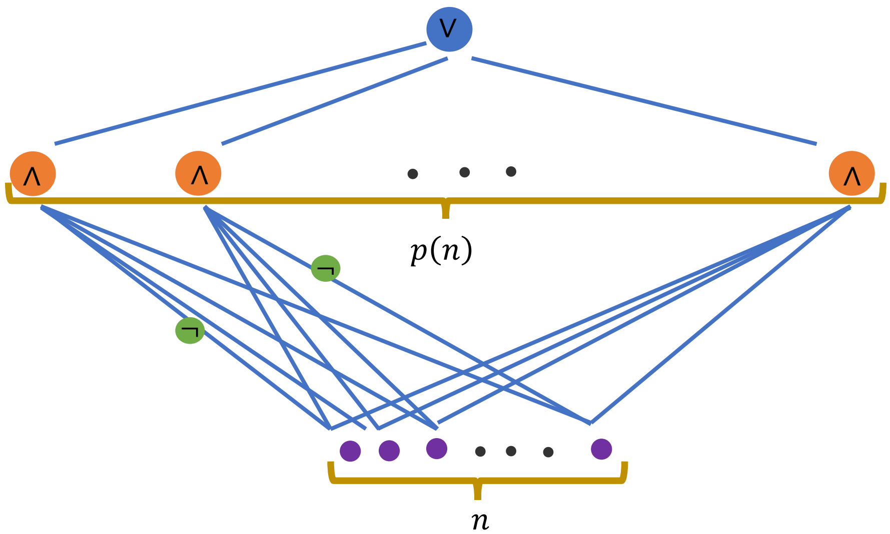
The circuit for each n would look like this:



The blue gate at the top is an OR gate, all the orange gates are AND gates, each green gate is a NOT gate. The in-degree of each AND gate is n, as we can see by the group of n purple nodes (inputs to the circuit), and there are $p(n)$ orange AND gates, and the top blue node tells us whether the input belongs to $L \cap \{0,1\}^n$ – it is the output. The n purple nodes are the n-length input.

This circuit is correct because if the input $x \in L \cap \{0,1\}^n$, then it equals one of the $p(n)$ accepted inputs, i.e. it's the first one OR the second one OR … OR the $p(n)$-th one, and for x to equal $y \in \{p(n) \text{ accepted inputs}\}$, it has to be that $(x_1 = y_1)\ AND\ (x_2 = y_2)\ AND \ldots AND\ (x_n = y_n)$. There is a NOT gate between the x_i and the z-th AND gate if the z-th accepted input's i-th bit is 0.

This circuit is polynomial size because the number of edges is $O\big(p(n) + 2 * (p(n) \cdot n)\big)$. There is a wire connecting the blue (output) gate and each of the $p(n)$ AND gates, and there are at most $p(n) \cdot n$ NOT gates, making us have at most $2 \cdot p(n) \cdot n$ wires between the orange AND gates and the purple input nodes. QED.