GCN-RL Circuit Designer: Transistor Sizing with GNN & RL
Hanrui Wang, Kuan Wang, Jiacheng Yang, Linxiao Shen, Nan Sun, Hae-Seung Lee, Song Han, MIT&UT Austin

Overview
Although there have been plenty of work on transistor sizing targeting one circuit, limited research has been done on transferring knowledge from one circuit to another to reduce re-design overhead. We leverage Reinforcement Learning (RL) algorithm to conduct knowledge transfer between different technology nodes and schematics. Moreover, inspired by the fact that circuit is a graph, we propose to learn on the schematic graph with Graph Convolutional Neural Networks (GCN). The GCN-RL agent extracts the features on the schematic graph, whose vertices are transistors, edges are wires.

Proposed GCN-RL Agent

Proposed GCN-RL achieves highest figure of merits

Proposed GCN-RL has knowledge transfer ability

Conclusions
1. GCN-RL consistently achieves higher Figure of Merits (FoMs) on four different circuits than conventional black box optimization methods (BO, ES, random search);
2. GCN-RL has the transfer ability between technology nodes and schematics.

Contact: Hanrui Wang hanrui@mit.edu
Website: https://gcnrl.mit.edu/