Different Machine learning algorithms are widely used in different real time predictions including temperature, whether etc. The power, area and temperature (PAT) prediction of Network-on-Chip can also leverage the ability of machine learning models. However, lack of availability of proper public dataset is a key issue. Addition, most existing studies independently focus on power, area or thermal analysis. Framework on simultaneous analysis of three parameters are very rare. Most of the existing studies are tested on smaller network and scalability to larger system is unclear.

We propose machine learning regression algorithm such support vector regression (SVR) and decision trees, that can learn the nonlinear relationship between different NoC configuration parameters and PAT output metrics. Based on the learning the algorithms can predict PAT values for unseen input NoC configuration especially for low-complexity NoC designs. However, understanding complex NoC Design requires complex Neural network model. We propose Convolutional Neural Networks (CNNs) and **Recurrent Neural Networks (RNNs)** or **LSTM (Long Short-Term Memory)** model that can learn the spatial correlations and complex relation in NoC. This Deep learning models are highly useful especially in temperature prediction which is depended on complex nonlinear relationship in NoC. In addition to that we propose hybrid model that combine the ML and DL algorithms to increase the prediction accuracy. ML component of hybrid model can be used to prediction of area and power which has linear relationship with NoC parameters. DL component of hybrid model like CNN or LSTM can be used to learn the complex non linear relationship in 3D NoC for predicting the temperature. The prediction of both models can be combined using Ensemble Learning technique such **stacking**.

We generate dataset using PAT Noxim with different values of NoC configuration such that topology, buffer\_size

Dataset creation:

Topology - 3**D Mesh Topology**:

Routing Algorithm - XYZ Routing

Network size –

 **2x2x2** (8 routers)

 **3x3x3** (27 routers)

 **4x4x4** (64 routers)

 **5x5x5** (125 routers)

 **6x6x6** (216 routers)

 **7x7x7** (343 routers)

 **8x8x8** (512 routers)

 **9x9x9** (729 routers)

 **10x10x10** (1000 routers)

 **12x12x12** (1728 routers)

Traffic Pattern- Uniform Random Traffic, hotspot traffic

Buffer Size – 8

Packet size – 16 flits

Packet Injection Rate (PIR)

**X-axis PIR (10 values):**

* [0.01, 0.03, 0.05, 0.07, 0.09, 0.11, 0.13, 0.15, 0.17, 0.2]

**Y-axis PIR (10 values):**

* [0.01, 0.03, 0.05, 0.07, 0.09, 0.11, 0.13, 0.15, 0.17, 0.2]

**Z-axis PIR (10 values):**

* [0.0001, 0.0003, 0.0005, 0.0007, 0.001, 0.003, 0.005, 0.007, 0.009, 0.01]

Sample Period: 20000000