A variety of deep learning

Comparison execution time performance on CPU, GPU, TPU of different network

Baekeun Park

parkbae@iu.edu

In the observation of a variety of deep learning model, it shows the best time performance when executed with GPU. In detail, sometimes CPU or TPU shows the best performance in the data-load process or compile process. However, GPU execution shows results that are incomparably faster than others. Especially in the CNN model, GPU results can be seen to perform more than 30x as CPU execution. The following are the results of each model's execution. The execution time for each process is indicated in the yellow box.

1. MLP(Multi-Layer Perceptron)

Type	Time (Total)	Results
CPU	66.419s	
GPU	**10.310s**	
TPU	77.527s	

2. CNN(Convolutional Neural Networks)

Type	Time (Total)	Results
CPU	1,310.075s	
GPU	**43.841s**	
TPU	1,260.536s	

3. RNN(Recurrent Neural Networks)

Type	Time (Total)	Results
CPU	116.17s	
GPU	**39.286s**	
TPU	134.918s	

4. LSTM(Long Short Term Memory networks)

Type	Time (Total)	Results
| CPU | 295.822s | ```
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| Name           | Status | Time    | Sum     | Start               | tag | Node         | User   | OS    | Version                        |
|--------------------------------------------------------------------------------------------------------------------|
| data-load      | failed | 0.458   | 0.458   | 2021-03-01 08:44:29 |     | 1a2813829790 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| data-pre-process | failed | 0.092  | 0.092   | 2021-03-01 08:44:30 |     | 1a2813829790 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| compile        | failed | 1.229   | 1.229   | 2021-03-01 08:44:30 |     | 1a2813829790 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| train          | failed | 277.667 | 277.667 | 2021-03-01 08:44:31 |     | 1a2813829790 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| evaluate       | failed | 16.376  | 16.376  | 2021-03-01 08:49:09 |     | 1a2813829790 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
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| GPU | **25.386s** | ```
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| Name           | Status | Time   | Sum    | Start               | tag | Node         | User   | OS    | Version                        |
|--------------------------------------------------------------------------------------------------------------------|
| data-load      | failed | 0.461  | 0.461  | 2021-03-01 08:50:45 |     | 89fd165a3858 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| data-pre-process | failed | 0.076 | 0.076  | 2021-03-01 08:50:46 |     | 89fd165a3858 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| compile        | failed | 6.452  | 6.452  | 2021-03-01 08:50:46 |     | 89fd165a3858 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| train          | failed | 16.989 | 16.989 | 2021-03-01 08:50:52 |     | 89fd165a3858 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| evaluate       | failed | 1.408  | 1.408  | 2021-03-01 08:51:09 |     | 89fd165a3858 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
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| TPU | 394.701s | ```
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| Name           | Status | Time    | Sum     | Start               | tag | Node         | User   | OS    | Version                        |
|--------------------------------------------------------------------------------------------------------------------|
| data-load      | failed | 0.657   | 0.657   | 2021-03-01 08:51:14 |     | c6290864f66f | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| data-pre-process | failed | 0.1    | 0.1     | 2021-03-01 08:51:15 |     | c6290864f66f | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| compile        | failed | 1.605   | 1.605   | 2021-03-01 08:51:15 |     | c6290864f66f | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| train          | failed | 370.495 | 370.495 | 2021-03-01 08:51:16 |     | c6290864f66f | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| evaluate       | failed | 21.844  | 21.844  | 2021-03-01 08:57:27 |     | c6290864f66f | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
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5. Autoencoder

Type	Time (Total)	Results
| CPU | 130.768s | ```
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| Name           | Status | Time    | Sum     | Start               | tag | Node         | User   | OS    | Version                        |
|--------------------------------------------------------------------------------------------------------------------|
| data-load      | failed | 0.891   | 0.891   | 2021-03-01 08:58:45 |     | 525f9a3a38ff | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| data-pre-process | failed | 0.092  | 0.092   | 2021-03-01 08:58:46 |     | 525f9a3a38ff | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| compile        | failed | 0.828   | 0.828   | 2021-03-01 08:58:46 |     | 525f9a3a38ff | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| train          | failed | 128.957 | 128.957 | 2021-03-01 08:58:47 |     | 525f9a3a38ff | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| evaluate       | failed | 5.274   | 5.274   | 2021-03-01 09:00:56 |     | 525f9a3a38ff | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
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| GPU | **18.528s** | ```
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| Name           | Status | Time   | Sum    | Start               | tag | Node         | User   | OS    | Version                        |
|--------------------------------------------------------------------------------------------------------------------|
| data-load      | failed | 0.476  | 0.476  | 2021-03-01 08:56:15 |     | f47b4dde3b5e | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| data-pre-process | failed | 0.068 | 0.068  | 2021-03-01 08:56:15 |     | f47b4dde3b5e | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| compile        | failed | 5.99   | 5.99   | 2021-03-01 08:56:18 |     | f47b4dde3b5e | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| train          | failed | 10.896 | 10.896 | 2021-03-01 08:56:27 |     | f47b4dde3b5e | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| evaluate       | failed | 1.098  | 2.311  | 2021-03-01 08:57:04 |     | f47b4dde3b5e | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
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| TPU | 153.158s | ```
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| Name           | Status | Time   | Sum    | Start               | tag | Node         | User   | OS    | Version                        |
|--------------------------------------------------------------------------------------------------------------------|
| data-load      | failed | 0.674  | 0.674  | 2021-03-01 08:58:16 |     | b11780348ef3 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| data-pre-process | failed | 0.106 | 0.106  | 2021-03-01 08:58:16 |     | b11780348ef3 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| compile        | failed | 1.258  | 1.258  | 2021-03-01 08:58:16 |     | b11780348ef3 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| train          | failed | 144.81 | 144.81 | 2021-03-01 08:58:18 |     | b11780348ef3 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
| evaluate       | failed | 6.31   | 6.31   | 2021-03-01 09:00:43 |     | b11780348ef3 | collab | Linux | #1 SMP Thu Jul 23 08:00:38 PDT 2020 |
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