ECE 510 EmbV II – Lab 3

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**Simulation of a Hardware Implementation of the Back-Propagation Algorithm**

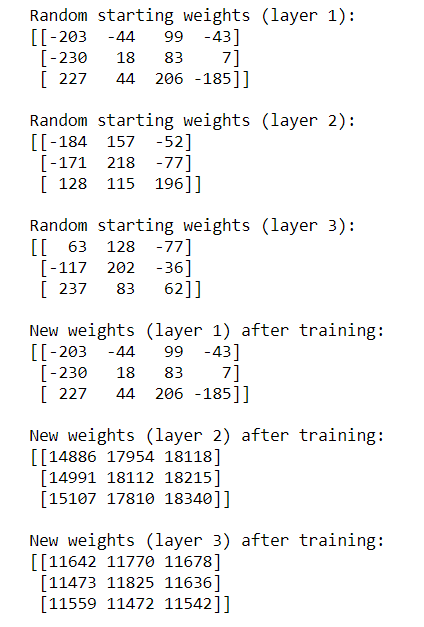
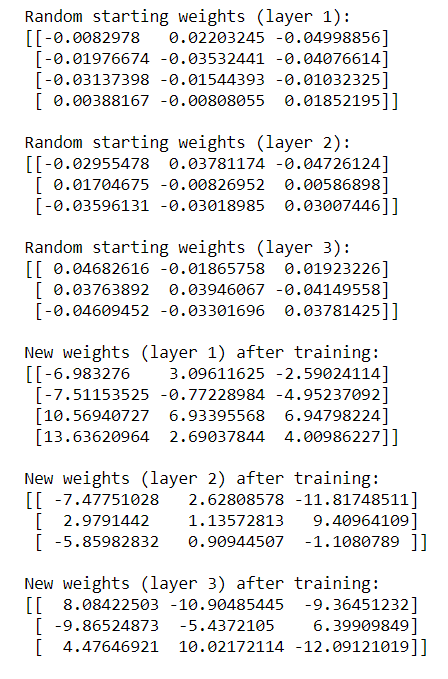
**1.Program**

**2.Numerical analysis**

**3.Fixed point back propagation results**

Weights learned by both implementations

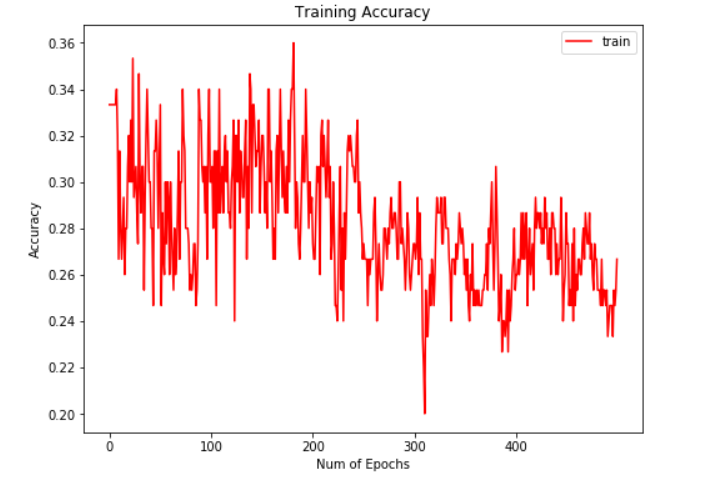
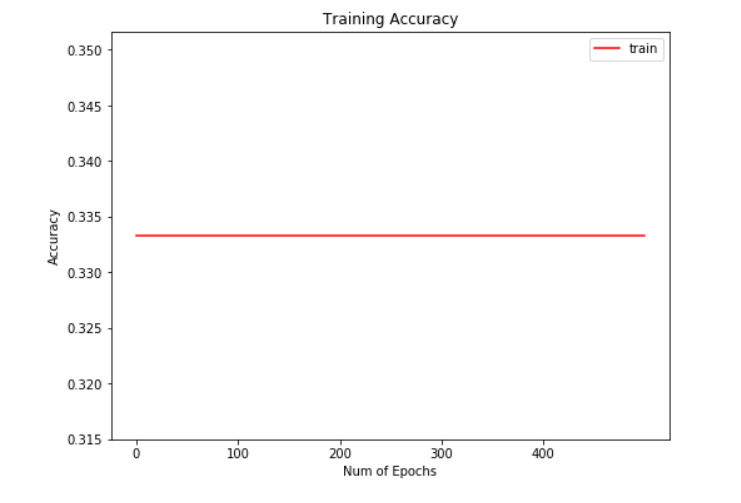
Epochs = 2000, Learning rate = 0.1

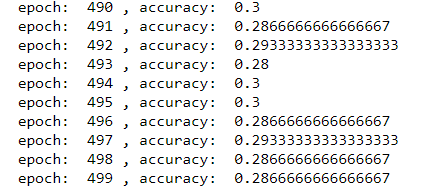
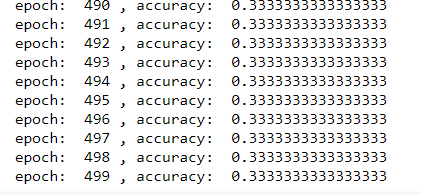
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**4: Accuracy comparison**

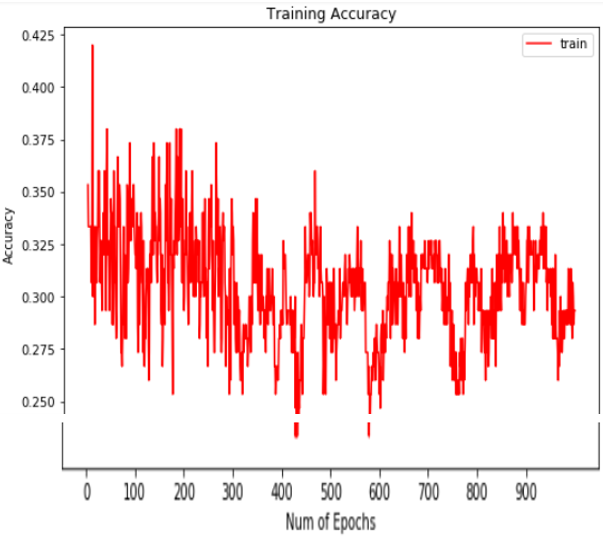
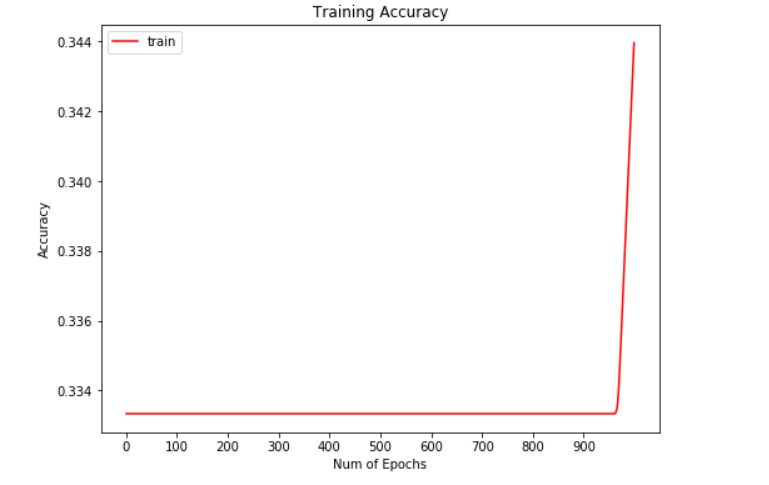
**Fixed Point Implementation**  **Floating Point Implementation**

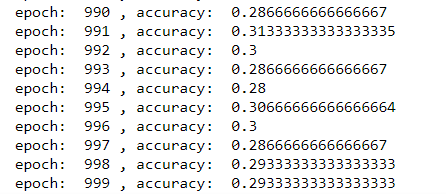
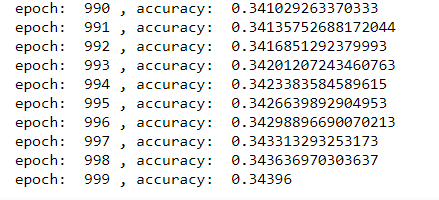
For epochs = 500

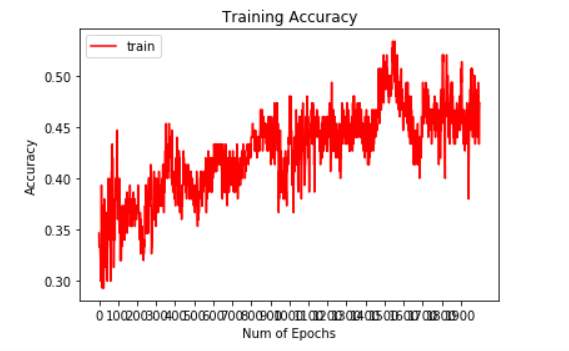
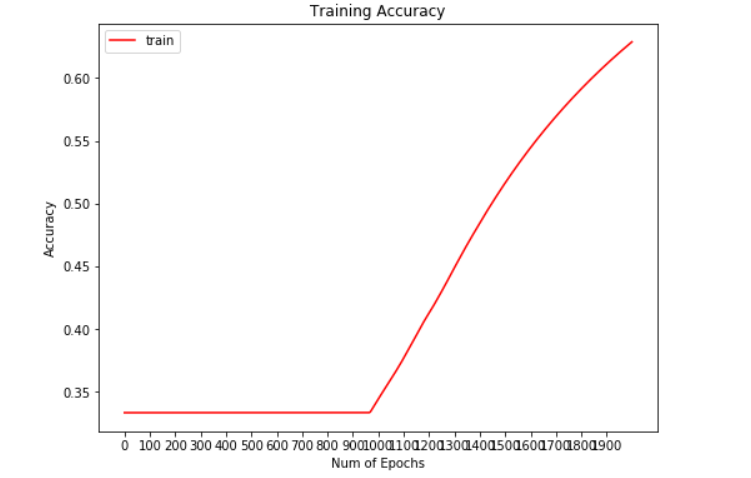
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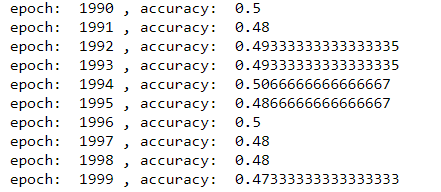
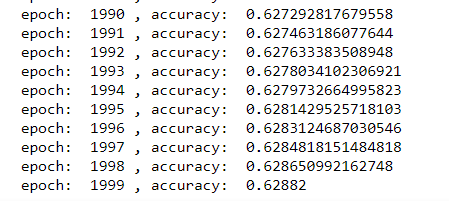
For epochs = 1000

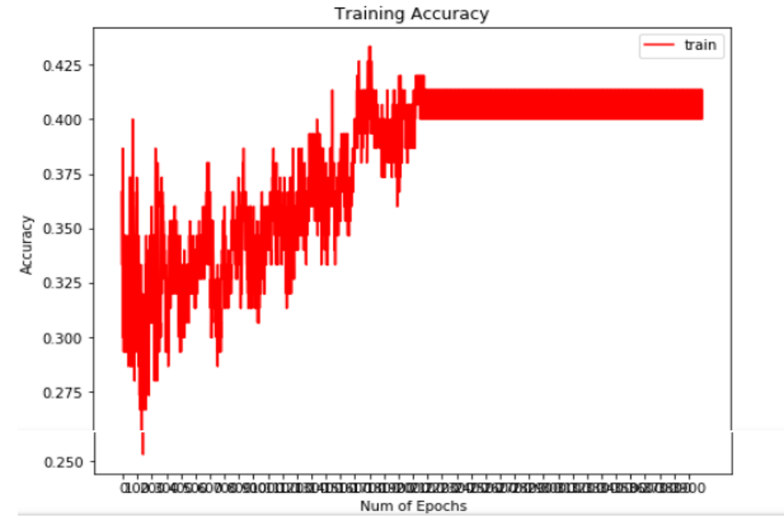
 

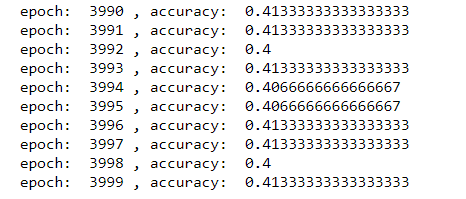
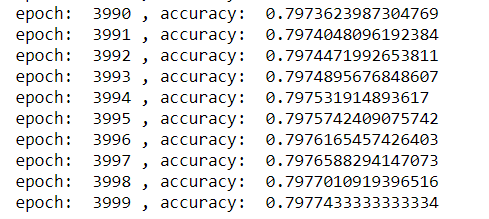
For epochs = 2000

For epochs = 4000

**5: Conclusions**

* Using floating point arithmetic is an easy way to preserve accuracy and GPUs are designed to accelerate these calculations
* Fixed point computation of weights is slower on CPU compared to floating point computation of weights as CPU has dedicated FPU’s
* Performance/accuracy is significantly worse with fixed point
* Fixed point requires additional instructions compared to floating point for operations such as multiplication