Report for Homework 4: Optimization Methods

From the above plot of losses for every 100 iterations with respect to every optimization methods, we can decide which methods converges faster than the other. Naïve update converges to slowest; in above plot, we can see that it never converged at all much after first iteration. It’s simply zig-zag away without converging. Momentum update converged much faster than Naïve; we can it converged to its minimum in loop 600. Next Nestrov update also converged much faster than Naïve; but particular this run it converged to its minimum in loop 900; we can see the variation in losses or zig zagging is less so it’s much better than Momentum update. Several others run showed Nestrov converged much faster than Momentum. Whereas with AdaGrad update, it converged much than Nestrov i.e. at loop 700 its reached its minimum and loss reached much lower than Nestrov & Momentum. And loss variation in loss was good too. With RMSProp update, it converged much faster than AdaGrad i.e. at loop 500 itself it reached its minimum loss and converged. And also, loss value was further minimized than AdaGrad. Even Adam update converged to its minimum at loop 500 however during several other runs it was faster than RMSProp and variation in loss was better than with RMSProp update.

Conclusion, convergence is fastest with Adam & slowest with Naïve update. Adam < RMSProp < AdaGrad < Nestrov < Momentum < Naïve

Not only with model converges fastest with Adam update, model reaches & function with highest accuracy with it. From above plot, accuracy is best attained with Adam & least with Naïve. With respect to accuracy percentage, Adam > RMSProp > AdaGrad > Nestrov > Momentum > Naïve.

Best stuff comes with a price – True with every case, here too; with Adam update training time required is highest because of extra overhead with respect to calculation in every iteration & naïve update requires least training time. Therefore, Naïve is fastest & Adam is slowest. Naïve > Momentum > Nestrov > AdaGrad > RMSProp > Adam.