בס"ד

למידת מכונה – דו"ח מטלת בית 4
Neural Networks

מגישים:
לירון חיים 206234635
וסתיו לידור 207299785

במטלה זו התנסינו ביצירת מספר מודלים של רשתות עמוקות ב Pytorch. להלן גרפים המתארים את ביצועי המודלים שנתבקשנו ליצור.
כל המודלים רצו במשך 10 איפוקים בהם רצו על סט התמונות (Fashion MNIST).

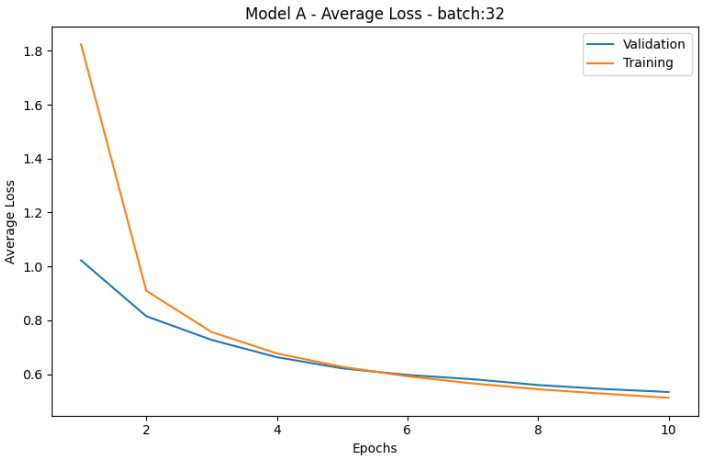
גודל כל batch הוא בגודל 32, וכן החלוקה של סט הדגימות שלנו מתחלק ל-20% סט וולידציה ו-80% סט אימון.

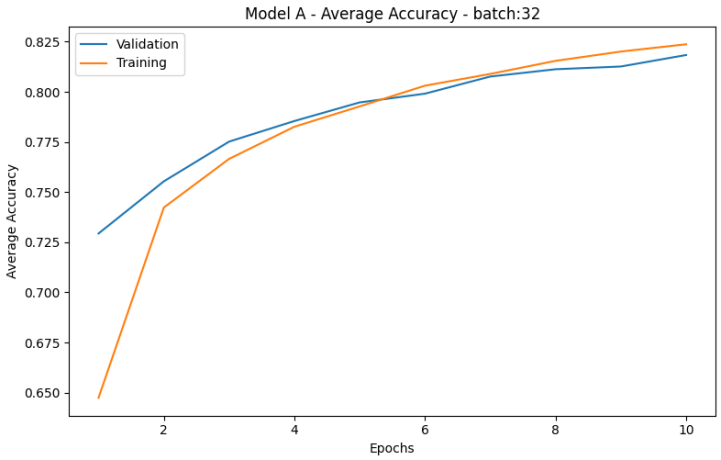
סיכום התוצאות של כלל המודלים:

```
A -- Test_set: Average_loss: 0.5343, Accuracy: 9002 / 11000 (81.84 % ) -- A
B -- Test_set: Average_loss: 0.3638, Accuracy: 9663 / 11000 (87.85 % ) -- B
C -- Test_set: Average_loss: 0.3687, Accuracy: 9524 / 11000 (86.58 % ) -- C
D -- Test_set: Average_loss: 0.3016, Accuracy: 9812 / 11000 (89.20 % ) -- D
E -- Test_set: Average_loss: 0.3558, Accuracy: 9628 / 11000 (87.53 % ) -- E
F -- Test_set: Average_loss: 1.0318, Accuracy: 6225 / 11000 (56.59 % ) -- F
```

מודל A

Optimizer: SGM
Learning Rate: 0.000001

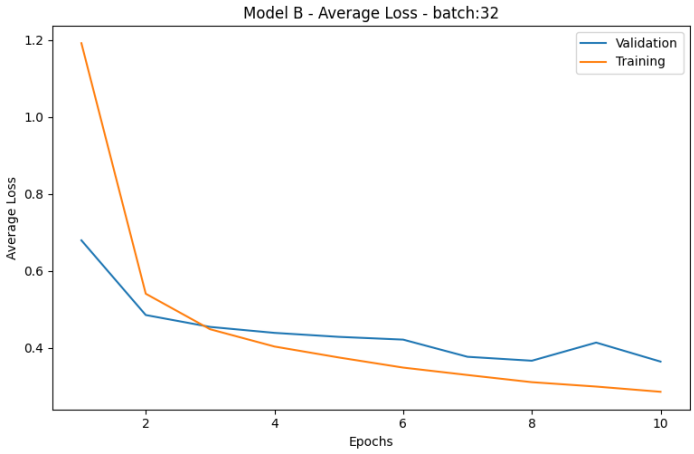


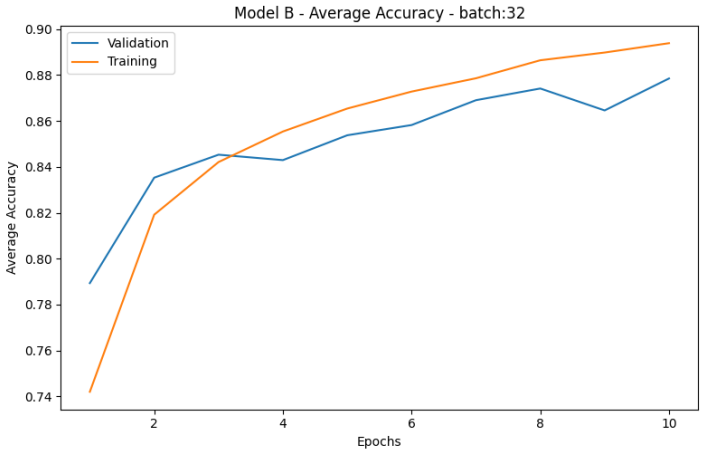


בס"ד

מודל B

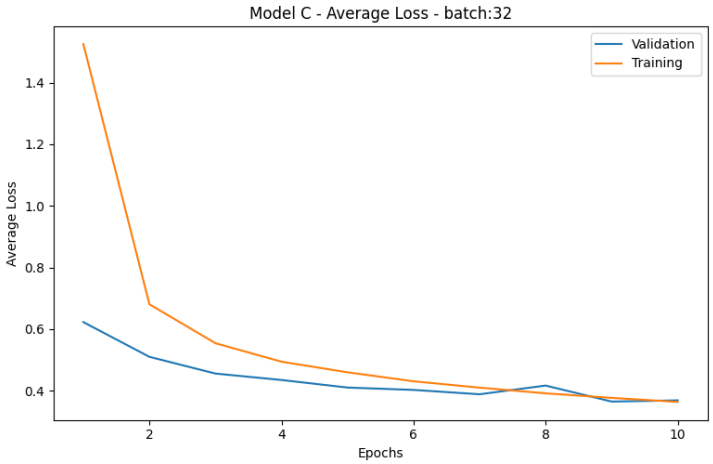
Optimizer: ADAM
Learning Rate: 0.0001
Momentum = 0.9
RSMprop = 0.999

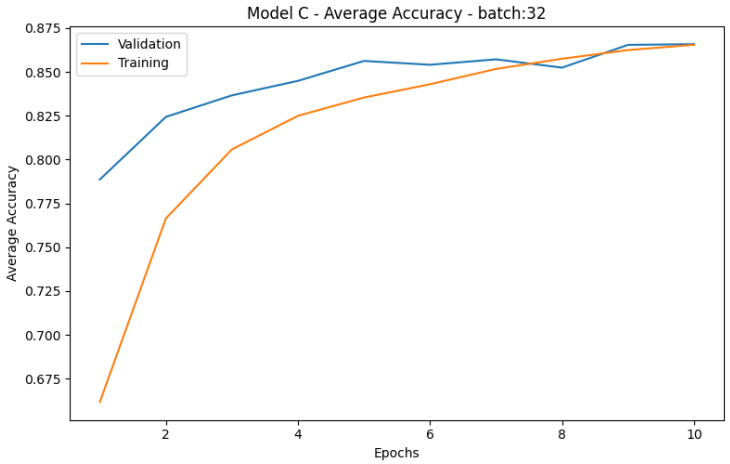




מודל C

Optimizer: ADAM
Learning Rate: 0.0001
Two dropout layers after each activation function: p=0.1
Momentum = 0.9
RSMprop = 0.999

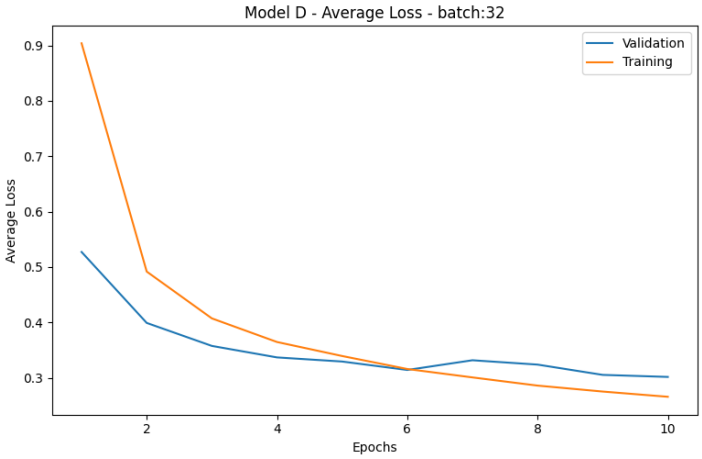


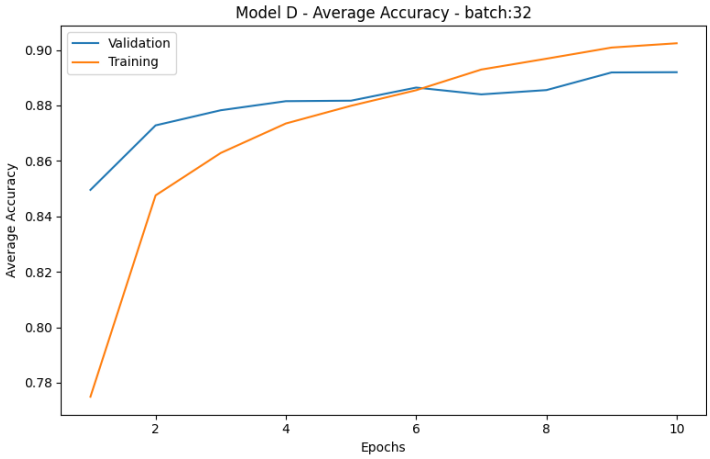


בס"ד

מודל D

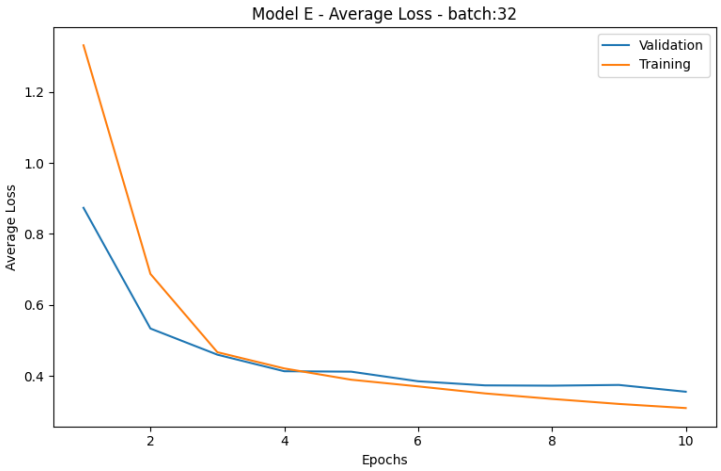
Optimizer: ADAM
Learning Rate: 0.0001
Momentum = 0.9
RSMprop = 0.999

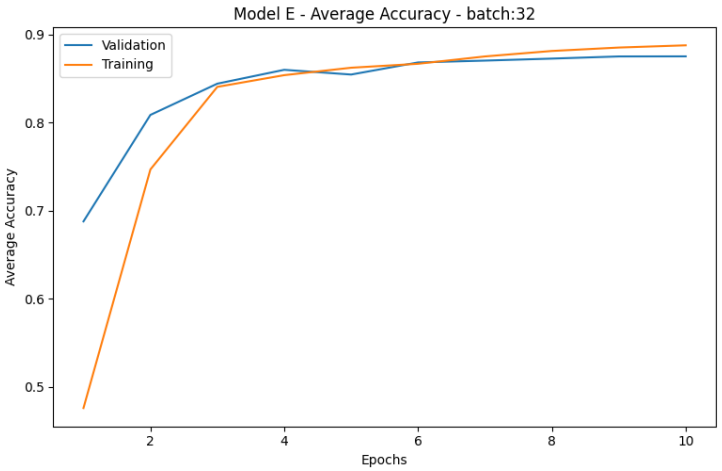




מודל E

Optimizer: ADAM
Learning Rate: 0.0001
Momentum = 0.9
RSMprop = 0.999

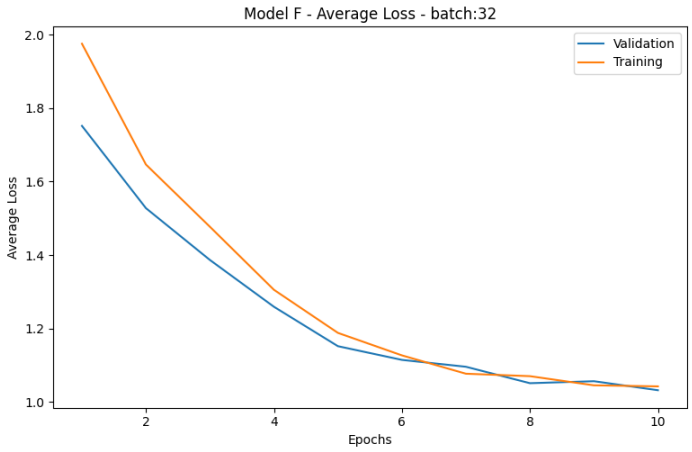


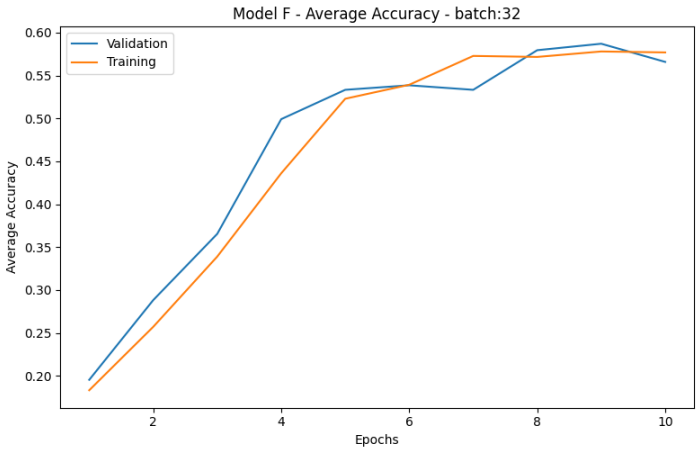


בס"ד

מודל F

Optimizer: ADAM
Learning Rate: 0.001
Momentum = 0.9
RSMprop = 0.999





בס"ד

<u>המודל שבחרנו</u>

בנוסף לששת המודלים לעיל, אימנו מודל נוסף שאת הקוד שלו הגשנו במערכת הסבמיט. רשת זו מורכבת 6 שכבות נסתרות בגדלים הבאים: 10 [512, 256, 128, 64, 32, 16] 784.

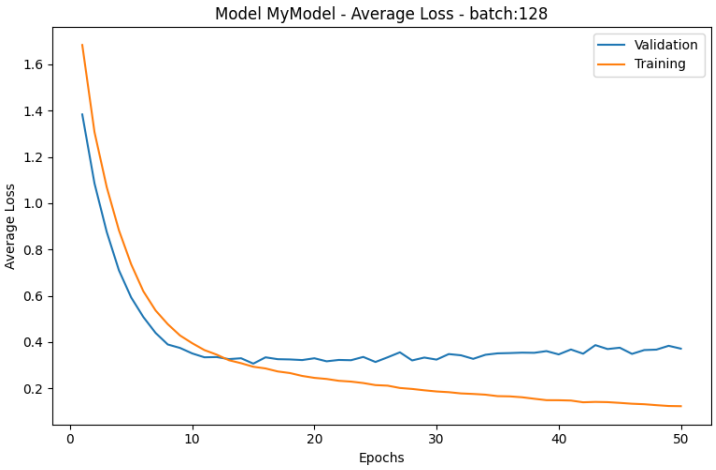
פונקציית האקטיבציה לכל שכבה היא ReLU כיוון שמצאנו שהיא הטובה ביותר. לפני כל אקטיבציה מבצעים Batch Normalization (אם מבצעים אחריה אין שיפור בביצועים). ולאחר כל אקטיבציה מבצעים Dropout לנוירונים בהסתברות P=0.1.

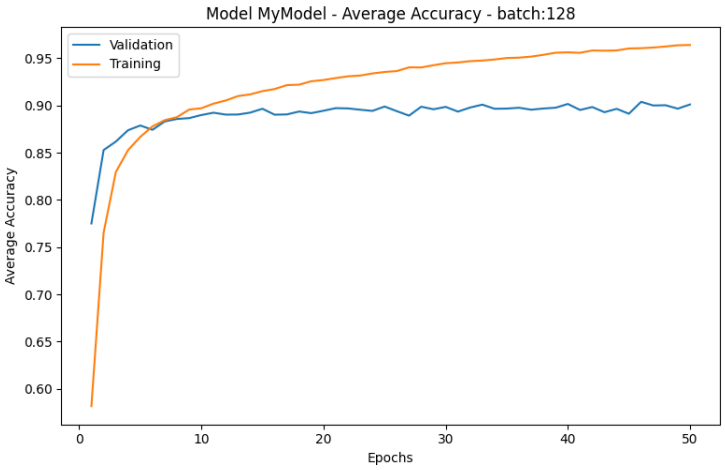
פרמטרים:

Batch size: 128
Learning Rate: 0.0001
Momentum = 0.9
RSMprop = 0.99

הדיוק שקיבלנו הוא סביב ה-90%.

להלן התוצאות:





```
Model MyModel Epoch 1: Test_set: Average_loss: 1.3833, Accuracy: 8526 / 11000 (77.51 % )
Model MyModel Epoch 2: Test_set: Average_loss: 1.0854, Accuracy: 9381 / 11000 (85.28 % )
Model MyModel Epoch 3: Test_set: Average_loss: 0.8759, Accuracy: 9480 / 11000 (86.18 % )
Model MyModel Epoch 4: Test_set: Average_loss: 0.7099, Accuracy: 9612 / 11000 (87.38 % )
Model MyModel Epoch 5: Test_set: Average_loss: 0.5927, Accuracy: 9667 / 11000 (87.88 % )
Model MyModel Epoch 6: Test_set: Average_loss: 0.5080, Accuracy: 9617 / 11000 (87.43 % )
Model MyModel Epoch 7: Test_set: Average_loss: 0.4394, Accuracy: 9714 / 11000 (88.31 % )
Model MyModel Epoch 8: Test_set: Average_loss: 0.3894, Accuracy: 9743 / 11000 (88.57 % )
Model MyModel Epoch 9: Test_set: Average_loss: 0.3745, Accuracy: 9753 / 11000 (88.66 % )
Model MyModel Epoch 10: Test_set: Average_loss: 0.3507, Accuracy: 9789 / 11000 (88.99 % )
Model MyModel Epoch 11: Test_set: Average_loss: 0.3340, Accuracy: 9816 / 11000 (89.24 % )
Model MyModel Epoch 12: Test_set: Average_loss: 0.3351, Accuracy: 9794 / 11000 (89.04 % )
Model MyModel Epoch 13: Test_set: Average_loss: 0.3262, Accuracy: 9795 / 11000 (89.05 % )
Model MyModel Epoch 14: Test_set: Average_loss: 0.3299, Accuracy: 9817 / 11000 (89.25 % )
Model MyModel Epoch 15: Test_set: Average_loss: 0.3067, Accuracy: 9862 / 11000 (89.65 % )
Model MyModel Epoch 16: Test_set: Average_loss: 0.3339, Accuracy: 9793 / 11000 (89.03 % )
Model MyModel Epoch 17: Test_set: Average_loss: 0.3259, Accuracy: 9796 / 11000 (89.05 % )
Model MyModel Epoch 18: Test_set: Average_loss: 0.3248, Accuracy: 9830 / 11000 (89.36 % )
Model MyModel Epoch 19: Test_set: Average_loss: 0.3221, Accuracy: 9811 / 11000 (89.19 % )
Model MyModel Epoch 20: Test_set: Average_loss: 0.3298, Accuracy: 9839 / 11000 (89.45 % )
Model MyModel Epoch 21: Test_set: Average_loss: 0.3167, Accuracy: 9869 / 11000 (89.72 % )
Model MyModel Epoch 22: Test_set: Average_loss: 0.3226, Accuracy: 9866 / 11000 (89.69 % )
Model MyModel Epoch 23: Test_set: Average_loss: 0.3215, Accuracy: 9851 / 11000 (89.55 % )
Model MyModel Epoch 24: Test_set: Average_loss: 0.3356, Accuracy: 9837 / 11000 (89.43 % )
Model MyModel Epoch 25: Test_set: Average_loss: 0.3138, Accuracy: 9888 / 11000 (89.89 % )
Model MyModel Epoch 26: Test_set: Average_loss: 0.3340, Accuracy: 9834 / 11000 (89.40 % )
Model MyModel Epoch 27: Test_set: Average_loss: 0.3555, Accuracy: 9782 / 11000 (88.93 % )
Model MyModel Epoch 28: Test_set: Average_loss: 0.3205, Accuracy: 9886 / 11000 (89.87 % )
Model MyModel Epoch 29: Test_set: Average_loss: 0.3329, Accuracy: 9856 / 11000 (89.60 % )
Model MyModel Epoch 30: Test_set: Average_loss: 0.3241, Accuracy: 9884 / 11000 (89.85 % )
Model MyModel Epoch 31: Test_set: Average_loss: 0.3480, Accuracy: 9829 / 11000 (89.35 % )
Model MyModel Epoch 32: Test_set: Average_loss: 0.3427, Accuracy: 9876 / 11000 (89.78 % )
Model MyModel Epoch 33: Test_set: Average_loss: 0.3273, Accuracy: 9910 / 11000 (90.09 % )
Model MyModel Epoch 34: Test_set: Average_loss: 0.3449, Accuracy: 9862 / 11000 (89.65 % )
Model MyModel Epoch 35: Test_set: Average_loss: 0.3511, Accuracy: 9864 / 11000 (89.67 % )
Model MyModel Epoch 36: Test_set: Average_loss: 0.3523, Accuracy: 9874 / 11000 (89.76 % )
Model MyModel Epoch 37: Test_set: Average_loss: 0.3541, Accuracy: 9851 / 11000 (89.55 % )
Model MyModel Epoch 38: Test_set: Average_loss: 0.3534, Accuracy: 9865 / 11000 (89.68 % )
Model MyModel Epoch 39: Test_set: Average_loss: 0.3608, Accuracy: 9874 / 11000 (89.76 % )
Model MyModel Epoch 40: Test_set: Average_loss: 0.3465, Accuracy: 9918 / 11000 (90.16 % )
Model MyModel Epoch 41: Test_set: Average_loss: 0.3678, Accuracy: 9848 / 11000 (89.53 % )
Model MyModel Epoch 42: Test_set: Average_loss: 0.3495, Accuracy: 9882 / 11000 (89.84 % )
Model MyModel Epoch 43: Test_set: Average_loss: 0.3866, Accuracy: 9822 / 11000 (89.29 % )
Model MyModel Epoch 44: Test_set: Average_loss: 0.3697, Accuracy: 9861 / 11000 (89.65 % )
Model MyModel Epoch 45: Test_set: Average_loss: 0.3755, Accuracy: 9804 / 11000 (89.13 % )
Model MyModel Epoch 46: Test_set: Average_loss: 0.3487, Accuracy: 9943 / 11000 (90.39 % )
Model MyModel Epoch 47: Test_set: Average_loss: 0.3653, Accuracy: 9900 / 11000 (90.00 % )
Model MyModel Epoch 48: Test_set: Average_loss: 0.3672, Accuracy: 9903 / 11000 (90.03 % )
Model MyModel Epoch 49: Test_set: Average_loss: 0.3837, Accuracy: 9863 / 11000 (89.66 % )
Model MyModel Epoch 50: Test_set: Average_loss: 0.3714, Accuracy: 9912 / 11000 (90.11 % )
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SUMMARY:
MyModel -- Test_set: Average_loss: 0.3714, Accuracy: 9912 / 11000 (90.11 % ) -- MyModel
```