

# Report for Lab 2

## Learning and convolutional neural networks

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### Ex 2.7



Figure 1. The Results after Applying Function sliding\_window

## Ex 2.8



Figure 2. The Results after Applying Function `strict_local_maxima`

## Ex 2.17

There are more errors when learning rate is reduced from 0.001 to 0.0001, since loss function hasn't arrived its local minimum when the learning rate is too low.

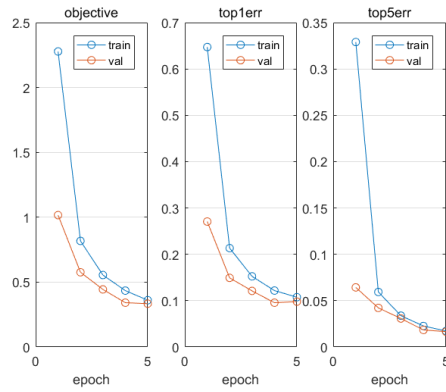


Figure 3. Errors at Learning Rate 0.001

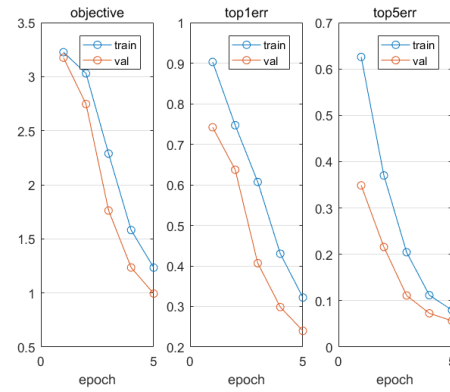


Figure 4. Errors at Learning Rate 0.0001

## Ex 2.18 - 2.20

Recall and precision of given network and my network are shown in Table 1. We did not improve the result.

Characters	Recall		Precision	
	Given Network	My Network	Given Network	My Network
<i>a</i>	<b>0.91</b>	0.88	<b>0.95</b>	0.90
<i>b</i>	<b>0.92</b>	0.91	<b>0.91</b>	0.89
<i>c</i>	<b>0.92</b>	0.87	<b>0.86</b>	<b>0.86</b>
<i>d</i>	<b>0.90</b>	0.88	<b>0.94</b>	<b>0.94</b>
<i>e</i>	<b>0.89</b>	0.81	<b>0.91</b>	0.87
<i>f</i>	<b>0.97</b>	<b>0.97</b>	<b>0.76</b>	0.72
<i>g</i>	<b>0.86</b>	0.84	<b>0.96</b>	0.91
<i>h</i>	<b>0.89</b>	0.86	<b>0.95</b>	0.92
<i>i</i>	0.80	<b>0.84</b>	<b>0.94</b>	0.88
<i>j</i>	<b>0.93</b>	0.90	<b>0.96</b>	0.95
<i>k</i>	<b>0.93</b>	0.88	<b>0.93</b>	<b>0.93</b>
<i>l</i>	<b>0.90</b>	<b>0.90</b>	0.80	<b>0.82</b>
<i>m</i>	<b>0.94</b>	0.92	<b>0.96</b>	0.95
<i>n</i>	<b>0.91</b>	<b>0.91</b>	<b>0.95</b>	0.87
<i>o</i>	<b>0.93</b>	0.91	<b>0.87</b>	0.83
<i>p</i>	<b>0.96</b>	0.94	<b>0.94</b>	<b>0.94</b>
<i>q</i>	<b>0.94</b>	0.92	<b>0.94</b>	<b>0.94</b>
<i>r</i>	<b>0.86</b>	0.83	<b>0.94</b>	0.87
<i>s</i>	<b>0.95</b>	0.93	0.82	<b>0.88</b>
<i>t</i>	<b>0.89</b>	0.88	<b>0.92</b>	0.95
<i>u</i>	<b>0.92</b>	0.87	<b>0.95</b>	<b>0.95</b>
<i>v</i>	0.87	<b>0.88</b>	<b>0.96</b>	<b>0.96</b>
<i>w</i>	<b>0.94</b>	<b>0.94</b>	<b>0.96</b>	0.95
<i>x</i>	<b>0.96</b>	0.94	<b>0.91</b>	0.86
<i>y</i>	<b>0.94</b>	0.93	<b>0.91</b>	0.90
<i>z</i>	<b>0.93</b>	0.91	<b>0.94</b>	<b>0.94</b>

Table 1. Recall and Precision of Given Network and My Network