Supplementary material of Lucy-Richardson-Rosen Algorithm Assisted Classification of Blurred Images with Deep Learning Networks

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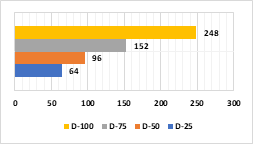
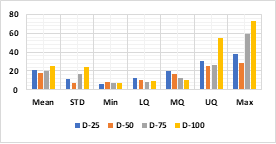
Deep Learning Experiments

The table encapsulates the outcomes of an investigative trial wherein the imaging condition was perturbed by shifting the object distance (Delta) in millimeters, and the hit count was documented. For every Delta value, the mean, standard deviation (STD), minimum (Min), lower quartile (LQ), middle quartile (MQ) or median, upper quartile (UQ), and maximum (Max) hit count was counted.

**Table 1:** Statistical Analysis of Delta Values with respect to NLR

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Delta** | **Hits** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| D-25 | 64 | 21.2 | 11.2 | 5.6 | 12 | 19.5 | 31 | 37.8 |
| D-50 | 96 | 18.3 | 7.3 | 8.6 | 10.9 | 17.2 | 24.8 | 29 |
| D-75 | 152 | 20.2 | 16.5 | 7.1 | 8.2 | 12.3 | 26.6 | 59 |
| D-100 | 248 | 25.1 | 23.8 | 6.8 | 9.4 | 10.1 | 55.4 | 73 |

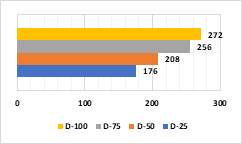
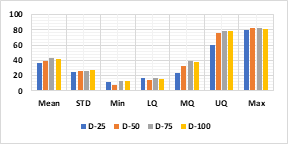
These statistical findings in Figs. S1-S4 reveal a collection of the hit values for each deblurring methodologies. The statistical Analysis from Table 1, 2 and 3 shows that the NLR method gained the most meager mean hit value of 140, sporting a broad standard deviation of 72.53. The hit values ranged from 64 to 248, with the first quartile (Q1) at 80, the median at 124, and the third quartile (Q3) at 184. The LRA method had a more noteworthy mean hit value of 228, along with a reduced standard deviation of 35.47. The hit values ranged from 176 to 272, with Q1 at 192, median at 232, and Q3 at 256. The LR2A method had the most impressive mean hit value of 250, touting an infinitesimal standard deviation of 6.44. The hit values ranged from 240 to 256, with Q1 at 248, median at 248, and Q3 at 256.



**Figure S1:** Performance Comparison of Delta/No. of Hits.r.t NLR

**Table 2:** Statistical Analysis of Delta Values with respect to LRA

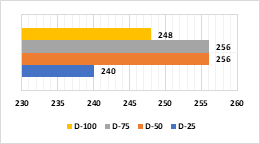
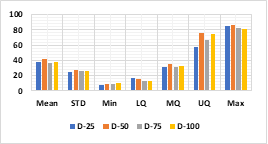
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Delta** | **Hits** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **D-25** | 176 | 37.1 | 24.9 | 11.2 | 17.4 | 22.7 | 60.6 | 80.3 |
| **D-50** | 208 | 39.7 | 26.6 | 7.4 | 14.4 | 32.2 | 75.3 | 83 |
| **D-75** | 256 | 43.6 | 26.5 | 12.8 | 16.7 | 38.9 | 78.8 | 82.9 |
| **D-100** | 272 | 41.3 | 26.7 | 13.3 | 15.2 | 37.2 | 78.6 | 81.8 |



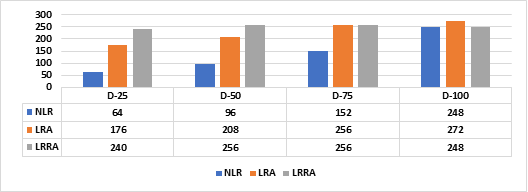
**Figure S2:** Performance Comparison of Delta/No. of Hits.r.t LRA

**Table 3:** Statistical Analysis of Delta Values with respect to LR2A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Delta** | **Hits** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **D-25** | 240 | 38 | 24.6 | 7.9 | 17 | 31.7 | 56.9 | 84.7 |
| **D-50** | 256 | 41.9 | 27.4 | 8.4 | 15.4 | 35.2 | 75.5 | 86.7 |
| **D-75** | 256 | 37.1 | 26.5 | 9.3 | 13.1 | 31.2 | 66.9 | 82.1 |
| **D-100** | 248 | 37.4 | 26.1 | 10.6 | 12.8 | 32.4 | 74.6 | 81.1 |



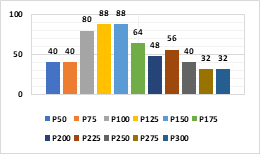
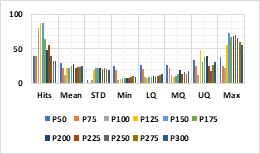
**Figure S3:** Performance Comparison of Delta/No. of Hits.r.t LR2A



**Figure S4:** Performance comparison of NLR, LRA, LR2A with respect to Delta

**Table 4:** Statistical Analysis of PSF Values with respect to NLR

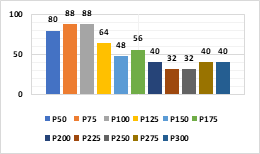
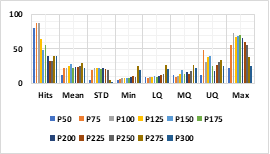
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PSF** | **Hits** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| P50 | 40 | 29.8 | 5.2 | 24.9 | 25.7 | 26.6 | 33.9 | 37.8 |
| P75 | 40 | 22.2 | 2.1 | 19.2 | 20.7 | 22.2 | 24.3 | 24.8 |
| P100 | 80 | 11.8 | 4.5 | 4.8 | 9.4 | 11.3 | 12.5 | 21.6 |
| P125 | 88 | 21.9 | 18.9 | 5.6 | 7.4 | 9.2 | 47.8 | 55.4 |
| P150 | 88 | 22.4 | 21.9 | 7.3 | 8.6 | 9.6 | 30.2 | 73 |
| P175 | 64 | 25.6 | 21.7 | 8.1 | 8.3 | 13.8 | 37.9 | 67.4 |
| P200 | 48 | 27.2 | 21.8 | 7.8 | 9.9 | 19 | 39.4 | 68.2 |
| P225 | 56 | 21.3 | 20.8 | 7.1 | 9 | 13.5 | 24.8 | 70 |
| P250 | 40 | 23.7 | 21.9 | 9.4 | 10 | 15.5 | 17 | 66.6 |
| P275 | 32 | 24.1 | 20.8 | 10 | 11.7 | 13.4 | 25.7 | 59.5 |
| P300 | 32 | 25.1 | 18.6 | 8.8 | 12.7 | 18 | 30.5 | 55.7 |



**Figure S5:** Performance Comparison of Hits with respect to NLR

**Table 5:** Statistical Analysis of PSF Values with respect to LRA

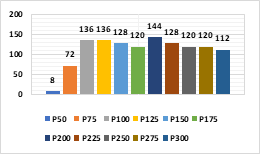
|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PSF** | **Hits** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **P50** | 80 | 11.8 | 4.5 | 4.8 | 9.4 | 11.3 | 12.5 | 21.6 |
| **P75** | 88 | 21.9 | 18.9 | 5.6 | 7.4 | 9.2 | 47.8 | 55.4 |
| **P100** | 88 | 22.4 | 21.9 | 7.3 | 8.6 | 9.6 | 30.2 | 73 |
| **P125** | 64 | 25.6 | 21.7 | 8.1 | 8.3 | 13.8 | 37.9 | 67.4 |
| **P150** | 48 | 27.2 | 21.8 | 7.8 | 9.9 | 19 | 39.4 | 68.2 |
| **P175** | 56 | 21.3 | 20.8 | 7.1 | 9 | 13.5 | 24.8 | 70 |
| **P200** | 40 | 23.7 | 21.9 | 9.4 | 10 | 15.5 | 17 | 66.6 |
| **P225** | 32 | 24.1 | 20.8 | 10 | 11.7 | 13.4 | 25.7 | 59.5 |
| **P250** | 32 | 25.1 | 18.6 | 8.8 | 12.7 | 18 | 30.5 | 55.7 |
| **P275** | 40 | 29.8 | 5.2 | 24.9 | 25.7 | 26.6 | 33.9 | 37.8 |
| **P300** | 40 | 22.2 | 2.1 | 19.2 | 20.7 | 22.2 | 24.3 | 24.8 |



**Figure S6:** Performance Comparison of Hits with respect to LRA

**Table 6:** Statistical Analysis of PSF Values with respect to LR2A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PSF** | **Hits** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **P50** | 8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 | 15.8 |
| **P75** | 72 | 18.8 | 12.2 | 7.9 | 9.4 | 12.7 | 28 | 39.7 |
| **P100** | 136 | 36.2 | 23 | 13.2 | 17 | 26.7 | 51.1 | 77.2 |
| **P125** | 136 | 38.5 | 26.2 | 11.8 | 15.1 | 31.5 | 74.3 | 81.6 |
| **P150** | 128 | 42.3 | 26.8 | 12.6 | 15.6 | 38.4 | 76.5 | 81.7 |
| **P175** | 120 | 45.1 | 28.2 | 11.2 | 12.9 | 37.2 | 77.6 | 82.9 |
| **P200** | 144 | 35.7 | 23.6 | 11.6 | 15.5 | 32.5 | 56.9 | 79.6 |
| **P225** | 128 | 46 | 26.6 | 9.9 | 21.3 | 46.6 | 71.2 | 84.7 |
| **P250** | 120 | 42 | 28 | 10.7 | 14 | 34.1 | 78.1 | 86.7 |
| **P275** | 120 | 43.7 | 27.2 | 8.3 | 23 | 35.1 | 78.4 | 82.1 |
| **P300** | 112 | 36.5 | 25.4 | 8.4 | 15.5 | 23.7 | 66.2 | 77.8 |



**Figure S7:** Performance Comparison of Hits with respect to LR2A

Taken together, these performance analysis figures S5, S6 and S7 suggest that the LR2A method evinced the most optimal performance in terms of hit values. The LR2A method likewise shone brightly, boasting a higher mean than NLR and a smaller standard deviation than both NLR and LRA. The NLR method, conversely, suffered the lowest mean and the widest standard deviation, indicating a lesser degree of consistency in performance across the delta values.

The utilization of image quality metrics plays a pivotal role in the evaluation of digital image quality, especially in the field of optics where the accuracy and quality of images are of utmost importance. Numerous metrics are available to quantify the image quality, such as pSNR, SSIM, FSIM, VIF, and RMSE, with each metric offering a distinct perspective on the image quality assessment, enabling us to assess the diverse facets of image quality. We utilized the power of the above-mentioned metrics to validate the effectiveness of the system.

**Table 7:** Statistical Analysis of Peak signal-to-noise ratio (PSNR) with respect to deblurring

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **PSNR** | **Range/Values** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **PSFLR2A** | 100 | 17.74854 | 0.091352 | 17.6269 | 17.6883 | 17.739 | 17.8004 | 17.8881 |
| 125 | 17.76634 | 0.101549 | 17.6558 | 17.6769 | 17.7278 | 17.8778 | 17.8934 |
| 150 | 17.70294 | 0.039991 | 17.669 | 17.6799 | 17.6853 | 17.7014 | 17.7791 |
| 175 | 17.65704 | 0.107786 | 17.4559 | 17.6727 | 17.674 | 17.7144 | 17.7682 |
| 200 | 17.73004 | 0.071905 | 17.6064 | 17.715 | 17.7295 | 17.7989 | 17.8004 |
| 225 | 17.69528 | 0.14212 | 17.4332 | 17.6963 | 17.7141 | 17.8099 | 17.8229 |
| 25 | 16.05172 | 0.175861 | 15.7778 | 15.9927 | 16.0378 | 16.148 | 16.3023 |
| 250 | 17.75808 | 0.10512 | 17.6554 | 17.6708 | 17.7353 | 17.7852 | 17.9437 |
| 275 | 17.61372 | 0.171143 | 17.3811 | 17.4425 | 17.6908 | 17.7731 | 17.7811 |
| 300 | 17.5467 | 0.232194 | 17.1965 | 17.3684 | 17.6352 | 17.7233 | 17.8101 |
| 50 | 17.57936 | 0.139726 | 17.4034 | 17.4446 | 17.593 | 17.6984 | 17.7574 |
| 75 | 17.82424 | 0.312741 | 17.3983 | 17.5188 | 17.9671 | 18.0533 | 18.1837 |
| **PSFLRA** | 100 | 17.6985 | 0.087683 | 17.5828 | 17.6076 | 17.7396 | 17.7663 | 17.7962 |
| 125 | 17.71916 | 0.039808 | 17.6421 | 17.727 | 17.7337 | 17.7434 | 17.7496 |
| 150 | 17.69312 | 0.012488 | 17.669 | 17.6946 | 17.699 | 17.7007 | 17.7023 |
| 175 | 17.73666 | 0.186246 | 17.4916 | 17.697 | 17.7048 | 17.7271 | 18.0628 |
| 200 | 17.71176 | 0.330071 | 17.1534 | 17.7021 | 17.7035 | 17.8369 | 18.1629 |
| 225 | 17.68822 | 0.18987 | 17.3383 | 17.7018 | 17.7085 | 17.8091 | 17.8834 |
| 25 | 15.74872 | 0.229865 | 15.3993 | 15.5947 | 15.7824 | 15.9714 | 15.9958 |
| 250 | 17.75864 | 0.23908 | 17.3589 | 17.7046 | 17.7506 | 17.9216 | 18.0575 |
| 275 | 17.33148 | 0.503872 | 16.4422 | 17.1336 | 17.6214 | 17.6759 | 17.7843 |
| 300 | 17.38022 | 0.477727 | 16.4752 | 17.4165 | 17.5268 | 17.6707 | 17.8119 |
| 50 | 17.34076 | 0.221501 | 17.0116 | 17.2622 | 17.2938 | 17.4704 | 17.6658 |
| 75 | 17.7701 | 0.129552 | 17.6164 | 17.6508 | 17.7934 | 17.8167 | 17.9732 |
| **PSFNLR** | 100 | 15.94376 | 0.027169 | 15.8995 | 15.9282 | 15.9539 | 15.9631 | 15.9741 |
| 125 | 15.86102 | 0.13376 | 15.6198 | 15.8201 | 15.9316 | 15.9663 | 15.9673 |
| 150 | 15.72036 | 0.259741 | 15.2828 | 15.5921 | 15.8145 | 15.9352 | 15.9772 |
| 175 | 15.54926 | 0.393462 | 14.8981 | 15.3546 | 15.6504 | 15.8701 | 15.9731 |
| 200 | 15.33504 | 0.594791 | 14.2968 | 15.1545 | 15.4789 | 15.7839 | 15.9611 |
| 225 | 15.12146 | 0.765164 | 13.8022 | 14.8447 | 15.3336 | 15.6819 | 15.9449 |
| 25 | 12.92562 | 0.412457 | 12.3489 | 12.6348 | 12.9288 | 13.2189 | 13.4967 |
| 250 | 14.8652 | 0.984277 | 13.2202 | 14.3649 | 15.2423 | 15.5745 | 15.9241 |
| 275 | 14.71732 | 1.109914 | 12.8911 | 14.0948 | 15.1682 | 15.5114 | 15.9211 |
| 300 | 14.66412 | 1.116753 | 12.911 | 13.9053 | 15.1126 | 15.4717 | 15.92 |
| 50 | 15.59262 | 0.090502 | 15.4588 | 15.5352 | 15.5988 | 15.6572 | 15.7131 |
| 75 | 15.89214 | 0.053975 | 15.8192 | 15.8506 | 15.8916 | 15.9332 | 15.9661 |
| **DLR2A** | D-25 | 17.54262 | 0.401266 | 16.3023 | 17.55305 | 17.65045 | 17.72442 | 17.9437 |
| D-50 | 17.51184 | 0.460782 | 16.148 | 17.39783 | 17.67385 | 17.7359 | 17.9671 |
| D-75 | 17.62915 | 0.509218 | 15.9927 | 17.68195 | 17.7333 | 17.8212 | 18.0533 |
| D-100 | 17.63333 | 0.576956 | 15.7778 | 17.70758 | 17.76525 | 17.8133 | 18.1837 |
| **DLRA** | D-25 | 17.50261 | 0.537048 | 15.9714 | 17.32718 | 17.6599 | 17.78728 | 18.0628 |
| D-50 | 17.49096 | 0.56874 | 15.7824 | 17.37792 | 17.73525 | 17.79733 | 17.9216 |
| D-75 | 17.53038 | 0.598383 | 15.5947 | 17.61175 | 17.70345 | 17.74985 | 17.9732 |
| D-100 | 17.50658 | 0.640409 | 15.3993 | 17.66948 | 17.6994 | 17.70378 | 17.8167 |
| **DNLR** | D-25 | 14.99195 | 0.871531 | 13.2189 | 14.29738 | 15.25455 | 15.69793 | 15.9631 |
| D-50 | 15.34378 | 0.787729 | 12.9288 | 15.22378 | 15.53885 | 15.83378 | 15.9741 |
| D-75 | 15.48088 | 0.880195 | 12.6348 | 15.52925 | 15.7329 | 15.88638 | 15.9673 |
| D-100 | 15.59524 | 0.993479 | 12.3489 | 15.8948 | 15.92615 | 15.9624 | 15.9772 |

**Figure S8:** Graphical Plot Analysis of Peak signal-to-noise ratio (PSNR) with respect to deblurring

The Statistical Analysis of Table 7. represents the PSNR value with respect to deblurring and Graphical Plot Analysis of Fig S8 represents the Deblurring with respect to PSNR.

**Table 8:** Statistical Analysis of similarity index measure (SSIM) with respect to deblurring

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SSIM** | **Range/Values** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **PSF** **LR2A** | 100 | 0.60332 | 0.003091 | 0.5981 | 0.6021 | 0.6046 | 0.6047 | 0.6071 |
| 125 | 0.60856 | 0.000515 | 0.6079 | 0.6082 | 0.6086 | 0.6087 | 0.6094 |
| 150 | 0.60652 | 0.003134 | 0.6004 | 0.6075 | 0.6076 | 0.6084 | 0.6087 |
| 175 | 0.60418 | 0.004624 | 0.5982 | 0.599 | 0.6077 | 0.6078 | 0.6082 |
| 200 | 0.6033 | 0.004683 | 0.597 | 0.5986 | 0.6052 | 0.6076 | 0.6081 |
| 225 | 0.59984 | 0.007867 | 0.5888 | 0.5931 | 0.6014 | 0.6075 | 0.6084 |
| 25 | 0.40426 | 0.007485 | 0.3948 | 0.3982 | 0.4034 | 0.41 | 0.4149 |
| 250 | 0.6009 | 0.00661 | 0.5898 | 0.5996 | 0.6001 | 0.6071 | 0.6079 |
| 275 | 0.59402 | 0.011908 | 0.5764 | 0.5883 | 0.5913 | 0.6063 | 0.6078 |
| 300 | 0.59624 | 0.009771 | 0.5848 | 0.5855 | 0.5978 | 0.6051 | 0.608 |
| 50 | 0.51144 | 0.010089 | 0.4982 | 0.5052 | 0.5124 | 0.5133 | 0.5281 |
| 75 | 0.58034 | 0.005762 | 0.5732 | 0.579 | 0.5794 | 0.5794 | 0.5907 |
| **PSFLRA** | 100 | 0.60148 | 0.003461 | 0.5962 | 0.599 | 0.6025 | 0.6043 | 0.6054 |
| 125 | 0.60738 | 0.000412 | 0.6066 | 0.6074 | 0.6075 | 0.6077 | 0.6077 |
| 150 | 0.5989 | 0.018079 | 0.5632 | 0.6076 | 0.6077 | 0.6077 | 0.6083 |
| 175 | 0.59292 | 0.018324 | 0.5683 | 0.5734 | 0.6074 | 0.6075 | 0.608 |
| 200 | 0.58582 | 0.018185 | 0.5654 | 0.5695 | 0.5802 | 0.6069 | 0.6071 |
| 225 | 0.57996 | 0.025098 | 0.5514 | 0.552 | 0.5823 | 0.6069 | 0.6072 |
| 25 | 0.39028 | 0.010316 | 0.3758 | 0.3829 | 0.3905 | 0.3979 | 0.4043 |
| 250 | 0.5829 | 0.022363 | 0.5486 | 0.5715 | 0.5811 | 0.6063 | 0.607 |
| 275 | 0.56338 | 0.037375 | 0.5035 | 0.5461 | 0.5649 | 0.5956 | 0.6068 |
| 300 | 0.5632 | 0.036502 | 0.5067 | 0.5449 | 0.5617 | 0.5961 | 0.6066 |
| 50 | 0.50888 | 0.010544 | 0.4958 | 0.4994 | 0.5083 | 0.5179 | 0.523 |
| 75 | 0.57944 | 0.006522 | 0.5697 | 0.576 | 0.5795 | 0.5833 | 0.5887 |
| **PSFNLR** | 100 | 0.45426 | 0.004626 | 0.4456 | 0.4539 | 0.4561 | 0.4577 | 0.458 |
| 125 | 0.45142 | 0.016476 | 0.4234 | 0.4436 | 0.4577 | 0.4656 | 0.4668 |
| 150 | 0.44248 | 0.027609 | 0.4004 | 0.4233 | 0.4488 | 0.4662 | 0.4737 |
| 175 | 0.43338 | 0.034172 | 0.3887 | 0.4039 | 0.4339 | 0.4626 | 0.4778 |
| 200 | 0.42544 | 0.038108 | 0.3793 | 0.394 | 0.4181 | 0.4556 | 0.4802 |
| 225 | 0.41814 | 0.040336 | 0.3723 | 0.3866 | 0.4054 | 0.4457 | 0.4807 |
| 25 | 0.34872 | 0.008164 | 0.3374 | 0.3429 | 0.3488 | 0.3543 | 0.3602 |
| 250 | 0.41144 | 0.042485 | 0.3634 | 0.38 | 0.3981 | 0.4353 | 0.4804 |
| 275 | 0.40738 | 0.04369 | 0.3575 | 0.3769 | 0.394 | 0.4286 | 0.4799 |
| 300 | 0.40576 | 0.043385 | 0.3576 | 0.3759 | 0.3918 | 0.424 | 0.4795 |
| 50 | 0.41594 | 0.005124 | 0.4087 | 0.4128 | 0.4157 | 0.4191 | 0.4234 |
| 75 | 0.44264 | 0.004031 | 0.4366 | 0.4401 | 0.4429 | 0.4459 | 0.4477 |
| **DLR2A** | D-25 | 0.575583 | 0.054563 | 0.4149 | 0.588325 | 0.5974 | 0.60085 | 0.6086 |
| D-50 | 0.5753 | 0.058043 | 0.4034 | 0.583975 | 0.60075 | 0.605775 | 0.6079 |
| D-75 | 0.578742 | 0.061697 | 0.3982 | 0.596325 | 0.6067 | 0.608125 | 0.6094 |
| D-100 | 0.577333 | 0.063269 | 0.3948 | 0.591875 | 0.60765 | 0.607925 | 0.6087 |
| **DLRA** | D-25 | 0.556008 | 0.054912 | 0.3979 | 0.5458 | 0.56845 | 0.58855 | 0.6083 |
| D-50 | 0.564508 | 0.059151 | 0.3905 | 0.5641 | 0.58065 | 0.60375 | 0.608 |
| D-75 | 0.57435 | 0.065071 | 0.3829 | 0.5907 | 0.60265 | 0.60725 | 0.6077 |
| D-100 | 0.57445 | 0.067816 | 0.3758 | 0.589575 | 0.6067 | 0.606925 | 0.6077 |
| **DNLR** | D-25 | 0.404783 | 0.030956 | 0.3543 | 0.379225 | 0.39895 | 0.428375 | 0.4539 |
| D-50 | 0.417742 | 0.031233 | 0.3488 | 0.397075 | 0.4169 | 0.444375 | 0.4577 |
| D-75 | 0.43645 | 0.032931 | 0.3429 | 0.42745 | 0.4429 | 0.45915 | 0.4662 |
| D-100 | 0.454817 | 0.041531 | 0.3374 | 0.451225 | 0.47575 | 0.479975 | 0.4807 |

**Figure S9:** Graphical Plot Analysis of structural similarity index measure (SSIM) with respect to deblurring

The Statistical Analysis of Table 8. represents the SSIM value with respect to deblurring and Graphical Plot Analysis of Fig. S9 represents the Deblurring with respect to SSIM.

**Table 9:** Statistical Analysis of Visual information fidelity (VIF) with respect to deblurring

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **VIF** | **Range** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **PSFLR2A** | 100 | 0.2522 | 0.006342 | 0.242 | 0.2489 | 0.2542 | 0.2556 | 0.2603 |
| 125 | 0.26268 | 0.000796 | 0.2614 | 0.2624 | 0.2626 | 0.2634 | 0.2636 |
| 150 | 0.26064 | 0.004848 | 0.2511 | 0.2627 | 0.2628 | 0.2628 | 0.2638 |
| 175 | 0.25844 | 0.006375 | 0.2478 | 0.2546 | 0.2629 | 0.2633 | 0.2636 |
| 200 | 0.25478 | 0.007528 | 0.2459 | 0.2482 | 0.2529 | 0.2631 | 0.2638 |
| 225 | 0.25274 | 0.010039 | 0.2397 | 0.2437 | 0.253 | 0.2628 | 0.2645 |
| 25 | 0.13286 | 0.003391 | 0.1278 | 0.1308 | 0.1332 | 0.135 | 0.1375 |
| 250 | 0.25474 | 0.007649 | 0.2443 | 0.2493 | 0.2537 | 0.2621 | 0.2643 |
| 275 | 0.24588 | 0.014492 | 0.2251 | 0.2354 | 0.2468 | 0.2578 | 0.2643 |
| 300 | 0.24744 | 0.011994 | 0.2335 | 0.2361 | 0.2463 | 0.2569 | 0.2644 |
| 50 | 0.16658 | 0.006476 | 0.1598 | 0.1624 | 0.1649 | 0.1675 | 0.1783 |
| 75 | 0.22092 | 0.006891 | 0.2123 | 0.2181 | 0.2187 | 0.2227 | 0.2328 |
| **PSFLRA** | 100 | 0.25436 | 0.004607 | 0.2475 | 0.2511 | 0.2552 | 0.258 | 0.26 |
| 125 | 0.2627 | 0.000725 | 0.2614 | 0.2626 | 0.2628 | 0.2633 | 0.2634 |
| 150 | 0.2535 | 0.020407 | 0.2132 | 0.2635 | 0.2635 | 0.2636 | 0.2637 |
| 175 | 0.24624 | 0.021484 | 0.2164 | 0.2245 | 0.2631 | 0.2634 | 0.2638 |
| 200 | 0.23794 | 0.021325 | 0.2148 | 0.2181 | 0.2311 | 0.2627 | 0.263 |
| 225 | 0.2334 | 0.026364 | 0.2031 | 0.2062 | 0.2321 | 0.2627 | 0.2629 |
| 25 | 0.1332 | 0.002596 | 0.1287 | 0.1322 | 0.1343 | 0.1348 | 0.136 |
| 250 | 0.23372 | 0.025131 | 0.1988 | 0.2179 | 0.2283 | 0.2606 | 0.263 |
| 275 | 0.21888 | 0.033196 | 0.1718 | 0.2001 | 0.2121 | 0.2475 | 0.2629 |
| 300 | 0.21776 | 0.032691 | 0.1751 | 0.1964 | 0.2083 | 0.246 | 0.263 |
| 50 | 0.17502 | 0.007111 | 0.1672 | 0.168 | 0.174 | 0.1808 | 0.1851 |
| 75 | 0.22946 | 0.006697 | 0.2202 | 0.2255 | 0.2288 | 0.2332 | 0.2396 |
| **PSFNLR** | 100 | 0.21652 | 0.004275 | 0.2088 | 0.2155 | 0.2181 | 0.2197 | 0.2205 |
| 125 | 0.2186 | 0.015689 | 0.192 | 0.2113 | 0.2239 | 0.2319 | 0.2339 |
| 150 | 0.21278 | 0.027463 | 0.1707 | 0.1936 | 0.22 | 0.2362 | 0.2434 |
| 175 | 0.20598 | 0.034667 | 0.1589 | 0.1773 | 0.2079 | 0.2362 | 0.2496 |
| 200 | 0.19928 | 0.039976 | 0.149 | 0.1671 | 0.1934 | 0.2314 | 0.2555 |
| 225 | 0.1938 | 0.042989 | 0.1451 | 0.157 | 0.1838 | 0.2239 | 0.2592 |
| 25 | 0.13402 | 0.003527 | 0.1286 | 0.1318 | 0.1348 | 0.1364 | 0.1385 |
| 250 | 0.18718 | 0.045171 | 0.1374 | 0.1496 | 0.1749 | 0.2153 | 0.2587 |
| 275 | 0.18358 | 0.046485 | 0.1324 | 0.147 | 0.1701 | 0.209 | 0.2594 |
| 300 | 0.18178 | 0.046345 | 0.1332 | 0.145 | 0.1669 | 0.2044 | 0.2594 |
| 50 | 0.17538 | 0.004944 | 0.1683 | 0.1721 | 0.1754 | 0.179 | 0.1821 |
| 75 | 0.20278 | 0.003022 | 0.1978 | 0.2013 | 0.2034 | 0.2055 | 0.2059 |
| **DLR2A** | D-25 | 0.232217 | 0.038176 | 0.1375 | 0.23845 | 0.24655 | 0.250875 | 0.2634 |
| D-50 | 0.23255 | 0.040299 | 0.1308 | 0.231225 | 0.25295 | 0.2563 | 0.2629 |
| D-75 | 0.238083 | 0.042846 | 0.1332 | 0.2412 | 0.25995 | 0.2636 | 0.2638 |
| D-100 | 0.2381 | 0.043641 | 0.135 | 0.234575 | 0.26295 | 0.2643 | 0.2645 |
| **DLRA** | D-25 | 0.215833 | 0.035962 | 0.1343 | 0.199175 | 0.21635 | 0.2394 | 0.2635 |
| D-50 | 0.224567 | 0.037413 | 0.1348 | 0.21115 | 0.22995 | 0.2571 | 0.2638 |
| D-75 | 0.237142 | 0.041237 | 0.1322 | 0.240875 | 0.25585 | 0.2627 | 0.2637 |
| D-100 | 0.2389 | 0.043354 | 0.1287 | 0.240675 | 0.2629 | 0.263 | 0.2636 |
| **DNLR** | D-25 | 0.173692 | 0.02666 | 0.1364 | 0.14895 | 0.1722 | 0.196575 | 0.2155 |
| D-50 | 0.189583 | 0.025866 | 0.1348 | 0.1737 | 0.1886 | 0.210925 | 0.2239 |
| D-75 | 0.209433 | 0.029425 | 0.1318 | 0.203625 | 0.2175 | 0.231525 | 0.2362 |
| D-100 | 0.227658 | 0.04087 | 0.1286 | 0.213025 | 0.2465 | 0.258825 | 0.2594 |

**Figure S10:** Graphical Plot Analysis of Visual information fidelity (VIF) with respect to deblurring

The Statistical Analysis of Table 9. represents the VIF value with respect to deblurring and Graphical Plot Analysis of Fig. S10 represents the Deblurring with respect to VIF.

**Table 10:** Statistical Analysis of Feature Similarity Index (FSIM) w.r.t deblurring

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **FSIM** | **Range** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **PSFLR2A** | 100 | 0.7594 | 0.001252 | 0.7574 | 0.7587 | 0.7597 | 0.7603 | 0.7609 |
| 125 | 0.76058 | 0.000251 | 0.7603 | 0.7603 | 0.7606 | 0.7608 | 0.7609 |
| 150 | 0.76024 | 0.000304 | 0.7597 | 0.7602 | 0.7603 | 0.7604 | 0.7606 |
| 175 | 0.7601 | 0.000808 | 0.7586 | 0.7603 | 0.7603 | 0.7603 | 0.761 |
| 200 | 0.75914 | 0.000985 | 0.7579 | 0.7583 | 0.759 | 0.7602 | 0.7603 |
| 225 | 0.75852 | 0.002188 | 0.7544 | 0.7586 | 0.7591 | 0.7601 | 0.7604 |
| 25 | 0.62674 | 0.007535 | 0.6173 | 0.6201 | 0.6269 | 0.6318 | 0.6376 |
| 250 | 0.75916 | 0.001147 | 0.7572 | 0.7588 | 0.7593 | 0.7601 | 0.7604 |
| 275 | 0.75744 | 0.003309 | 0.7513 | 0.7574 | 0.7581 | 0.7601 | 0.7603 |
| 300 | 0.7584 | 0.001838 | 0.7551 | 0.7579 | 0.7592 | 0.7596 | 0.7602 |
| 50 | 0.70482 | 0.009208 | 0.6926 | 0.6989 | 0.7035 | 0.7102 | 0.7189 |
| 75 | 0.7466 | 0.005216 | 0.7395 | 0.7435 | 0.7461 | 0.7492 | 0.7547 |
| **PSFLRA** | 100 | 0.75822 | 0.001405 | 0.7558 | 0.7577 | 0.7587 | 0.7591 | 0.7598 |
| 125 | 0.76078 | 0.000402 | 0.7603 | 0.7606 | 0.7607 | 0.7608 | 0.7615 |
| 150 | 0.75768 | 0.006961 | 0.744 | 0.7605 | 0.7607 | 0.7608 | 0.7624 |
| 175 | 0.75486 | 0.006913 | 0.7464 | 0.7466 | 0.7604 | 0.7604 | 0.7605 |
| 200 | 0.7506 | 0.009326 | 0.7374 | 0.7429 | 0.7521 | 0.7603 | 0.7603 |
| 225 | 0.74886 | 0.011484 | 0.7349 | 0.7358 | 0.7531 | 0.7602 | 0.7603 |
| 25 | 0.61162 | 0.006536 | 0.6043 | 0.6051 | 0.6111 | 0.6167 | 0.6209 |
| 250 | 0.74978 | 0.010207 | 0.7352 | 0.7414 | 0.7517 | 0.7602 | 0.7604 |
| 275 | 0.74372 | 0.015915 | 0.7159 | 0.738 | 0.7499 | 0.7546 | 0.7602 |
| 300 | 0.74062 | 0.017155 | 0.7131 | 0.731 | 0.7446 | 0.7541 | 0.7603 |
| 50 | 0.69588 | 0.011129 | 0.681 | 0.6871 | 0.6962 | 0.7035 | 0.7116 |
| 75 | 0.74216 | 0.005209 | 0.7353 | 0.738 | 0.7422 | 0.7457 | 0.7496 |
| **PSFNLR** | 100 | 0.671 | 0.004685 | 0.6623 | 0.6703 | 0.6732 | 0.6744 | 0.6748 |
| 125 | 0.67068 | 0.015878 | 0.6439 | 0.6628 | 0.6766 | 0.6841 | 0.686 |
| 150 | 0.66484 | 0.025752 | 0.6263 | 0.646 | 0.6705 | 0.6873 | 0.6941 |
| 175 | 0.65852 | 0.031311 | 0.6181 | 0.6312 | 0.6583 | 0.6858 | 0.6992 |
| 200 | 0.65262 | 0.034976 | 0.6111 | 0.6231 | 0.6452 | 0.681 | 0.7027 |
| 225 | 0.64716 | 0.037424 | 0.6053 | 0.6172 | 0.6349 | 0.6735 | 0.7049 |
| 25 | 0.59012 | 0.005373 | 0.5828 | 0.5863 | 0.5899 | 0.5938 | 0.5978 |
| 250 | 0.64194 | 0.039245 | 0.5992 | 0.6121 | 0.6276 | 0.6653 | 0.7055 |
| 275 | 0.6397 | 0.039453 | 0.5985 | 0.6098 | 0.6248 | 0.6595 | 0.7059 |
| 300 | 0.63924 | 0.038637 | 0.6016 | 0.6089 | 0.624 | 0.6559 | 0.7058 |
| 50 | 0.63274 | 0.004286 | 0.6267 | 0.63 | 0.6326 | 0.6355 | 0.6389 |
| 75 | 0.6589 | 0.003158 | 0.654 | 0.6569 | 0.6595 | 0.6616 | 0.6625 |
| **DLR2A** | D-25 | 0.743525 | 0.036475 | 0.6318 | 0.7552 | 0.75825 | 0.759775 | 0.7609 |
| D-50 | 0.742567 | 0.03835 | 0.6269 | 0.75495 | 0.75905 | 0.75985 | 0.7606 |
| D-75 | 0.741842 | 0.040651 | 0.6201 | 0.7549 | 0.7601 | 0.7603 | 0.7604 |
| D-100 | 0.74075 | 0.041939 | 0.6173 | 0.752925 | 0.7602 | 0.7603 | 0.7604 |
| **DLRA** | D-25 | 0.732683 | 0.038419 | 0.6167 | 0.733925 | 0.74355 | 0.75385 | 0.7624 |
| D-50 | 0.736 | 0.041445 | 0.6111 | 0.742725 | 0.7508 | 0.759125 | 0.7607 |
| D-75 | 0.738275 | 0.045142 | 0.6051 | 0.750075 | 0.75895 | 0.760425 | 0.7607 |
| D-100 | 0.738267 | 0.046289 | 0.6043 | 0.750675 | 0.76025 | 0.7603 | 0.7608 |
| **DNLR** | D-25 | 0.631025 | 0.023698 | 0.5938 | 0.611525 | 0.62715 | 0.6499 | 0.6703 |
| D-50 | 0.643192 | 0.024802 | 0.5899 | 0.6269 | 0.64005 | 0.66225 | 0.6766 |
| D-75 | 0.6617 | 0.027813 | 0.5863 | 0.65665 | 0.6694 | 0.681775 | 0.6873 |
| D-100 | 0.6784 | 0.037507 | 0.5828 | 0.6684 | 0.69665 | 0.70505 | 0.7059 |

**Figure S11:** Graphical Plot Analysis of Feature Similarity Index (FSIM) with respect to deblurring

The Statistical Analysis of Table 10. represents the FSIM value with respect to deblurring and Graphical Plot Analysis of Fig. S11 represents the Deblurring with respect to FSIM.

Table 11: Statistical Analysis of Root-mean-square deviation (RMSE) with respect to deblurring

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **RMSE** | **Range** | **Mean** | **STD** | **Min** | **LQ** | **MQ** | **UQ** | **Max** |
| **PSFLR2A** | 100 | 33.04746 | 0.347161 | 32.51899 | 32.84895 | 33.08194 | 33.27565 | 33.51178 |
| 125 | 32.98002 | 0.384956 | 32.49903 | 32.55729 | 33.12446 | 33.31909 | 33.4002 |
| 150 | 33.21981 | 0.152472 | 32.92955 | 33.22535 | 33.28688 | 33.30782 | 33.34944 |
| 175 | 33.39807 | 0.417275 | 32.97085 | 33.17554 | 33.33047 | 33.33547 | 34.17801 |
| 200 | 33.1171 | 0.274948 | 32.84879 | 32.8546 | 33.11796 | 33.17327 | 33.5909 |
| 225 | 33.2531 | 0.548755 | 32.76368 | 32.8129 | 33.17675 | 33.24475 | 34.2674 |
| 25 | 40.18287 | 0.81485 | 39.03224 | 39.73211 | 40.23921 | 40.44894 | 41.46185 |
| 250 | 33.0116 | 0.397458 | 32.3114 | 32.90651 | 33.09583 | 33.34257 | 33.40167 |
| 275 | 33.56892 | 0.663576 | 32.92199 | 32.95231 | 33.26612 | 34.23064 | 34.47354 |
| 300 | 33.83423 | 0.909058 | 32.81223 | 33.14183 | 33.47941 | 34.52388 | 35.21381 |
| 50 | 33.6998 | 0.542343 | 33.01172 | 33.23693 | 33.64268 | 34.22245 | 34.3852 |
| 75 | 32.77956 | 1.186274 | 31.4306 | 31.90631 | 32.22425 | 33.93121 | 34.40541 |
| **PSFLRA** | 100 | 33.23817 | 0.336072 | 32.86478 | 32.97789 | 33.07973 | 33.58624 | 33.68223 |
| 125 | 33.15789 | 0.152375 | 33.04137 | 33.06529 | 33.10225 | 33.12764 | 33.45289 |
| 150 | 33.25712 | 0.047808 | 33.22213 | 33.22811 | 33.23461 | 33.25123 | 33.3495 |
| 175 | 33.09806 | 0.704927 | 31.87117 | 33.12706 | 33.21222 | 33.24236 | 34.0375 |
| 200 | 33.20933 | 1.27301 | 31.5063 | 32.71115 | 33.21746 | 33.22263 | 35.38911 |
| 225 | 33.28368 | 0.73557 | 32.53658 | 32.81613 | 33.19817 | 33.22369 | 34.64383 |
| 25 | 41.6152 | 1.106208 | 40.43414 | 40.54809 | 41.43982 | 42.34514 | 43.30882 |
| 250 | 33.01937 | 0.915092 | 31.8907 | 32.39353 | 33.0379 | 33.21298 | 34.56173 |
| 275 | 34.72877 | 2.06585 | 32.9097 | 33.32303 | 33.53278 | 35.4698 | 38.40852 |
| 300 | 34.52895 | 1.961429 | 32.80536 | 33.34303 | 33.89986 | 34.33341 | 38.26311 |
| 50 | 34.64501 | 0.883453 | 33.36198 | 34.12075 | 34.82185 | 34.94863 | 35.97182 |
| 75 | 32.96727 | 0.49062 | 32.20195 | 32.78708 | 32.87544 | 33.41962 | 33.55227 |
| **PSFNLR** | 100 | 40.67752 | 0.127426 | 40.53525 | 40.58696 | 40.62976 | 40.75046 | 40.88516 |
| 125 | 41.0714 | 0.637157 | 40.56734 | 40.57186 | 40.73417 | 41.26073 | 42.22288 |
| 150 | 41.75549 | 1.261242 | 40.5212 | 40.71761 | 41.28716 | 42.35777 | 43.89373 |
| 175 | 42.61037 | 1.955456 | 40.53992 | 41.02354 | 42.07477 | 43.53222 | 45.8814 |
| 200 | 43.73187 | 3.072617 | 40.59619 | 41.43298 | 42.9135 | 44.54663 | 49.17005 |
| 225 | 44.88947 | 4.078091 | 40.672 | 41.92225 | 43.63763 | 46.16415 | 52.05131 |
| 25 | 57.64173 | 2.737291 | 53.91432 | 55.66685 | 57.55745 | 59.53896 | 61.53107 |
| 250 | 46.35129 | 5.435827 | 40.76934 | 42.44404 | 44.09886 | 48.78583 | 55.6584 |
| 275 | 47.22958 | 6.253811 | 40.78336 | 42.75346 | 44.47625 | 50.32715 | 57.80771 |
| 300 | 47.52235 | 6.280227 | 40.78851 | 42.94944 | 44.76199 | 51.43675 | 57.67508 |
| 50 | 42.35776 | 0.44173 | 41.77186 | 42.04189 | 42.32543 | 42.63654 | 43.01306 |
| 75 | 40.92044 | 0.254232 | 40.57264 | 40.72688 | 40.9222 | 41.11576 | 41.26469 |
| **DLR2A** | D-25 | 33.87549 | 1.653615 | 32.3114 | 33.13749 | 33.42113 | 33.79886 | 39.03224 |
| D-50 | 34.0075 | 1.906938 | 32.22425 | 33.09389 | 33.33083 | 34.40729 | 39.73211 |
| D-75 | 33.5631 | 2.131769 | 31.90631 | 32.7707 | 33.10389 | 33.30001 | 40.44894 |
| D-100 | 33.56448 | 2.441261 | 31.4306 | 32.8001 | 32.98202 | 33.20167 | 41.46185 |
| **DLRA** | D-25 | 34.06132 | 2.226 | 31.87117 | 32.89847 | 33.38456 | 34.68833 | 40.54809 |
| D-50 | 34.11606 | 2.402366 | 32.39353 | 32.86062 | 33.09617 | 34.48722 | 41.43982 |
| D-75 | 33.97098 | 2.577608 | 32.20195 | 33.0405 | 33.21743 | 33.57014 | 42.34514 |
| D-100 | 34.07759 | 2.803616 | 32.78708 | 33.21634 | 33.23303 | 33.34776 | 43.30882 |
| **DNLR** | D-25 | 45.61948 | 4.719348 | 40.58696 | 41.8466 | 44.03942 | 49.17116 | 55.66685 |
| D-50 | 43.77705 | 4.413854 | 40.53525 | 41.19592 | 42.61947 | 44.1932 | 57.55745 |
| D-75 | 43.14431 | 5.039722 | 40.56734 | 40.94706 | 41.67762 | 42.66577 | 59.53896 |
| D-100 | 42.65014 | 5.760656 | 40.5212 | 40.59011 | 40.7599 | 40.90756 | 61.53107 |

**Figure S12:** Graphical Plot Analysis of Root-mean-square deviation (RMSE) with respect to deblurring.

The performance measures based on PSF and Delta values were evaluated on different deep learning models and compared. To determine the best-performing models with descriptive statistics, image quality metrics such as PSNR, SSIM, FSI, and VIF were also used to evaluate the similarity between the ground truth and the reconstructed images. PSNR and SSIM measure pixel-level differences between the original and processed images, while FSI and VIF focus on the visual quality of the image.

**Table 11:** Overall Performance comparison w.r.t Image Similarity Metrics

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Method** | **Range/Values** | **PSNR Mean** | **SSIM Mean** | **VIF Mean** | **FSIM Mean** | **RMSE Mean** |
| **PSF-LR2A** | 100 | 17.74854 | 0.60332 | 0.2522 | 0.7594 | 33.04746 |
| 125 | 17.76634 | 0.60856 | 0.26268 | 0.76058 | 32.98002 |
| 150 | 17.70294 | 0.60652 | 0.26064 | 0.76024 | 33.21981 |
| 175 | 17.65704 | 0.60418 | 0.25844 | 0.7601 | 33.39807 |
| 200 | 17.73004 | 0.6033 | 0.25478 | 0.75914 | 33.1171 |
| 225 | 17.69528 | 0.59984 | 0.25274 | 0.75852 | 33.2531 |
| 25 | 16.05172 | 0.40426 | 0.13286 | 0.62674 | 40.18287 |
| 250 | 17.75808 | 0.6009 | 0.25474 | 0.75916 | 33.0116 |
| 275 | 17.61372 | 0.59402 | 0.24588 | 0.75744 | 33.56892 |
| 300 | 17.5467 | 0.59624 | 0.24744 | 0.7584 | 33.83423 |
| 50 | 17.57936 | 0.51144 | 0.16658 | 0.70482 | 33.6998 |
| 75 | 17.82424 | 0.58034 | 0.22092 | 0.7466 | 32.77956 |
| AVG | **17.5561667** | **0.5760767** | **0.2341583** | **0.742595** | **33.841045** |
| **PSF-LRA** | 100 | 17.6985 | 0.60148 | 0.25436 | 0.75822 | 33.23817 |
| 125 | 17.71916 | 0.60738 | 0.2627 | 0.76078 | 33.15789 |
| 150 | 17.69312 | 0.5989 | 0.2535 | 0.75768 | 33.25712 |
| 175 | 17.73666 | 0.59292 | 0.24624 | 0.75486 | 33.09806 |
| 200 | 17.71176 | 0.58582 | 0.23794 | 0.7506 | 33.20933 |
| 225 | 17.68822 | 0.57996 | 0.2334 | 0.74886 | 33.28368 |
| 25 | 15.74872 | 0.39028 | 0.1332 | 0.61162 | 41.6152 |
| 250 | 17.75864 | 0.5829 | 0.23372 | 0.74978 | 33.01937 |
| 275 | 17.33148 | 0.56338 | 0.21888 | 0.74372 | 34.72877 |
| 300 | 17.38022 | 0.5632 | 0.21776 | 0.74062 | 34.52895 |
| 50 | 17.34076 | 0.50888 | 0.17502 | 0.69588 | 34.64501 |
| 75 | 17.7701 | 0.57944 | 0.22946 | 0.74216 | 32.96727 |
| AVG | **17.4647783** | **0.5628783** | **0.2246817** | **0.734565** | **34.229068** |
| **PSF-NLR** | 100 | 15.94376 | 0.45426 | 0.21652 | 0.671 | 40.67752 |
| 125 | 15.86102 | 0.45142 | 0.2186 | 0.67068 | 41.0714 |
| 150 | 15.72036 | 0.44248 | 0.21278 | 0.66484 | 41.75549 |
| 175 | 15.54926 | 0.43338 | 0.20598 | 0.65852 | 42.61037 |
| 200 | 15.33504 | 0.42544 | 0.19928 | 0.65262 | 43.73187 |
| 225 | 15.12146 | 0.41814 | 0.1938 | 0.64716 | 44.88947 |
| 25 | 12.92562 | 0.34872 | 0.13402 | 0.59012 | 57.64173 |
| 250 | 14.8652 | 0.41144 | 0.18718 | 0.64194 | 46.35129 |
| 275 | 14.71732 | 0.40738 | 0.18358 | 0.6397 | 47.22958 |
| 300 | 14.66412 | 0.40576 | 0.18178 | 0.63924 | 47.52235 |
| 50 | 15.59262 | 0.41594 | 0.17538 | 0.63274 | 42.35776 |
| 75 | 15.89214 | 0.44264 | 0.20278 | 0.6589 | 40.92044 |
| AVG | **15.1823267** | **0.4214167** | **0.19264** | **0.6472883** | **44.729939** |
| **D-LR2A** | D-25 | 17.54262 | 0.575583 | 0.232217 | 0.743525 | 33.87549 |
| D-50 | 17.51184 | 0.5753 | 0.23255 | 0.742567 | 34.0075 |
| D-75 | 17.62915 | 0.578742 | 0.238083 | 0.741842 | 33.5631 |
| D-100 | 17.63333 | 0.577333 | 0.2381 | 0.74075 | 33.56448 |
| AVG | 17.579235 | 0.5767395 | 0.2352375 | 0.742171 | 33.752643 |
| **D-LRA** | D-25 | 17.50261 | 0.556008 | 0.215833 | 0.732683 | 34.06132 |
| D-50 | 17.49096 | 0.564508 | 0.224567 | 0.736 | 34.11606 |
| D-75 | 17.53038 | 0.57435 | 0.237142 | 0.738275 | 33.97098 |
| D-100 | 17.50658 | 0.57445 | 0.2389 | 0.738267 | 34.07759 |
| AVG | 17.5076325 | 0.567329 | 0.2291105 | 0.7363063 | 34.056488 |
| **D-NLR** | D-25 | 14.99195 | 0.404783 | 0.173692 | 0.631025 | 45.61948 |
| D-50 | 15.34378 | 0.417742 | 0.189583 | 0.643192 | 43.77705 |
| D-75 | 15.48088 | 0.43645 | 0.209433 | 0.6617 | 43.14431 |
| D-100 | 15.59524 | 0.454817 | 0.227658 | 0.6784 | 42.65014 |
| AVG | 15.3529625 | 0.428448 | 0.2000915 | 0.6535793 | 43.797745 |

The Statistical Analysis of Table 11. represents the RMSE value with respect to deblurring and Graphical Plot Analysis of Fig. S12 represents the Deblurring with respect to RMSE.

**Figure S13:** Graphical Plot Analysis of Performace Comparison - NLR, LRA, LR2A

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