



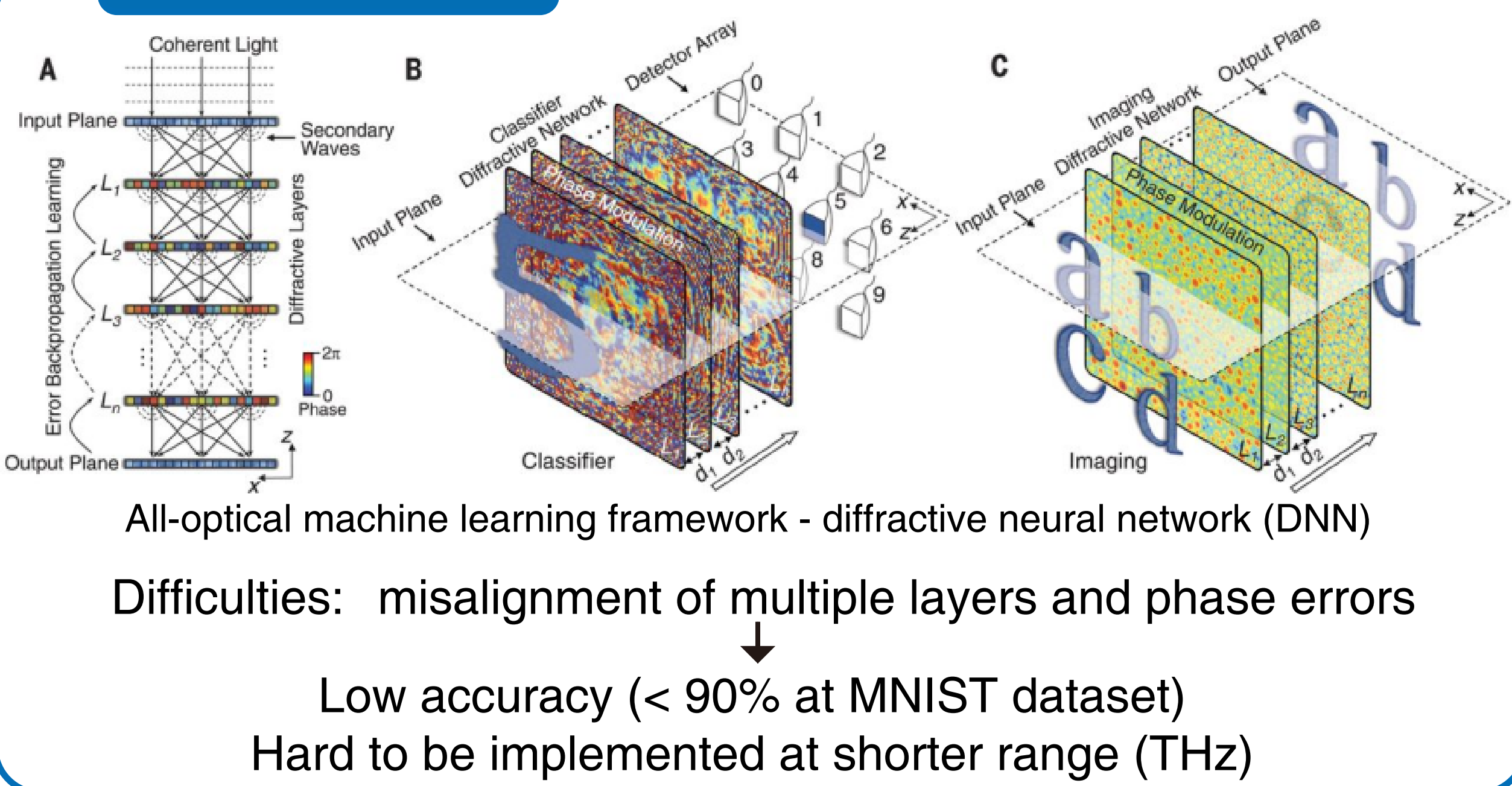
Optimize performance of diffractive neural network by controlling the Fresnel number

Minjia Zheng,¹ Lei Shi^{1,*} and Jian Zi¹

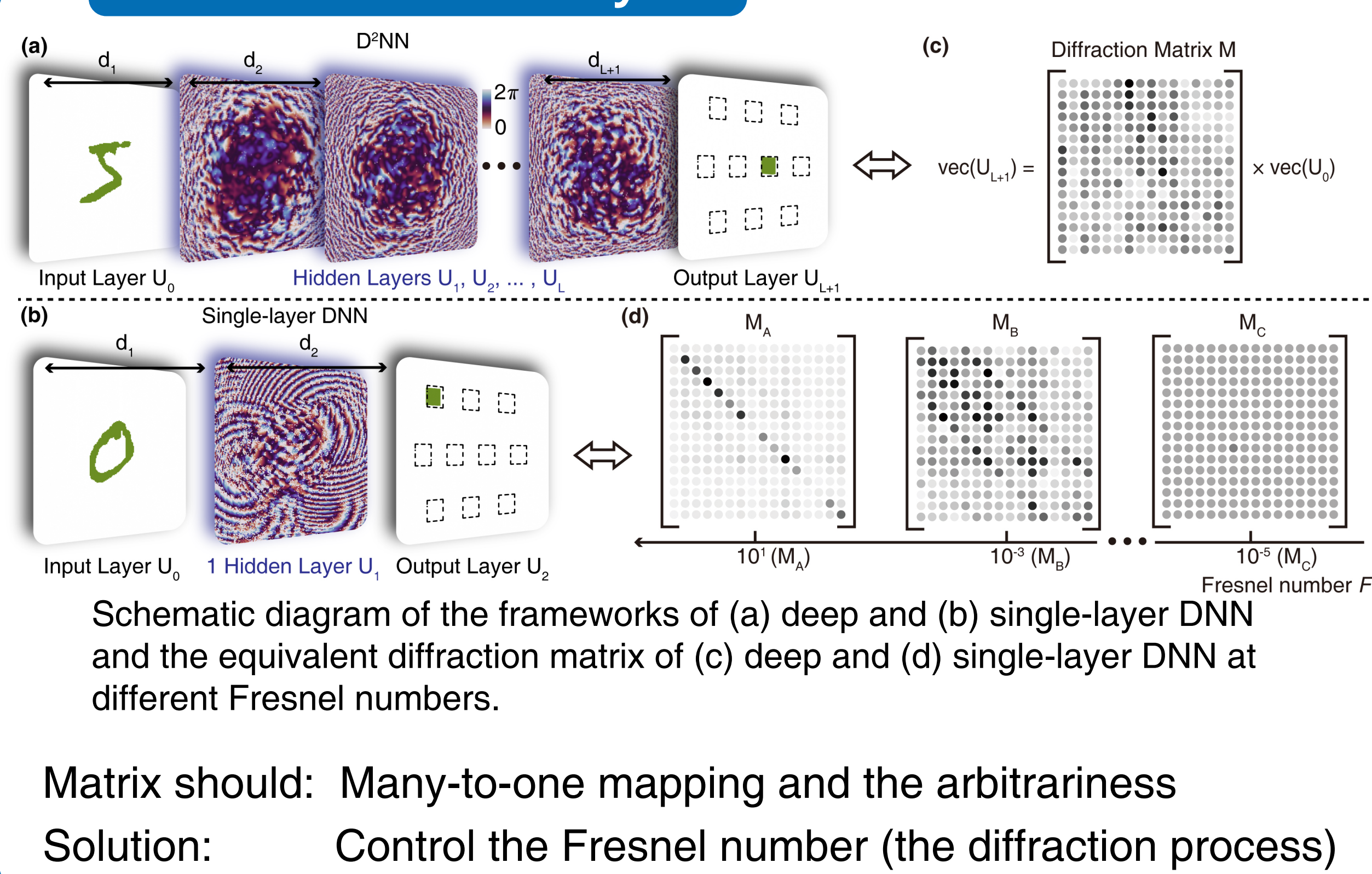
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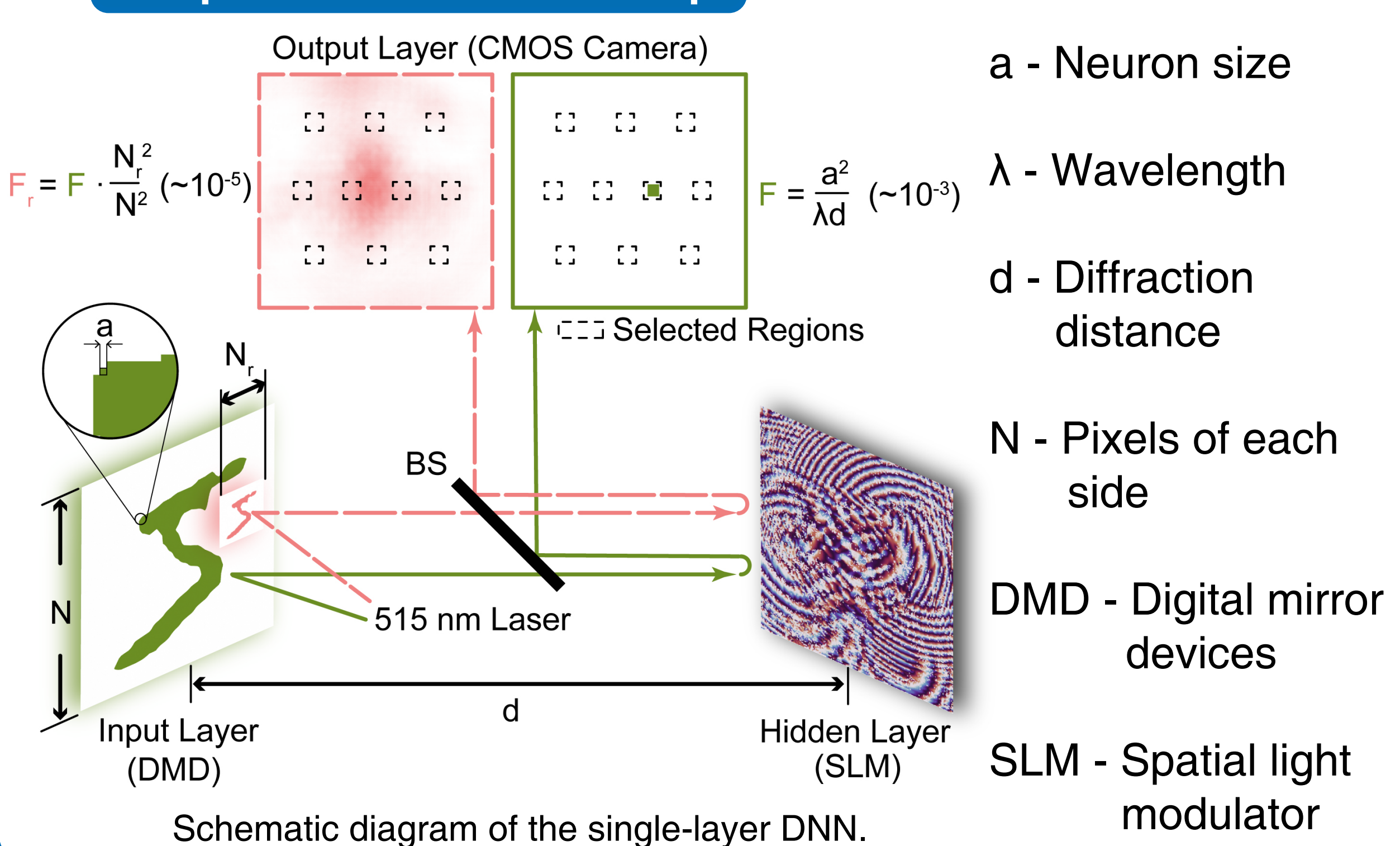
Introduction



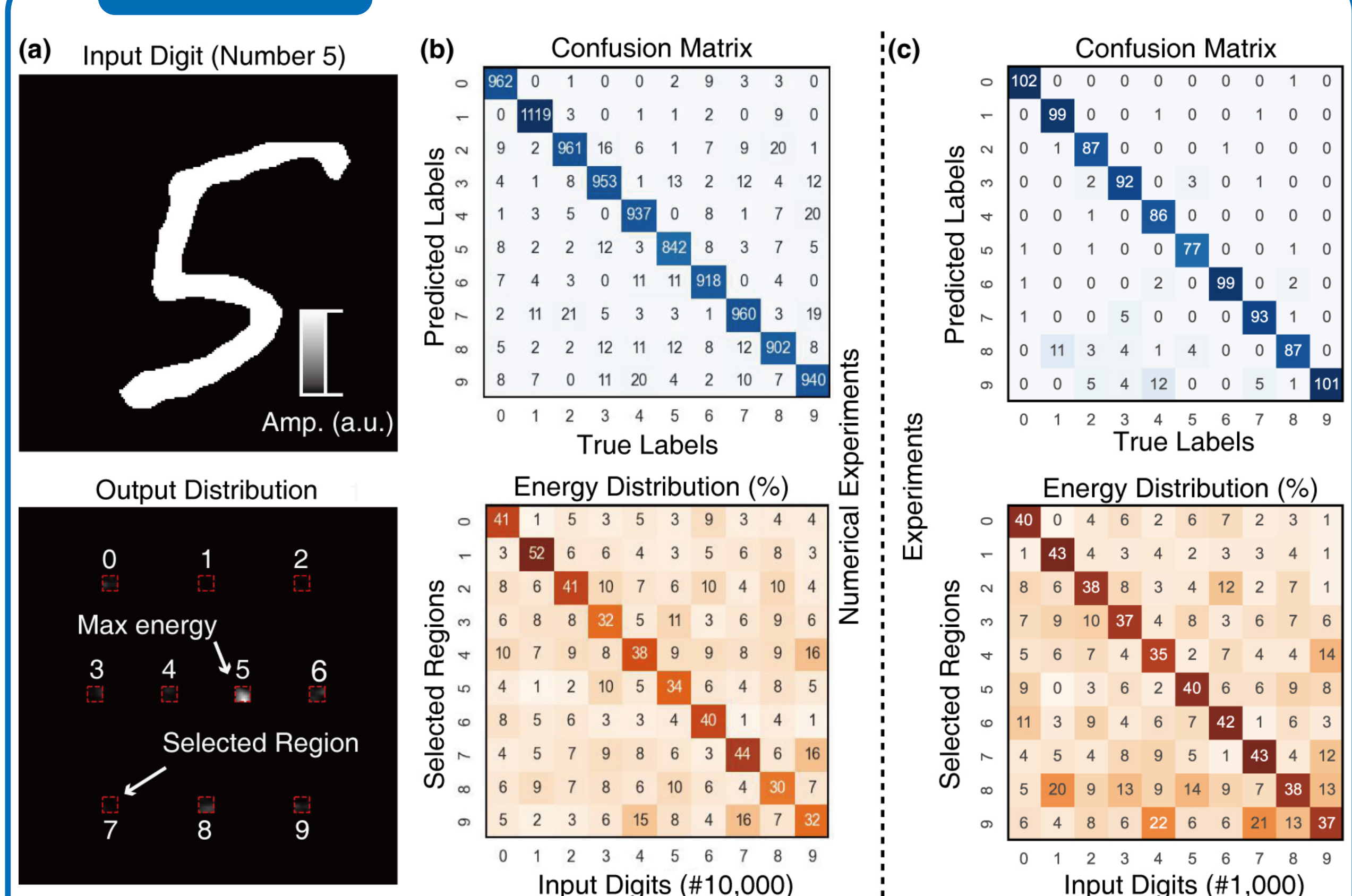
Theoretical analysis



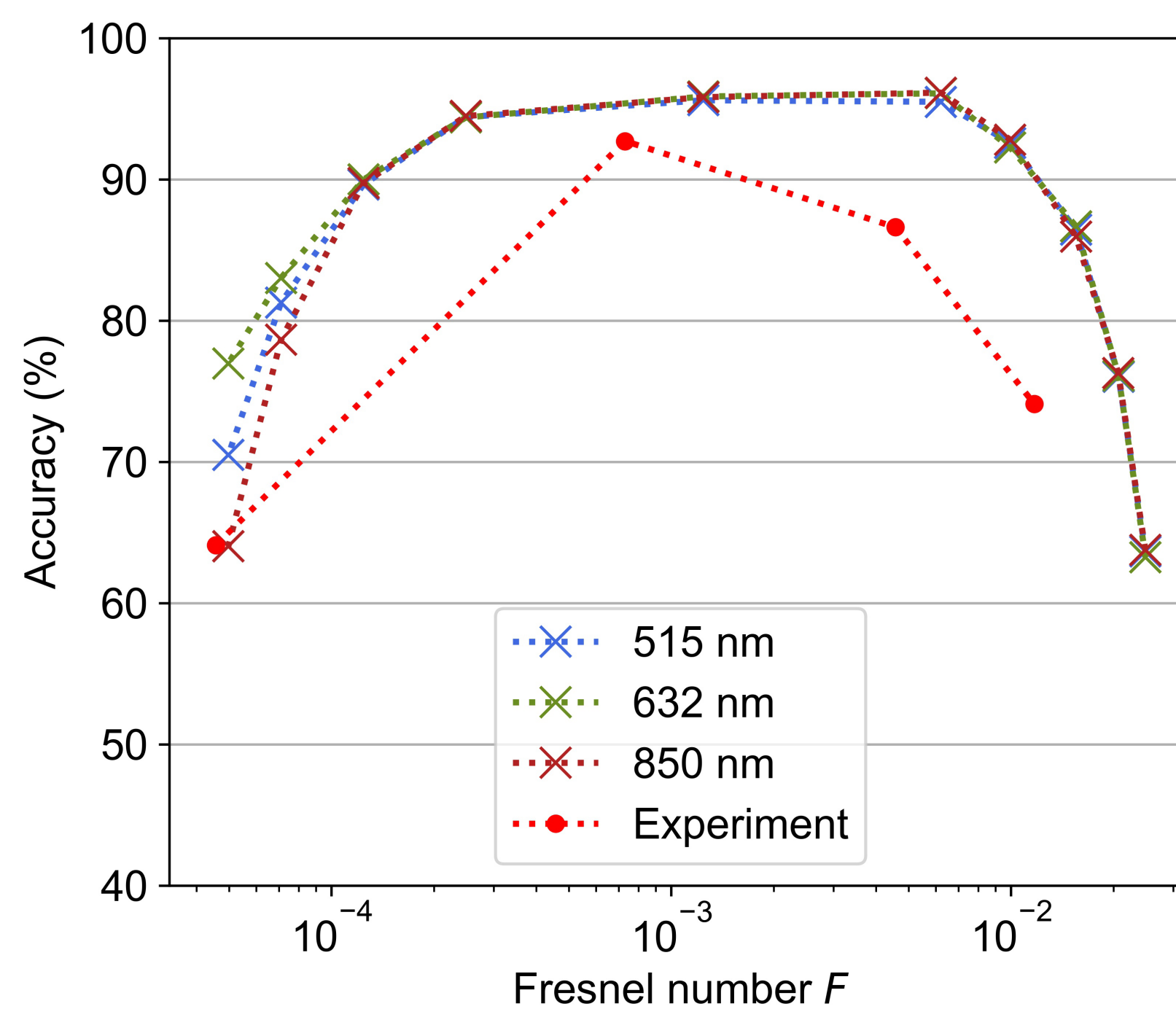
Experimental setup



Results



(a) MNIST handwritten digit and light distribution at the output plane. (b) The confusion matrix and energy distribution percentage of numerical simulation (97.08%) and experimental results (92.70%).



The optimal range of the Fresnel number:

$$F \in (4/N^2, 4/N)$$

Conclusion

We propose a new approach that controlling the diffraction related parameter, which is the Fresnel number, can improve the network's capability of expression and optimize the performance of DNN.

We implement DNN at visible range and experimentally tested the performance of single-layer DNN (got an accuracy of 92.70%).

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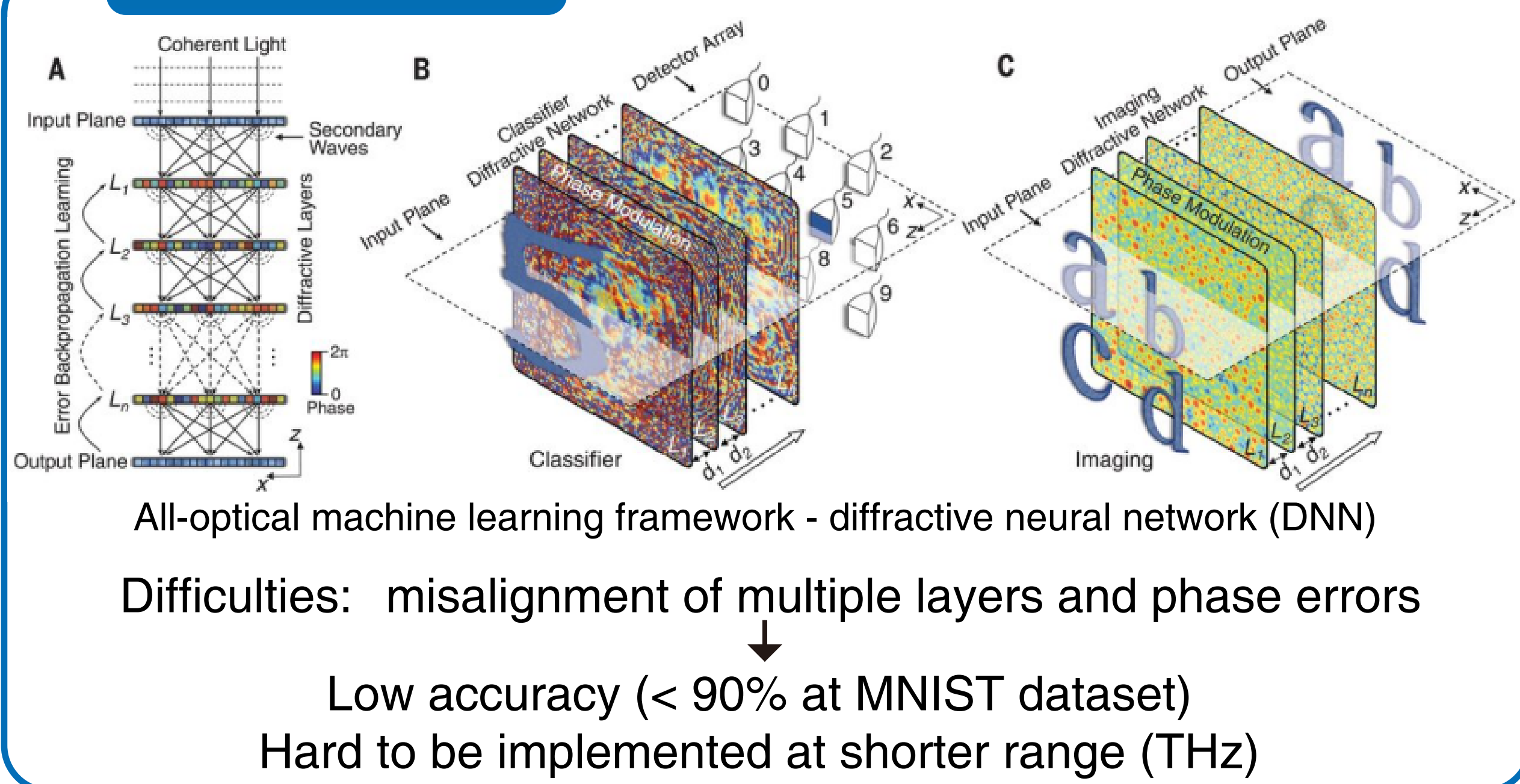
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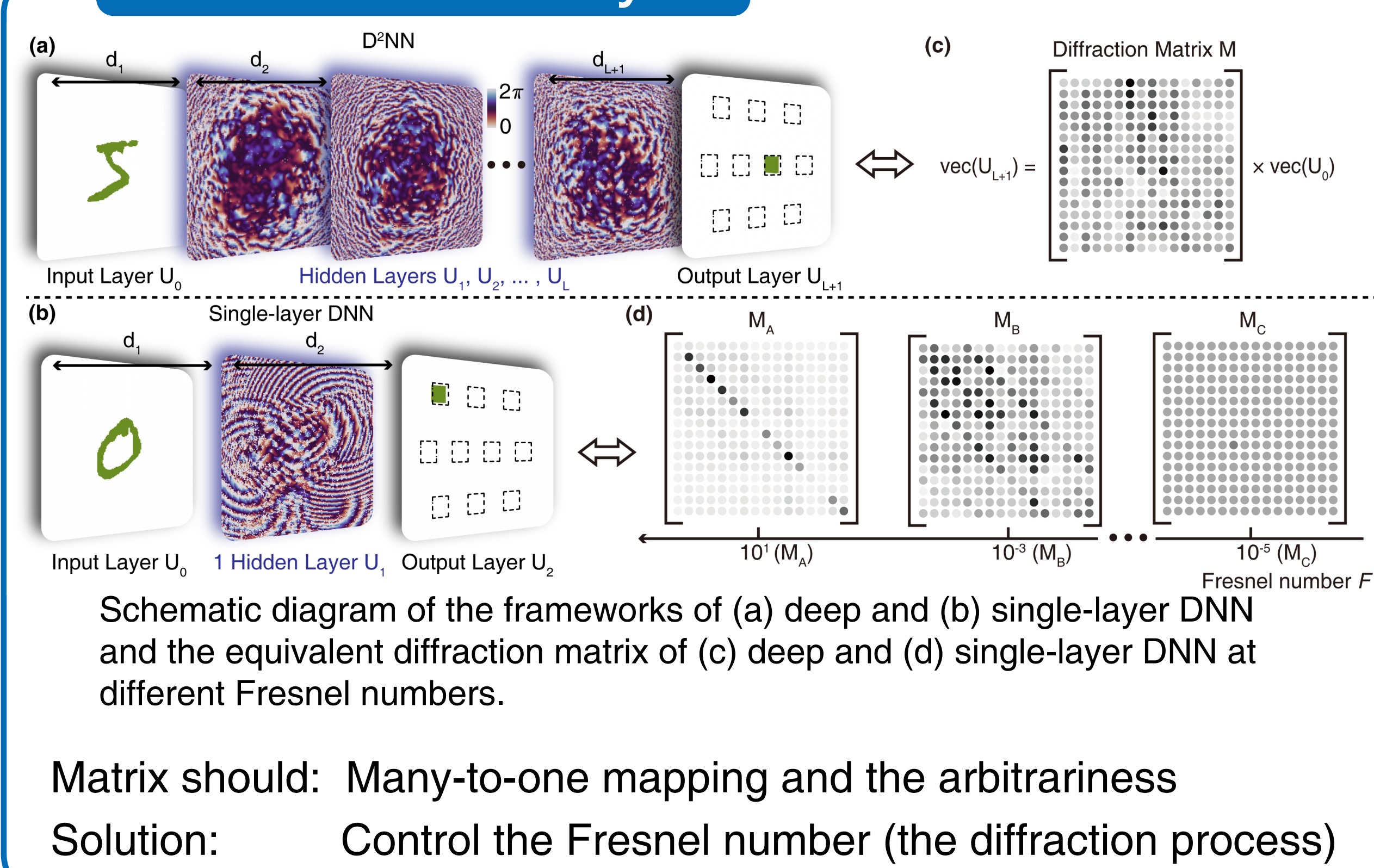
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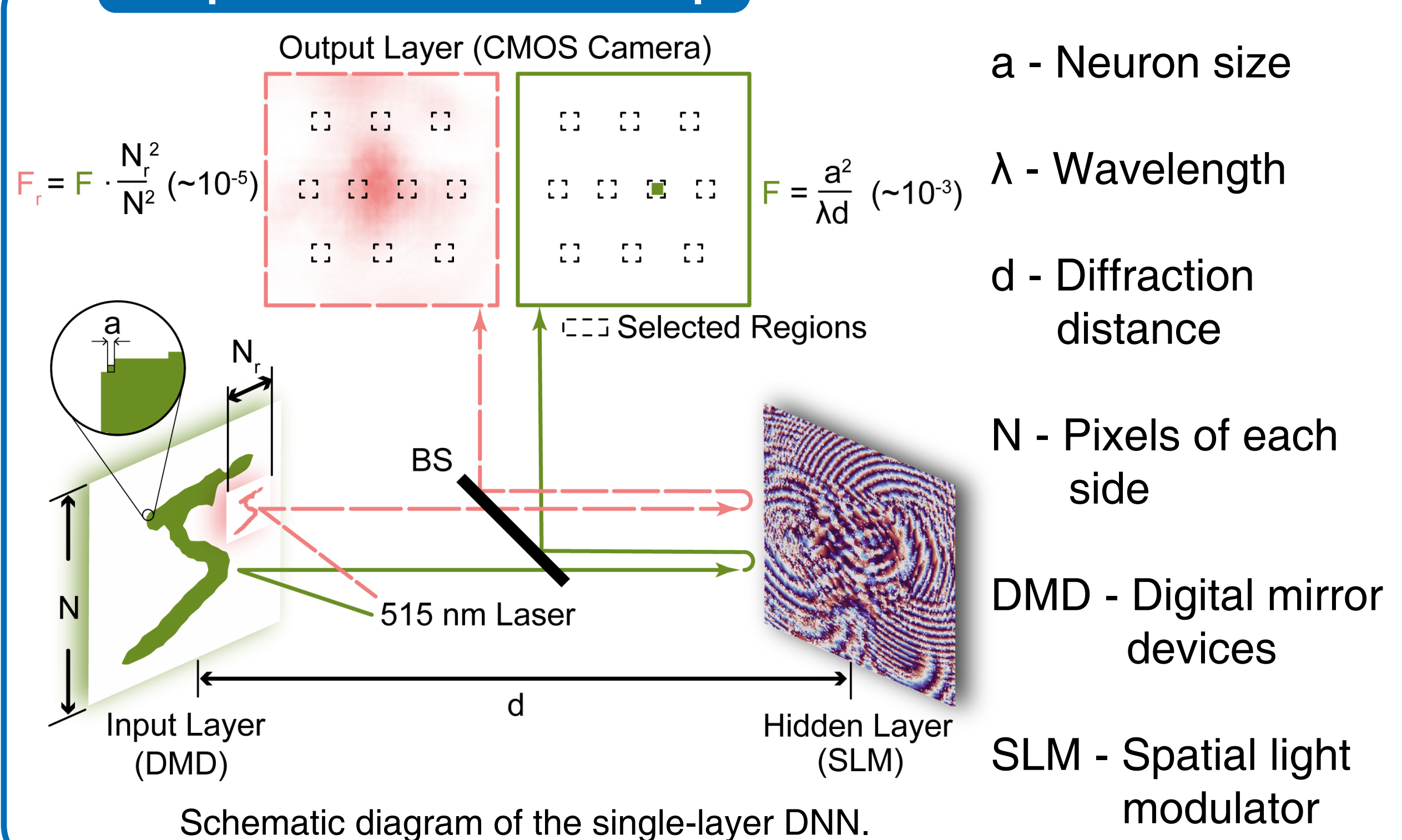
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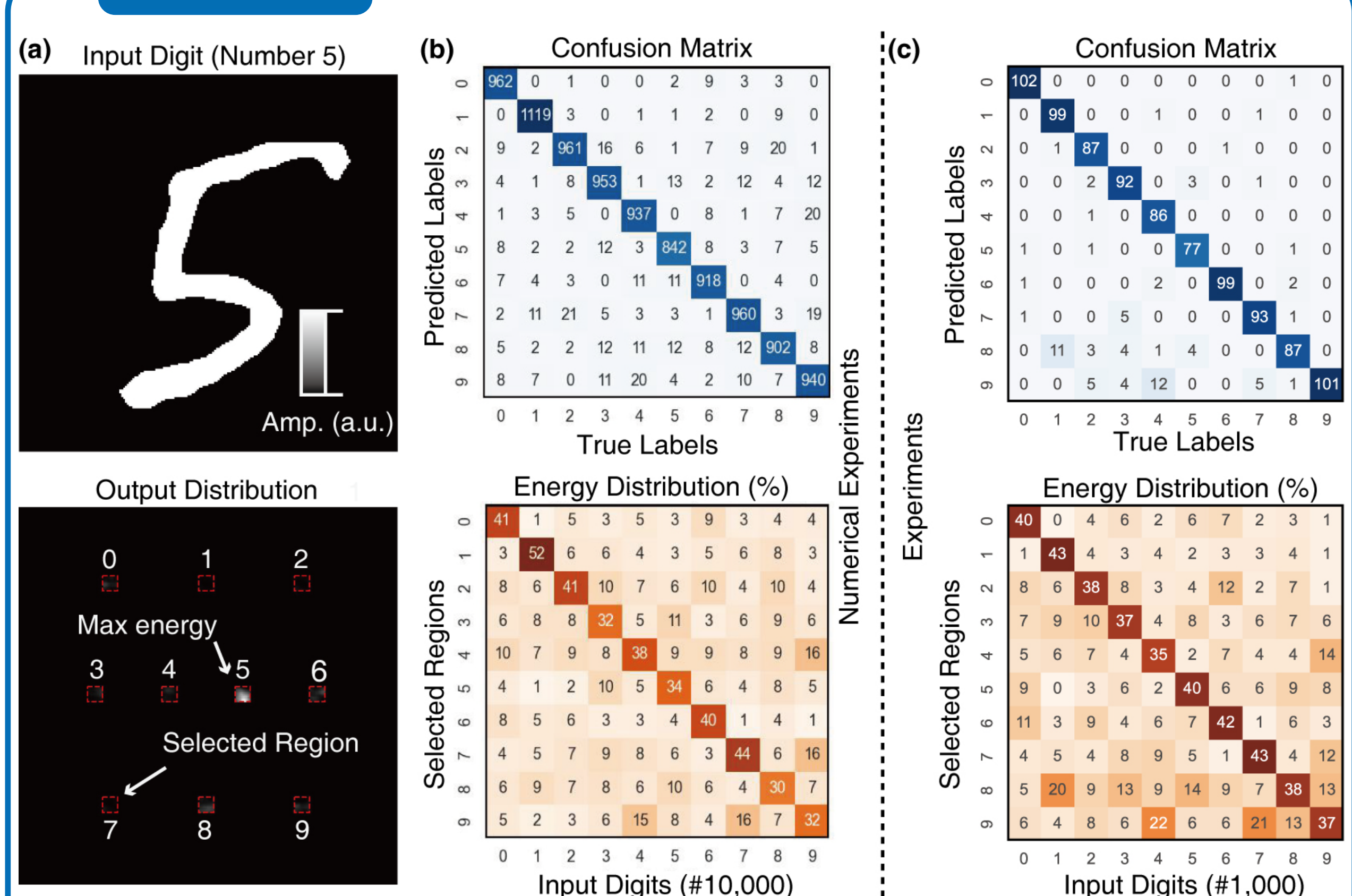
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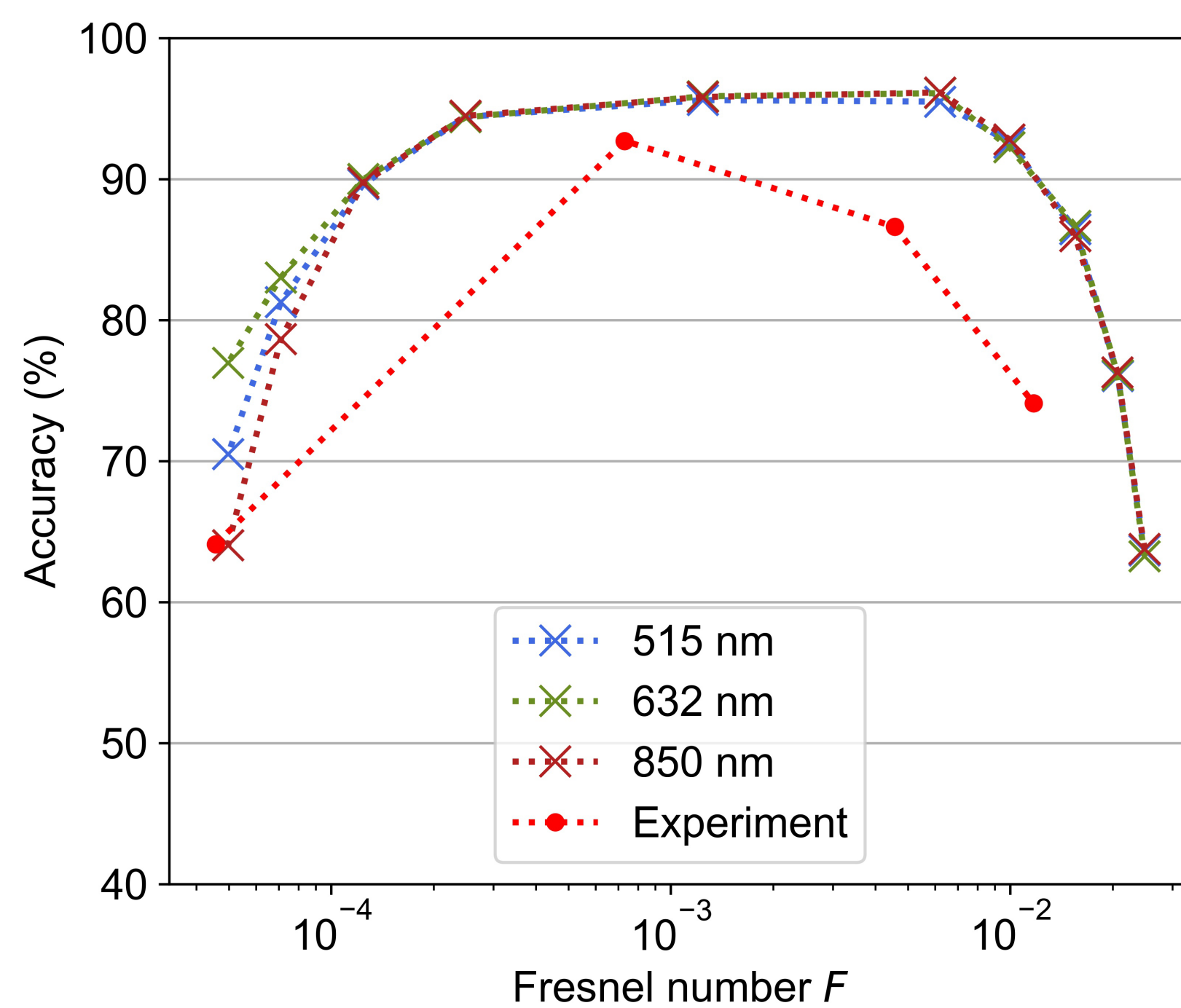
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