



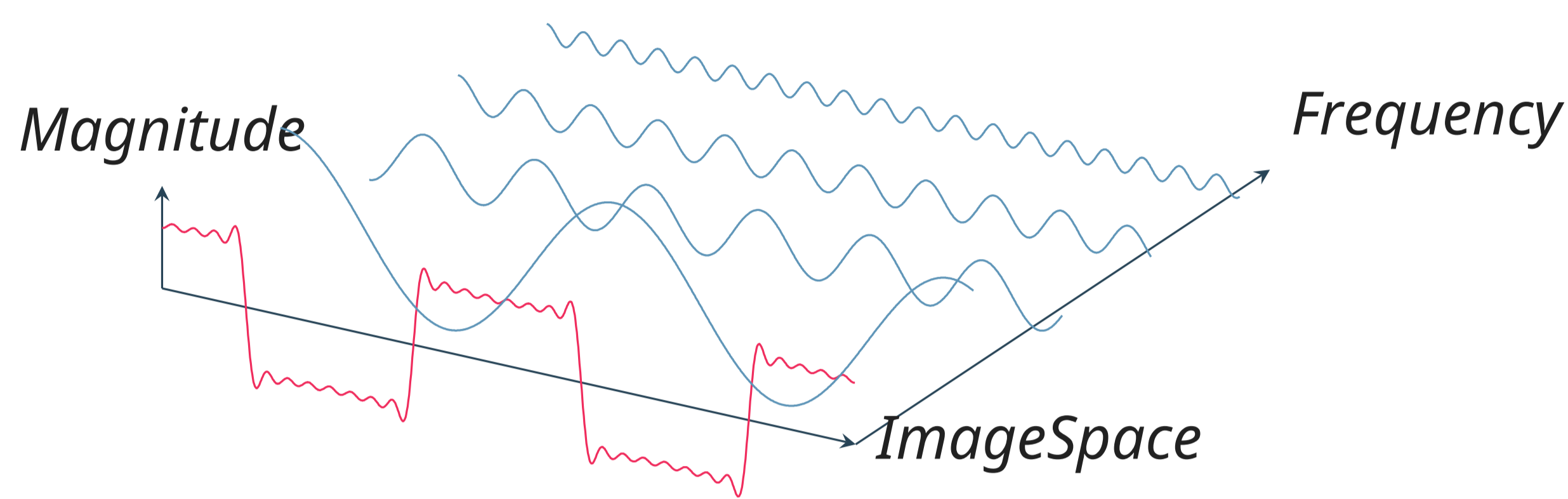
# Manipulating phase of the Fourier Transformation for pattern recognition of prostate cancer in MRI

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 Video link: <https://youtu.be/Ojp1Ql6h1Zg>

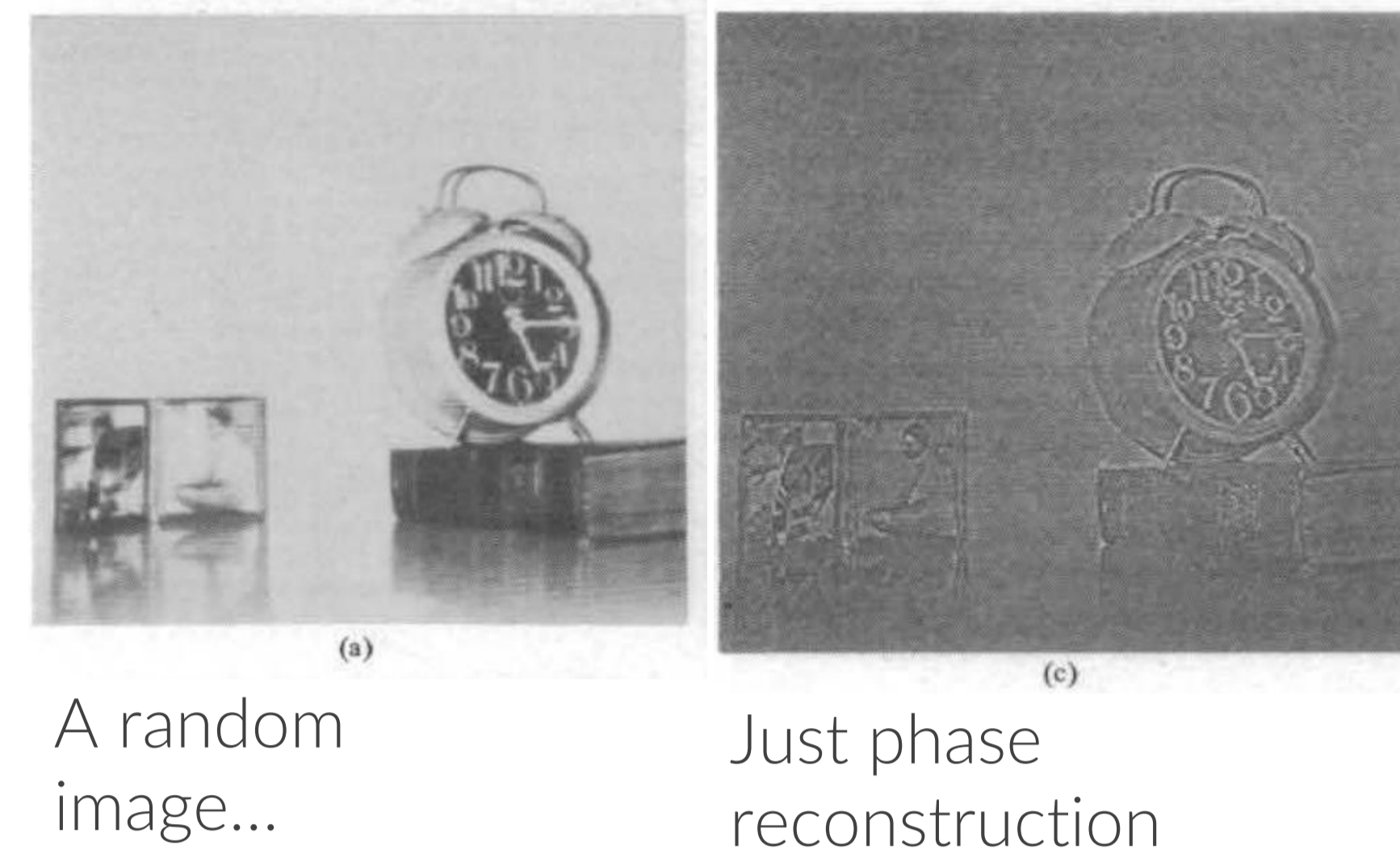
## 1. INTRODUCTION

### A. Fourier Transform

Decomposes a signal into its frequential components i.e Magnitude and phase

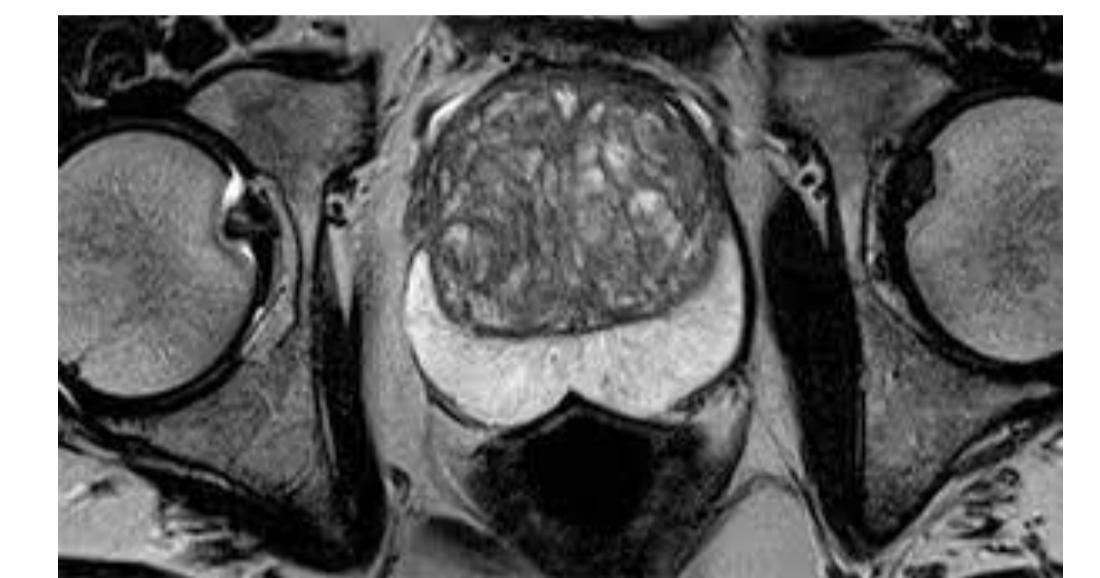


### B. Phase Interpretation [1]



### C. MRI Imaging

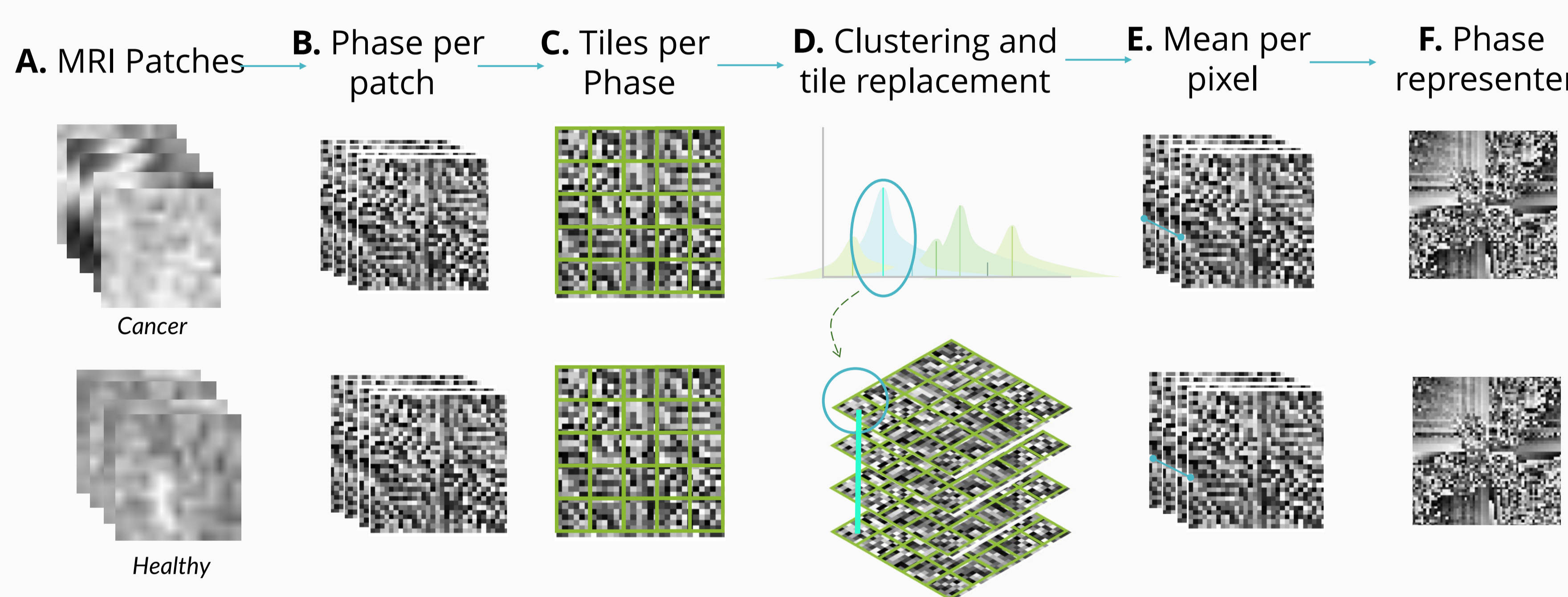
Is a response of tissue to radio waves



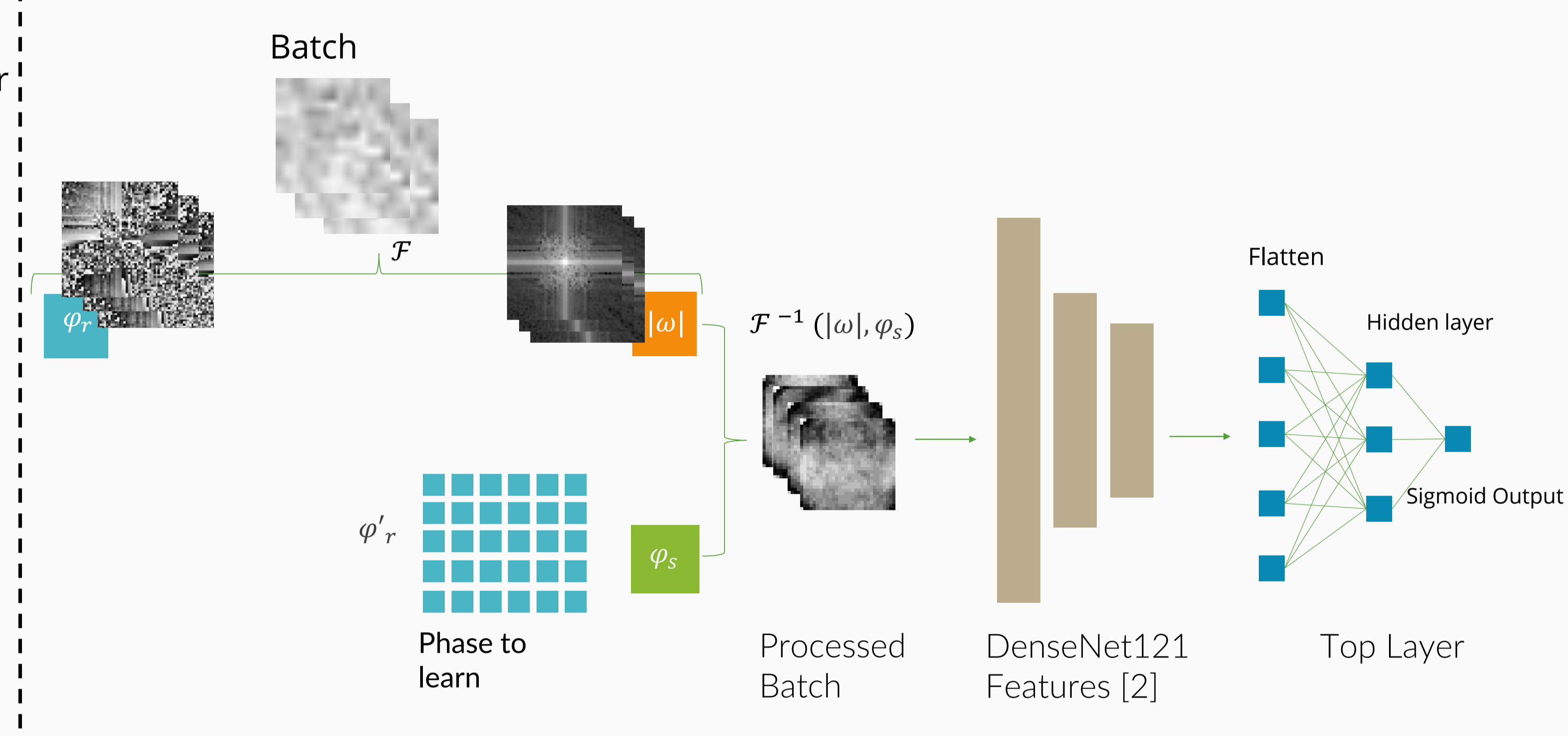
Healthy and abnormal tissue should have different spatial representations

## 2. METHOD

### A. Dirichlet Approach



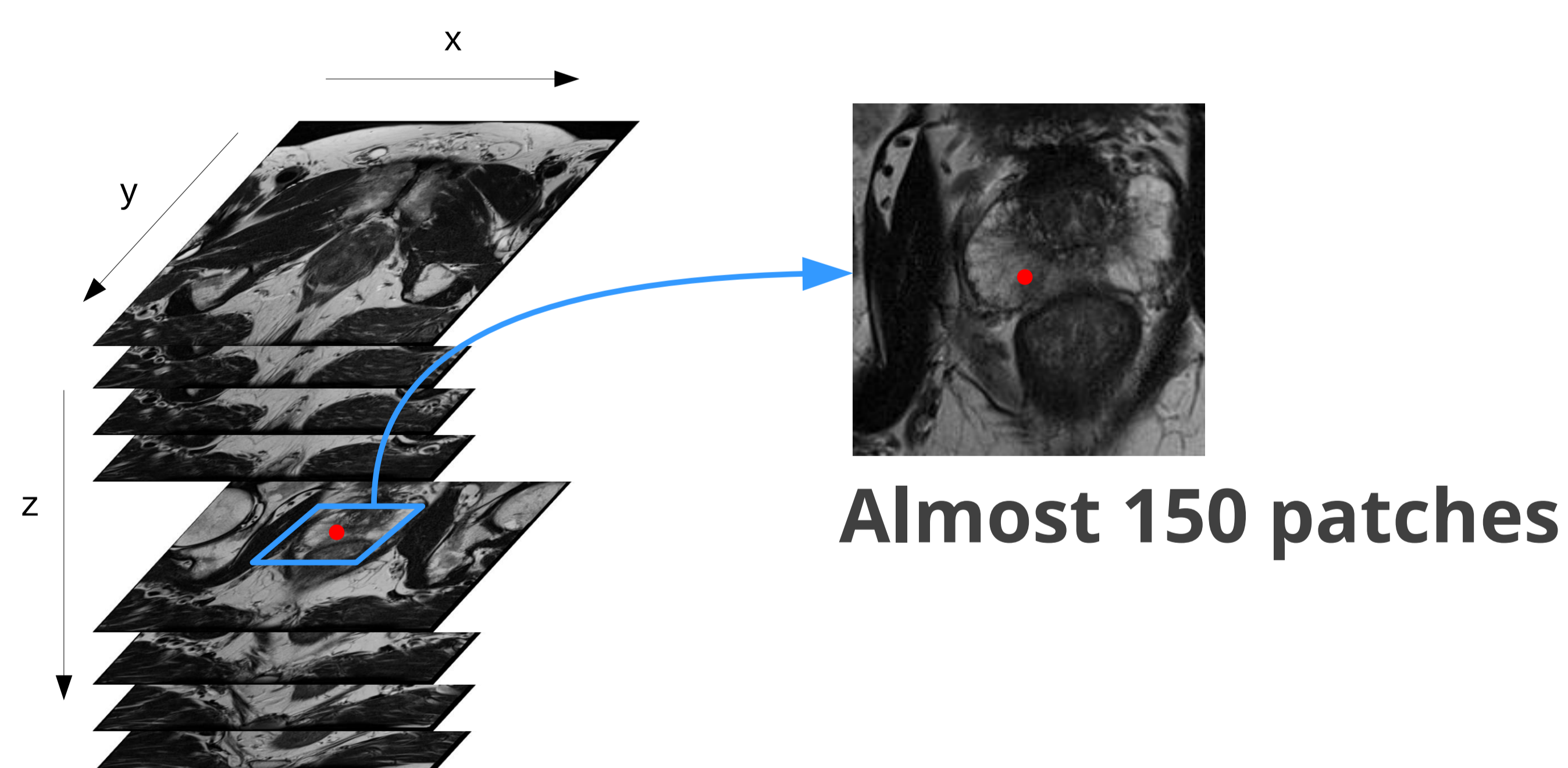
### B. Neural Networks



## 3. RESULTS A. Dataset

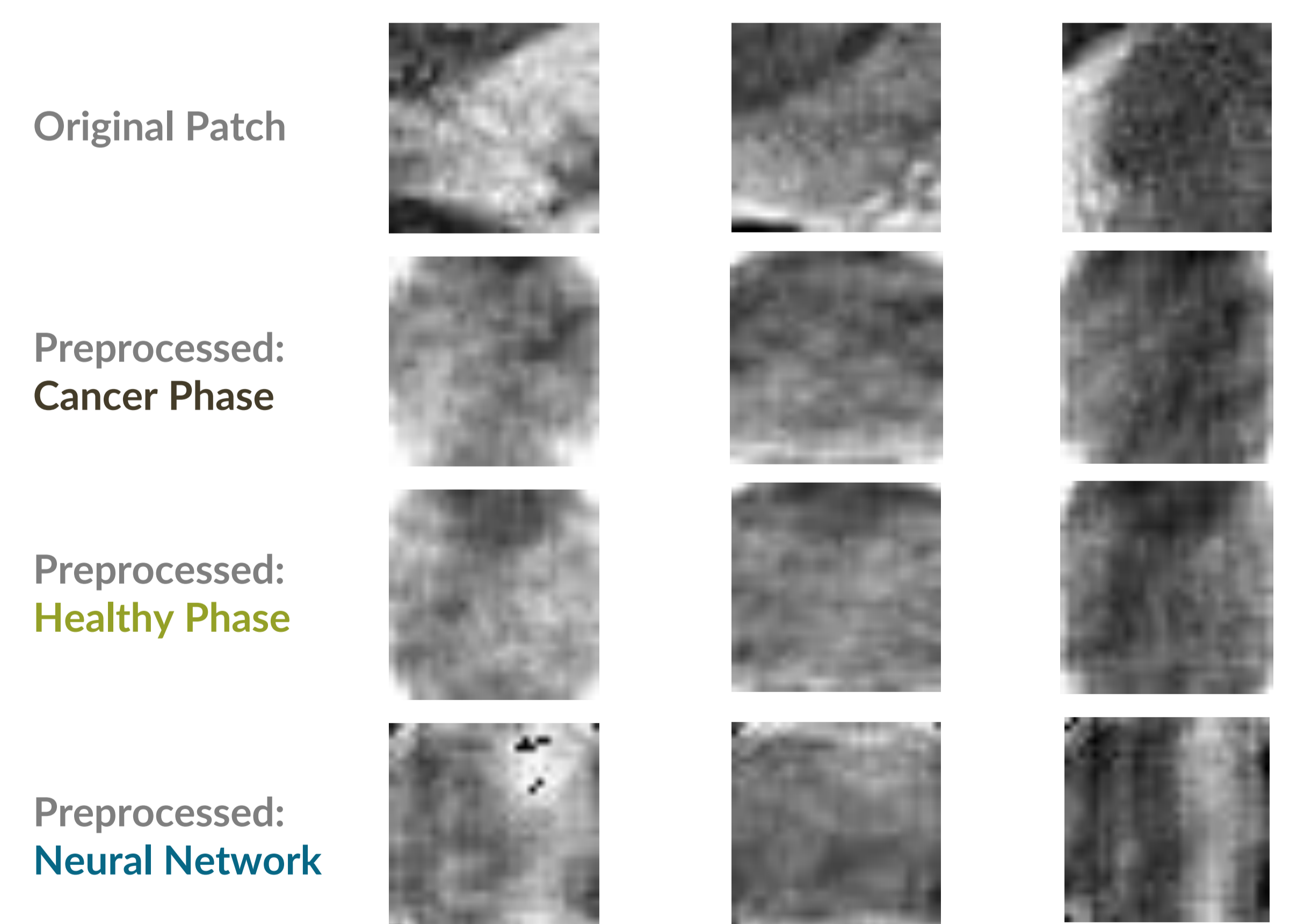
Prostate MRI was taken from ProstateX Dataset

95 lessons [3]



## B. Visual Results

Patches: Prostate X - 002 Prostate X - 084 Prostate X - 026



## C. Classification

Base			Cancer			Healthy			Neural Networks		
Sens	Spec	Acc	Sens	Spec	Acc	Sens	Spec	Acc	Sens	Spec	Acc
0.94	0.88	0.92	1.00	0.92	0.97	1.00	0.96	0.98	0.66	0.60	0.63

## 5. REFERENCES [1] Oppenheim, A. V. and Lim, J. S., "The importance of phase in signals," Proceedings of the IEEE 69(5), 529-541 (1981).

[2] Iandola, F., Moskewicz, M., Karayev, S., Girshick, R., Darrell, T., and Keutzer, K., "Densenet: Implementing efficient convnet descriptor pyramids," arXiv preprint arXiv:1404.1869(2014).

[3] Litjens, G., Debats, O., Barentsz, J., Karssemeijer, N., and Huisman, H., "Computer-aided detection of prostate cancer in MRI," IEEE Transactions on Medical Imaging 33, 1083-1092 (may 2014).

Tancik, M., Srinivasan, P. P., Mildenhall, B., Fridovich-Keil, S., Raghavan, N., Singhal, U., Ramamoorthi, R., Barron, J. T., and Ng, R., "Fourier features let networks learn high frequency functions in low dimensional domains," arXiv preprint arXiv:2006.10739(2020).