



2022「中技社科技獎學金」

2022 CTCI Foundation Science and Technology Scholarship

境外生研究獎學金

Research Scholarship for International Graduate Students

Periodic-net: An End-to-End Data Driven Framework for Imaging of Breast Cancer with Noisy Data

Nazish Murad, Min-Chun Pan

Ph.D. scholar, Advisor

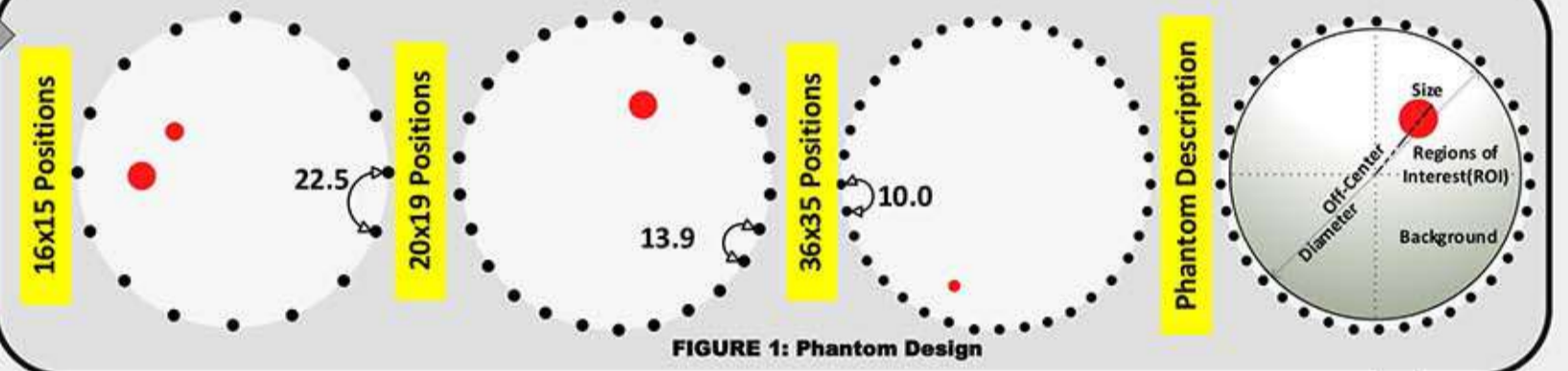
Department of Mechanical Engineering, National Central University, Zhongli, Taiwan.

Email: nazish.murad@g.ncu.edu.tw, pan.minc@g.ncu.edu.tw



INTRODUCTION

Diffuse optical imaging (DOI), is a soft tissue properties reconstruction technique that predicts the distribution of light under the assumption of predetermined parameters for both the light source and the tissue within an object. A simulation dataset based on the frequency domain is generated using the finite-element forward solver, with Robin boundary conditions, and a mesh containing 4225 nodes and 8192 triangular elements.



ARCHITECTURE

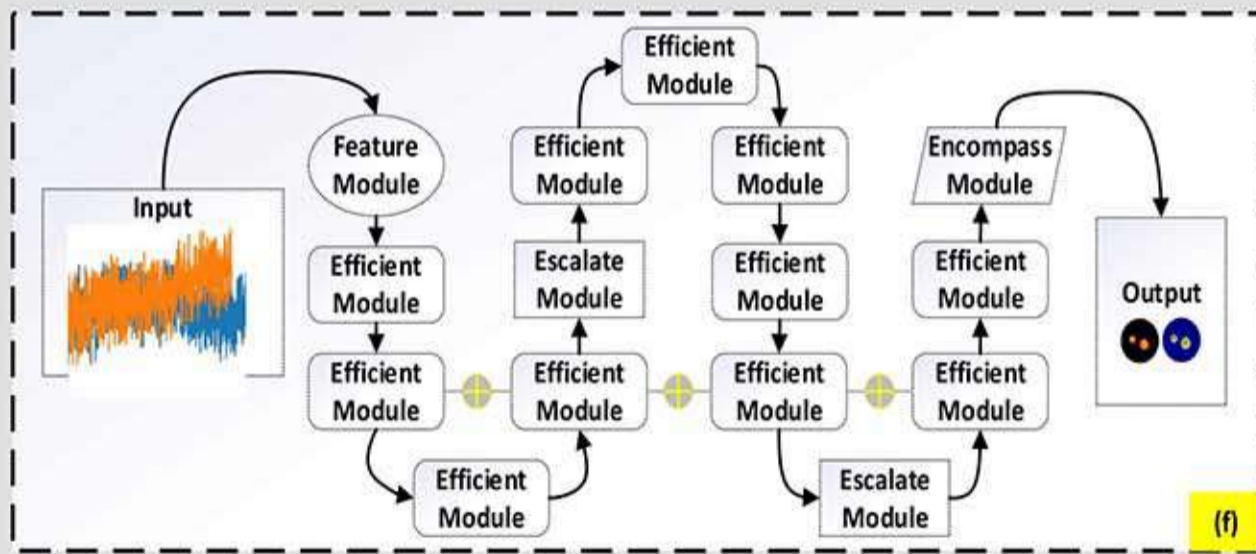
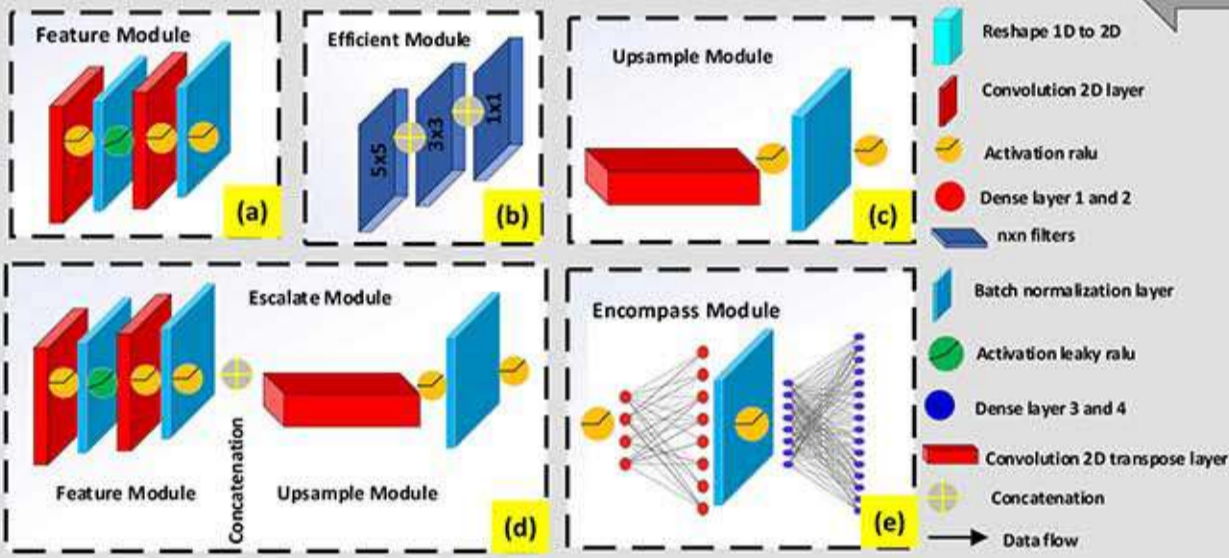


FIGURE 3: (a) Feature Module, (b) Efficient Module, (c) Upsample Module, (d) Escalate Module, (e) Encompass Module, (f) Overall Architecture of Periodic-net

DATA PREPARATION

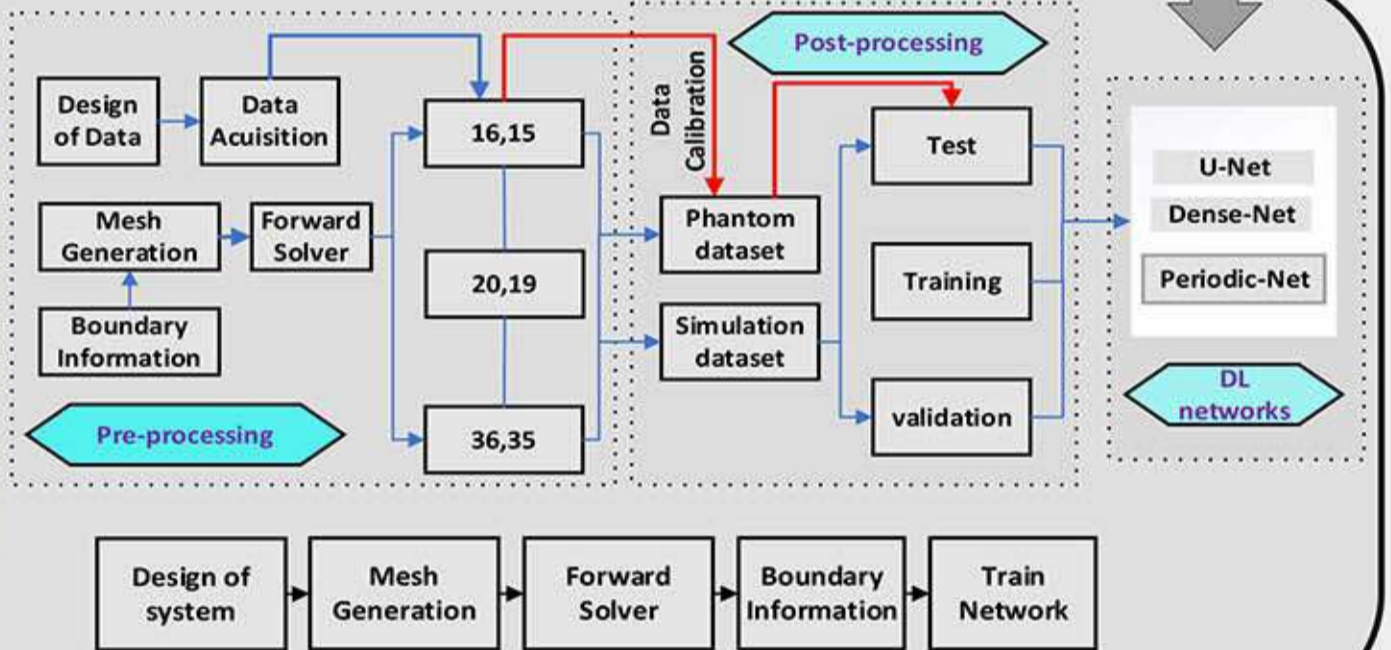


FIGURE 2: Flow chart of the dataset(s) preparation for network training

RESULTS

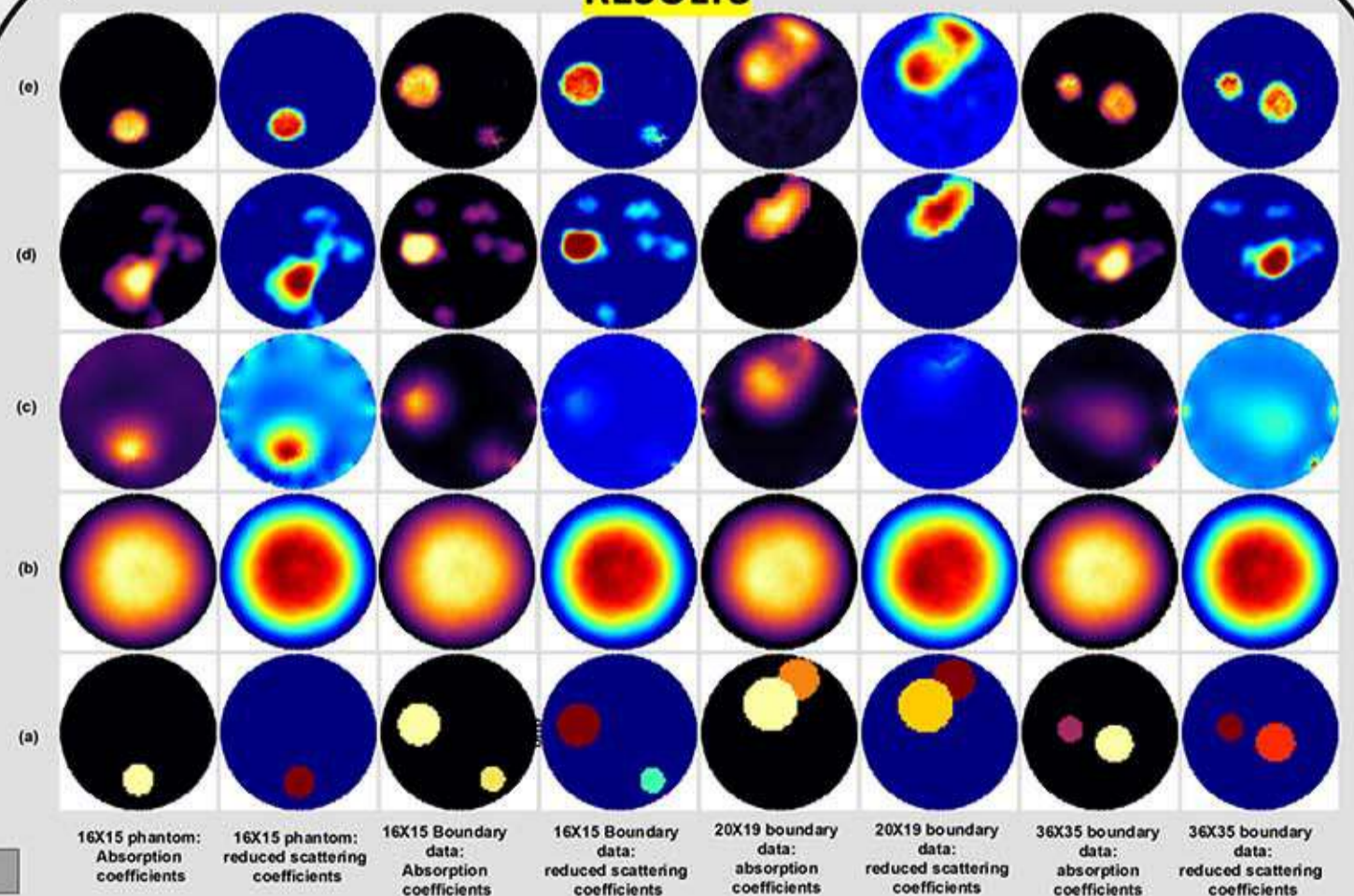


FIGURE 4: 2D tomographic image of a one and two inhomogeneity probed. These images illustrate the effects of deblurring and provide a comparison to determine resolution improvements. a) Ground truth, b) Dense-net, c) Tikhonov regularization, d) U-net, e) Periodic-net. Overall, Periodic-net and U-net performed well, and a better shape and size of inclusion were reconstructed with less noise

SUMMARY

- Periodic-net offers a potential reconstruction of optical coefficients that is not only cost-effective, sensitive, and non-invasive but also provides better localization and suppresses noise when compared with existing state-of-the-art networks.
- Addresses the reconstruction of highly scattered soft tissues in the breast
- Developing a versatile, robust, and novel architecture
- Reducing the speed of imaging i.e. reconstruction time, enhancing spatial resolution.
- Simulation and experimental observations are included in the study



中技社
CTCI FOUNDATION