Discovery Radiomics via StochasticNet Sequencers for Cancer Detection

Mohamad Javad Shafiee*[1] (mjshafiee@uwaterloo.ca), **Audrey G. Chung[1], Devinder Kumar[1], Alexander Wong[1], Farzad Khalvati[2], Masoom A. Haider[2]**
[1]Vision and Image Processing Research Group, Department of Systems Design Engineering, University of Waterloo, Canada,
[2]Department of Medical Imaging, Sunnybrook Research Institute, University of Toronto, ON

INTRODUCTION

Background

Radiomics has proven to be a powerful prognostic tool for cancer detection, and has previously been applied in lung, breast, prostate, and head-and-neck cancer studies with great success.

Conventional **Radiomics-driven** methods rely on pre-defined, hand-crafted radiomic feature sets that can limit their ability to characterize unique cancer

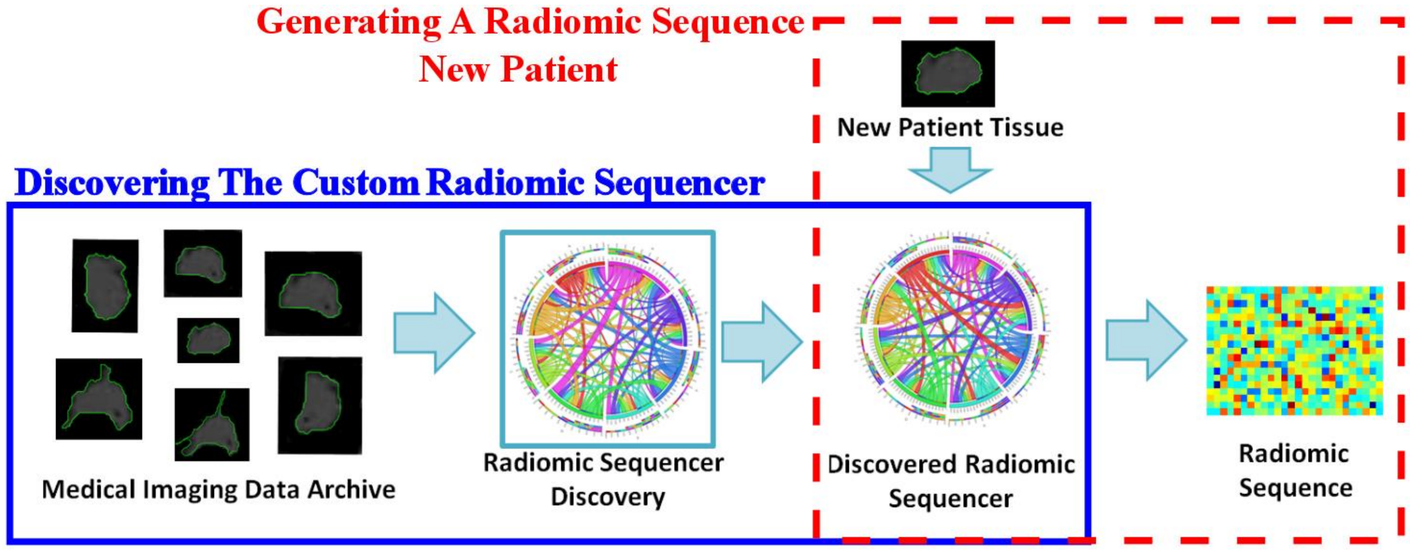
Novel Discovery Radiomics Framework where directly discovers custom radiomic features is proposed.

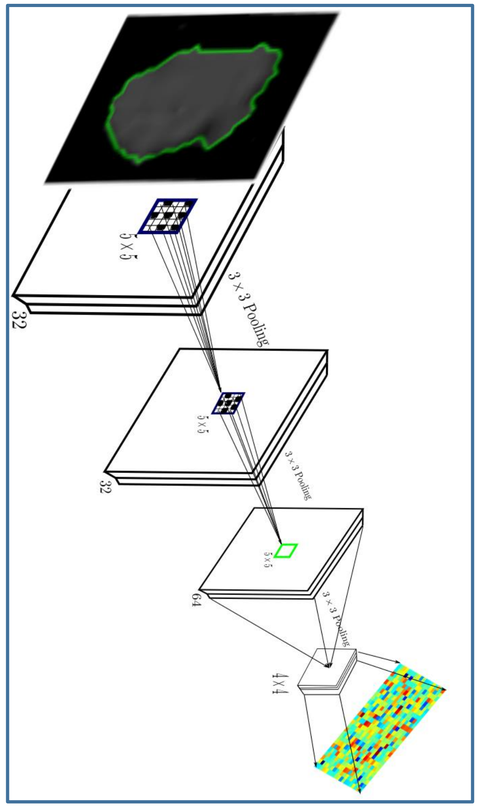
Novel **StochasticNet radiomic sequencers** for extracting custom radiomic features tailored for characterizing unique cancer tissue phenotype.

Goal

Having tailored radiomic features to discriminate cancerous tissue more efficient.

METHODS





- The radiomic sequencer discovery process learns a radiomics sequencer that can extract highly customized radiomic features.
- This approach is built upon a deep convolutional StochasticNet architecture [1]. (A deep convolutional neural network (CNN) is represented as a random graph)
- Three stochastically-formed convolutional layers, each containing 32, 32, and 64 receptive fields (size 5 × 5), respectively were incorporated.

EXPERIMENTAL RESULTS

- A subset of 93 patient cases from the LIDC-IDRI dataset is utilized.
- An enriched dataset of 42,340 lung lesions was obtained via data augmentation. (The rotation of each malignant and benign lesion by 45^o and 10^o increments)

	Sensitivity	Specificity	Accuracy
BDT	N/A	N/A	54.32%
DARS	83.35%	20.18	75.01%
SNRS	**91.07%**	**75.98%**	**84.49%**

BDT: Belief decision trees [3]
DARS: Deep autoencoding radiomic sequencer [2]
SNRS: StochasticNet radiomic sequencer (proposed)

- These preliminary results illustrate the potential of the proposed discovery radiomics framework for improving cancer screening and diagnosis.

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