

End-to-end Deep Learning Architectures for Automated Assessment of Diffusion MRI in Breast Cancer

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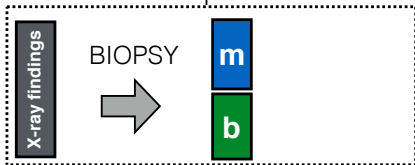
MEDICAL IMAGE COMPUTING GROUP



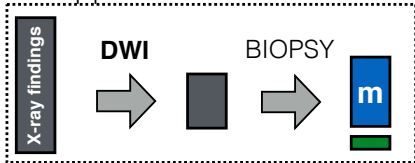
Clinical Motivation

- **problem:** $\sim 50\%$ of suspicious findings from mammographic screening are identified as benign lesions in biopsy.
- **approach:** Diffusion Weighted MR Imaging (DWI) + image analysis prior biopsy
→ *non-invasive clarification of mammographic findings.*

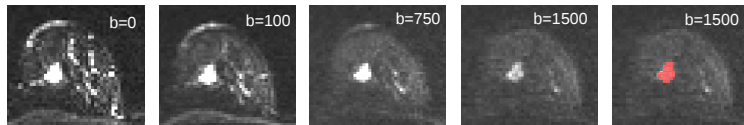
current clinical practice



our approach

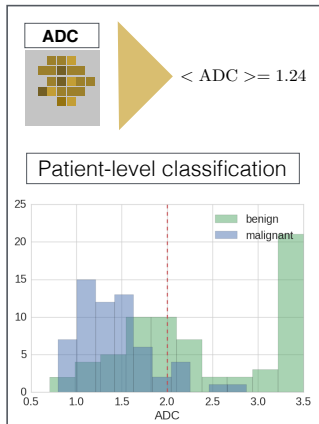
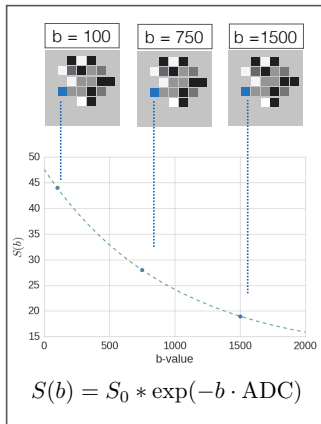


DWI breast lesion data set



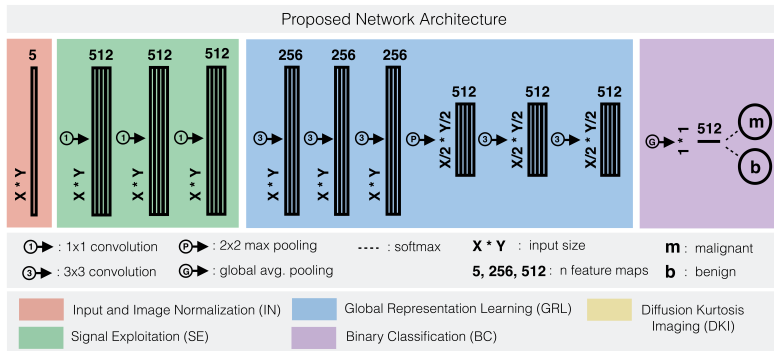
- 222 Patients from 2 different scanners.
- **Regions of interest** (ROI) provided by experts' annotations.
- Ground truth provided by histopathological results.
- Very small lesion sizes $\sim 10 \times 10 \times 3$ pixels

State of the art DWI analysis



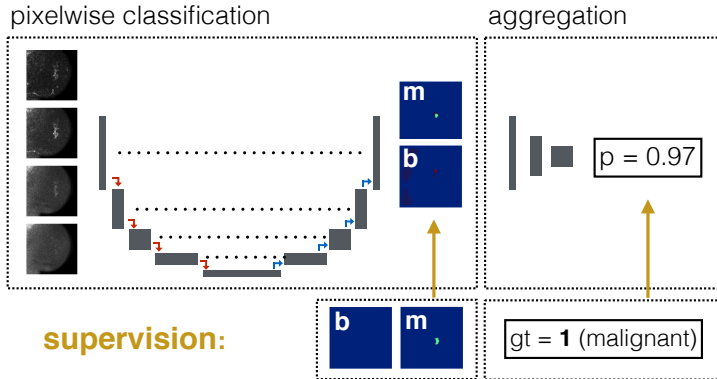
- Extract the separating variable (ADC) by fitting the signal behavior in all pixels.
- Perform classification as univariate cut-based decision.

CNN for Classification of Breast Lesions on DWI



- To appear at **MICCAI 2017**: *"Revealing Hidden Potentials of the q -Space Signal in Breast Cancer"*, jaeger et. al. (see also *arxiv*)
- Significantly superior to SOTA: clarifying $\sim 63\%$ of false positives at a sensitivity of $\sim 97\%$

Work in progress: End-to-end Segmentation + Classification



- **Challenges:** Limited Training Data. Tiny proportion of ROI / Image.
- **Approach:** Perform pixel-wise classification (= segmentation) and aggregate information to patient-level. Train **end-to-end**.

We are happy to receive **comments**, **input** and **questions**:

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