Docket #: S19-308

Plexus Convolutional Neural Network for Histologic Imaging Analysis with Smaller Training Datasets and Parameters

Using a novel convolutional neural network architecture, PlexusNet can be used for histologic image analysis with smaller parameter and training sets than current state-of-the-art models. Reduction in parameter capacity prevents overfitting of the data, requires less data and is less computationally expensive. PlexusNet neural network architecture utilizes an optional normalization section with mandatory feature extraction and classification sections. In practice, a well-fitted PlexusNet model distinguished prostate cancer from healthy tissue on par with comparison models but was 23 times smaller and had better model calibration and clinical utility. Similarly, a model for detecting breast cancer metastases reduced required slide numbers by 43.8% and parameters by 200-fold.

Stage of Research

- Prototype

Related Technology:

Stanford Docket S19-376-"Clinical Evaluation of Prostate Cancer using Machine Learning-Based Pathology Report Generation"

Applications

- **Detection and screening on histologic images**
  - Specific features are user defined

    - Examples include grading or feature extraction for genomic and omic analysis
- **Diagnosis and prognosis of cancer or any histologic findings**
    - Already tested for prostate cancer and breast cancer metastases

Advantages

- **Less prone to overfitting**
- Significant parameter reduction (~200 times) and required images to train PlexusNet derived models
- Only extracts tissue structures pathologists consider during evaluation

Publications

- Eminaga et al. arXiv preprint: "Plexus Convolutional Neural Network (PlexusNet): A novel neural network architecture for histologic image analysis"

Innovators

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