DEVELOPMENT OF COMPUTER AIDED DETECTION AND DIAGNOSIS TOOL FOR ELUCIDATING THE DIFFERENCE BETWEEN PANCREATIC CYSTIC TUMORS

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Mayo PI: Dr. Michael Wallace

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Pancreatic Cancer (PC) & IPMN (Intraductal Papillary Mucinous Neoplasia)

- PC is fourth leading cause of cancer death in the US.
- Poorest prognosis of any major cancer type
- 5-year survival rate is only 7.7%
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IPMN is a type of tumor that grows within the pancreatic duct

Important if left untreated, some of them progress to invasive cancer

More common, less invasive
PROBLEM / CLINICAL NEED

➤ To reduce mortality and morbidity rates of PC, it is vital to detect IPMN tumors in early phase, and classify/characterize their types/subtypes precisely for personalized treatment planning.
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Current (radiology) screening paradigms (MRI and CT) can reveal IPMN tumors, but its uncertainty is high when identifying its risk (low-grade, high-grade).
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- International guidelines are imperfect due to highly heterogenous shape and appearance patterns.
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Our Overall Goal is to address this significant research gap by developing a computer aided detection (CAD) and diagnosis tool that can differentiate / characterize IPMN tumors.
UCF AND MAYO COLLABORATION

M. Wallace-PI
C. Bolan-Radiologist
P. Kandel, Post-Doc

U. Bagci-PI
S. Hussein (PhD student)
M. Pensky - Statistician
COLLABORATION PLAN – TIMELINE

➢ We visited Mayo Campus at Jacksonville!
➢ (Almost) Biweekly progress meetings
➢ Imaging data transfer and logistic issues delayed our starting date for this project
➢ We target top-tier publication in very near future
➢ NIH and/or DoD grant applications in Fall 2017
OUR PROPOSED SOLUTION AND INITIAL RESULTS!

T1 post contrast

Diffusion image

Convolutional Neural Network

Convolution
Max-pooling

Convolution
Max-pooling

Confidence Fusion

Normal
Low grade
High grade
INITIAL RESULTS TO BE SUBMITTED INTO JOURNAL PUBLICATIONS

- 10 fold cross validation on 60 T1-postcontrast MRI
- 100 trees, 10 times run on each CV set
- Deep features are from deep learning architecture Fast-VGG

**Merging class 2 with class 3**

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**GIST Features**
- Normal vs. IPMN

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**Deep Features**
- Normal vs. IPMN
Deep features based results are improved when LASSO method is further applied!

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Method is also validated on a separate lung cancer data (over 90% accuracy!)

This is the first automated IPMN diagnosis system in the literature, more data will increase the robustness and accuracy of the proposed system!
THANK YOU FOR LISTENING!

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Deep neural network

![Image of a deep neural network diagram]