



**DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING
TEZPUR UNIVERSITY
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ASSAM :: INDIA**

A REPORT ON

Name of the Collaborative Activity

1. Name of the Collaborative Activity: **Radiomics with Machine Learning Methods towards Prediction of Gall Bladder Cancer** (File No.5/7/1679/NER/Adhoc/2019-RBMCH)
2. Nature of Activity: Research based
3. Name of the Collaborating Agency/ Individual with affiliation, and contact details:
Dr. Abhijit Talukdar, Dept. of Surgical Oncology
Affiliation: Dr B Borooah Cancer Institute, Guwahati, Assam
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Dr. Amal Chandra Katak, Director
Affiliation: Dr B Borooah Cancer Institute, Guwahati, Assam,
Contact : dramalchkatak@yahoo.com, 9864094372
4. Summary of collaboration: Collaboration with Dr B Borooah Cancer Institute, Guwahati, Assam. The collaboration is research based. Data for the study will be provided by Dr B Borooah Cancer Institute, Guwahati, Assam and secured storage, analysis and prediction of gall bladder cancer will be done by Tezpur University.
5. List of year-wise activities under the collaboration:

Year	Activities
First half 2020	<ul style="list-style-type: none">• Data Collection• To develop a GUI based Pre-processor to facilitate: (a) An intelligent GUI based pre-processor to enhance image quality and (b) modelling data from heterogeneous sources (clinical, and image) to support integrative analysis.• Parallel feature extraction to generate structured meta data to enable the multimodal image analysis towards detection of radiomic biomarkers for GBC.• Knowledge transfer (Capacity building, outreach, sharing): trainings, Publications (book, research papers, reviews, reports).• To develop solutions utilizing block chain approach for secure yet cost effective storage and transmission of health related privacy preserved data.
Second Half	<ul style="list-style-type: none">• Data Collection• Supervised ML tool to support identification of GWT, presence of gallstones, liver metastasis detection, lymph nodes and para aortic node involvement and

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	<p>selection of radiomic biomarkers.</p> <ul style="list-style-type: none"> • A multiobjective approach towards identification of radiomic signatures. • To develop solutions utilizing block chain approach for secure yet cost effective storage and transmission of health related privacy preserved data. • Knowledge Transfer: Workshop
First half 2021	<ul style="list-style-type: none"> • Data Collection • To develop a robust, peer to peer prototype for clinical (Big) data management system (CDMS) using private blockchain approach to facilitate researchers in systematic analysis of multi-omics data. This private blockchain will be initially deployed only at the partner institutions. • An unsupervised ML tool to support construction of radiomic biomarkers, detection of GWT, presence of gallstones, liver metastasis detection and lymph nodes and para aortic node involvement.
Second Half 2021	<ul style="list-style-type: none"> • Data Collection • Develop a correlation engine to validate the identified radiomic biomarkers using meta data with reference to other clinical traits database. • Statistical, biological and clinical validation of the proposed AI/ML tools for identification using partner institutions to ascertain their clinical usefulness and biological relevance. • A smart App for GBC patients' awareness. • Knowledge transfer: Awareness campaign • To conceptualize and propose a detailed ToC of a book on Decision support in Gall Bladder Cancer: An ML Perspective.

6. **Results:** The work done are:

(i) Data Collection has been done

(ii) Proposed a method for segmentation of the healthy gallbladder from a Computed Tomography (CT) scan image by integrating Rough Entropy Thresholding technique along with contour and convex hull operations. Our method has been found to perform significantly better than other competing methods.

(iii) An unsupervised ML tool to detect presence of GallStones has been devised and which has been found to give better results with its counterparts. This work is currently in the writing phase for submission to an SCI indexed journal.

(iv) Extracted 120 radiomic features from the CT scan images. The radiomic features extracted include the shape based 2D and 3D features, first order statistics, Gray Level Concurrence Matrix (GLCM), Gray Level Run Length Matrix (GLRLM), Gray Level Size Tone Matrix (GLSTM), Gray Level Dependence Matrix (GLDM) and Neighbouring Gray Tone Difference Matrix (NGTDM). Work is being done to select the relevant features from the obtained set of features for further analysis and knowledge discovery.

(v) Developed a GUI based Pre-processor to facilitate: (a) An intelligent GUI based pre-processor to enhance image quality and (b) modelling data from heterogeneous sources (clinical, and image) to support integrative analysis.

(vi) A smart App for GBC patients' awareness has been developed.

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(vii) Developed a robust, peer to peer prototype for clinical (Big) data management system (CDMS) using private blockchain approach to facilitate researchers in systematic analysis of multi-omics data.

(viii) Proposed a detailed ToC of a book on **Multimodal images towards Decision support in Gall Bladder Cancer: An ML Perspective.**

Translational Potential: Ethical Approval and scientific clearance was obtained for this study. Informed consent was taken from the patients involved in this study.

Signature of Faculty	Signature and Seal of Head of Department/ Centre/ Cell
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