Project

One year life expectancy post Thoracic surgery using IBM Watson

(Career Basic-RSIP2020)

Done by Gowri Muralikrishnan

INDEX

i)Project Detail

Project ID : SPS_PRO_304

Project Title : One Year Life expectancy post-thoracic surgery using IBM Watson

Duration : 15 Days

Project Support : SmartBridge Educational Services

Submitted by: Gowri Muralikrishnan

1) INTRODUCTION

1.1) Overview

Lung cancer is the most common form of cancer world-wide, and the most common cause of cancer death. Radical surgical resection, with or without adjuvant treatment, is still a prerequisite for cure. In spite of different additional modes of treatment, survival is still poor.It is important to have knowledge of pre- and post- operative mortality (life expectancy) and morbidity (health complications), and also of risk factors prior to surgery, to be able to improve the quality of operative procedures and identify patients running the highest risk.This helps to optimize the patient’s condition, medication and respiratory status before surgery. Furthermore, the operative risks must be considered in relation to the long-term results in order to identify patients who will clearly benefit from surgery.

1.2) Purpose

Thoracic surgery focuses on the chest organs, including the heart, lungs, esophagus, and trachea. Technological advances have increased the safety and availability of these complex surgical procedures. The Project “One year life expectancy post Thoracic surgery using Watson Auto AI” is to be able to predict the life expectancy of the patients within 1 year after undergoing thoracic surgery with accuracy. The life expectancy post thoracic surgery can be predicted using the Machine Learning techniques. Thus, the system can be taken as an aid for the doctors to effectively make decisions for the treatment of lung cancer patients. The project is based on IBM provided features. IBM Watson for Oncology (WFO) is one of the leading representatives in artificial intelligence (AI) or cognitive technologies. It is a unique system, with an ability to acquire much of its knowledge by “reading” the literature, protocols, and patient charts, and learning from test cases and experts from Memorial Sloan Kettering Cancer Center (MSKCC).It can identify connections among all of the data to answer a complex medical question in a very short amount of time, resulting in evidence-based and personalized treatment options.

2)LITERATURE SURVEY

2.1)Existing Problem

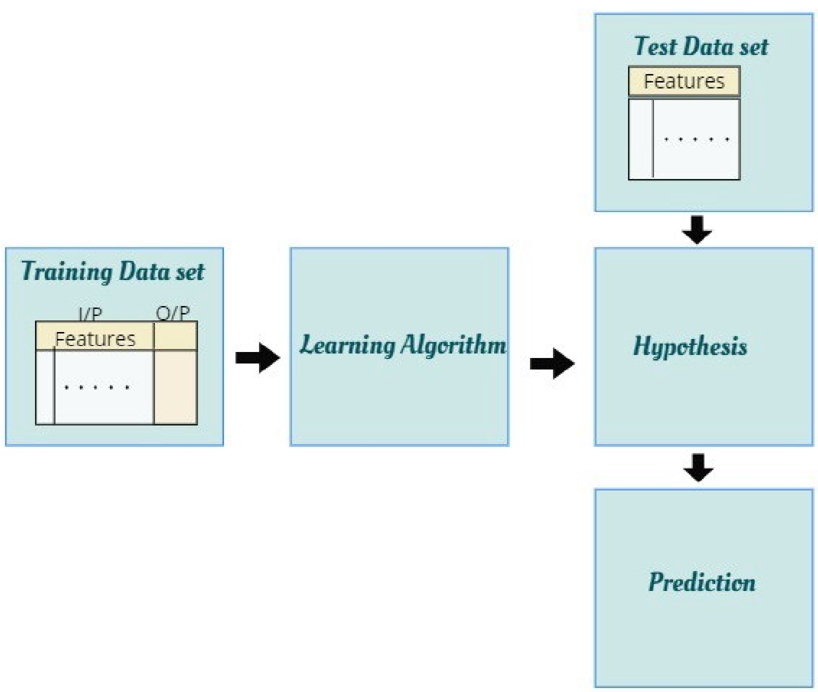
- Patients who receive thoracic surgery for lung cancer do so with the expectation that their lives will be prolonged for a sufficient amount of time afterwards.
- The problem to solve is whether there is a way to determine postoperative 1 year survival of lung cancer patients utilizing the patient attributes in the data set.

2.2)Proposed Solution

The aim of the project is to examine the operative mortality (life expectancy) and morbidity (Health issues) after lung cancer surgery and to identify factors associated with an adverse Outcome. IBM Watson AutoAI Machine Learning Service is developed to predict the post operative life expectancy of lung cancer patients using the computational methods. These methods were used specifically to predict whether a lung cancer patient will survive one year after he or she has had thoracic surgery. The results of each of the techniques were then measured and compared based on accuracy and performance.. The model is deployed on IBM cloud to get a scoring end point which can be used as API in mobile app or web app building. We are developing a web application which is built using node red service. We make use of the scoring end point to give user input values to the deployed model. The model prediction is then showcased on User Interface

3 THEORETICAL ANALYSIS

3.1 Block diagram



3.2 Hardware / Software designing

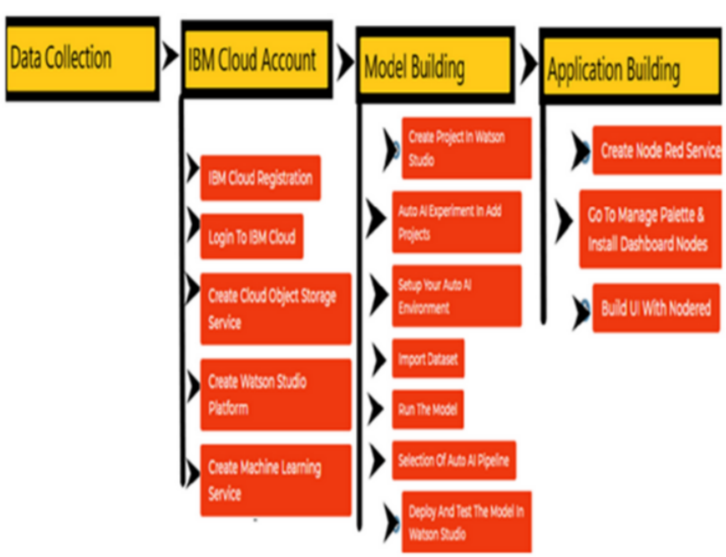
The project has been done by using IBM Cloud in which machine learning service, Watson studio and cloud storage service (to store the data) have been created by using the options available in Catalog.

4 EXPERIMENTAL INVESTIGATIONS

There are six steps in experimental investigation on of a general project:

1. Choose a Project Idea
2. Conduct Background Research
3. Compose a Hypothesis
4. Design your Experiment
5. Collect Data
6. Analyse Data and Draw Conclusions

5 FLOWCHART



6 RESULT

After the implimentation of the project the ui predicts the one year life expectancy of a patients undergoing post Thoracic surgery and the Node Red UI provide us simple way to get the result of Auto AI Experiment. The Node Red User Interface can be a web application help the people to be know the approximate predicted life expectancy. With the output of this experiment doctors can successfully determine how the patient's life can be prolonged or saved.

7 ADVANTAGES & DISADVANTAGES

The advantages:

- easy to implement
- fast accessibility
- continuous Improvement
- wide application

The disadvantages:

- lack of security
- loss of control on data
- high error susceptibility
- dependence of networkproviders

8 APPLICATIONS

Lymphatic mapping:

Patients with Stage I lung cancer have a recurrence rate of nearly 40% and the overall 5-year survival rate is just 52%. The high rate of disease recurrence suggests that these patients are frequently understaged and, subsequently, undertreated. By identifying lymph nodes at highest risk for tumour metastasis, SLN mapping helps identify patients who could benefit from adjuvant therapy. Several NP-based molecular imaging techniques have been explored for potential in the mapping of tumour-draining lymph nodes in human cancers. Quantum dots (QDs) have been utilized as lymphatic mapping agents in a porcine model of non-small-cell lung cancer (NSCLC), with favourable properties including appropriate size for lymphatic migration and visible histological fluorescence. More recently, superparamagnetic iron oxide (SPIO) NPs were coupled with magnetic resonance imaging (MRI) to create ultrasensitive nanoprobes for cellular and molecular imaging of various cancers. Notably, SPIO-enhanced MRI technology has been shown to detect tumour metastases in the SLNs of breast, bladder and prostate cancer patients. In a 2011 study of 102 breast cancer patients with clinically negative axillary nodes, SPIO-enhanced MRI achieved almost 90% accuracy in the detection of SLN metastases. These promising results warrant the upcoming investigation of SPIO-enhanced MR imaging as an SLN mapping strategy for lung and esophageal cancer patients.

Image-guided nanosurgery

NP-based technologies possess several properties that enhance imaging of biological targets, including the ability to amplify contrast signal, unique physicochemical characteristics such as magnetic, thermal and pH-responsive phase changes, and the ability to modify pharmacokinetics via alterations in surface chemistry. The development of targeted near-infrared fluorescent (NIRF) and surface-enhanced Raman scattering imaging probes for the evaluation of surgical margins and the real-time intraoperative identification of residual disease is a major focus of recent investigation. These technological advances have been translated to patient care with excellent initial results. Currently, NIRF-image-guided surgery utilizing 5-aminolevulinic acid (5-ALA) generates tumour fluorescence and better tumour visualization in patients with malignant glioma. 5-ALA precursor in the haemoglobin synthesis pathway elicits the accumulation of fluorescent porphyrins in various epithelia and cancerous tissues. Oral administration of 5-ALA leads to preferential accumulation of fluorescent porphyrins within glioma tissue, enabling more complete oncological resection and improved progression-free survival. Ongoing research efforts are focused on the clinical translation of various Raman NPs that can be specifically utilized for NIRF imaging of various solid tumours, including lung cancer. It is anticipated that this technology will improve intraoperative guidance of surgical resection with negative margins in the future. Several investigators have developed triple-modality NP imaging probes for use with a number of cancer imaging modalities, including PET, NIRF and MRI, to allow for preoperative tumour localization and surgical planning. One of the best characterized strategies utilizes MRI-photoacoustic silica-coated Raman NPs . Kircher et al .reported the intravenous injection of Raman NPs into glioblastoma-bearing mice, which leads to intratumoral accumulation and retention for several days. Triple-modality MRI-based photoacoustic imaging was then used to guide intraoperative resection and accurately delineate tumour margins. Ultra-sensitive Raman imaging can be utilized to detect and remove residual microscopic tumour burden. Coupling of high-resolution tissue-penetrating photoacoustic imaging and tumour-homing Raman NPs has potential to enable localization and accurate resection of non-palpable deep parenchymal lung lesions. Such approaches highlight the potential for translation of emerging nanotechnology platforms to thoracic surgery, particularly with the focus of enabling more accurate tumour imaging and improve oncological resection in patients with thoracic cancers

9 CONCLUSION

In this project by using IBM Cloud the model processing is been done in Auto AI services in IBM cloud and then the deployment is been done in Watson studio and application is build using Node red service which has been successful as we are able to get the desired output.

10 FUTURE SCOPE

In this project by using IBM Cloud the model processing is been done in Auto AI services in IBM cloud and then the deployment is been done in Watson studio and application is build using Node red service which has been successful as we are able to get the desired output.

11 BIBLIOGRAPHY

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Colectomy.DisColon Rectum.2019 Apr;62(4):476-482.
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R, Yi F, Hill S, Meyer D, Maykel J, Attalla S, Kochman M, Steele S. A
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obstruction.
1. Curr Probl Surg. 2018 Oct;55(10):394-438.
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the Small Bowel on VideoCapsule Endoscopy.
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Surgeons risk model. JThorac Cardiovasc Surg. 2019 Feb 27. pii: S0022-5223(19)30491
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Morbidity and Length of StayFollowing Hyperthermic Intraperitoneal
Chemoperfusion.AnnSurg Oncol. 2019 Feb;26(2):490-496.

12 APPENDIX

12.1. Source code


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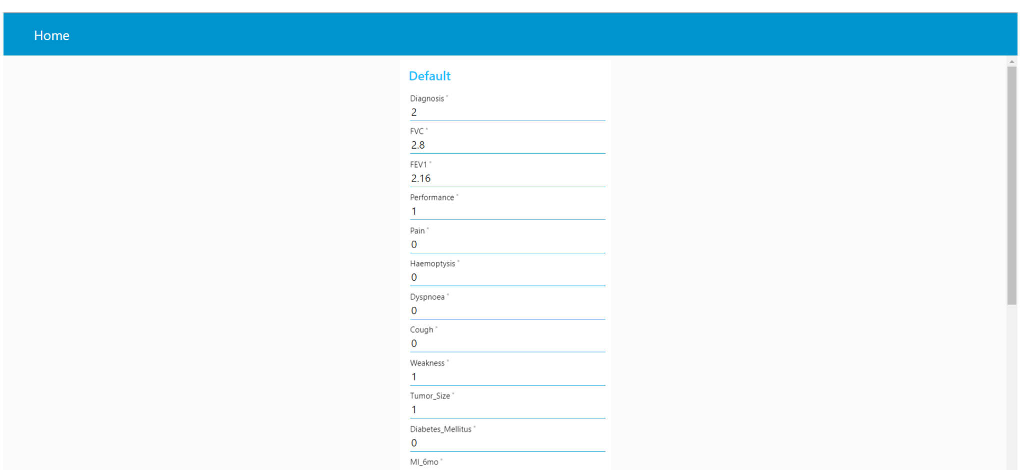
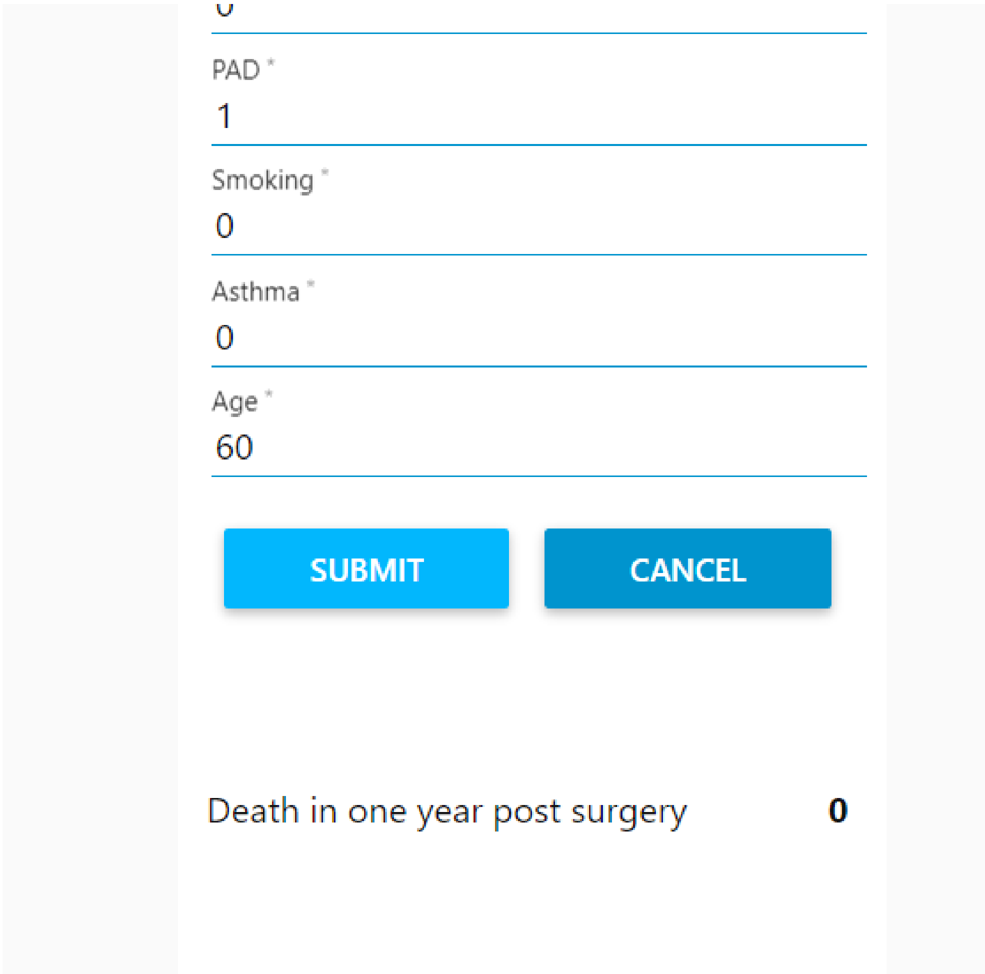
12.2. UI output Screenshot.

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