

Diagnosis Project Documentation

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July 2023

Summary

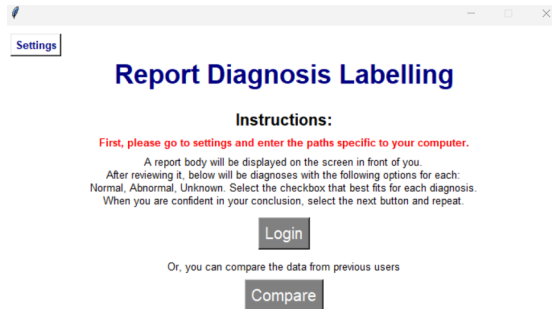
The intention of this project is to allow users to efficiently and consistently label health reports, along with the ability to validate other user's labelling to ensure reliability.

Users can view reports easily and select the corresponding labels. All data is saved to allow users to return and pick up reviewing where they left off. Multiple users can also use this program, in fact they are encouraged to as their labelling can then be compared to ensure that labels are correct and consistent between multiple reviewers. Data used to train artificial intelligence should be as accurate as possible as training a model on incorrect data can lead to faulty functionality and inaccurate results.

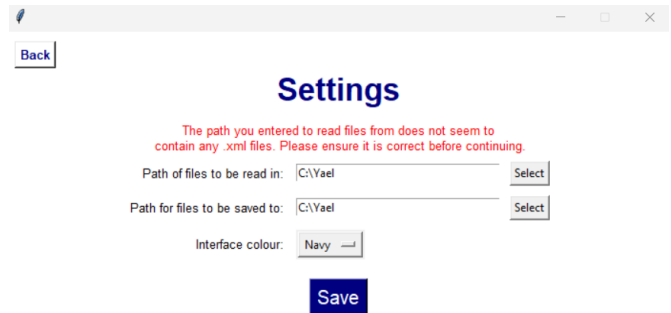
Instructions

0.1 Settings

Upon opening the application, the user first sees the login page (Figure 1). Before they can login though they must first enter the paths where their XML files should be read from and where the corresponding JSON output files should be saved too. The user may also change the colour of the interface if they wish (Figure 2).



(a) Figure 1: Main Screen



(b) Figure 2: Settings

Both of the paths entered must be valid path, i.e. must exist on the user's computer. The path entered (or selected) for the 'file in' option must lead to a folder containing XML files otherwise an error will be displayed. When selecting the folder path, the user may either type a path in, or select it from the list of folders using the select button.

Once the user has entered valid paths, they may return to the login screen wherein they are now given two options: 'Login' and 'Compare'.

0.2 Login

If the user selects 'Login', they are prompted to enter a username. If they have previously used the application their username will be saved, so users should use the same username for each login preferably.

Login

Please enter your username below:

Entering your username will allow you to resume previous activity if you wish.
If you do not have an existing username, enter a new one and it will be saved for future reference.

user

Submit

(c) Figure 3: Login Page

0.2.1 Labelling

Having entered and submitted their username, the user is then brought to the labelling screen:

Report Body

Diagnoses

Back File: 1/50000

	Positive	Negative	Uncertain
Atelectasis	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Cardiomegaly	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Consolidation	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Edema	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Enlarged Cardiomeastinum	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Fracture	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Lung Lesion	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Lung Opacity	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
No Finding	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pleural Effusion	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Pleural Other	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Pneumonia	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Pneumothorax	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
Support Devices	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>

Previous Next Finish

(d) Figure 4: Labelling Page

This screen is split in two: the left side displays an XML report from the selected folder (redacted here), and the right side shows a list of diagnoses arranged in the following columns: positive, negative and uncertain.

N.B. The diagnoses in the image are the default labels. If the user wants to add more labels or change them to more suitable labels for their purpose, they may include a .txt file in the same folder as the application named '*diagnoses.txt*' which will be read in and displayed instead.

The displayed report text is conveniently highlighted to make labelling as easy and efficient for the user a possible. An example of this is below:

The cardiodynamic contours are within normal limits. No collapse, consolidation, pleural effusion or pneumothorax. Within the limitations of plain film no suspicious pulmonary nodule or mass identified. No destructive bony lesion.

(e) Figure 5: Example Report Text

Any instance of a diagnosis within the report text is highlighted in green and any mention of the word 'no' is highlighted in red with the intention of making negative diagnoses clear (e.g. if you see **consolidation** as above you might check that label as positive when in fact there's actually **no consolidation**).

The user should read carefully through the report text, then go through each diagnosis on the right and either leave it as uncertain if it isn't mentioned, mark it as positive if the report states that it was diagnosed, or mark it as negative if the report says that there was no detection of that ailment. By default every diagnosis is set to uncertain other than the 'No Finding' option which is set to positive since this is the state a file should be in if no conclusions are drawn in the report.

0.2.2 Finishing

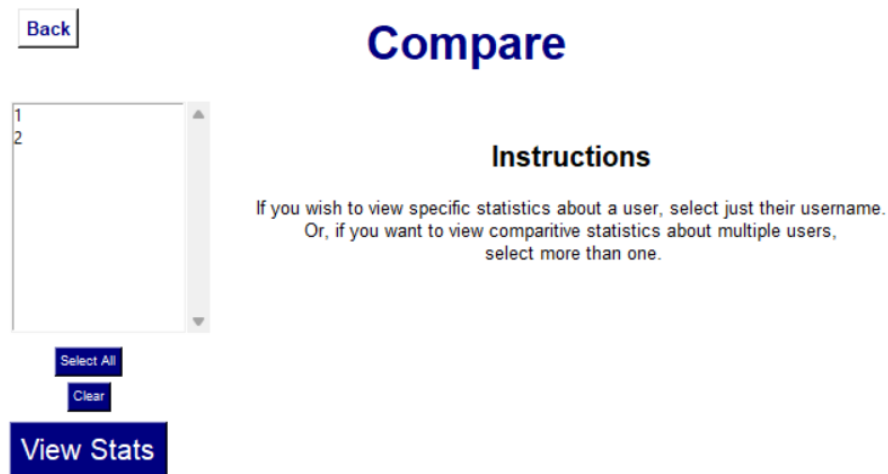
At the top the users progress is displayed. If they close the application and return, under the assumption they use the same username, they can continue from where they left off as previously mentioned.

Once the user has reviewed the files they wish to they can select finish, which gives them the option to either return to the home page or close the application.

0.3 Compare

As well as the option to login with a username and review reports, users also have the choice to compare the labelling done by other users to check it for disagreements. This option is only available when there is data from previous users saved, for obvious reasons.

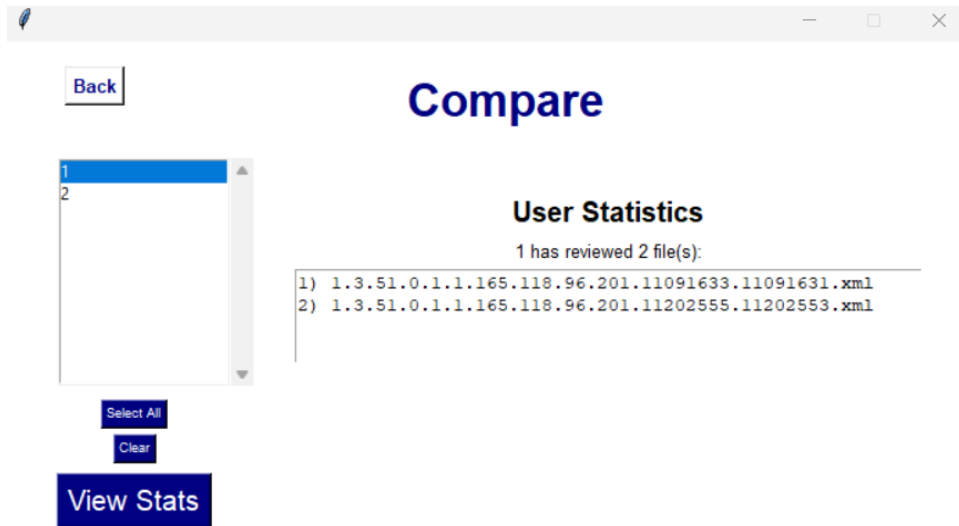
If on the main screen the '**Compare**' button is selected instead of logging in, the user is sent to a screen on which then can view all the previous users:



(f) Figure 6: User Selection Screen

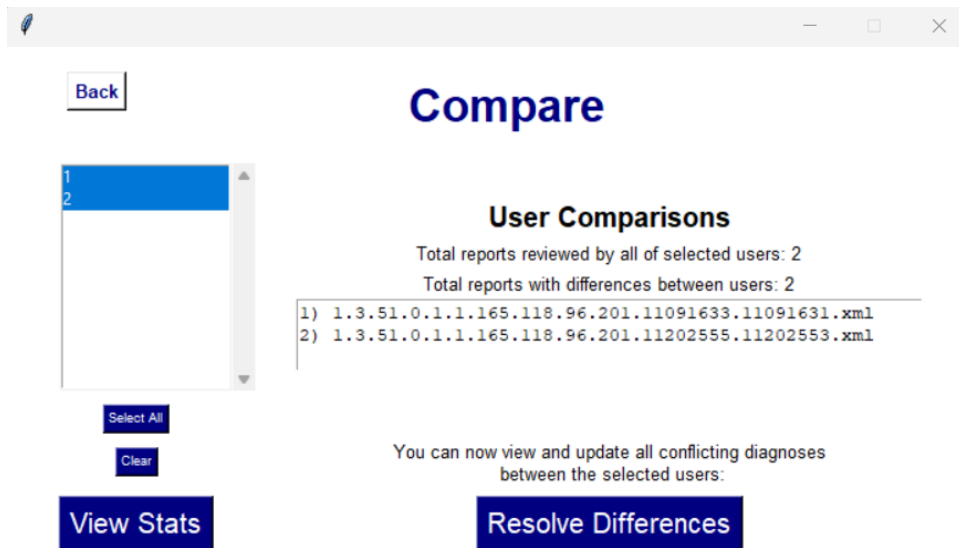
There are two options within this screen:

1. The user can select **one** username from the list provided. If they do so, they can view the number of files that user has reviewed and a list of the names of those files.



(g) Figure 7: Single User Selected

- The user can also select **more than one** username from the list. If this is the case, displayed on the screen will be the total number of files reviewed by the selected users (i.e. the number of files that **all** selected users have reviewed: the intersection) and the number of those files that contain conflicts between the users.



(h) Figure 8: Multiple Users Selected

If more than one user is selected and there are any conflicts between them, the user then has the option to resolve these differences, as seen in Figure 8. This then sends them to a screen much like the previous labelling screen, except this time the conflicts between users is displayed and must be resolved before they continue.

Report Body

Back
File: 1/2

Anonymised Id: 16194
Reason For Study: ^XR Chest General
Study Description: XR Chest
Study Instance UID: 1.3.51.0.1.1.165.118.96.201.11091633.11091631
Study Date: 2020-01-20
Study Time: 14:12:23

UMRN: A9510380 Surname: XXXXXXXX
Request #: F2001150022 Given Name(s): XXXXXX XXXXX
Ref Location: FSURO Date of Birth: 01/06/1952 (67)
Exam Date: 15/01/2020 Reported Date: 15/01/2020 09:52
Referred By: MUHAMMAD AKHLIL ABDUL-HAMID
Ref Address: FIONA STANLEY HOSPITAL : 11 ROBIN WARREN DRIVE # MURDOCH 6150
MURDOCH 6150
XR Chest
Clinical Notes:
Right nephrectomy for RCC. Low risk followup.
Findings:
The cardiac, mediastinal and hilar contours are normal. The lungs are clear.
Dr RONNY LOW
Reviewer:
Report Status: Validated

Diagnoses

	Positive	Negative	Uncertain
Atelectasis	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cardiomegaly	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Consolidation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Edema	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Enlarged Cardiomedastinum	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Fracture	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Lung Lesion	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Lung Opacity	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
No Finding	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pleural Effusion	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Pleural Other	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pneumonia	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Pneumothorax	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Support Devices	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Previous
Next
Finish

(i) Figure 9: Resolving User Conflicts

The report text is again displayed, and any labels that are not consistent between users are highlighted in red so the user can easily identify and rectify them. The user can go through as many files as they want to review and consolidate any discrepancies.

Once they have finished, they can select the 'Finish' button. This will produce a JSON file with the report body and the verified labels which can then be used as input to an AI model, which is the goal of this project.

```

Final_Diagnoses_1.3.51.0.1.1.165.118
File Edit View
{
  "Input":
  "*****",
  "Output": {
    "Atelectasis": "Uncertain",
    "Cardiomegaly": "Uncertain",
    "Consolidation": "Negative",
    "Edema": "Negative",
    "Enlarged Cardiomedastinum": "Uncertain",
    "Fracture": "Uncertain",
    "Lung Lesion": "Uncertain",
    "Lung Opacity": "Uncertain",
    "No Finding": "Positive",
    "Pleural Effusion": "Uncertain",
    "Pleural Other": "Uncertain",
    "Pneumonia": "Uncertain",
    "Pneumothorax": "Negative",
    "Support Devices": "Uncertain"
  }
}
Ln 2, Col 85 100% Windows (CRLF) UTF-8

```

(j) Figure 10: Example JSON Output (report data redacted)