

DETECȚIA TUMORILOR DIN VEZICA URINARĂ CU AJUTORUL UNUI ASISTENT AUTOMAT

Team members

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Moisuc Naomi, Software Engineering, 258

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ECHIPA NOASTRA - PINGUINII GALACTICI



NAOMI MOISUC

Frontend



ROBERT JUGARU

Frontend



MADALINA MIRCEA

Backend

CUPRINS

01

METODA PROPUSA

Modele inteligente,
arhitecturi

02

BACKEND

Flow, baza de date,
endpoint-uri

03

EXPERIMENTE SI REZULTATE

Seturi de date, IOU, DSC

04

FRONTEND

Website-ul propus



INTRODUCTION



INTRODUCTION

- **Cancer de vezica → foarte des intalnit, mortalitate mare**
- **Mortalitatea creste cu stadiul → diagnosticarea rapida poate salva viata pacientului**
- **Inteligenta artificiala poate automatiza procesul diagnosticarii**
- **Abordarea noastra → client (Angular) - server (Python)**
- **Imagini medicale → format NRRD**

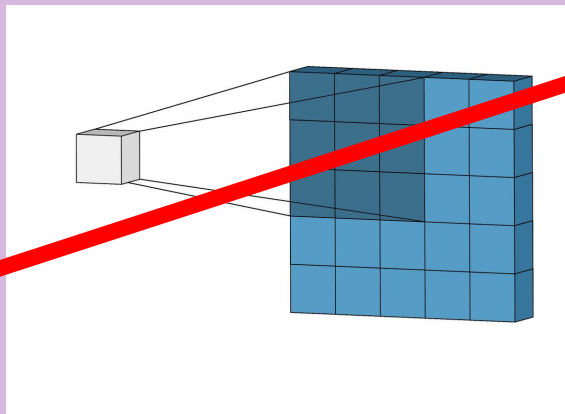
01

**METODA
PROPUSA**



MASK-RCNN

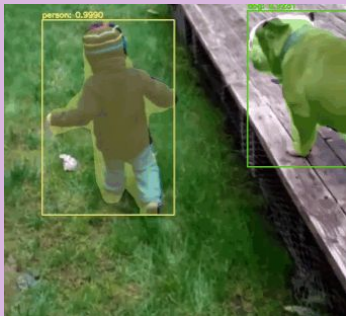
- CNN – rețele neuronale convolutive □ state-of-the-art in clasificare de imagini



DOG



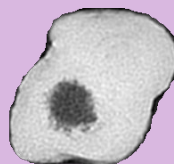
MASK-RCNN



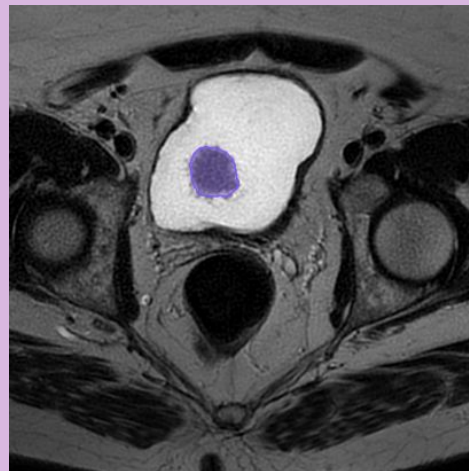
- **Mask-RCNN** □ segmentare a zonei de interes
- **CNN** □ **RCNN** □ **Fast RCNN** □ **Faster RCNN** □ **Mask RCNN**



Model 1



Model 2



02

SERVER



DETECTRON2 DE LA FACEBOOK

- State-of-the-art, robust, efficient



Detectron2

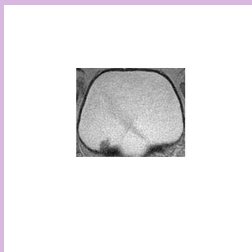
Detectron2 is Facebook AI Research's next generation software system that implements state-of-the-art object detection algorithms. It is a ground-up rewrite of the previous version, [Detectron](#), and it originates from [maskrcnn-benchmark](#).



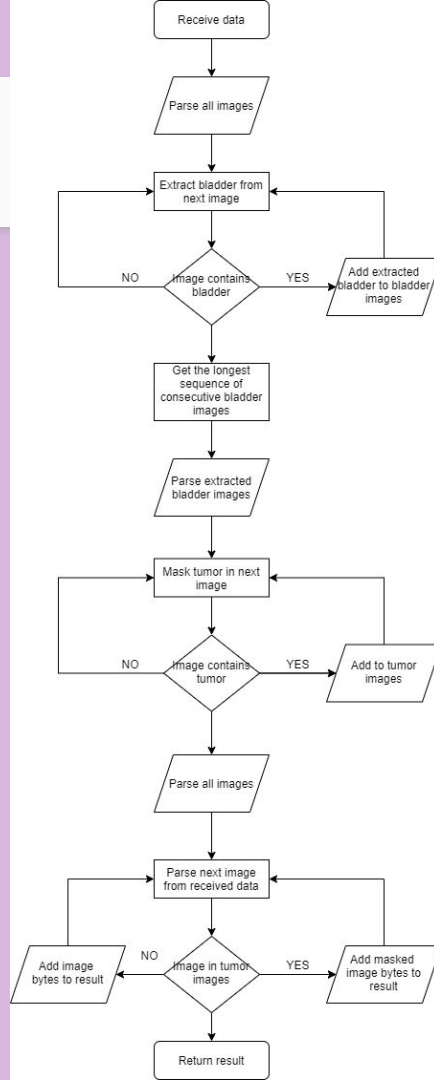
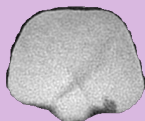
BACKEND FLOW

- Python □ cel mai popular limbaj pentru AI

- Metoda 1 □ dreptunghi



- Metoda 2 □ segmentare










COMUNICARE CLIENT-SERVER

- **JSON** □ e.g. {« code »: 200, « error »: « », « result_bytes »: [...]}
- **Endpoints:**
 - **analyse_image_server**
 - **get_user_history**
 - **get_record_images**
 - **login**
 - **register**



BAZA DE DATE

Users			
	UserID	uniqueidentifier	
	Email	nvarchar	
	Password	nvarchar	
 Add field			



HistoryRecords			
	RecordID	uniqueidentifier	
	UserID	uniqueidentifier	
	ImageName	nvarchar	
	ImageDate	nvarchar	
 Add field			

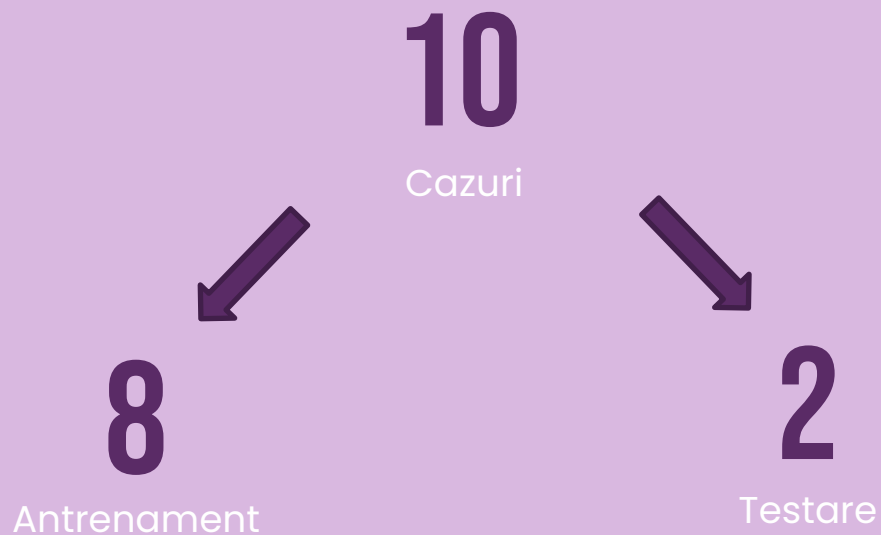
03

**EXPERIMENTE
SI REZULTATE**

SETURI DE DATE



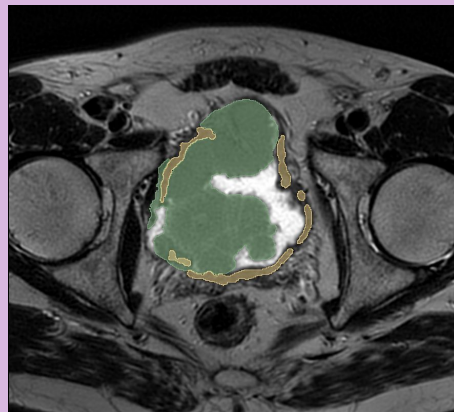
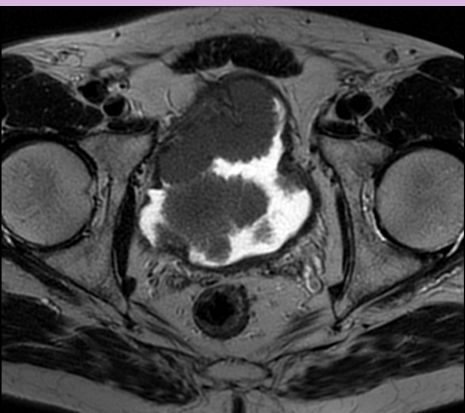
- Fisiere de la un spital din Cluj



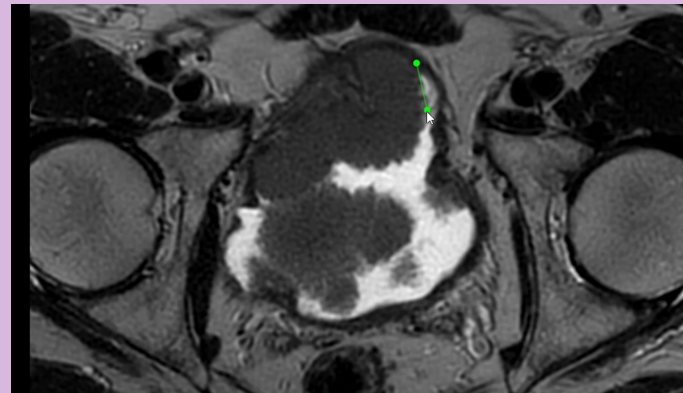
SETURI DE DATE



**Segmentate de
medici experti**



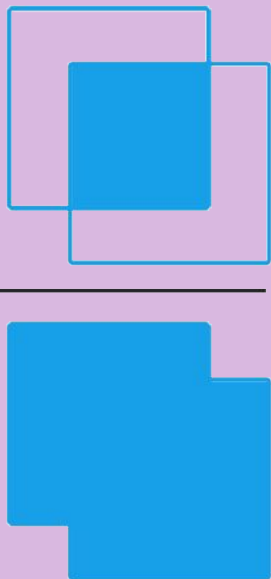
**Re-segmentate
cu labelme**



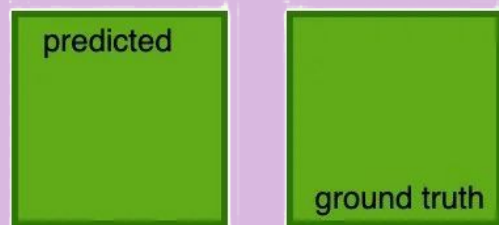
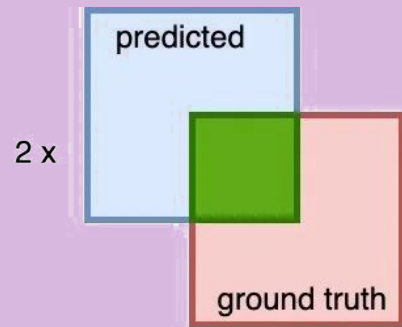


INDICI DE PERFORMANTA

$$\text{IoU} = \frac{\text{Area of Overlap}}{\text{Area of Union}}$$



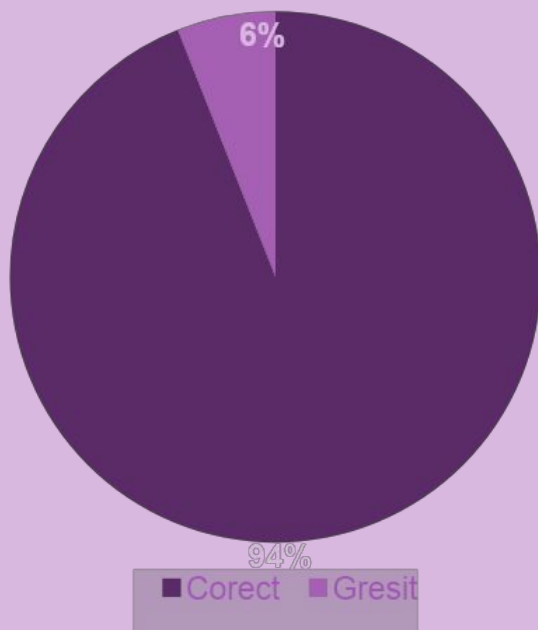
$$\text{Dice coefficient} = \frac{2 \times \text{area of overlapped (green)}}{\text{total area (green)}} =$$



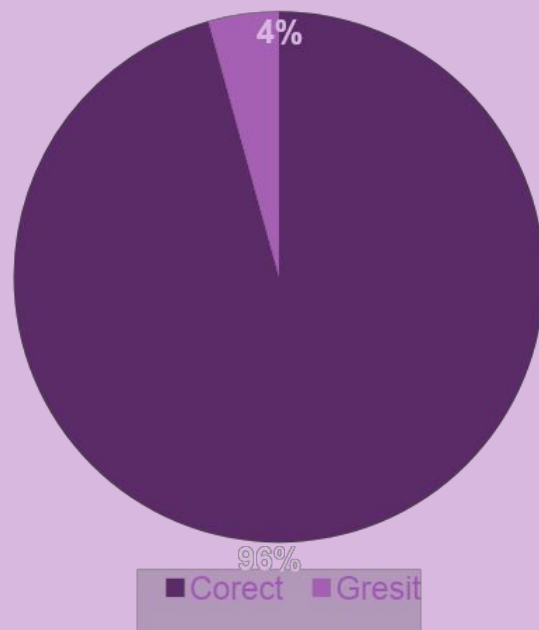


REZULTATE PENTRU SEGMENTAREA VEZICII

IOU



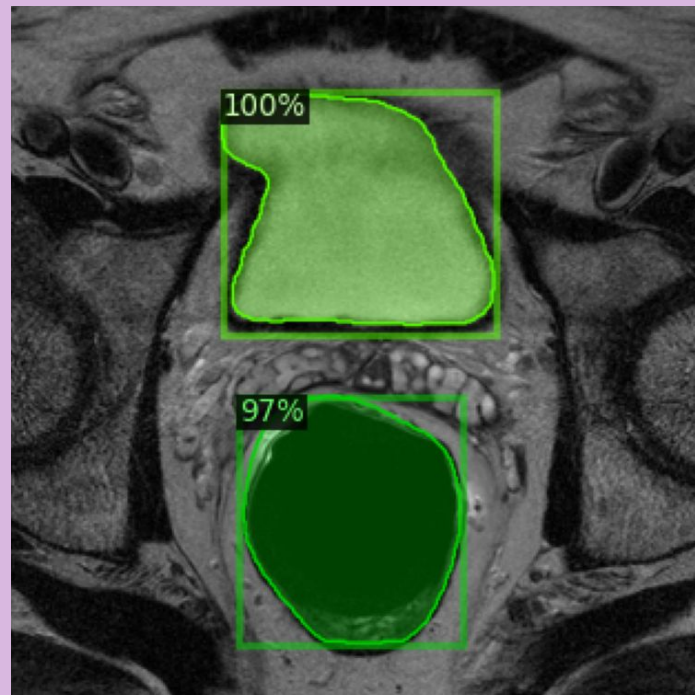
DSC





REZULTATE PENTRU SEGMENTAREA VEZICII

- **Problema:** algoritmul segmenteaza doua vezici
- **Solutia:** returnam doar segmentarea cu procentul de incredere mai mare

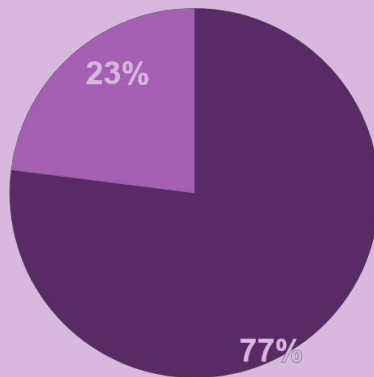




REZULTATE PENTRU SEGMENTAREA TUMORII

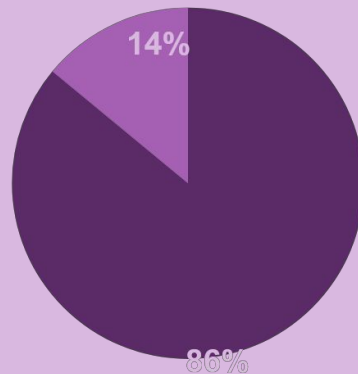
- **Metoda 1**

IOU



■ Corect ■ Gresit

IOU fara primele si
ultimele slice-uri



■ Corect ■ Gresit

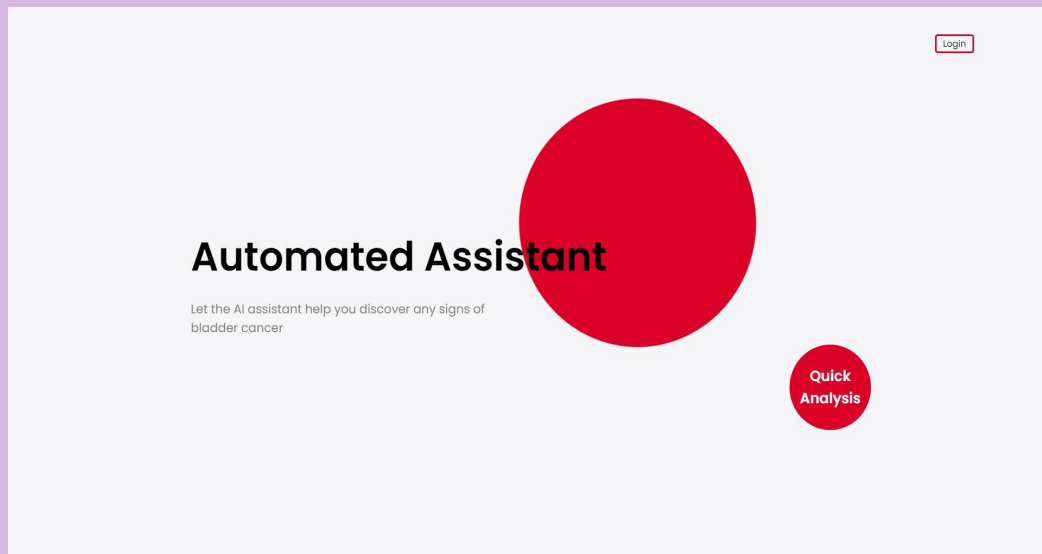
- **Metoda 2** □ creste cu 5-10%

04

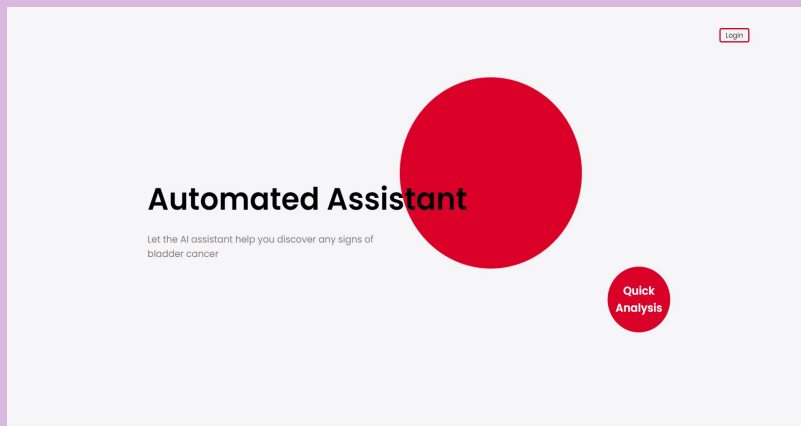
FRONTEND



WEBSITE-UL PROPUȘ

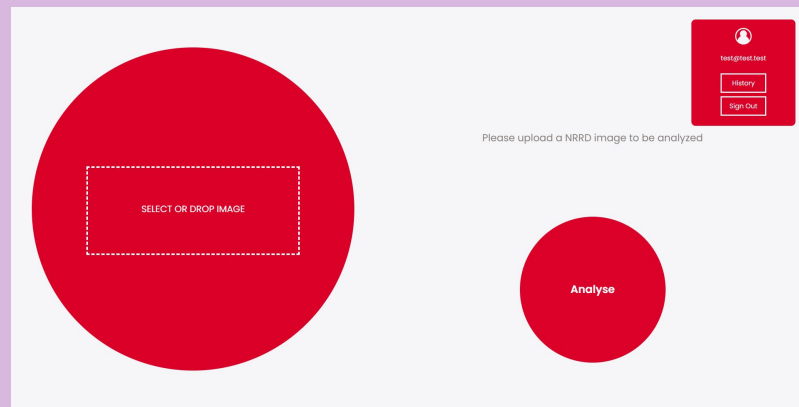


- **Framework – Angular**
- **Design minimalist**
- **Culori și fonturi vibrante**
- **Animații pentru îmbunătățirea experienței utilizatorului**



← **Landing Page**

Încărcarea imaginilor pentru analiză →

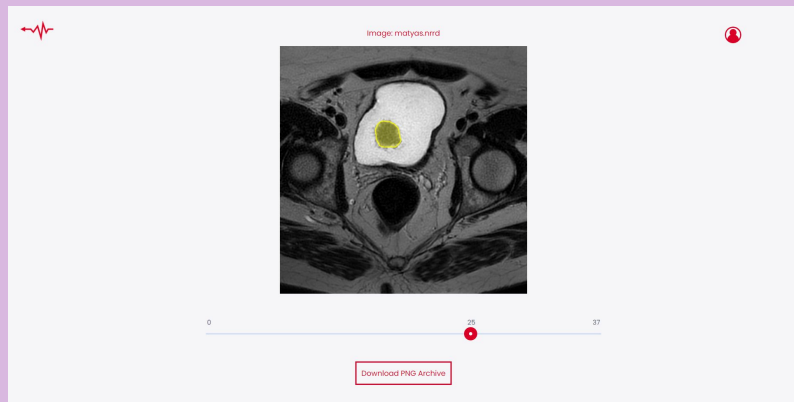


A white login form titled "LOGIN" with a red pencil icon in the top right corner. It features two input fields labeled "Email" and "Password", and a "GO" button at the bottom. The form is set against a grey background with a subtle geometric pattern.

← Login

Register →

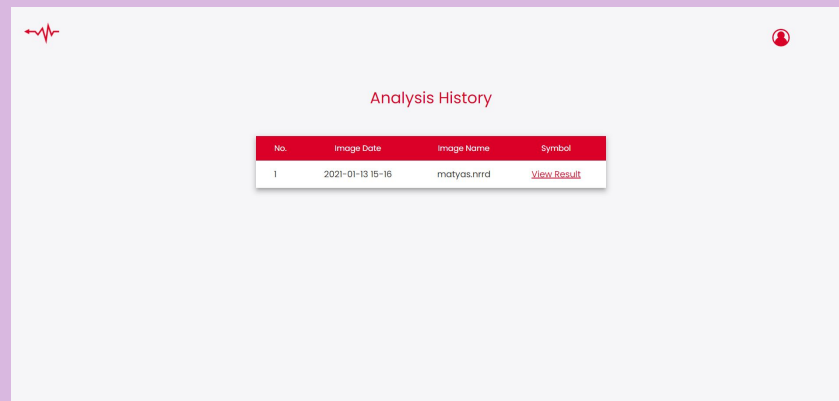
A red register form titled "REGISTER" with a close button (X) in the top right corner. It features three input fields labeled "Email", "Password", and "Repeat Password", and a "NEXT" button at the bottom. The form is set against a grey background with a subtle geometric pattern.



Istoricul Utilizatorului



Vizualizarea Rezultatului





DEMO

OPINIA POTENTIALILOR CLIENTI



TESTIMONIALE



DORU, MEDIC, SPEAKER

A fost foarte intuitiv să creez contul de utilizator. Câmpurile de încărcare a imaginilor și de start al analizei sunt foarte evidente. Îmi place cursorul de navigare prin rezultat care se mișcă atât cu mouse-ul cât și cu tastele de săgeți. E bine că se pot descărca imaginile. Secțiunea "history" din contul de utilizator e foarte utilă și ușor de găsit.

IOANA, MEDIC

Hey! Am folosit aplicatia, eu zic ca are potential si mi-as dori sa continui sa o perfectionezi :) Nu este domeniul meu de expertiza, ca sa iti dau un feedback valoros, dar ca simplu utilizator, pot sa iti spun ca mi-am creat contul usor si imi place designul pe care l-ai folosit. Mi s-a incarcat relativ repede si la fel de repede am downloadat imaginile. Nu imi dau foarte bine seama ce inseamna codurile de culoare albastru-verde pe care le-ai folosit pentru tumora.

Cred ca ar trebui adaugate informatii sau posibilitatea de a colecta informatii referitoare la dimensiune. Adica user-ul sa poata puna cursorul in anumite puncte si sa obtina informatii instant despre dimensiunile care il intereseaza (asa cum face ecocardiograful, de exemplu).

TESTIMONIALE



DORU, MEDIC, SPEAKER

A fost foarte intuitiv să creez contul de utilizator. Câmpurile de încărcare a imaginilor și de start al analizei sunt foarte evidente. Îmi place cursorul de navigare prin rezultat care se mișcă atât cu mouse-ul cât și cu tastele de săgeți. E bine că se pot descărca imaginile. Secțiunea "history" din contul de utilizator e foarte utilă și ușor de găsit.

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Possible Correction → use one color

imaginile. Nu imi dau foarte bine seama ce inseamna codurile de culoare albastru-verde pe care le-ai folosit pentru tumora.

Cred ca **Possible improvement** informatii sau posibilitatea de a selecta informatii referitoare la

dimensiune. Adica user-ul sa poata puna cursorul in anumite puncte si sa obtina informatii instant despre dimensiunile unei tumori (asa cum face ecocardiograful, de exemplu).

The background of the image is a solid light purple color. It features two large, dark purple, wavy shapes that resemble stylized hills or clouds. One shape is in the upper right corner, and the other is in the lower left corner, both curving towards the center.

VA MULTUMIM!

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