TUMOR DETECH

TEAM YALLAH

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19 million

New Cases
of cancer in 2023

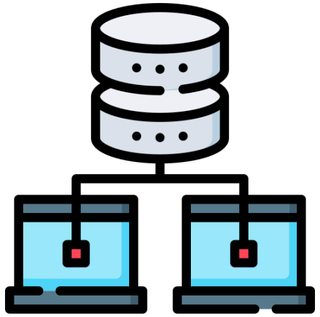
10 million

Deaths
of cancer in 2023

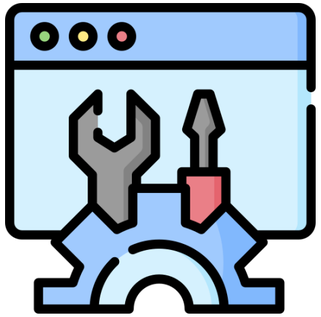
The 5-year survival rate for localized breast cancer is
99%, compared to 30% for distant-stage cancer

Current state of tumor growth prediction algorithms

Inaccurate models



Small and isolated datasets



Lack of standardized, accessible tools

120 Million mice and rats used for biomedical research every year

Imagine if we could...

standardized, **accessible** and **animal-free**

Connect labs across the world

Largest algorithm for tumor growth prediction in history

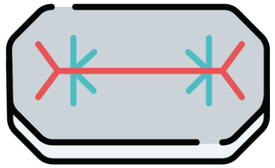
TumorDeTech

TumorDeTech is the project that allows labs across the world to study cancer tumor growth in a standardized way and share data to create the **largest open algorithm for tumor growth prediction**

4 Key Components

POSICS camera

POSICS is a cheap, small camera that allows for high accuracy, real-time monitoring of tumor growth
Accuracy: <0.5 mm vs 4mm currently

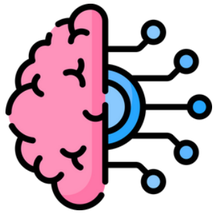


Organ-on-a-chip

OOC emulates human ecosystem artificially allowing for standardized **animal-free testing**

Open Innovation

Our platform connects labs and makes the ML algorithm open source, fostering transparency and collaboration



Tumor Growth Predictor

Large ML model trained on data from all labs and made available to labs in the program. Algorithm remains open source

How does it work?

01 **Research Labs Apply**

02 **Receive Research Camera**

03 **Study tumor growth**

04 **Data Collection**

05 **Predictive Algorithm**

01 **Research Labs Apply**

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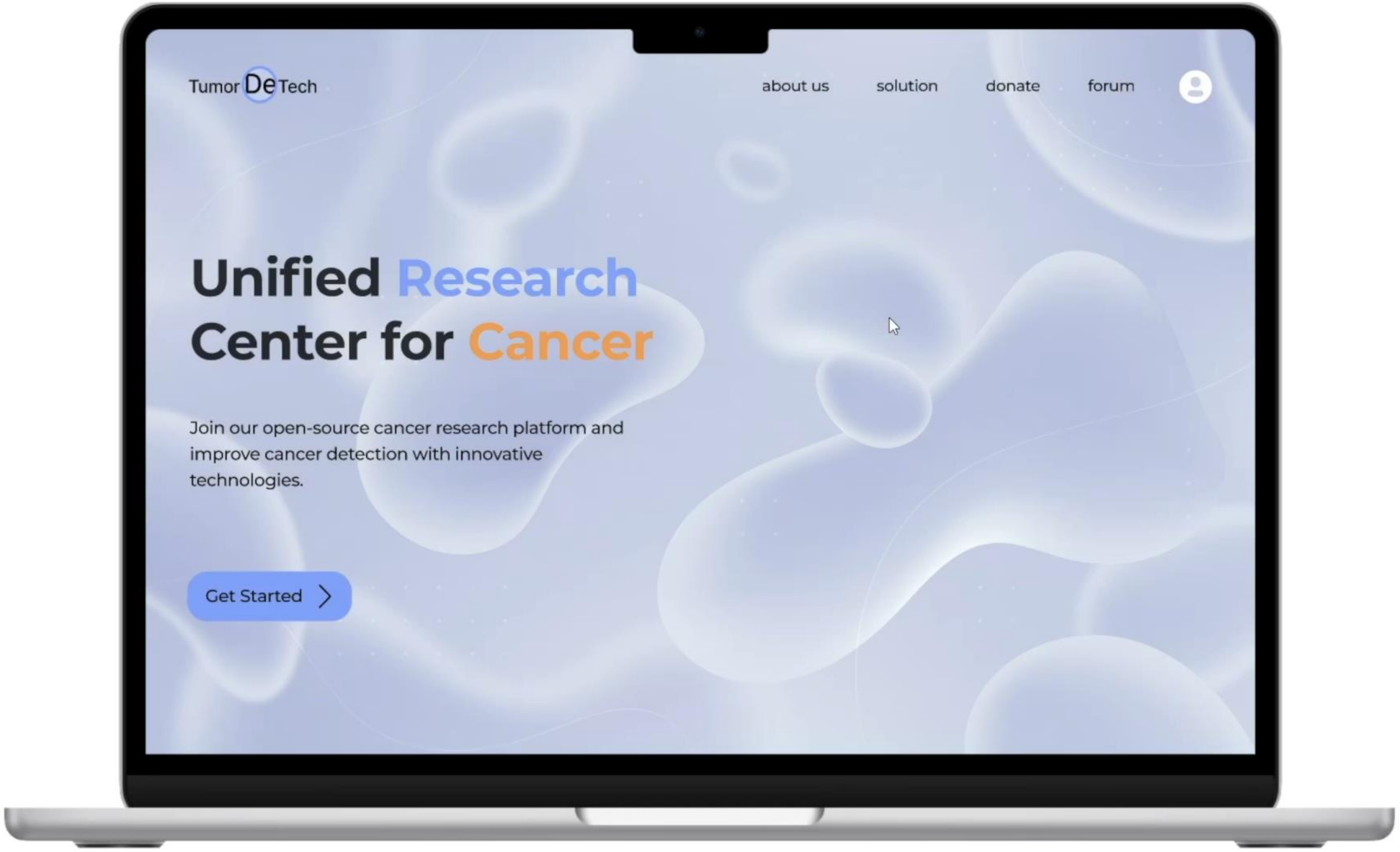
05 Predictive Algorithm



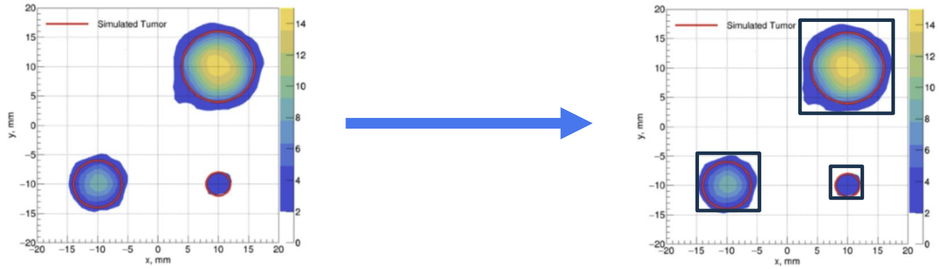
2 Main Neural Networks

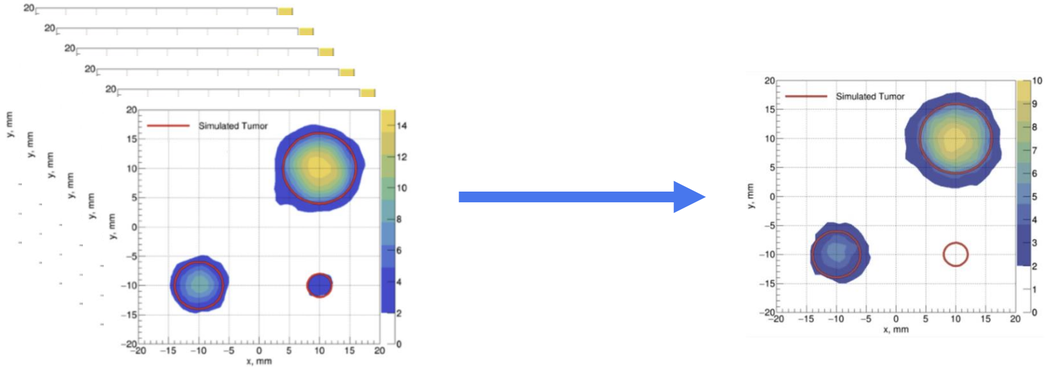
TUMOR DETECTION

GROWTH PREDICTION

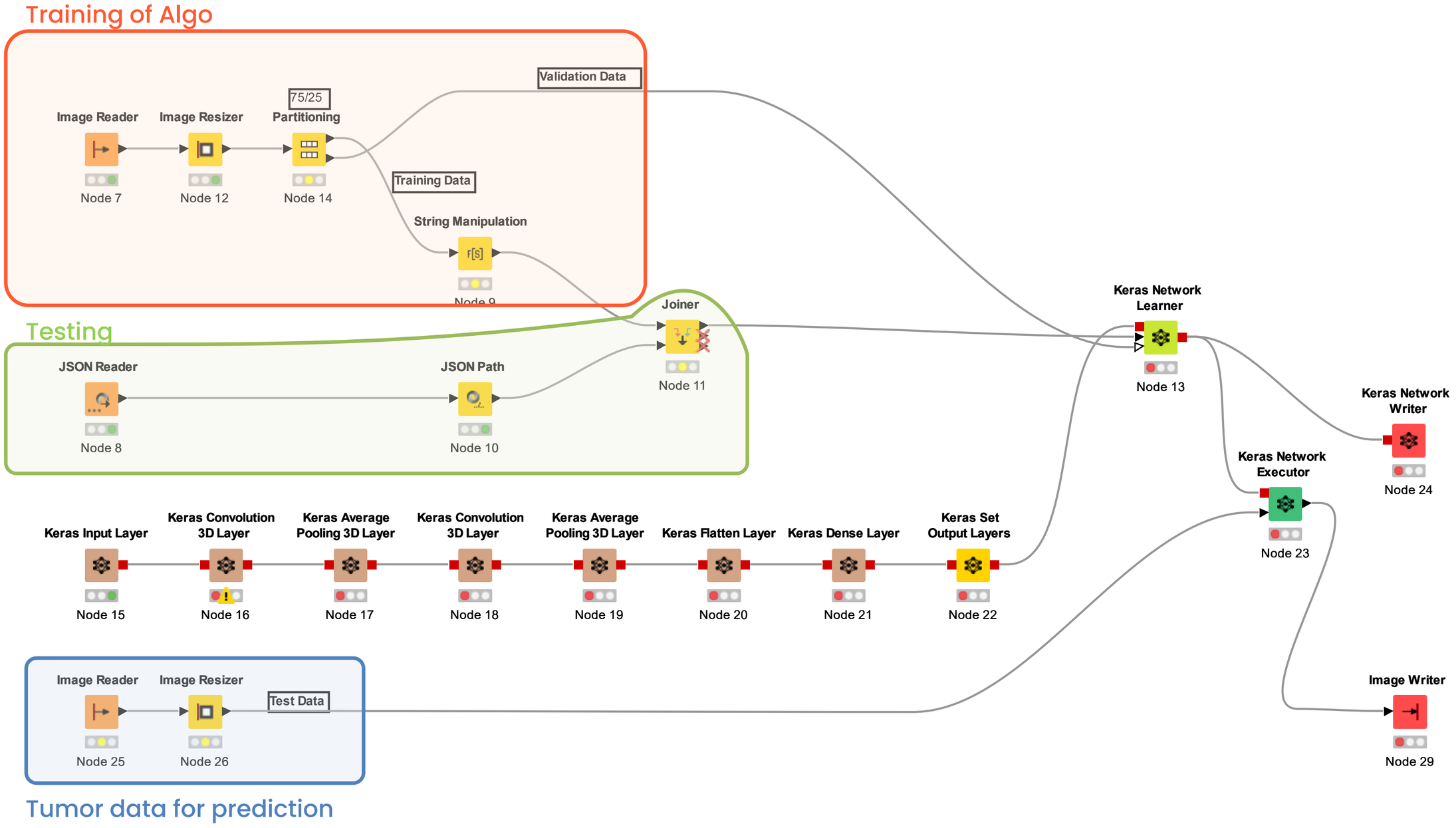
Given a POSICS image, detect and square the object (tumors)

Given **n** input images, predict and output the **n+1**

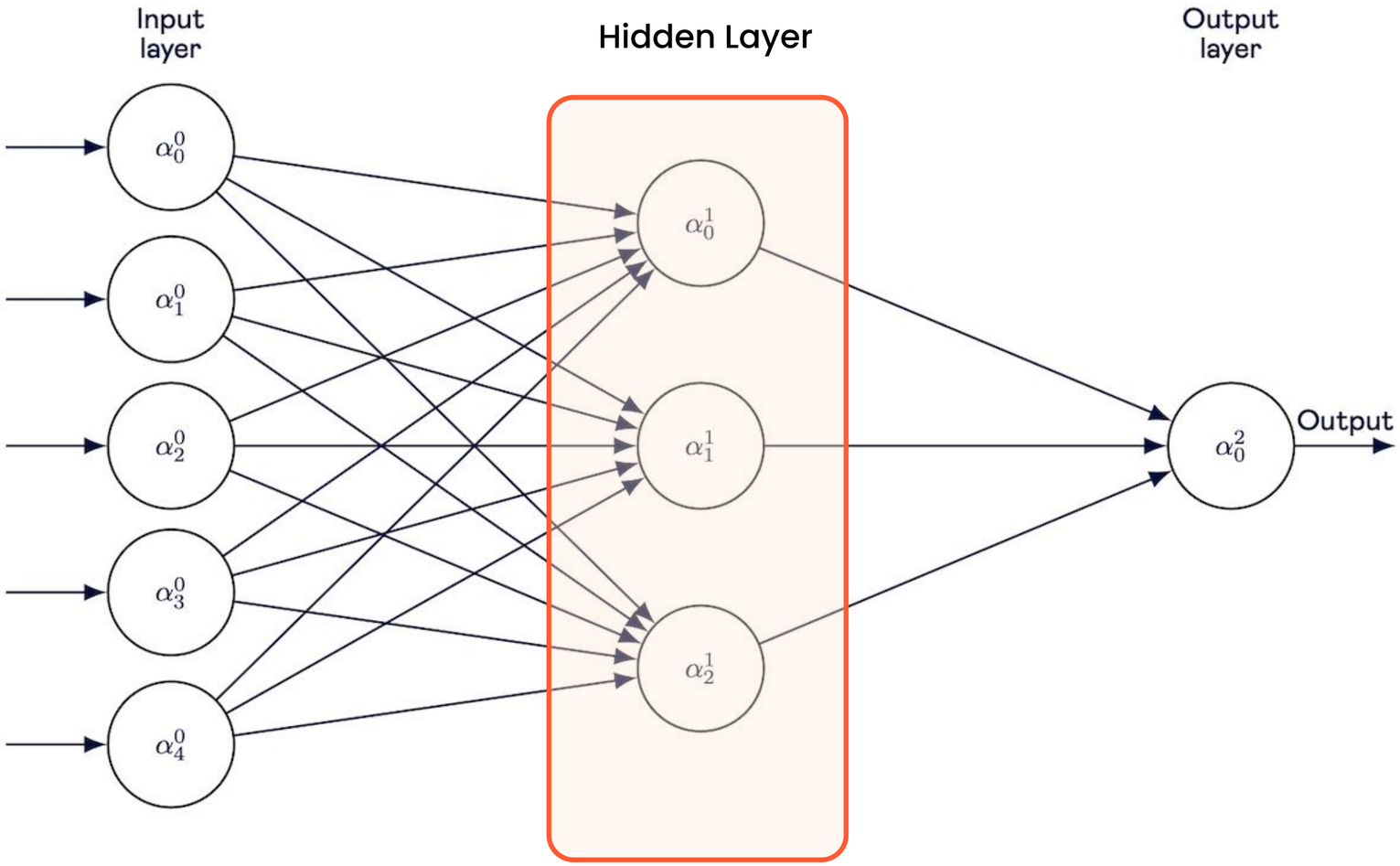




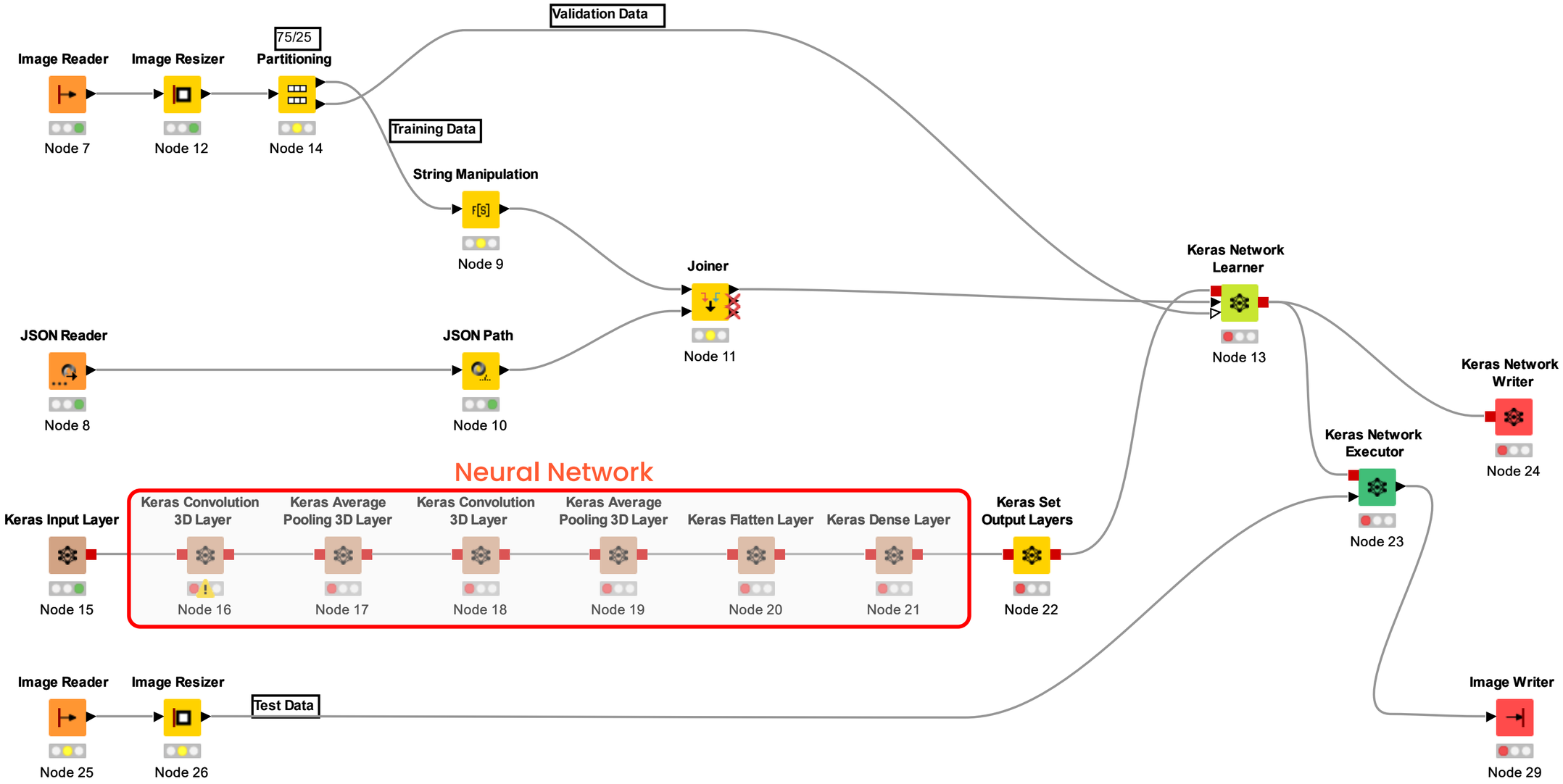
Neural Network Architecture



Neural Network Architecture



Improving our model with Random Power

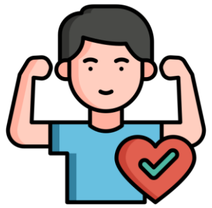


Impact of the Algorithm?

Research centers can **test drugs** and speed up the finding of **cancer solution**

Early Detection and Intervention

Create **personalized** drugs for patients



Reducing the need of aggressive treatments and save **resources**

Yallah Team

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Prototyping

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UI & UX Design

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UI & UX Design

Gabriel Marí

Business & Tech

Mattia Vanzini

Business & Tech

Marçal García

Tech & Engineering

“thx for saving me and my peers”

Greg

APPENDIX

SDG9 impact

Research & Development

TumorDeTech facilitates the development of new treatments, diagnostic tools, or preventive measures for cancer to improve the overall health infrastructure.

Infrastructure development

By implementing new technologies to develop the infrastructure which includes laboratory facilities and equipment

fostering research and innovation capacity, and on the other hand, it covers the SDG9 goal which is building resilient and sustainable infrastructure.

Access & affordability

TumorDeTech can help address the issue of access and affordability of cancer treatments since it reduces the costs and increase efficency.

Our Research Process- Interviews

Domenico della Volpe

Problem: the need to control parameters such as light and humidity, as well as the density of samples.

Posics limitation: limited in accuracy due to the use of technetium, which emits gamma rays and requires a 1mm x 1mm crystal.

The density of tumor cells in the samples needs to be determined. Creating larger samples with OOC can help achieve this. Posics can also work with dyes, allowing real-time detection and tracking of tumor evolution.

Miquel Gratacos

The use of 3D technologies, particularly organs-on-chips, provides a more realistic representation of human physiology compared to 2D cultures.

Cancer cells are fast and easy to cultivate and grow, multiplying rapidly. However, using certain techniques such as ink or MTT assays can render the samples useless.

Growing cancer cells in 3D cultures takes longer, around 3 months, but offers improved reliability compared to 2D cultures. The main goal is to re-use the samples, as cancer cells are expensive.

Carina Marí

Gamma imaging requires balancing proximity for accuracy and field of view. Photomics focuses on extracting predictive information from images locally.

In-vivo imaging is more accurate than ex-vivo imaging.

Obtaining post-treatment images for assessing effectiveness can be time-consuming, taking nearly an hour.

Ensuring Data Privacy

Compliance and Best Practices

Key Laws

Health Insurance Portability and Accountability Act (HIPAA)

General Data Protection Regulation (GDPR):

Our Approach

01 Informed Consent

We ensure all data shared with us is accompanied by informed patient consent, per HIPAA and GDPR requirements

02 Data Anonymization

We implement anonymization techniques to protect patient identities, reducing the risk of re-identification.

03 Data Encyrption

We employ strong encryption methods during data transfer and storage to ensure data security.

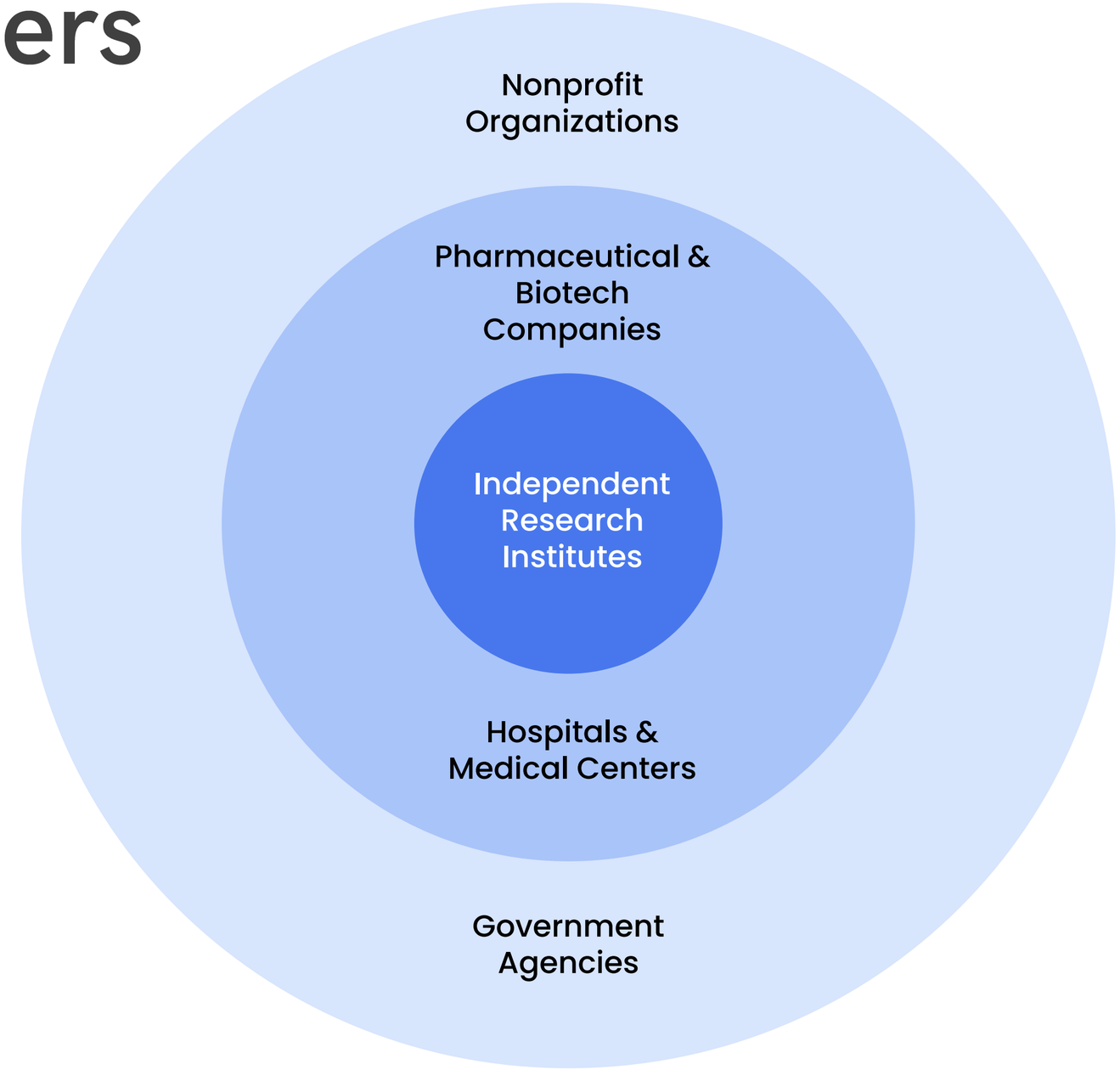
04 Access Control

We restrict data access to authorized personnel only, implementing role-based access control (RBAC) and regular audits.

Explanation of Posics Camera and benefits

Explanation of organ-on-a-chip and its benefits

Stakeholders



User personas

PERSONA 1

SARAH

- 59 years old
- female
- retired teacher
- heavy smoker

About Serah

Sarah has stage III lung cancer, which has spread to her lymph nodes. She is currently undergoing tests to see what treatment she should take.
As part of her treatment, the doctors have to monitor the size and location of the tumor. The data obtained from the scans is analyzed to identify any hidden patterns and anticipate changes and evolution of the tumor.

lung cancer

effects cells in the lungs

Smoking is the biggest risk factor for lung cancer, accounting for up to 85% of cases.

The two main types of lung cancer are non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC).

Symptoms of lung cancer can include a persistent cough, coughing up blood, shortness of breath,and unexplained weight loss.

Diagnosis usually involves imaging tests such as chest X-rays or CT scans, as well as a biopsy to examine the cells for signs of cancer.

Options of the treatment include surgery, radiation therapy, chemotherapy, targeted therapy, or immunotherapy.

Stage three cancer refers to a cancer that has spread beyond its original location to nearby tissues or lymph nodes but has not yet spread to distant parts of the body.

In stage three lung cancer, the cancer may have spread to lymph nodes in the chest or to nearby tissues, but it has not yet spread to other parts of the body.

Goals

manage her cancer illness

receiving data to predict her upcoming stages

Pain Points

suffering from fatigue and cancer symptoms

anxious about the upcoming stages, the spread of cancer, and how much the tumor might grow

Challenges

coping with the unknown of stages of her upcoming stages of her cancer illness

keeping track of her data and the analysis for her journey

Needs

access to resources that would help her keeping track of her journey

Serah needs to stay up-to-date about her tumor growth and tracking the improvement with the meds she is taking

User personas

PERSONA 2

John

- 43 years old
- male
- businessman

About John

John is struggling with his early stage of kidney cancer, yet he is determined to take control of his life and not ruin his daily routine. He understands the importance of predicting his upcoming stages and he is willing to invest in new technologies for his treatment such as Organ on a chip (OOC). John needs a treatment that is both, cost-effective and time-efficient. John is willing to put the effort to maintain his life and look for treatment options that align with his values, healthy and personal life.

Kidney cancer

effects cells in the kidney, but the early stage has not spread to nearby organs and lymph nodes

it is often asymptomatic, meaning there may be no symptoms in the early stages.

usually diagnosed through imaging tests such as ultrasound, CT scan, or MRI, or by biopsy.

Treatment options for early stage kidney cancer include surgery to remove the tumor and/or the entire kidney.

Patients with early stage kidney cancer generally have a good prognosis, with a five-year survival rate of around 80%.

there is still a risk of recurrence and patients will require regular monitoring and follow-up care.

Goals

detect and monitor the progression of his kidney cancer at an early stage

to find more cost-effective and time-efficient treatment option

Pain Points

now, he is suffering from financial problems, as he is concerned about the costs for his treatment

struggling to find balance between his work and family and his treatment appointments which is causing him more stress

Challenges

finding a cost-effective treatment option

struggling to adhere to his treatment plan if it interferes with his daily life routine

Needs

he needs to know accurate predictions of his cancer illness and timely information

john needs a treatment plan that is effective and minimizes the impact on his daily life

ELIMINATED SLIDES THAT MAY BE HELPFUL