



**Knight Foundation
School of Computing
and Information Sciences**

Cancer Outcome and Recurrence Prediction Tool

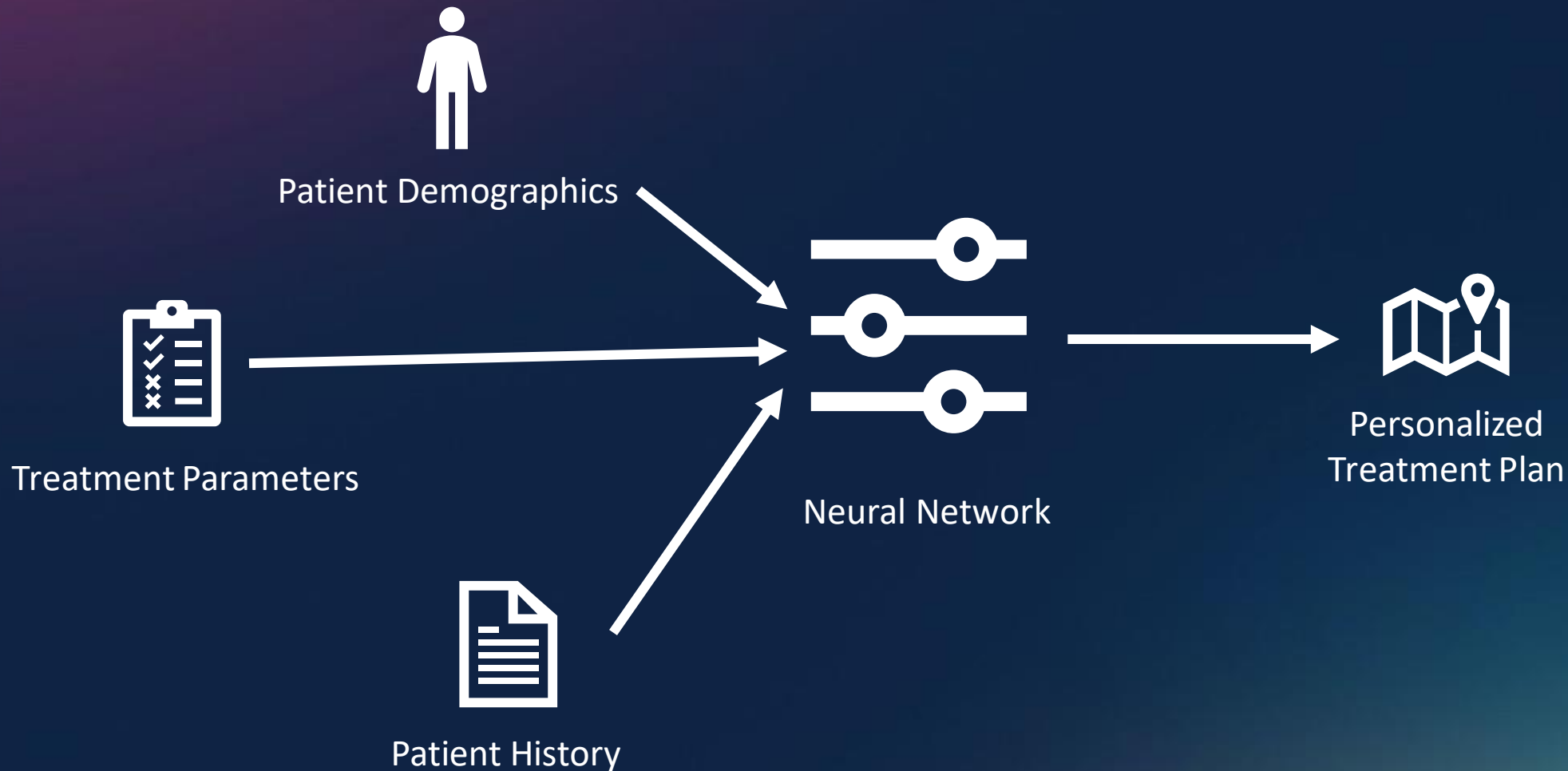
Team Members:

Alexis Diaz, Joshua Andres Fernandez, Sebastian Galloway, Michelle Ramos Pacheco, Raul Peña

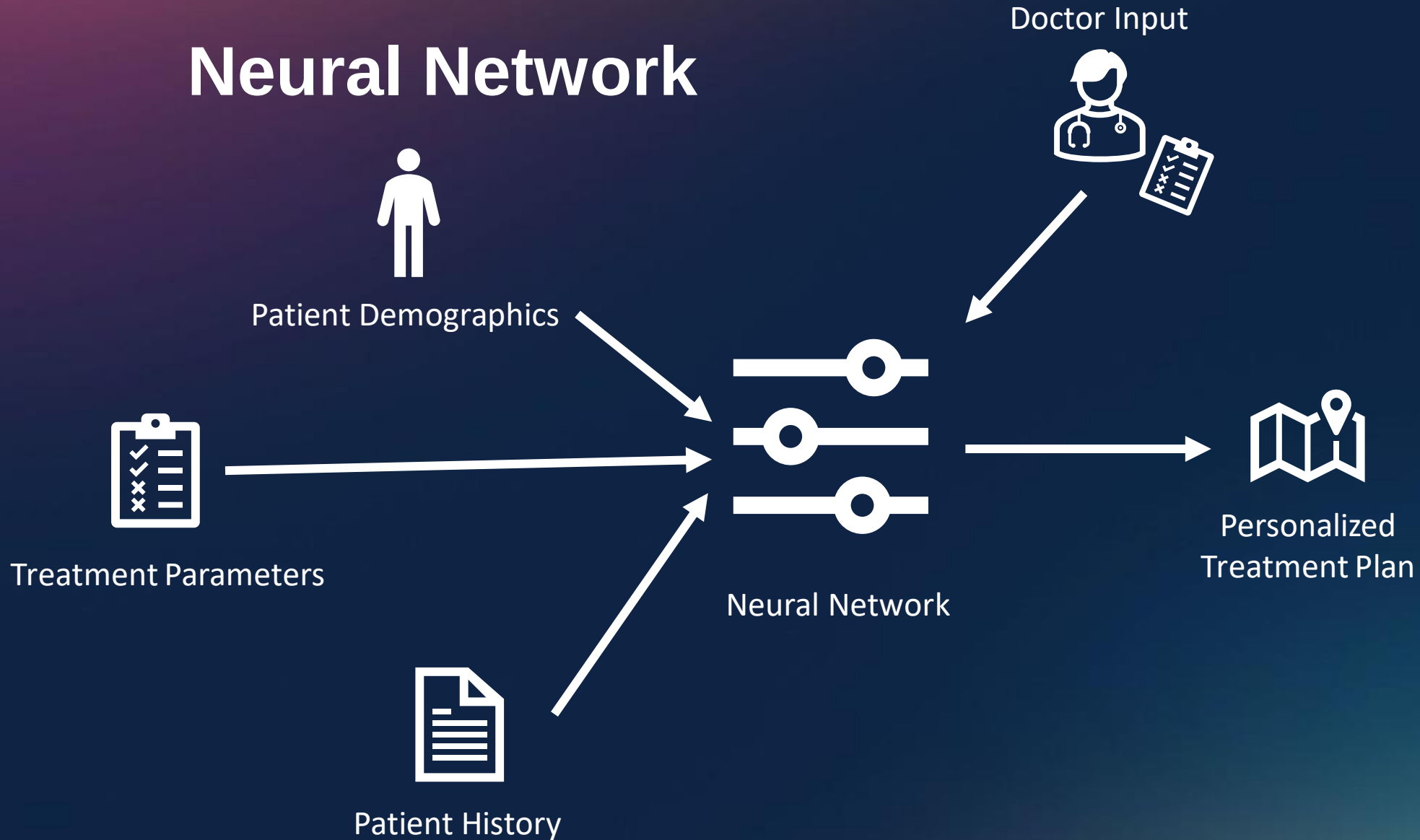
Project Purpose

We are the first step in a long-term project to develop a web-based tool that takes patient demographics, medical history, and other information as input and can then make predictions on cancer outcomes and recurrence based on a variety of variables, such as type(s) of treatments (surgery, radiation, chemo) and treatment parameters (rounds of treatments, dosages, etc.) to provide a clinician with recommendations for primary treatment and maintenance therapy.

Neural Network



Neural Network



Project Requirements



Christian Poellabauer

Interim Associate Dean for Research
and Graduate Studies

- Web Application
- Patient Management Dashboard
- Per-patient Treatment Predictions
- Modular Design

MEAN Tech Stack

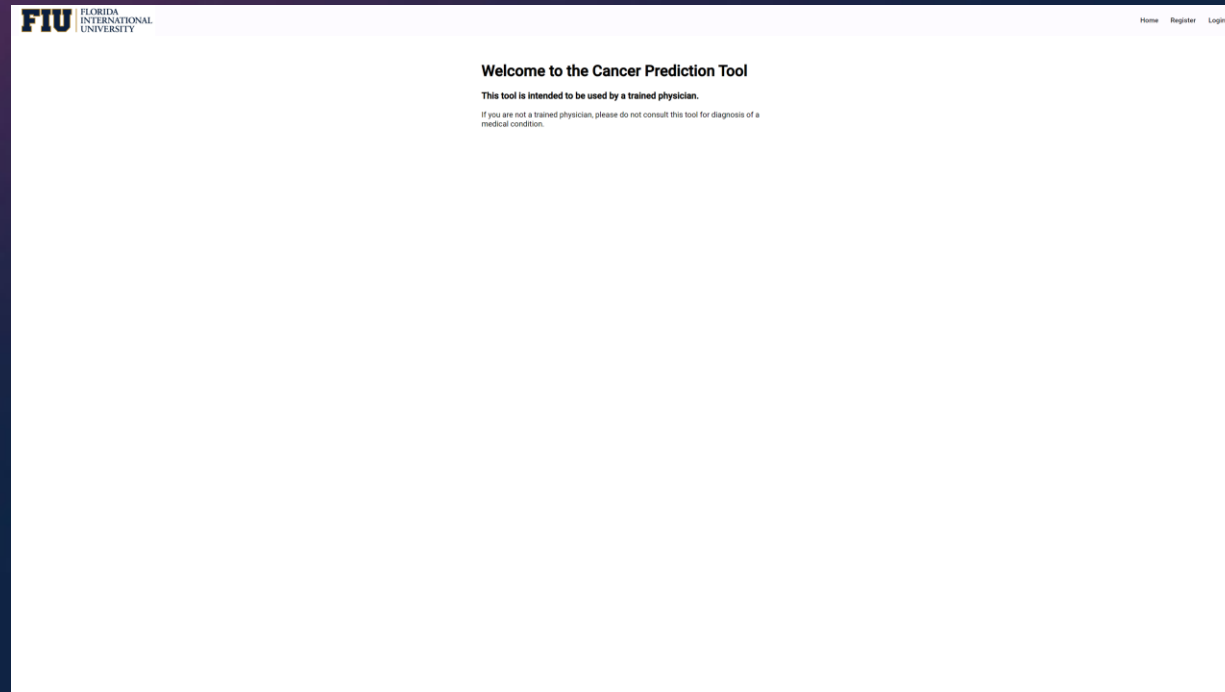


express



- Familiar
- Popular
- Lots of online resources
- Based around JavaScript
- Scalable
- Cloud Compatible

Landing Page



- Simple
- Disclaimers
- Information about the tool

Register

FIU FLORIDA INTERNATIONAL UNIVERSITY

Home Register Login

Cancer Outcome and Recurrence Prediction Tool

Register

Email address
 User Name
 Password

Already have an account? [Login here](#)



- Requires email address, username, and password

Login

FIU FLORIDA INTERNATIONAL UNIVERSITY

Home Register Login

Cancer Outcome and Recurrence Prediction Tool

Log in

User Name

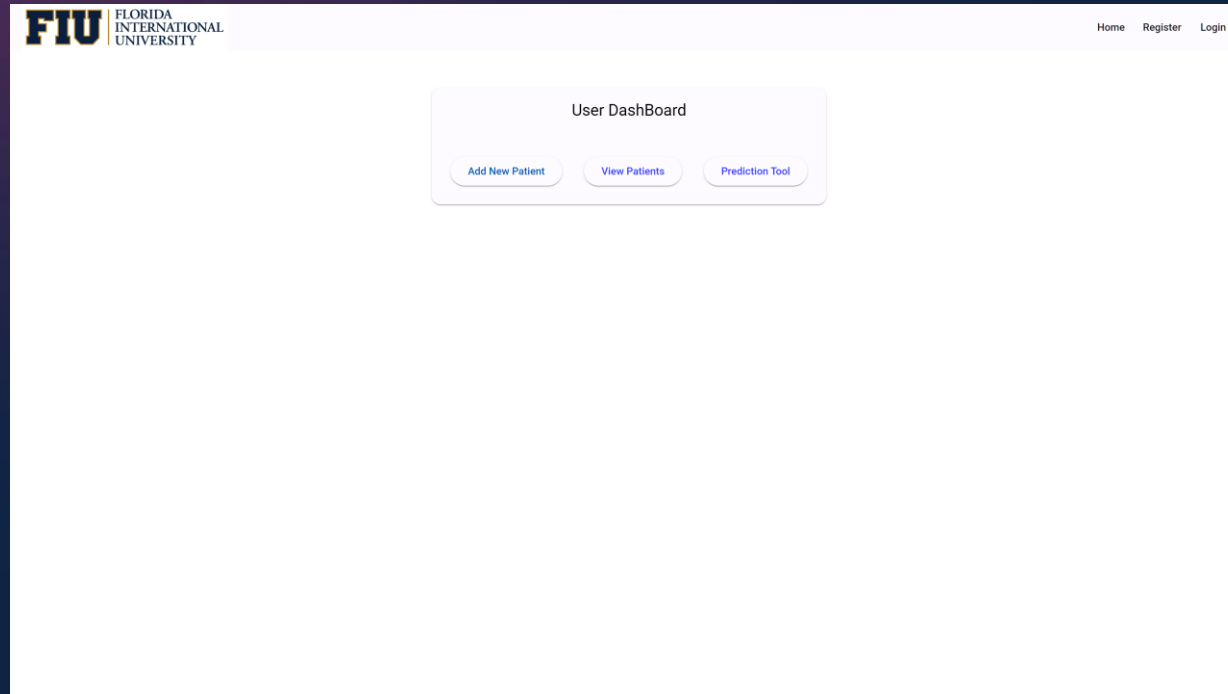
Password

Don't have an account? Register here



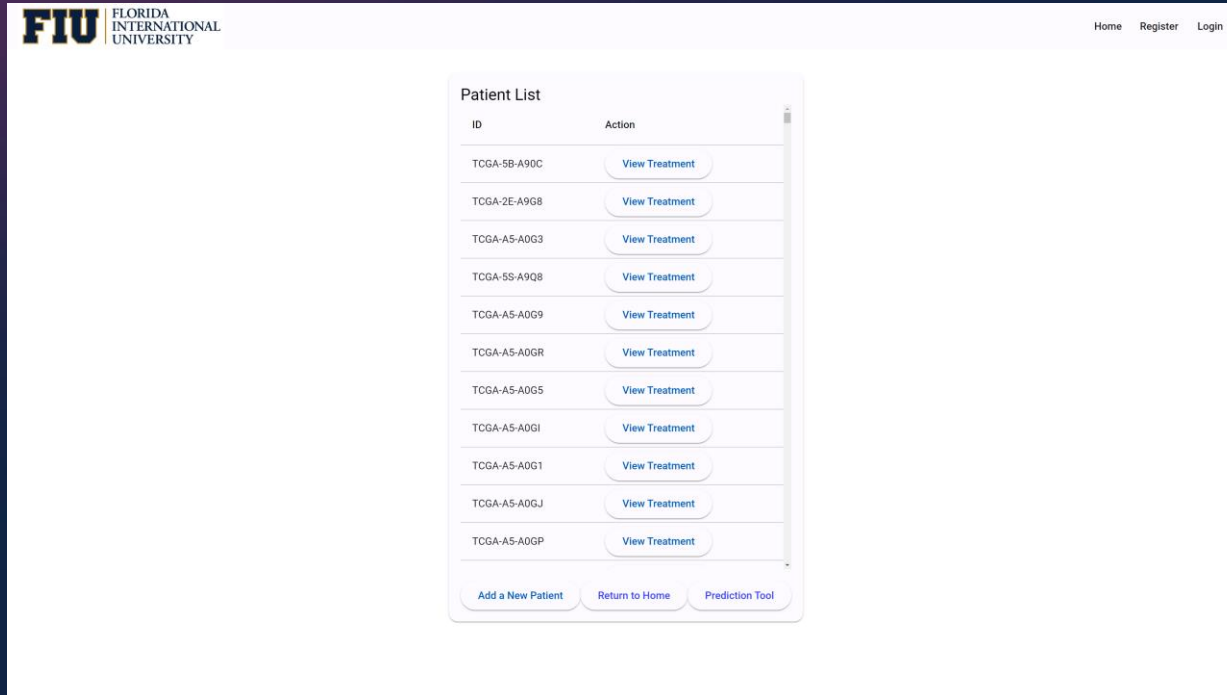
- Checks database for matching account and credentials

Dashboard



- Page loads only after a user logs in
- Add New Patient
- View Patients
- Prediction Tool

Patient List



The screenshot shows a web application interface for a 'Patient List'. At the top left is the FIU Florida International University logo. At the top right are links for 'Home', 'Register', and 'Login'. The main content area is titled 'Patient List' and contains a table with two columns: 'ID' and 'Action'. The table lists 12 patients, each with a unique ID and a 'View Treatment' button. Below the table are three buttons: 'Add a New Patient', 'Return to Home', and 'Prediction Tool'.

ID	Action
TCGA-5B-A90C	View Treatment
TCGA-2E-A9G8	View Treatment
TCGA-A5-A0G3	View Treatment
TCGA-5S-A9Q8	View Treatment
TCGA-A5-A0G9	View Treatment
TCGA-A5-A0GR	View Treatment
TCGA-A5-A0G5	View Treatment
TCGA-A5-A0GI	View Treatment
TCGA-A5-A0G1	View Treatment
TCGA-A5-A0GJ	View Treatment
TCGA-A5-A0GP	View Treatment

[Add a New Patient](#)
[Return to Home](#)
[Prediction Tool](#)

- Connects to database
- View patient prediction history
- View and Edit patient information
- Future improvement: only show patients for user that is signed in

Manual Entry Form

- Patient data
- Progression of disease
- Treatment data
- Current Status

Add a New Patient

Patient Entry

Patient ID:

Diagnosis Age:

Sex:
☐ Male
☐ Female

Race:
☐ American Indian or Alaska Native
☐ Asian
☐ Black/African American
☐ Native Hawaiian/Other Pacific Islander
☐ White
☐ None

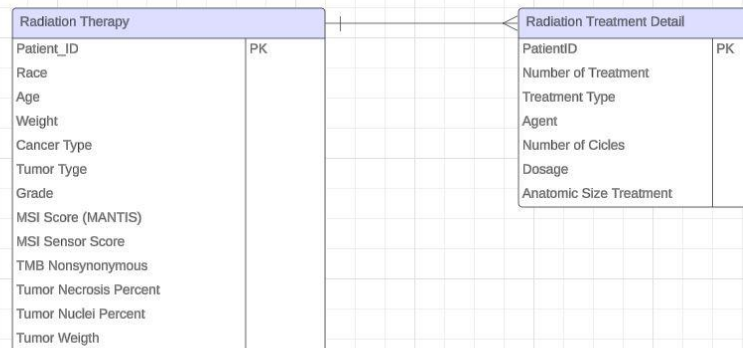
Patient Weight:

Prediction Tool

```

Person Neoplasm Cancer Status : "Tumor Free"
Race : "Black or African American"
Radiation Therapy : "Yes"
Patient Weight : 71
Overall Survival Status : "0:LIVING"
Overall Survival (Months) : 41.0625637
Disease-specific Survival status : "0:ALIVE OR DEAD TUMOR FREE"
Months of disease-specific survival : 41.0625637
Disease Free Status : "Missing"
Disease Free (Months) : "Missing"
Progression Free Status : "1:PROGRESSION"
Progress Free Survival (Months) : 11.01357793
ONCOTREE_CODE : "UEC"
CANCER_TYPE_DETAILED : "Uterine Endometrioid Carcinoma"
TUMOR_TYPE : "Endometrioid Endometrial Adenocarcinoma"
GRADE : "G2"
TISSUE_SOURCE_SITE_CODE : "2E"
ANEUPLOIDY_SCORE : 9
MSI_SCORE_MANTIS : 0.3234
    
```

↓ SHOW 304 MORE FIELDS



- Extensive database with all patient information.
- Each patient had up to 12 separate treatment records.
- Separated the treatment fields into a distinct entity
- The Patient entity is linked to the Treatment entity through a one-to-many relationship

Prediction Tool

PREDICTION TOOL

Patient Information

Select Patient

TCGA-AX-A06F

Diagnosis Age

59

Weight

84

Race

White

Current State of Illness

Cancer Type

Uterine Endometrioid Carcinoma

Cancer Grade

G3

Tumor Weight

210

MSI Score

0.3375

Other

Diabetes

Congestive Heart Failure

Hypertension

Dyspnea

Previous Treatments

Treatment Type	Agent	Cycles Number	Dosage
Chemotherapy	Carboplatin	5	6
Treatment Type	Agent	Cycles Number	Dosage
Chemotherapy	Paclitaxel	5	175

Predict Outcome

Return to Patient List

- Auto-fill based on patient data in database
- Provides input parameters for Machine Learning model

Prediction Tool

PREDICTION TOOL

Patient Information

Select Patient

TCGA-SB-A90C

Diagnosis Age

69

Weight

98

Race

Black or African American

Current State of Illness

Cancer Type

Uterine Endometrioid Carcinoma

Cancer Grade

G2

Tumor Weight

75

MSI Score

0.3344

Other

Diabetes

Congestive Heart Failure

Hypertension

Dyspnea

Previous Treatments

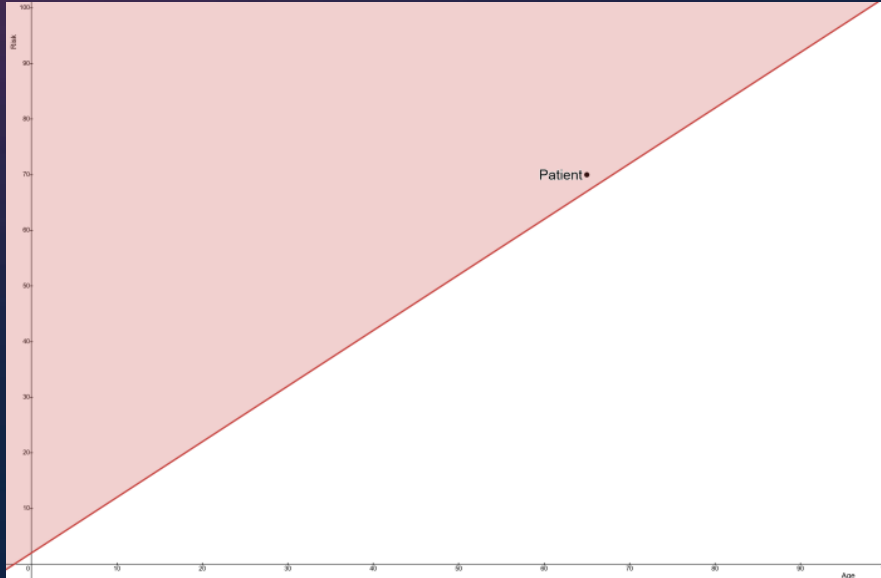
Treatment Type	Agent	Cycles Number	Dosage
Radiation Therapy	Radiation 1	0	0
Chemotherapy	Carboplatin	0	0
Chemotherapy	Paclitaxel	0	0

Predict Outcome

Return to Patient List

- Auto-fill based on patient data in database
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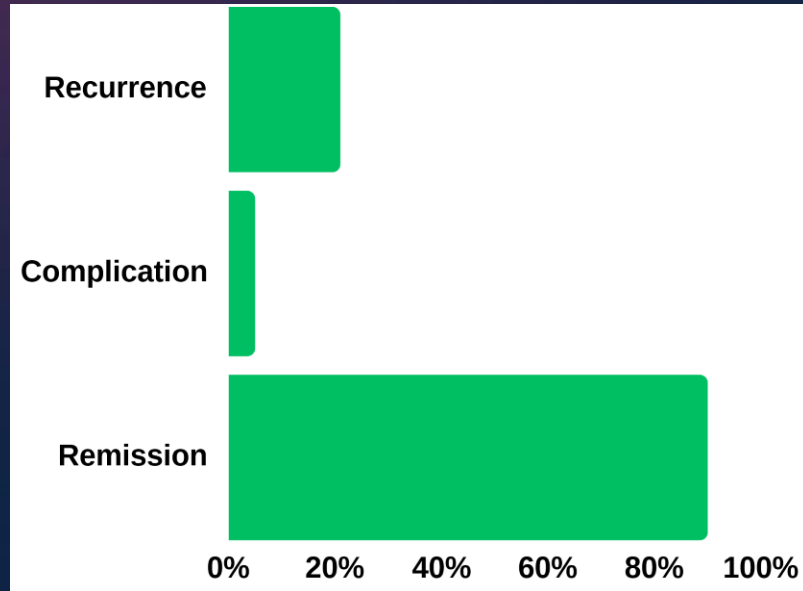
Prediction Results



- Receives output from machine learning prediction process

```
{
  "results": {
    "data": [
      {
        "type": "risk-graph",
        "x-label": "Age",
        "y-label": "Risk",
        "min-x": 0,
        "max-x": 100,
        "min-y": 0,
        "max-y": 100,
        "x": 65,
        "y": 70,
        "ref-line": "x + 2"
      },
      ...
    ]
  }
}
```

Prediction Results



```
{
  "results": {
    "data": [
      {
        "type": "bar-chart",
        "x-label": "Probability",
        "min-x": 0,
        "max-x": 100,
        "x-interval": 20,
        "x-format": "percent",
        "labels": [
          {
            "id": 1,
            "y-label": "Recurrence",
            "x": 21
          },
          {
            "id": 2,
            "y-label": "Complication",
            "x": 5
          },
          {
            "id": 3,
            "y-label": "Remission",
            "x": 90
          }
        ]
      }
    ]
  }
}
```

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