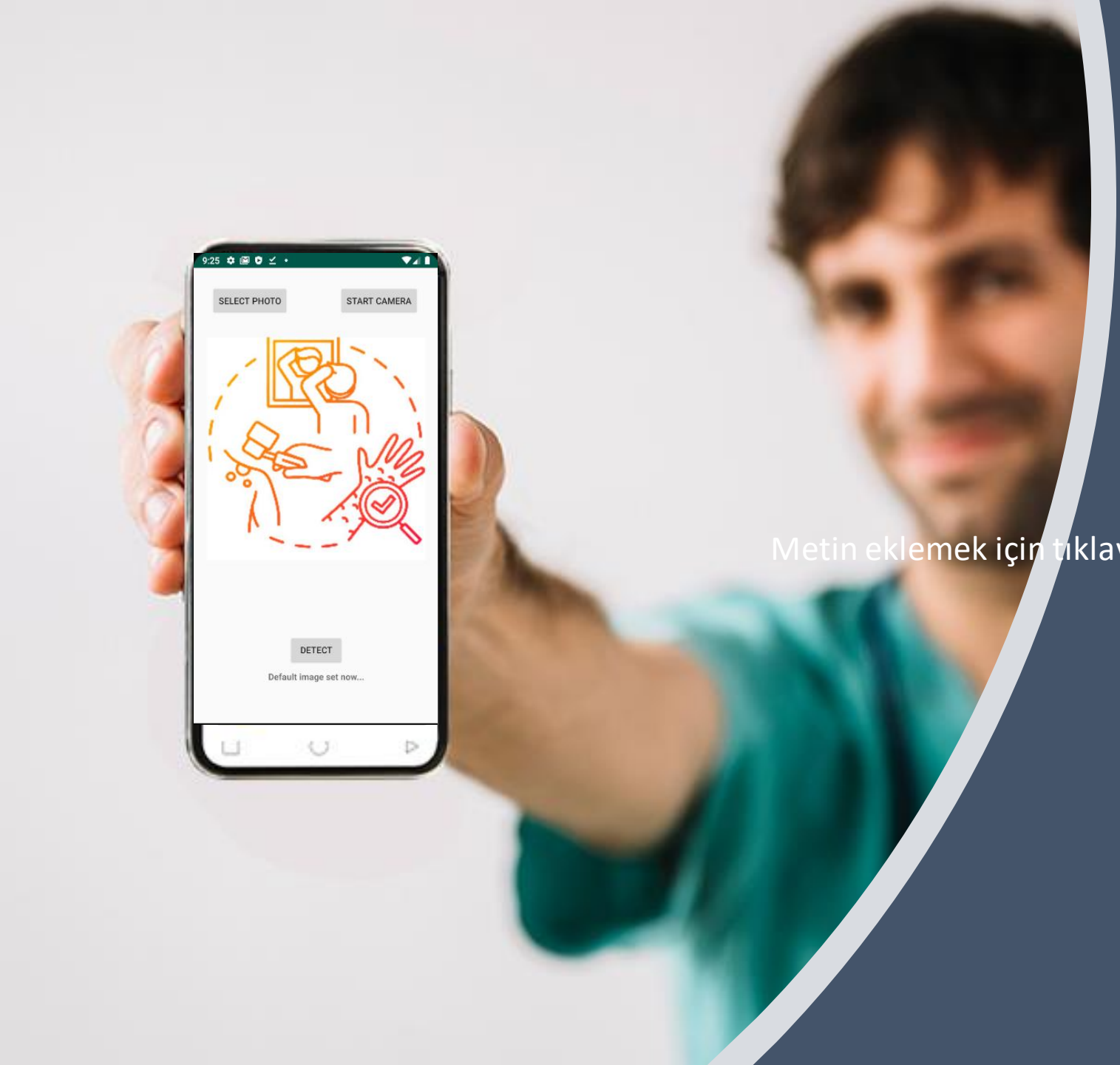


Metin eklemek için tıklayın

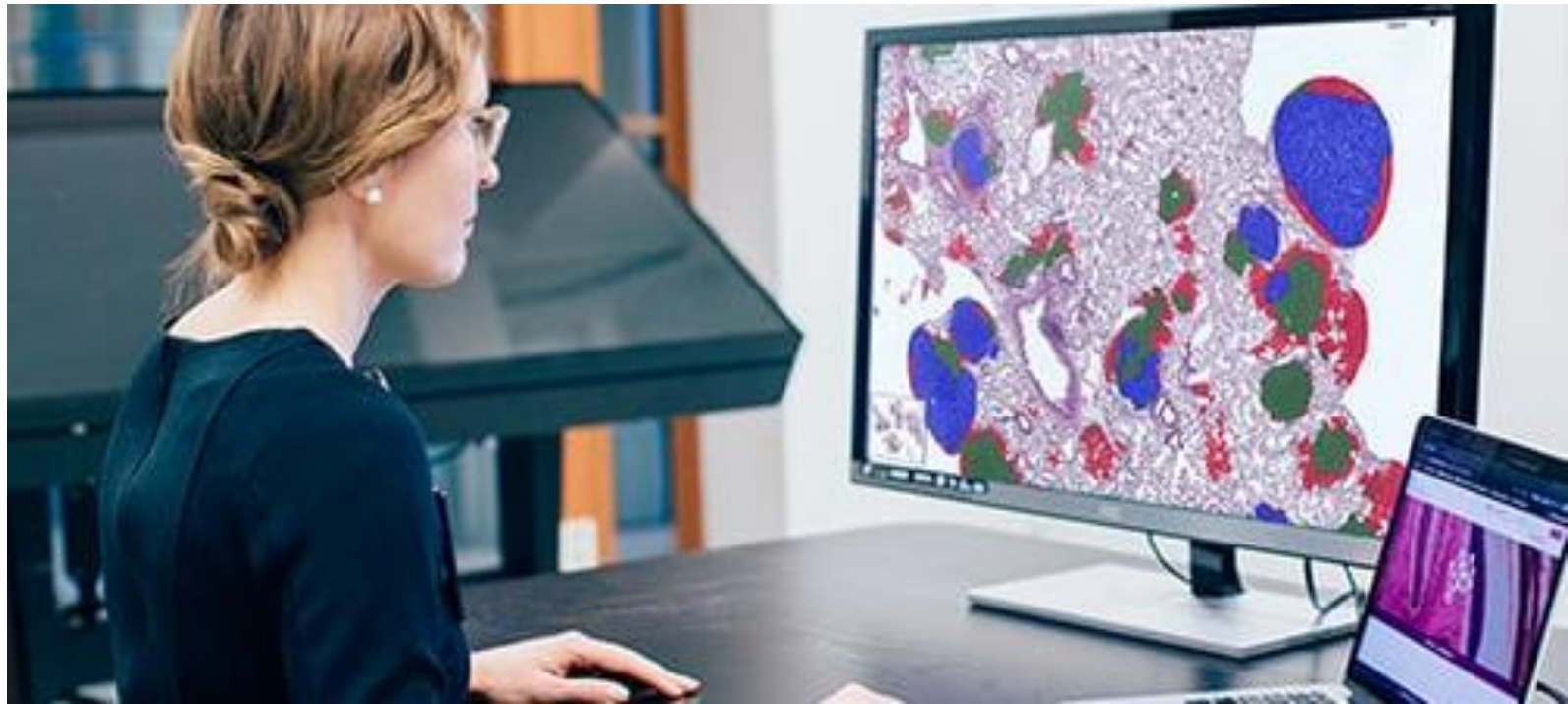
Clinical Support Mobile Application Development for Histopathology Images of Lung Cancer

Senior Design Project 2021-2022

Emre Taşkın

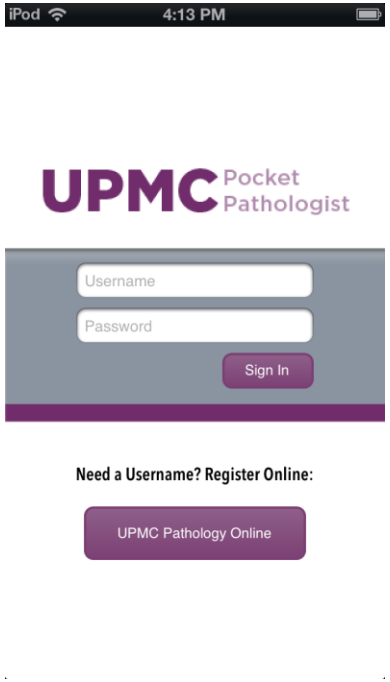
Goal-Motivation

- Developing a mobile application to assist pathologists in diagnosing lung cancer.



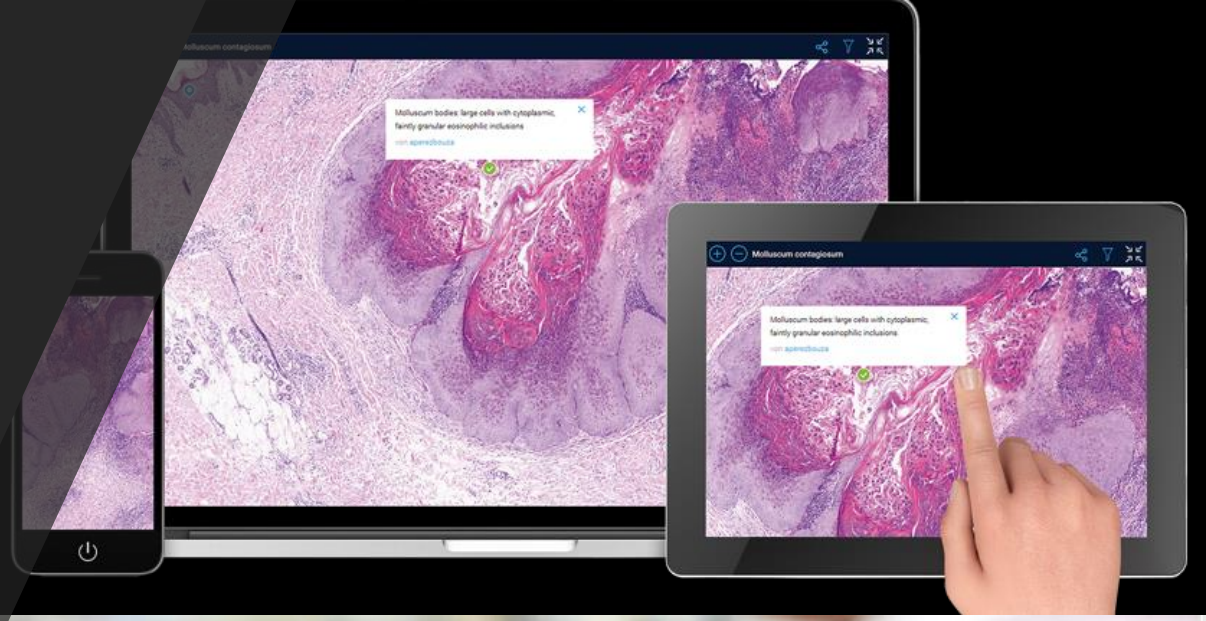
Market Analysis

LUNGEVITY
Find it. Treat it. Live.



Benefits

- Can be carried in pocket
- Easy to access and use
- Beneficial for human health.

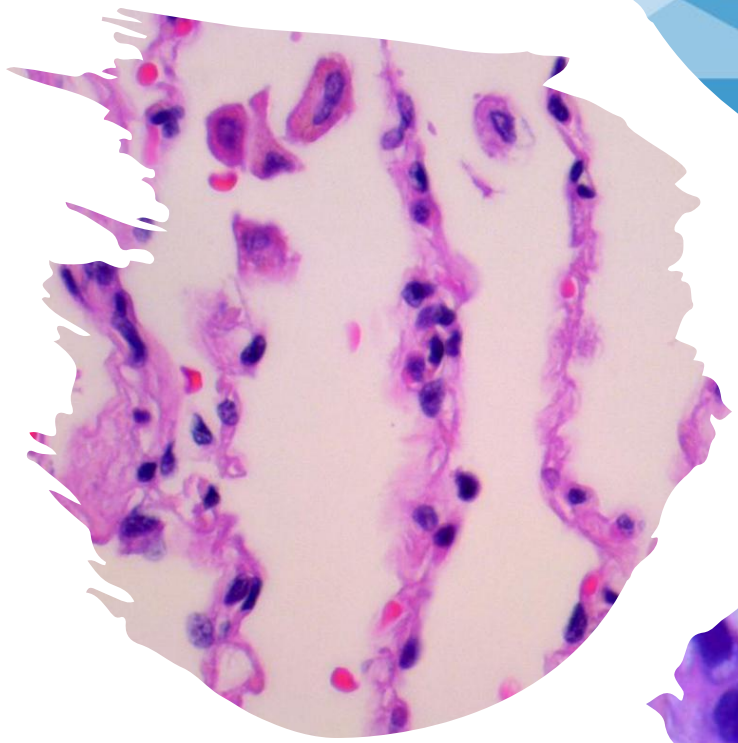


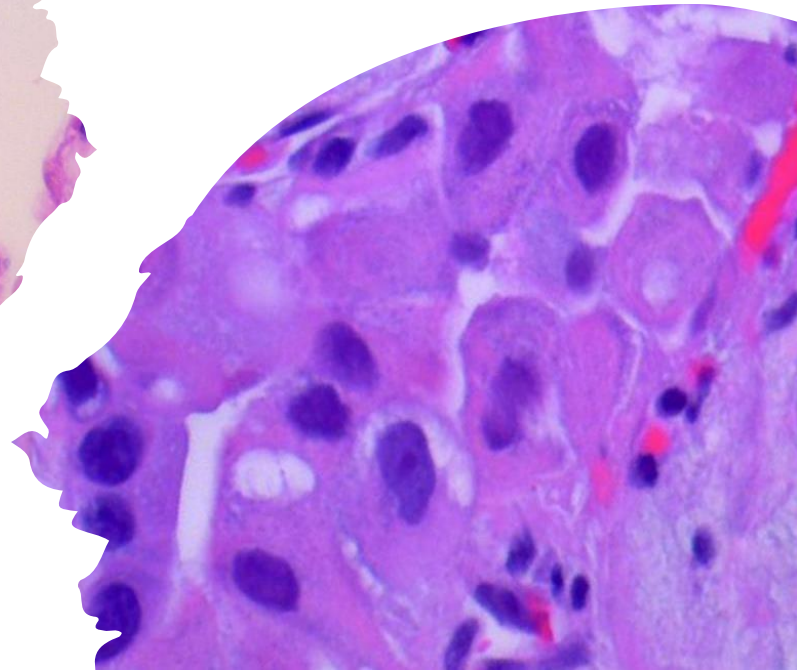
First semester

- Data prepared
- TUBITAK 2209-A
- I created the environment for development
- I created the prototype of the mobile app
- Second semester TUBITAK 2242 was also applied

Data

- The data was downloaded from the kaggle as 10,000 malignant and 5,000 benign images.





Android App Part

- Mobile application was developed in the android studio environment using the kotlin language.

Mobile App Interface

Building Model

- TensorFlow and Keras are used to build and create a machine learning model.
- TFLite is used to deploy the model to an Android application.

Tensorflow with Keras Deep Learning model

- Using Convolutional Neural Networks, I developed algorithms and models to distinguish between benign and malignant lung cancers. For source code editing, I utilise Colab.

Model Information

- To use the Tensorflow hub module, the model can be trained with the inception v3 or Mobilenet options. I used the MobileNet model.

```
Building model with https://tfhub.dev/google/tf2-preview/mobilenet_v2/feature_vector/2
Model: "sequential_4"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
keras_layer_10 (KerasLayer)  (None, 1280)              2257984
_________________________________________________________________
flatten_11 (Flatten)         (None, 1280)              0
_________________________________________________________________
dense_22 (Dense)             (None, 512)               655872
_________________________________________________________________
dropout_11 (Dropout)         (None, 512)               0
_________________________________________________________________
dense_23 (Dense)             (None, 2)                 1026
=================================================================
Total params: 2,914,882
Trainable params: 656,898
Non-trainable params: 2,257,984
_________________________________________________________________
```

Training Model

Validate each step by training the model with the validation dataset. I achieve 99% accuracy after 15 epochs

```
Epoch 1/15
656/656 [==============================] - 1905s 3s/step - loss: 0.0283 - accuracy: 0.9919 - val_loss: 0.0095 - val_accuracy: 0.9978
Epoch 2/15
656/656 [==============================] - 656s 1000ms/step - loss: 0.0182 - accuracy: 0.9954 - val_loss: 0.0138 - val_accuracy: 0.9951
Epoch 3/15
656/656 [==============================] - 652s 993ms/step - loss: 0.0125 - accuracy: 0.9967 - val_loss: 0.0064 - val_accuracy: 0.9976
Epoch 4/15
656/656 [==============================] - 648s 987ms/step - loss: 0.0090 - accuracy: 0.9975 - val_loss: 0.0148 - val_accuracy: 0.9967
Epoch 5/15
656/656 [==============================] - 652s 994ms/step - loss: 0.0104 - accuracy: 0.9978 - val_loss: 0.0076 - val_accuracy: 0.9978
Epoch 6/15
656/656 [==============================] - 649s 990ms/step - loss: 0.0108 - accuracy: 0.9977 - val_loss: 0.0253 - val_accuracy: 0.9956
Epoch 7/15
656/656 [==============================] - 649s 989ms/step - loss: 0.0099 - accuracy: 0.9980 - val_loss: 0.0200 - val_accuracy: 0.9960
Epoch 8/15
656/656 [==============================] - 650s 990ms/step - loss: 0.0116 - accuracy: 0.9970 - val_loss: 0.0109 - val_accuracy: 0.9980
Epoch 9/15
656/656 [==============================] - 643s 980ms/step - loss: 0.0091 - accuracy: 0.9980 - val_loss: 0.0147 - val_accuracy: 0.9962
Epoch 10/15
656/656 [==============================] - 643s 980ms/step - loss: 0.0058 - accuracy: 0.9988 - val_loss: 0.0036 - val_accuracy: 0.9991
Epoch 11/15
656/656 [==============================] - 641s 977ms/step - loss: 0.0074 - accuracy: 0.9980 - val_loss: 0.0119 - val_accuracy: 0.9969
Epoch 12/15
656/656 [==============================] - 638s 973ms/step - loss: 0.0076 - accuracy: 0.9984 - val_loss: 0.0043 - val_accuracy: 0.9982
Epoch 13/15
656/656 [==============================] - 642s 979ms/step - loss: 0.0049 - accuracy: 0.9988 - val_loss: 0.0289 - val_accuracy: 0.9942
Epoch 14/15
656/656 [==============================] - 644s 982ms/step - loss: 0.0053 - accuracy: 0.9988 - val_loss: 0.0053 - val_accuracy: 0.9984
Epoch 15/15
656/656 [==============================] - 651s 992ms/step - loss: 0.0087 - accuracy: 0.9978 - val_loss: 0.0346 - val_accuracy: 0.9944
```

Graph Results

Timeline

İP No	Name and Targets of Business Packages	By Who(s) It Will Be Performed	Time (..-.. Month)	Success Criterion and Contribution to the Success of the Project
1	Data Preprocessing	Emre Taşkın	0-1 Mo	Success criterion: Preparing at least 1 high-quality image for machine learning model from at least 50 patients in all 3 sub-cancer types. Contribution: 40%
2	Application of Learning Algorithms	Emre Taşkın	1-2 Mos	Success criterion: Creation of a learning model by ready-made machine learning libraries with images of at least 2 of 3 sub-cancer types. Contribution: 30%
3	Mobile Application Interface Design	Emre Taşkın	2-3 Mos	Success criterion: Design of easy-to-use interfaces on at least one platform (Android or Apple). Contribution: 5%
4	Testing the Learning Mechanism and Getting Feedback	Emre Taşkın	3-6 Mos	Success criterion: The model we trained predicts risk with at least 70% accuracy on the test data. Contribution: 20%
5	Dissemination of the Application	Emre Taşkın	6-7 Mos	Success criterion:Preparing an English paper and presenting the results as a poster or oral presentation at the international conference. Contribution: 5%

Thank you for listening!

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