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# B21-CAP0454

Automated Self Checkout (ASC) with Object Detection for Better Shopping Experience

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# Let's Begin

# SUMANGGA


*"Super Machine Learning Group Engagement in Action"*

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# Meet our team


**Hanan Iqbal Alrahma /**
***Mobile Development (Android)***

**Akmal Adnan Attamami /**
***Machine Learning***

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# Meet our team

**Aditheo Firman Saputra /**
***Mobile Development (Android)***

**Mohammad Arif Ikhsanudin /**
***Cloud computing***

**Mochamad Hakim Akbar Assidiq Maulana /**
***Machine Learning***

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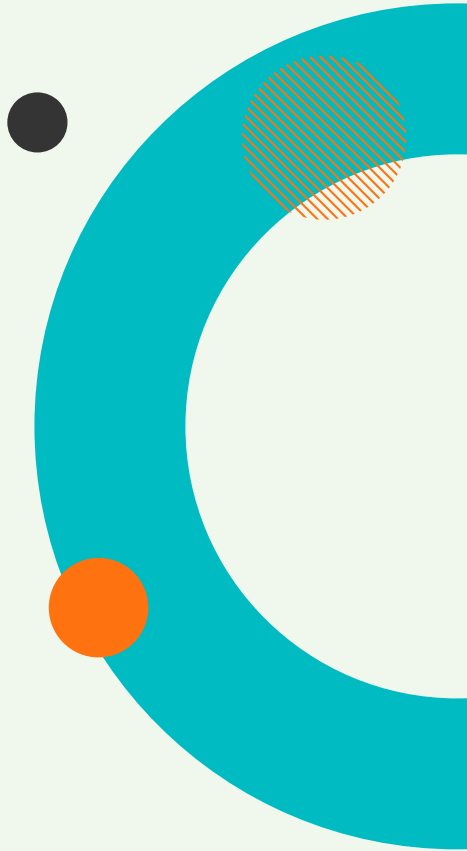
# Content





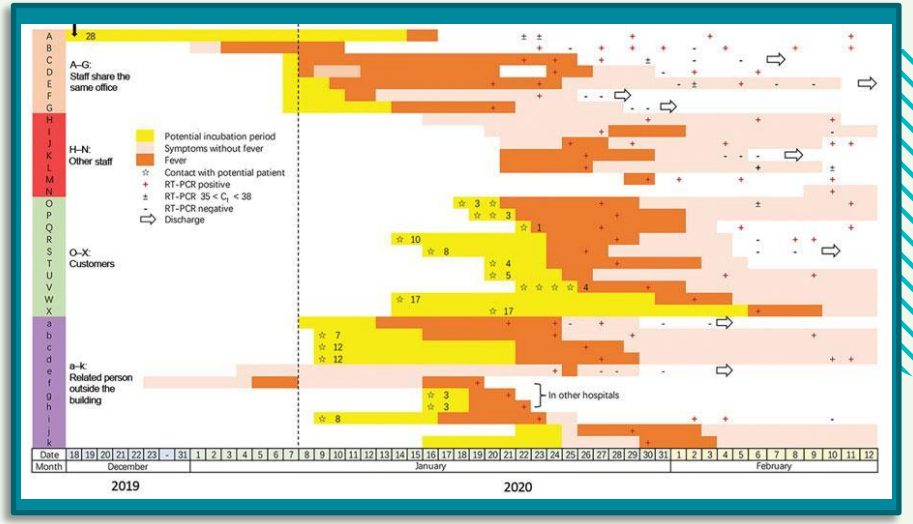
01

# Background

How could this happen? Let me tell you …

# Background (1/3)

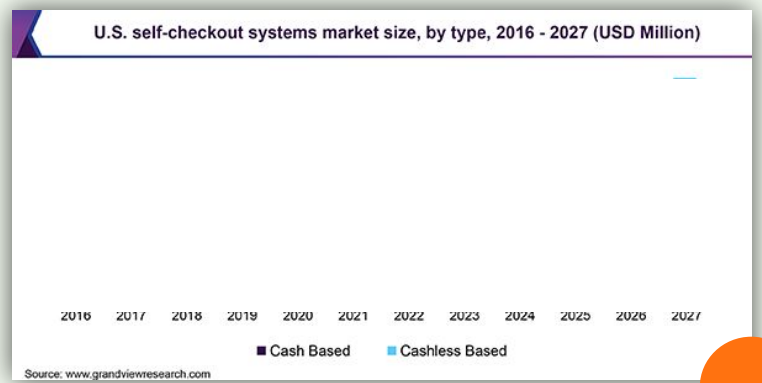
Many supermarkets rely on **manual cashier** systems to serve customers. This causes the queue of customers to **get longer** and **not suitable** for COVID-19 Person **not to stay in public** for long.




*Source :*
*Cluster of COVID-19 at shopping mall in Wenzhou, China*

# Background (2/3)

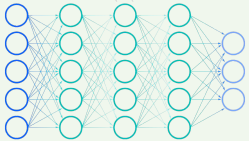
**Increase** of using Self-Checkout Systems around the world because of this **effectively** and **efficiency**.

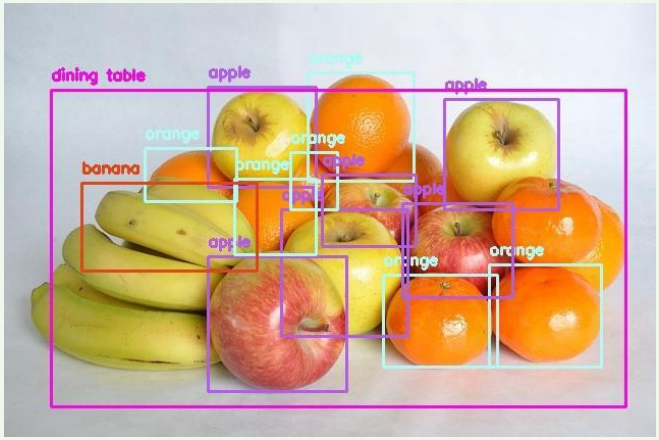




*Source :*
*US, Global*

# Background (3/3)

**Scanning the barcode** to identify the price product is **inefficient**. **Machine Learning** make shopping checkout process **easily and quickly**





02

# Comparison

There are other product vs Our solution

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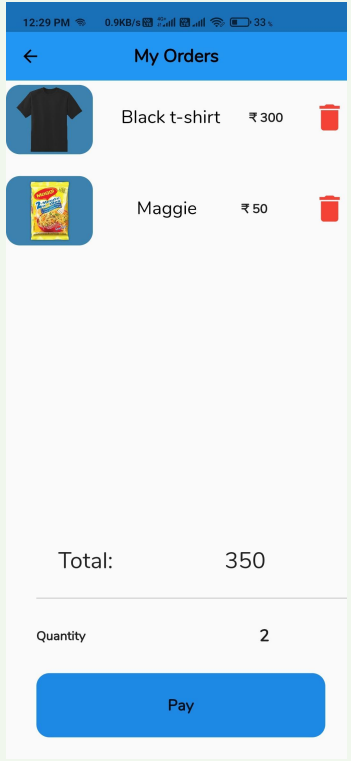
# Comparison

## Existing Solution

Other solution only use Barcode to analyze the description of Product





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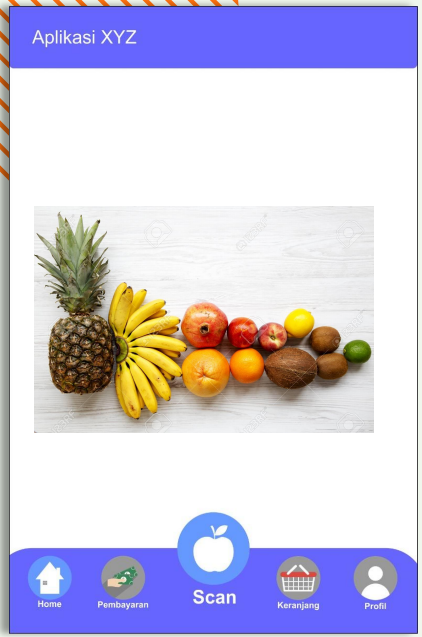
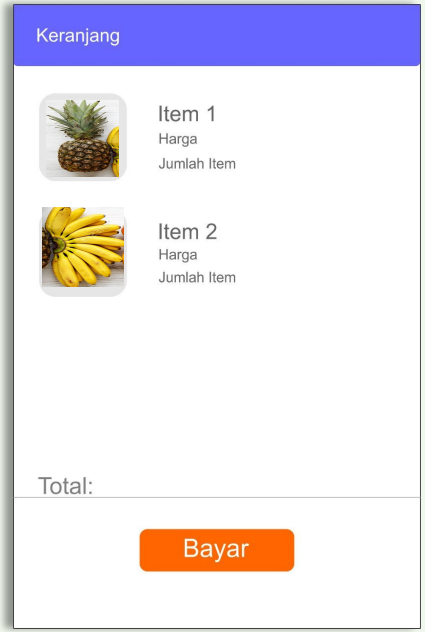
# Comparison




## Our Solution

Using Object Detection Algorithm to extract image feature to get Product description

03

# Evaluation

Analyzing our model perfomance

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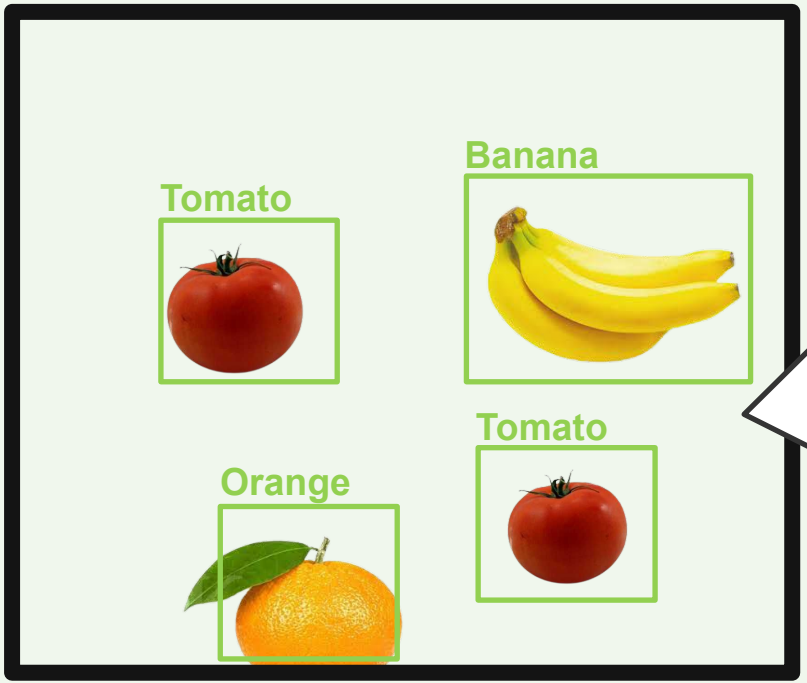
# IMPLEMENTATION




Check out List :

| Fruits | Quantity | Price (Rp) | Total (Rp) |
|---|---|---|---|
| Tomato | 2 | 500 | 1000 |
| Banana | 3 | 5000 | 15000 |
| Orange | 1 | 1000 | 1000 |

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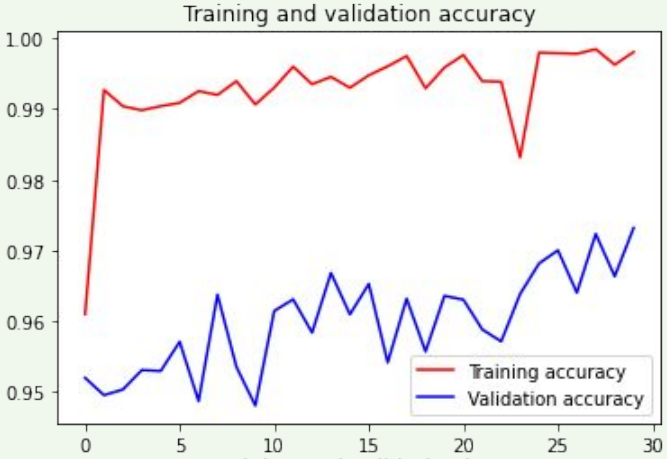
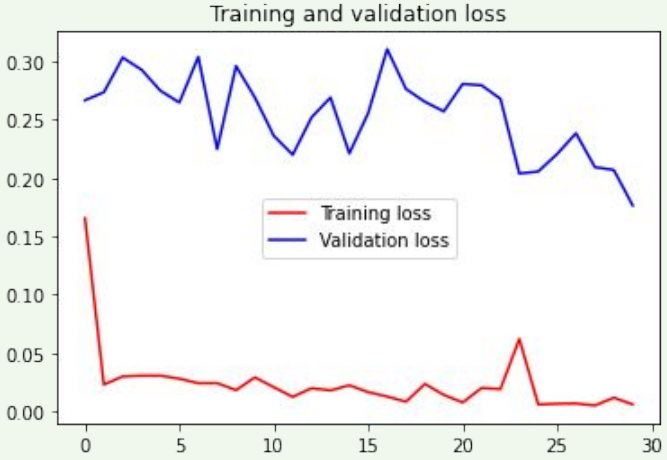
# VERSION 1

Using CNN and adding depthwise_conv2d layer




Model: "sequential"

| Layer (type) | Output Shape | Param # |
|---|---|---|
| conv2d (Conv2D) | (None, 222, 222, 16) | 448 |
| max_pooling2d (MaxPooling2D) | (None, 111, 111, 16) | 0 |
| depthwise_conv2d (DepthwiseC | (None, 27, 27, 16) | 16400 |
| max_pooling2d_1 (MaxPooling2 | (None, 13, 13, 16) | 0 |
| conv2d_1 (Conv2D) | (None, 13, 13, 64) | 9280 |
| conv2d_2 (Conv2D) | (None, 13, 13, 64) | 36928 |
| conv2d_3 (Conv2D) | (None, 13, 13, 128) | 73856 |
| max_pooling2d_2 (MaxPooling2 | (None, 6, 6, 128) | 0 |
| flatten (Flatten) | (None, 4608) | 0 |
| dense_1 (Dense) | (None, 512) | 2359808 |
| dropout (Dropout) | (None, 512) | 0 |
| dense_2 (Dense) | (None, 256) | 131328 |
| dense_3 (Dense) | (None, 67) | 17219 |

Total params: 2,645,267
Trainable params: 2,645,267
Non-trainable params: 0

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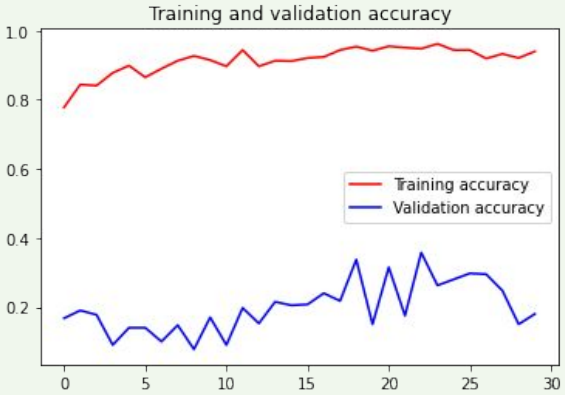
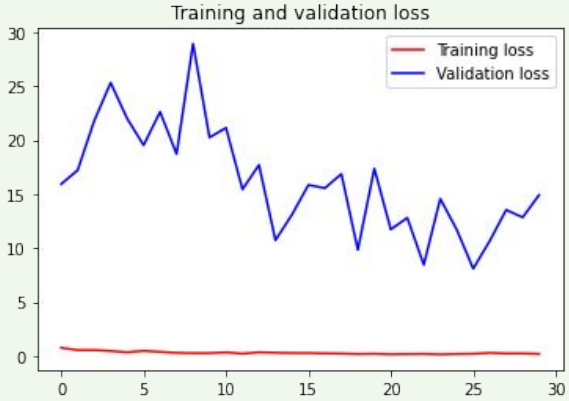
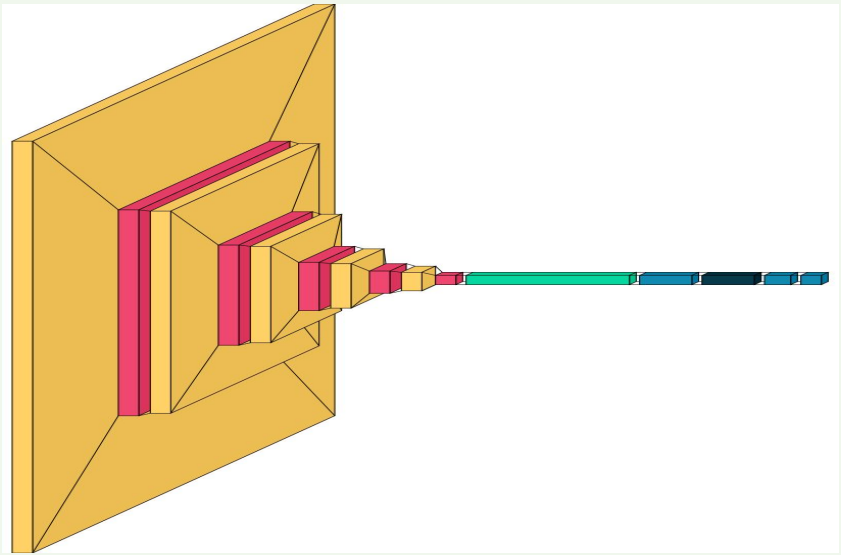
# VERSION 2

Using transfer learning mobilenet v2



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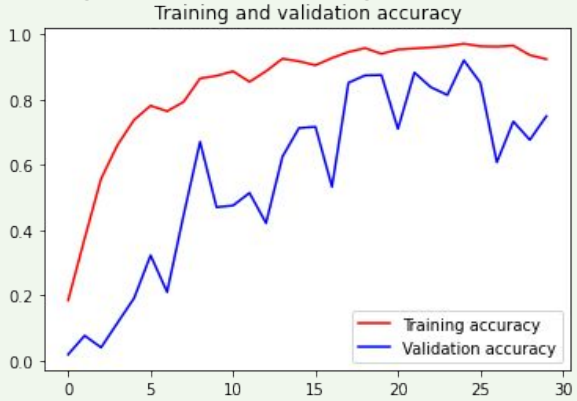
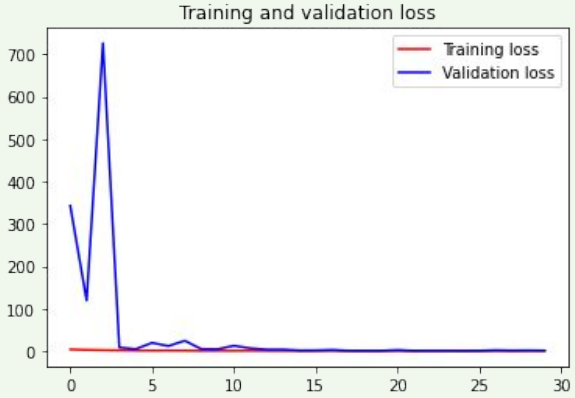
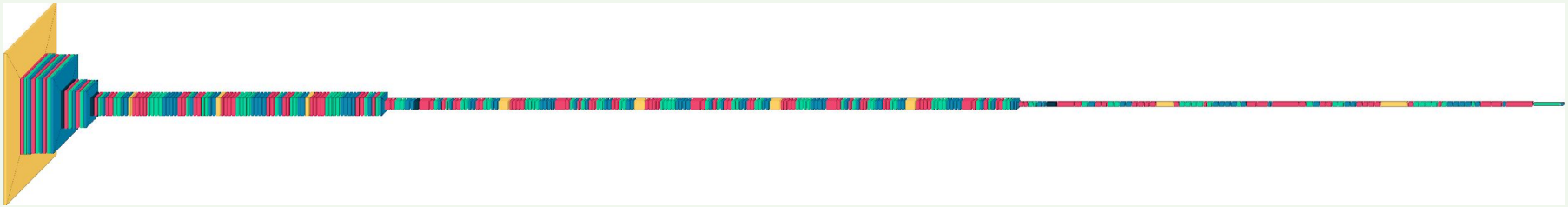
# VERSION 3

Using transfer learning Inception v3



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# VERSION 4

Using transfer learning mobilenet v4

```
Model: "sequential"
_________________________________________________________________
Layer (type)                 Output Shape              Param #
=================================================================
keras_layer (KerasLayer)     (None, 1280)              2257984
_________________________________________________________________
dense (Dense)                (None, 512)               655872
_________________________________________________________________
dropout (Dropout)            (None, 512)               0
_________________________________________________________________
dense_2 (Dense)              (None, 256)               131328
_________________________________________________________________
dense_3 (Dense)              (None, 67)                17219
=================================================================
Total params: 3,062,403
Trainable params: 804,419
Non-trainable params: 2,257,984
_________________________________________________________________
```

```
132/132 [==============================] - 119s 903ms/step - loss: 0.0050 - accuracy: 0.9984 - val_loss: 0.0999 - val_accuracy: 0.9849

Epoch 00022: val_loss did not improve from 0.06573
Epoch 23/30
132/132 [==============================] - 119s 903ms/step - loss: 0.0082 - accuracy: 0.9975 - val_loss: 0.0835 - val_accuracy: 0.9881

Epoch 00023: val_loss did not improve from 0.06573
Epoch 24/30
132/132 [==============================] - 119s 905ms/step - loss: 0.0074 - accuracy: 0.9975 - val_loss: 0.1070 - val_accuracy: 0.9869

Epoch 00024: val_loss did not improve from 0.06573
Epoch 25/30
132/132 [==============================] - 119s 902ms/step - loss: 0.0065 - accuracy: 0.9982 - val_loss: 0.1038 - val_accuracy: 0.9858

Epoch 00025: val_loss did not improve from 0.06573
Epoch 26/30
132/132 [==============================] - 121s 913ms/step - loss: 0.0073 - accuracy: 0.9977 - val_loss: 0.0919 - val_accuracy: 0.9847

Epoch 00026: val_loss did not improve from 0.06573
Epoch 27/30
132/132 [==============================] - 120s 909ms/step - loss: 0.0080 - accuracy: 0.9974 - val_loss: 0.1307 - val_accuracy: 0.9846

Epoch 00027: val_loss did not improve from 0.06573
Epoch 28/30
132/132 [==============================] - 120s 905ms/step - loss: 0.0095 - accuracy: 0.9969 - val_loss: 0.0999 - val_accuracy: 0.9862

Epoch 00028: val_loss did not improve from 0.06573
Epoch 29/30
132/132 [==============================] - 120s 908ms/step - loss: 0.0070 - accuracy: 0.9978 - val_loss: 0.1451 - val_accuracy: 0.9818

Epoch 00029: val_loss did not improve from 0.06573
Epoch 30/30
132/132 [==============================] - 120s 907ms/step - loss: 0.0068 - accuracy: 0.9978 - val_loss: 0.1388 - val_accuracy: 0.9833

Epoch 00030: val_loss did not improve from 0.06573
```

# How to Improve?

- **Add** more data and change augmentation parameters
- **Tuning** training parameters
- **Reduce** Similar classes

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# Documentation

From our work

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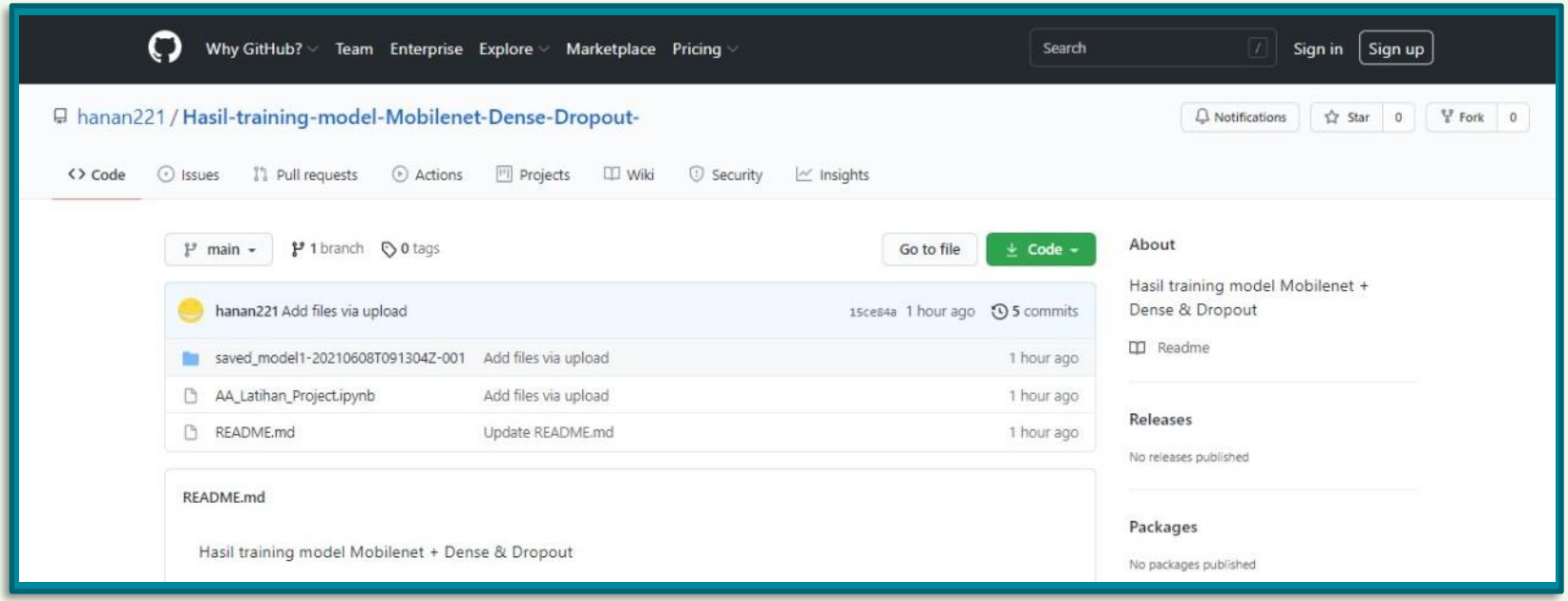
# Our Repository at Git Hub




*Source :*
*https://github.com/hanan221/Hasil-training-model-Mobilenet-Dense-Dropout-.git*

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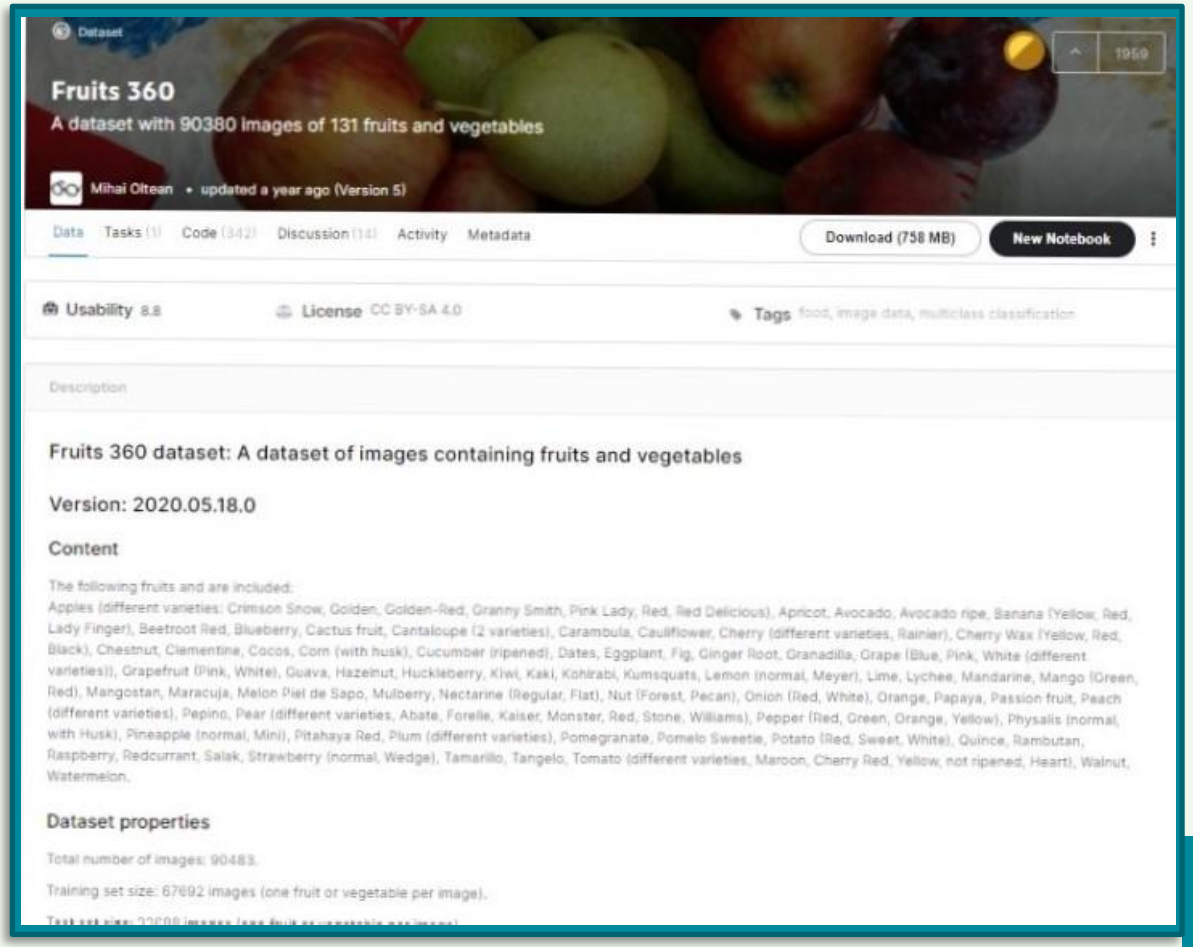


# Dataset Source
# FRUIT-360

*Source :*
*https://www.kaggle.com/moltean/fruits*

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# Our Milestone

# 05

# Business Insider

Go-to-market Proposal

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# Target Market

people who need us

| Age Range | Profession | Roles | Spesific |
|---|---|---|---|
| 25-60 | Owner of the grocery | Regulator & Stimulus | Who own and makes the rules of the grocerys |

# Local Deployment

| Timeline | Roles | Budget (max) in USD |
|---|---|---|
| Early July - End of July | Market Research & Analysis (Observation ,Questionnaire & Market Analysis ) | $1.000 / Rp14.000.000 |
| Early August – End of September | Research & Development, Production (Other Design, Improvements, and API Services) | $1.000 / Rp14.000.000 |
| Early October – End of December | Advertising, Operations and Maintenance with Cloud Services | $1.500 / Rp21.000.000 |
| July - December | Other (Team Salary, Electricity, Internet, Transportation, and Taxes & Legalities) | $2.500 / Rp35.000.000 |
| | **TOTAL** | $6000 / Rp84.000.000 |

# Budgeting @5000 USD

| Category | Propotions | Budget (max) in USD |
|---|---|---|
| Team Salary | 20% | $1.000 / Rp14.000.000 |
| Operational<br>1. Renting Cloud Service<br>2. Productions<br>3. Reaserching<br>4. Surveys<br>5. Transportation, Electricity and Internet<br>6. Advertising<br>7. Paid Experts, Observer and Respondens<br>8. Legalities Regristation<br>9. Taxes | 80% | $4.000 / Rp56.000.000 |

# Budgeting @10.000 USD

| Category | Propotions | Budget (max) in USD |
|---|---|---|
| All aspect covered in Budgeting | 50% | $5.000 / Rp70.000.000 |
| Additional for Team Salary | 15% | $1.500 / Rp21.000.000 |
| Additional for Research/Ops | 20% | $2.000 / Rp28.000.000 |
| Marketing and Sales | 20% | $2.000 / Rp28.000.000 |
| Market research competitive analysis | 10% | $1.000 / Rp 14.000.000 |
| Future Development/R&D | 20% | $2.000 / Rp28.000.000 |
| Other Expenses (taxes, reserves) | 10% | $1.000 / Rp14.000.000 |

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> “This is a quote, words full of wisdom that someone important said and can make the reader get inspired.”
>
> —Someone Famous