

深層学習を利用した 植物画像解析 (実習)

戸田陽介

名古屋大学トランスフォーマティブ生命分子研究所

特任助教

Mail: tyosuke@aquaseerser.com

@東京大学

2019/5/21 17:15-18:45

本講義の内容

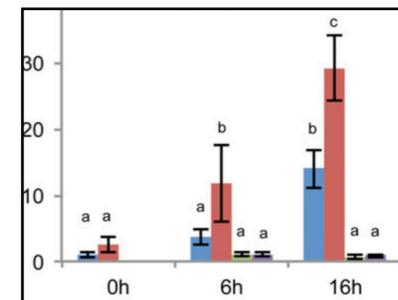
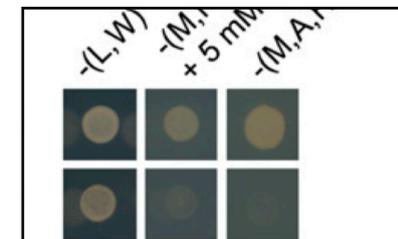
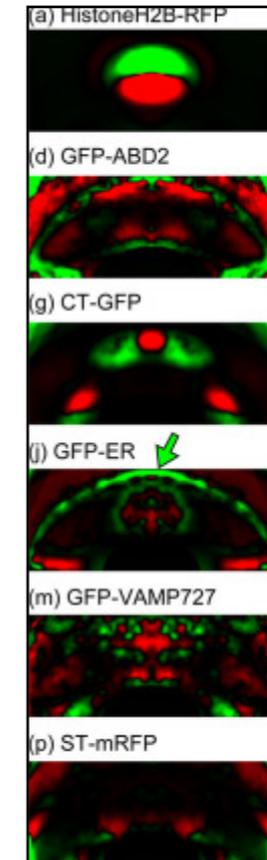
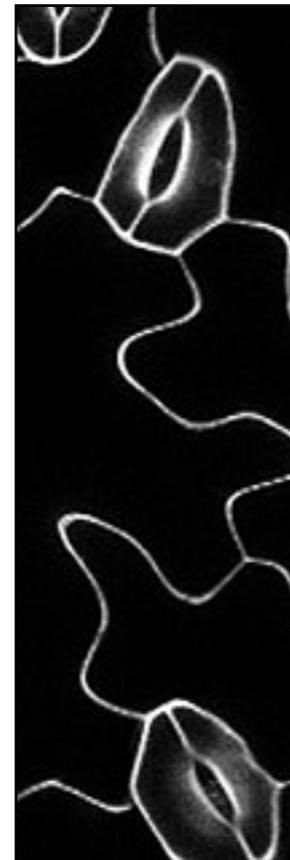
- プログラムコードベースで深層学習を活用した識別モデルを使用・訓練の体験。

Metrics in Phenotype

Evaluation of Interest

Phenotyping Metrics

- Genotype Effect
- Protein Function
- Environmental Stimulus
- Compound Effect



Hard	Difficulty in Defining Appropriate Quantification Metrics	Easy
High	Information Content	Low

GFP Image, Higaki et al., 2012

Epidermis image, http://news.stanford.edu/news/2008/december3/gifs/stomata_epidermis.jpg

その他のデータは著者が撮影もしくは作成したものの

Practical Convolutional Neural Network (AlexNet), Breakthrough Technology in Computer Vision



mite

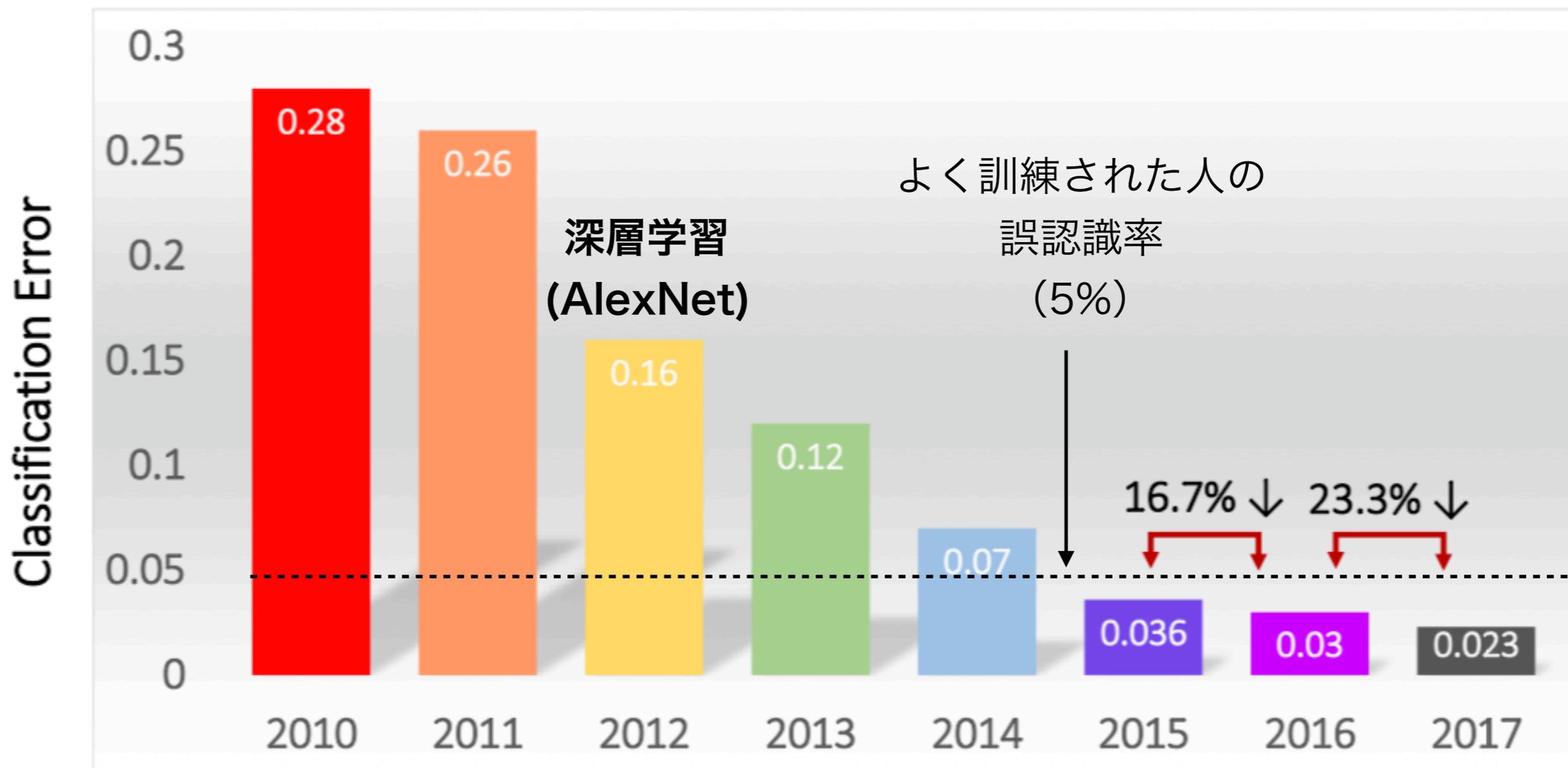
container ship

motor scooter

leopard

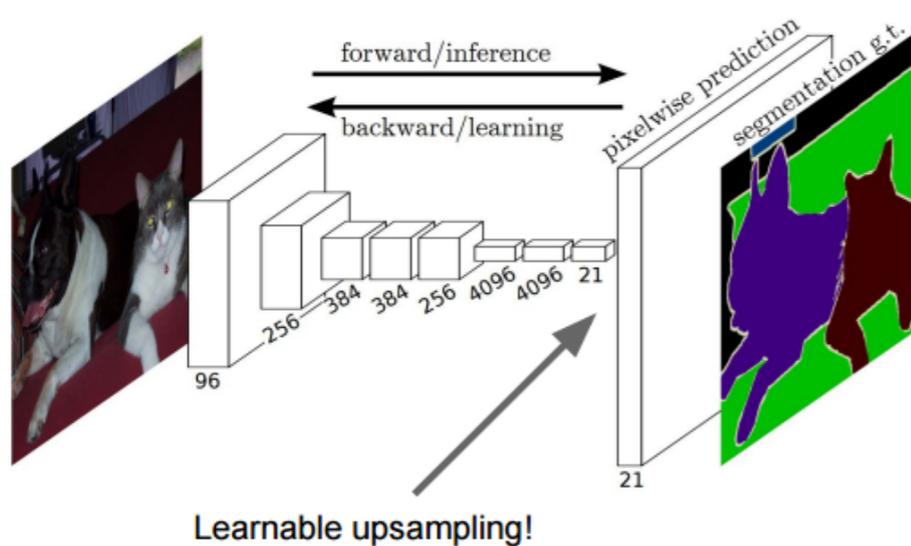
mite	container ship	motor scooter	leopard
mite	container ship	motor scooter	leopard
black widow	lifeboat	go-kart	jaguar
cockroach	amphibian	moped	cheetah
tick	fireboat	bumper car	snow leopard
starfish	drilling platform	golfcart	Egyptian cat

Classification Results (CLS)



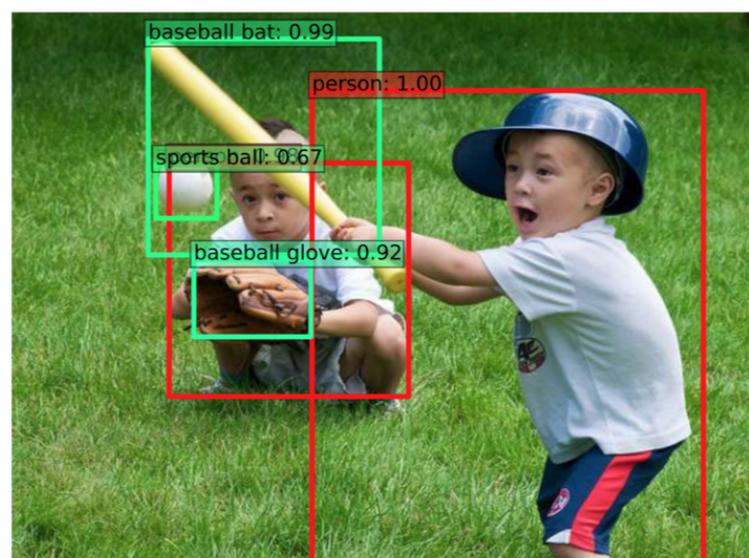
http://image-net.org/challenges/talks_2017/ILSVRC2017_overview.pdf

Application examples (related in image analysis)



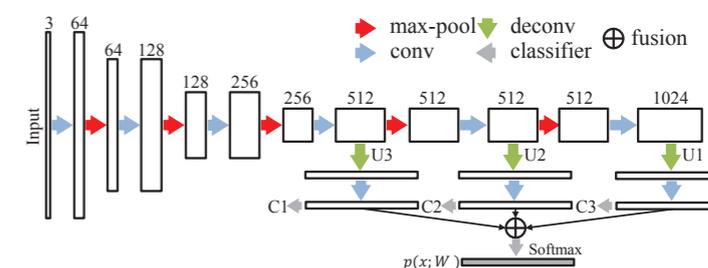
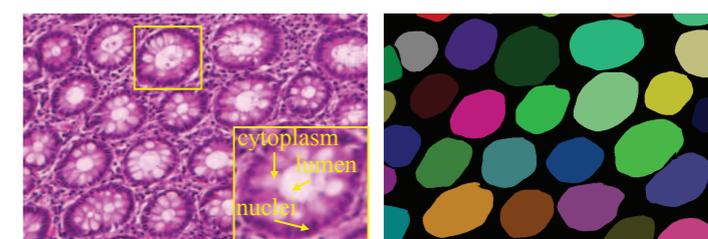
Long et al., 2015

物体領域抽出



Liu et al., 2015

物体検出



Chen et al., 2016

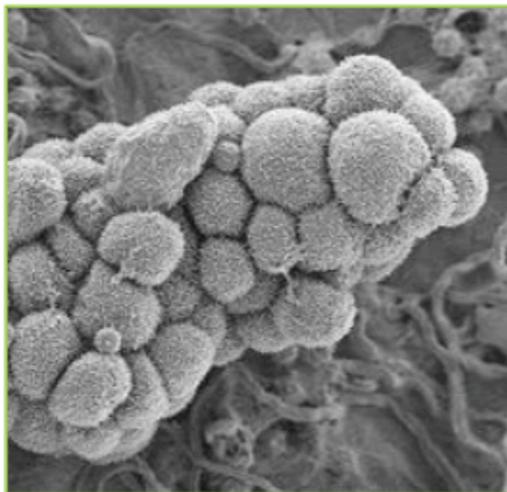
物体領域分割

Applications in various domain



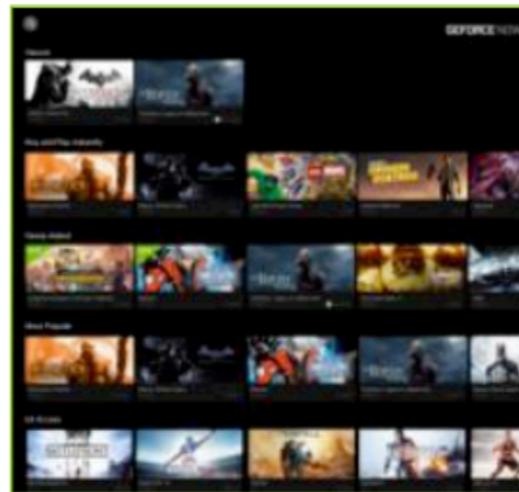
INTERNET & CLOUD

Image Classification
Speech Recognition
Language Translation
Language Processing
Sentiment Analysis
Recommendation



MEDICINE & BIOLOGY

Cancer Cell Detection
Diabetic Grading
Drug Discovery



MEDIA & ENTERTAINMENT

Video Captioning
Video Search
Real Time Translation



SECURITY & DEFENSE

Face Detection
Video Surveillance
Satellite Imagery



AUTONOMOUS MACHINES

Pedestrian Detection
Lane Tracking
Recognize Traffic Sign

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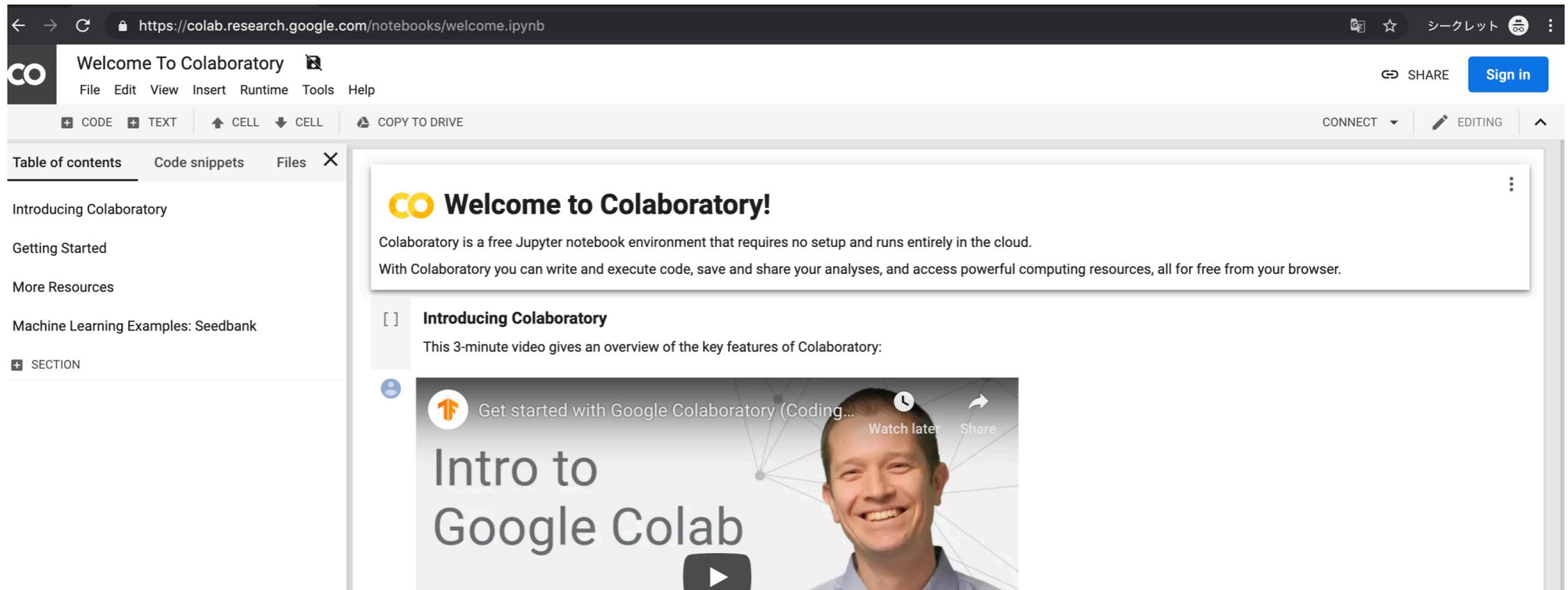
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NVIDIA

Google Colaboratory

次のサイトにアクセス <https://colab.research.google.com/>

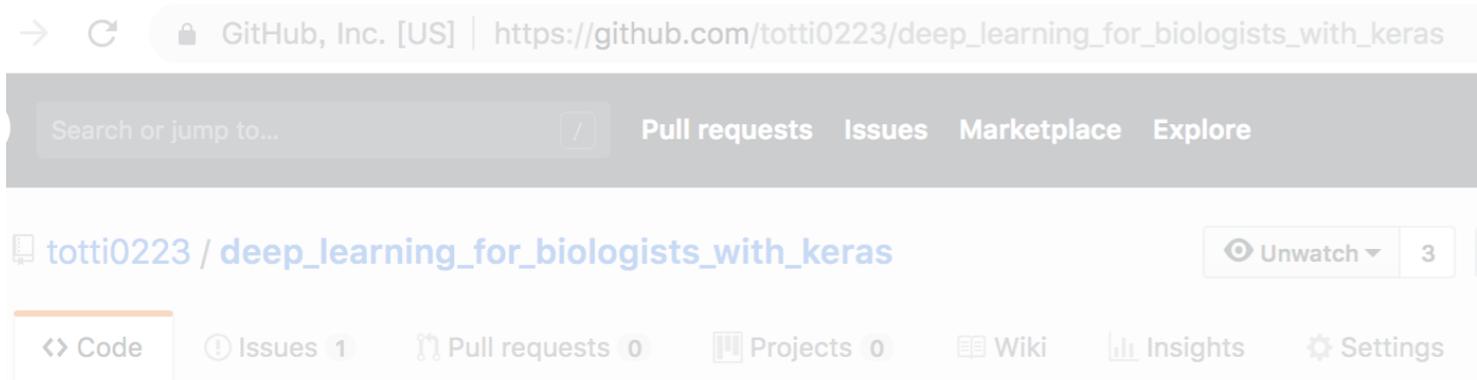


The screenshot shows the Google Colaboratory interface. The browser address bar displays `https://colab.research.google.com/notebooks/welcome.ipynb`. The page title is "Welcome To Colaboratory". The navigation menu includes "File", "Edit", "View", "Insert", "Runtime", "Tools", and "Help". The main content area features a "Welcome to Colaboratory!" message, stating that it is a free Jupyter notebook environment that runs in the cloud. Below this, there is a section titled "Introducing Colaboratory" with a video player showing a video titled "Intro to Google Colab". The video player includes a play button and a "Watch later" button. The left sidebar contains a "Table of contents" with links to "Introducing Colaboratory", "Getting Started", "More Resources", and "Machine Learning Examples: Seedbank".

チュートリアルへのアクセスの仕方

1. Github経由

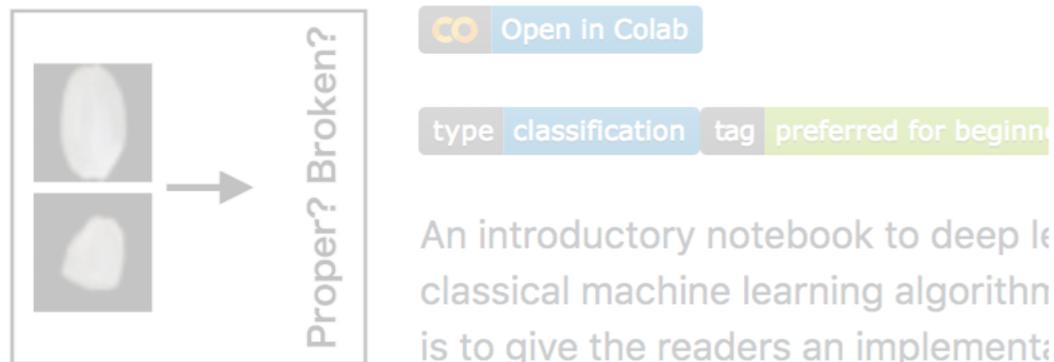
totti0223 github
で検索



open in colabをクリック

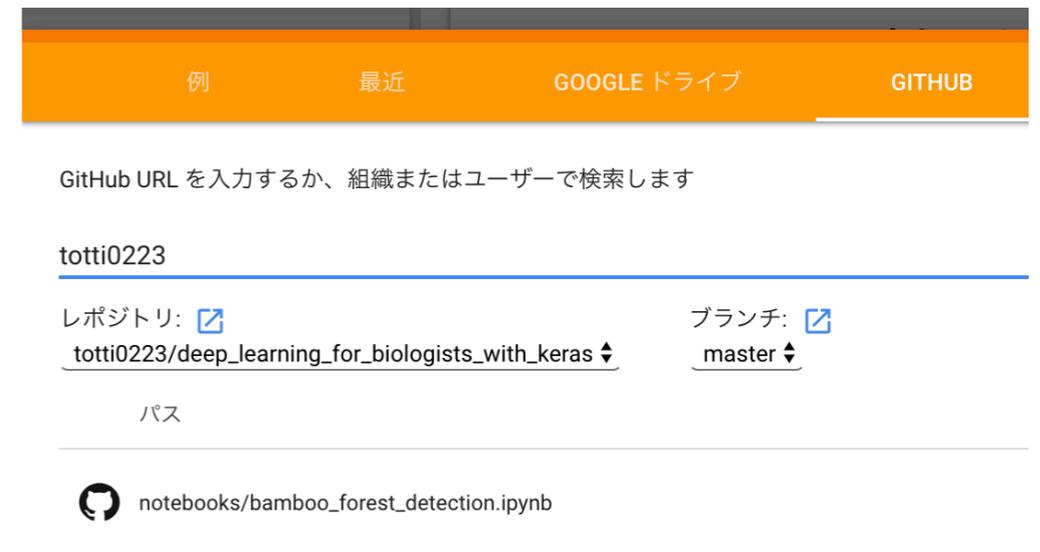
(ないしは右クリックで新しいタブ)

Rice Seed Integrity: What is deep learning.



2. Colab経由

colab.research.google.comにアクセス



初期画面か「ノートブックを開く」で

出てくるメニューから

→github→totti0223と入力

→repoからdeeplearningforbiologists~
を選択

→該当のtutorialを開く

今回は**VGG_demo.ipynb**

or **PlantDisease_tutorial.ipynb**

colab notebookを始める前に

1. googleアカウントにログインしていることを確認

(していない場合途中指示が出る)

ログイン中は画面右上に自分の名前が表示される



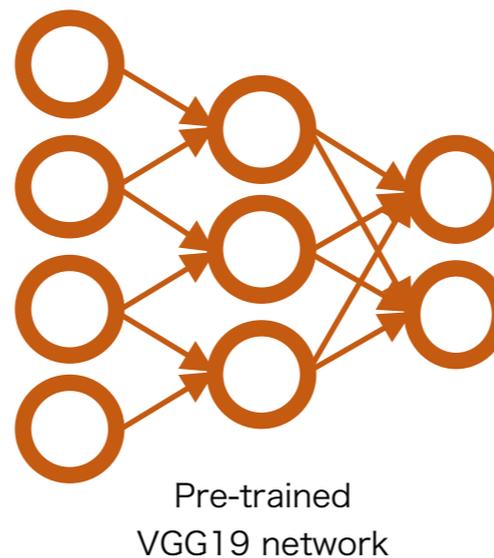
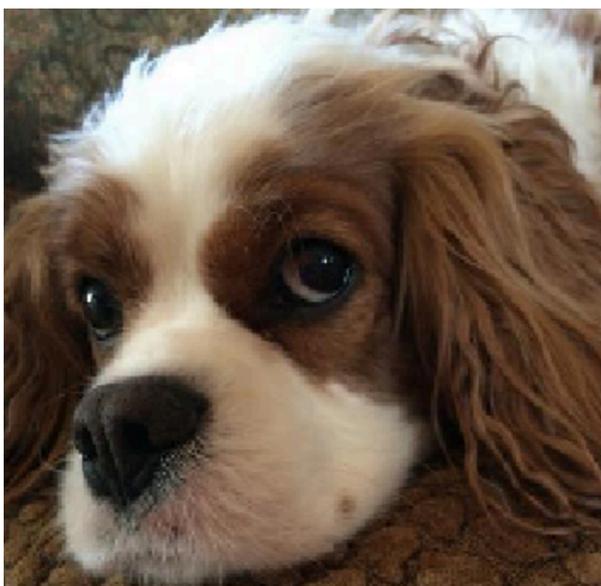
2. notebookをgoogle docにダウンロード

(自分で改変したコードを保存できるようになる)



はじめてnotebookを実行するときには上記の注意が出るので、
～リセットするのチェックを外して実行

VGG_demo.ipynb



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金魚の確率、
イタチザメの確率、
シュモクザメの確率、
.
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トイレットペーパーの確率
]

(height, width, channel)
= (224,224,3)

(カテゴリの数)
=(1000)

ImageNet(1000)ラベル

```
{0: 'tench, Tinca tinca',  
 1: 'goldfish, Carassius auratus',  
 2: 'great white shark, white shark, man-eater, man-eating shark, Carcharodon carcharias',  
 3: 'tiger shark, Galeocerdo cuvieri',  
 4: 'hammerhead, hammerhead shark',  
 5: 'electric ray, crampfish, numbfish, torpedo',  
 6: 'stingray',  
 7: 'cock',  
 8: 'hen',  
 9: 'ostrich, Struthio camelus',  
10: 'brambling, Fringilla montifringilla',  
11: 'goldfinch, Carduelis carduelis',  
12: 'house finch, linnet, Carpodacus mexicanus',  
13: 'junco, snowbird',  
14: 'indigo bunting, indigo finch, indigo bird, Passerina cyanea',  
15: 'robin, American robin, Turdus migratorius',  
16: 'bulbul',  
17: 'jay',  
18: 'magpie',  
19: 'chickadee',  
  
990: 'buckeye, horse chestnut, conker',  
991: 'coral fungus',  
992: 'agaric',  
993: 'gyromitra',  
994: 'stinkhorn, carrion fungus',  
995: 'earthstar',  
996: 'hen-of-the-woods, hen of the woods, Polyporus frondosus, Grifola frondosa',  
997: 'bolete',  
998: 'ear, spike, capitulum',  
999: 'toilet tissue, toilet paper, bathroom tissue'}
```

<https://gist.github.com/yrevar/942d3a0ac09ec9e5eb3a>

Constructing a crop disease diagnosis model

Using Deep Learning for Image-Based Plant Disease Detection

Sharada Prasanna Mohanty^{1,2}, David Hughes^{3,4,5}, and Marcel Salathé^{1,2,6}

¹Digital Epidemiology Lab, EPFL, Switzerland; ²School of Life Sciences, EPFL, Switzerland; ³Department of Entomology, College of Agricultural Sciences, Penn State University, USA; ⁴Department of Biology, Eberly College of Sciences, Penn State University, USA; ⁵Center for Infectious Disease Dynamics, Huck Institutes of Life Sciences, Penn State University, USA; ⁶School of Computer and Communication Sciences, EPFL, Switzerland

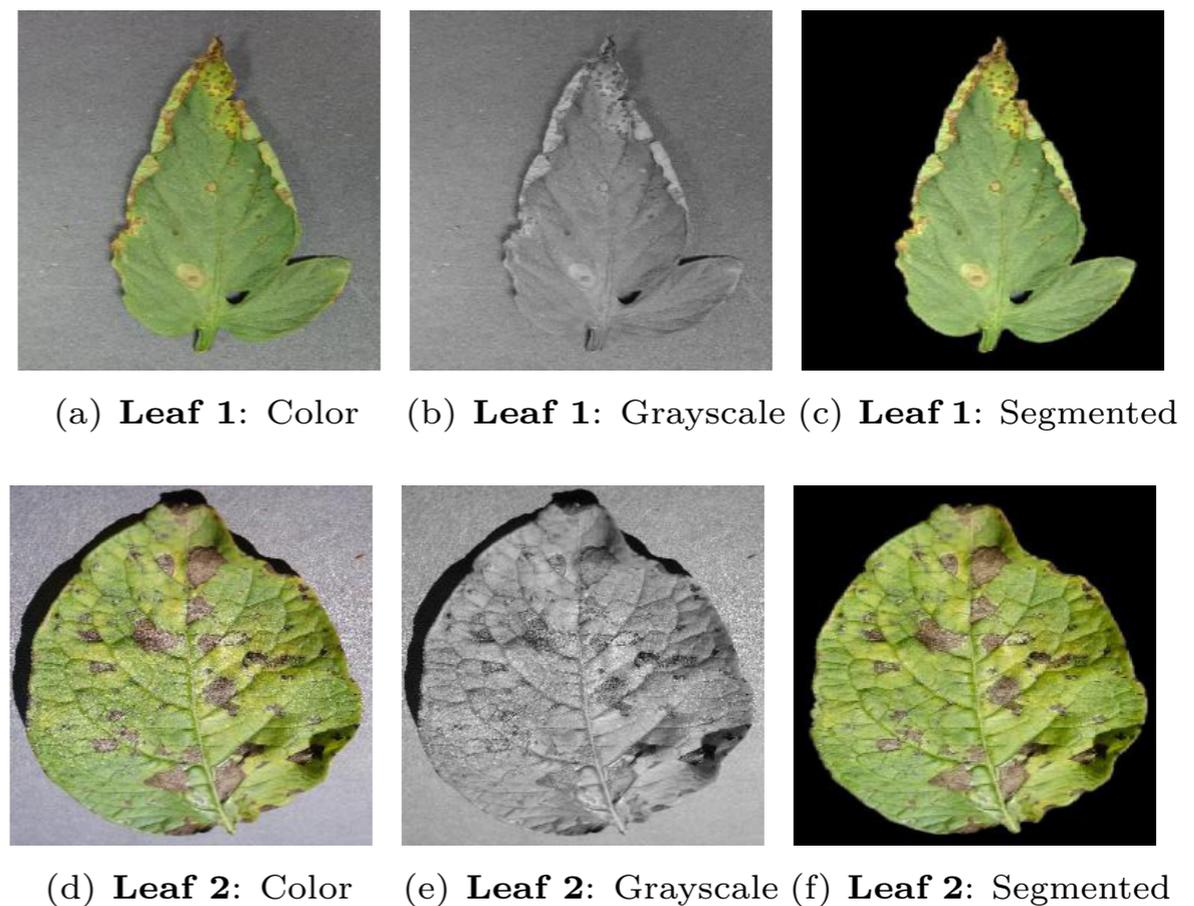
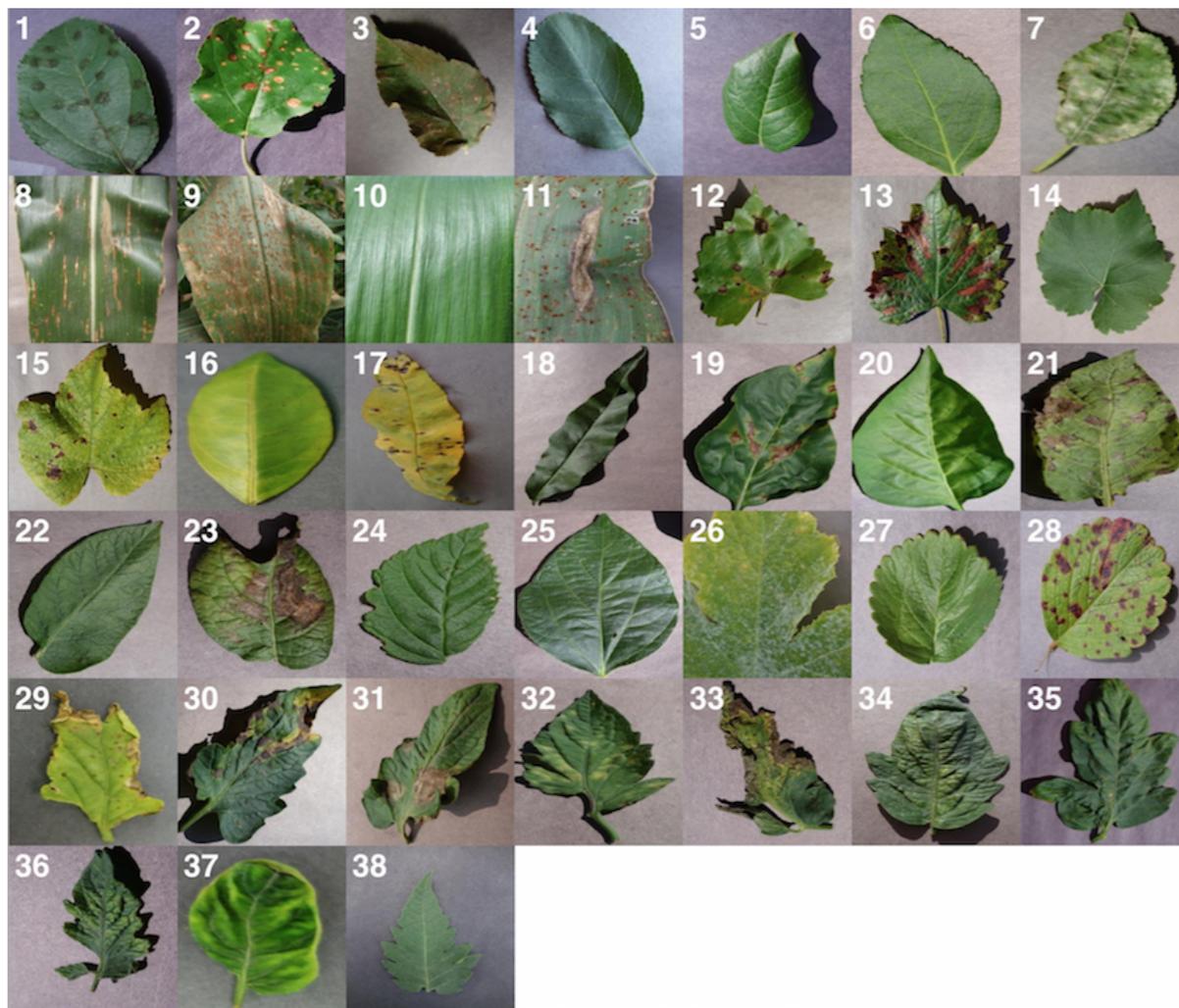


Fig. 2. Sample images from the three different versions of the PlantVillage dataset

PlantDisease_tutorial.ipynb

Late_blight



healthy



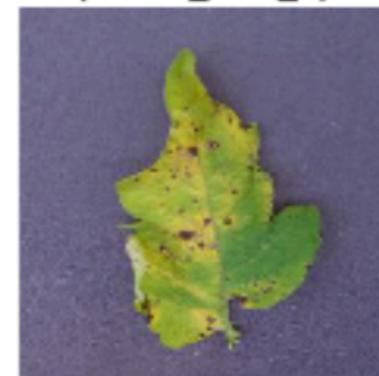
Target_Spot



Early_blight



Septoria_leaf_spot



Bacterial_spot



PlantVillageDatasetのうち、トマト5種の病気（+健康）を利用して病害診断モデルを作成してみましよう

Late Blight : 疫病

Target Spot : 褐色輪紋病

Early Blight : 輪紋病

Septoria Leaf Spot : 白星病

Bacterial Spot : 細菌病