



HUAWEI CLOUD



# [M]<sup>S</sup>INDSPORE CHALLENGE

## Pathology Diagnosis 2021

COMPUTER VISION IDENTIFYING CANCER CELLS

### TIMELINE



### BRIEF INTRODUCTION

MindSpore is an Open AI framework that supports the best Ascend matching and multi-processor architecture for all scenarios.

Your team's goal is to develop and design an AI model with the assistance of MindSpore to locate and classify cancer cells in pathological images.

### WHO & WHY TO PARTICIPATE

Postgraduate Students / Researchers / AI Companies

- Win a chance to cooperate with Huawei.
- Attend a series of workshops for free.
- A Great chance to interact with experts.

### WINNER PRIZE

Up to HKD 282,000

[Register Now](#)

DEADLINE: 2021.09.24

<https://mindsporechallenge.com>

More Information Join Discord



# MindSpore Challenge

## - Pathology Diagnosis

In the competition, participants are invited to use **MindSpore** as the AI training and inference framework, for developing trustworthy AI pathology diagnosis models that ensures **privacy**, **explainable** and **high accuracy**.

Quota

30 Teams

Team size

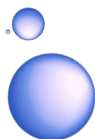
1 - 3 Members

Events

Workshops, Pitching, Award Ceremony

Competition Stage

Model Evaluation and Pitching Stage



HUAWEI CLOUD



# Co-organizers



HUAWEI CLOUD



## Huawei Cloud Hong Kong

- A leading cloud service provider, committed to bringing affordable, effective, and reliable cloud and AI services through technological innovation.

## Huawei Hong Kong Research Center

- Conducting researches in AI, fundamental theory, chips microarchitecture, software engineering, trustworthy software and so on.
- 250+ researchers, >48% PhD



## Hong Kong Science and Technology Parks Corporation

- A public corporation set up by the Hong Kong Government in 2001 to foster the development of innovation and technology in Hong Kong.
- Cultivated successful Innovation and Technology (I&T) companies, formed strong local and international partnership networks and created a thriving community

## Guangzhou LBP Medicine Science & Tech. Co., Ltd

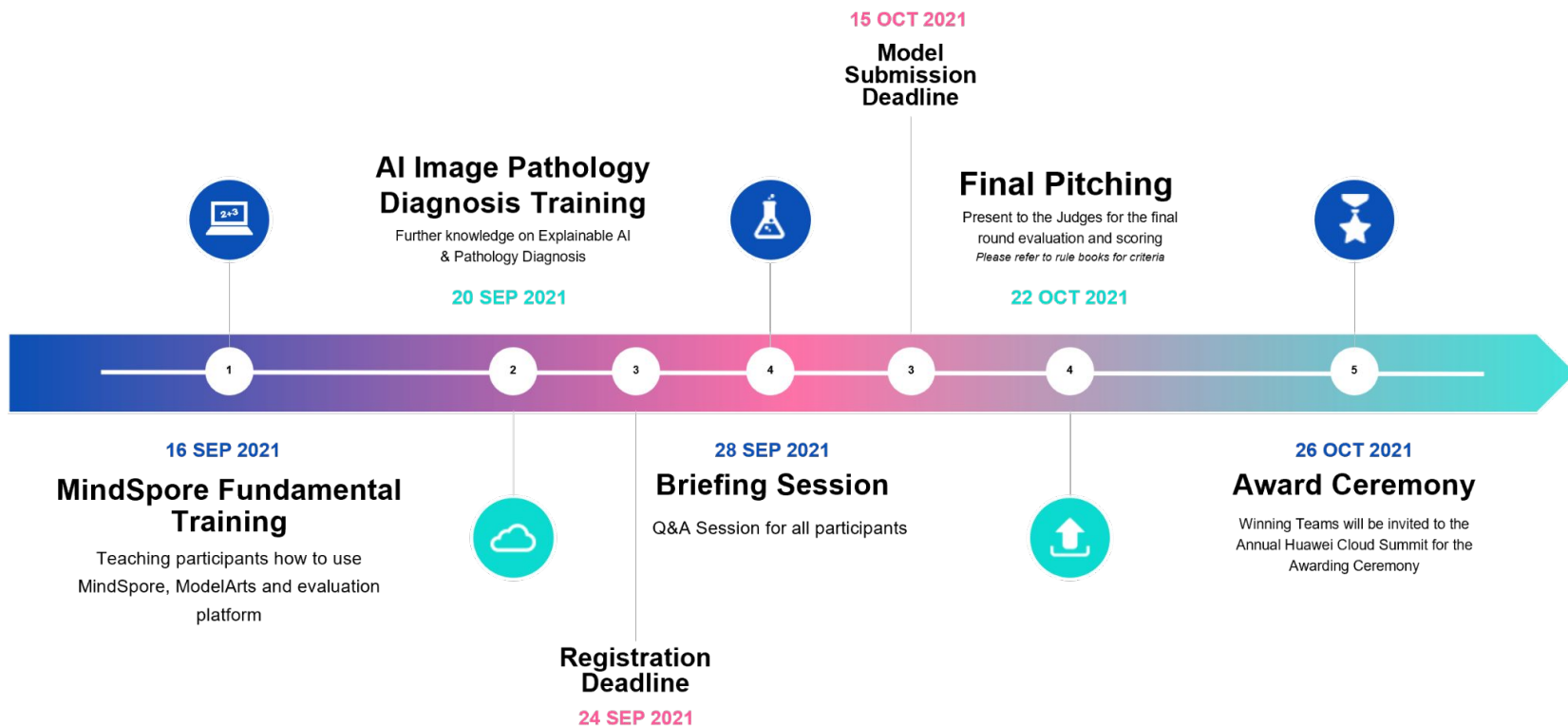
- Founded in 2005. The first listed company on the Science and Technology Board of the Shanghai Stock Exchange in the field of pathology diagnosis in China. (Securities Code: 688393)
- More than 500 registered/recorded products.
- Covering nearly 1,800 medical institutions in China.



## Guangzhou Bingli Technology Co., Ltd.

- A subsidiary of LBP Medicine, founded in 2017.
- The real-time visual field sharing system and pathology medical image analysis and processing system are widely used in intelligent diagnosis, data management, and data quality control.

# Competition Timeline



# ***Final Pitching & Award Ceremony***

## ***Final Pitching***

Date        **22 October 2021 (Friday)**  
Venue       **Inno2, 17W, Hong Kong Science Park**  
Time        **2:30pm**

### Agenda

- Welcoming Speech
- Solution Pitching
- On-site Evaluation



## ***Award Ceremony***

Event        **Huawei Cloud Summit 2021**  
Date        **26 October 2021 (Tuesday)**  
Venue       **Grand Hyatt Hong Kong**  
Time        **Afternoon**

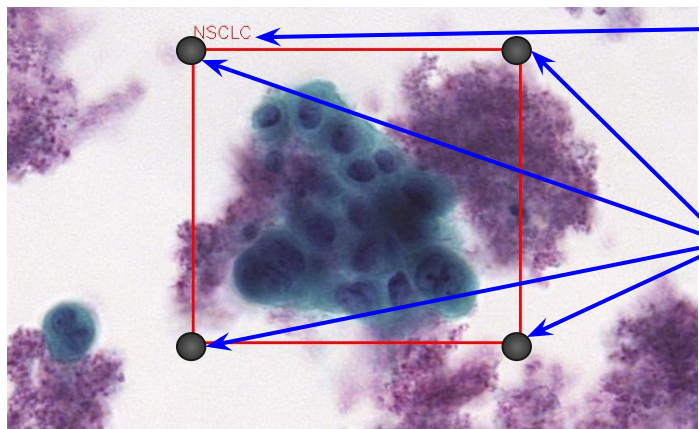
# Prizes!

Winning Teams Award	Prizes per Team
<i>Model Score Winner</i>	<b>HKD 60,000 Cash + HKD 12,000 Huawei Cloud Credit</b>
<i>Model Score Runner-up</i>	<b>HKD 45,000 Cash + HKD 6,000 Huawei Cloud Credit</b>
<i>Pitching Score Winner</i>	<b>HKD 45,000 Cash + HKD 6,000 Huawei Cloud Credit</b>
<i>Pitching Score Runner-up</i>	<b>HKD 30,000 Cash + HKD 6,000 Huawei Cloud Credit</b>
<i>Special Prize for Explainability</i>	<b>Souvenirs up to HKD 900 + HKD 1,500 Huawei Cloud Credit (max: 30 winners)</b>

# Problem Statement

Train a **MindSpore** AI model to **identify locations and classifications** of cancer cells in pathological images. The AI Models will **assist pathologists** in the diagnosis of **peripheral pulmonary diseases**.

This is a form of **multi-label object detection**.

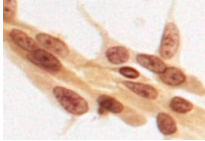
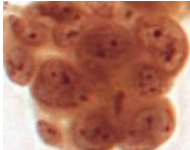
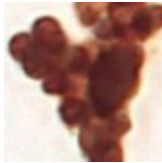
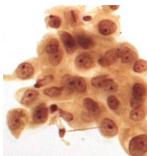


## Classification:

- Class of diagnosed cell

## Location:

- Bounding Boxes

Class	English Name	Subclass	Example
SCC	<i>Squamous Cell Carcinoma</i>	NSCLC	
AC	<i>Adenocarcinoma</i>	NSCLC	
SCLC	<i>Small Cell Lung Cancer</i>	-	
NSCLC	<i>Non-Small Cell Lung Cancer</i>	-	

# Model Evaluation - Evaluation Criteria

$$\text{Classification Score} = \frac{1}{|M|} \sum_{i \in M} \text{FROC}_i$$

$$\text{AUC} = \frac{1}{M \times N} \sum_{i \in \text{positive class}} \text{rank}_i - \frac{M(1 + M)}{2}$$

## Accuracy - FROC

- The trained MindSpore AI models should **accurately locate** and **classify** cancer cells.

## Explainability (Bonus) - AUC

- The trained MindSpore AI models should provides **pixel level feature attribution** as an explanation for the task!

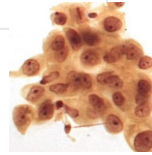
$$\text{Model Score} = \text{Accuracy Score} * 0.8 + \text{Explainable Score} * 0.2$$

The *top 6 highest model score* teams are invited to enter the **FINAL PITCHING**

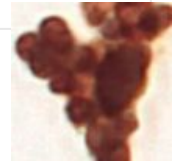


# ***Brief Introduction of Lung Cancer***

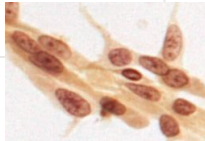
Non-small cell lung cancer (NSCLC)



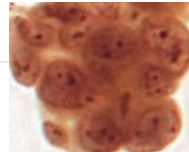
Small cell lung cancer (SCLC)



Squamous Cell  
Carcinoma (SCC)



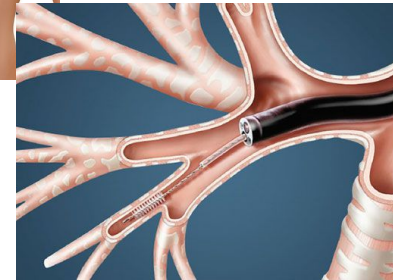
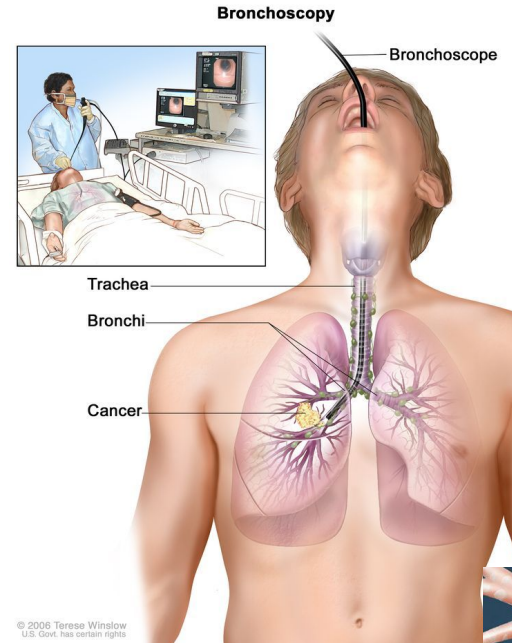
Adenocarcinoma  
(AC)



Their treatment and prognoses (outlook) are often similar.



# Brief Introduction of Bronchi Brushing



<https://www.youtube.com/watch?v=V4Y5U7UU27Y>

# ***Learn more about Pathology Diagnosis and Explainable AI***

Join the 2nd training workshop at 2:30pm on 20 SEP



Dr. Lawrence Chan  
Associate Professor  
Department of Health Technology and Informatics  
The Hong Kong Polytechnic University



Dr. Yongxiang Huang  
AI Researcher  
Huawei Hong Kong Research Center

# ***Register Now!***

OFFICIAL WEBSITE  
**Sign Up!**



  
DISCORD  
**Get Connected**

  
GITHUB  
**Get Resources**



RULE BOOK & GUIDELINES  
**Get Informed**

# Huawei Cloud



Elastic Cloud Server

## ELASTIC CLOUD SERVICE (ECS)

A powerful compute engine for you to deploy any application



ModelArts

## MODELARTS

A one-stop **development platform** for AI developers



HUAWEI CLOUD

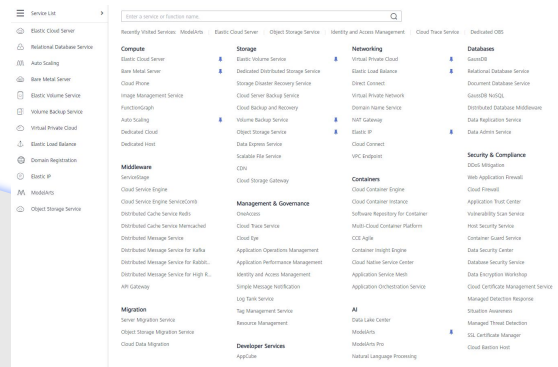


Object Storage Service

## OBJECT STORAGE SERVICE (OBS)

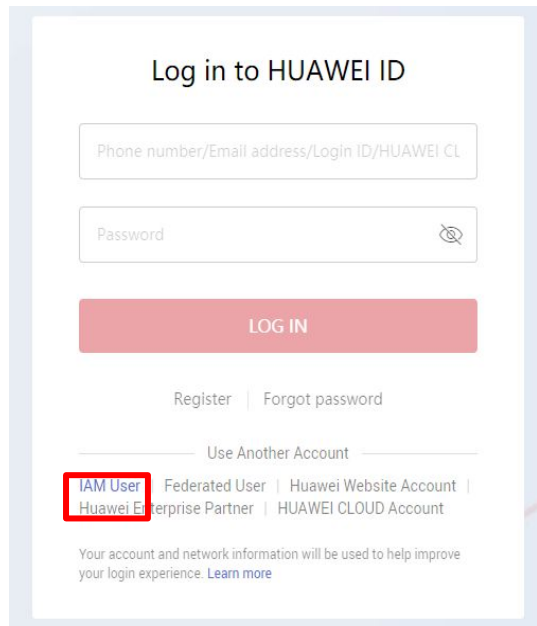
A **cloud storage service** optimized for storing massive amounts of data

AND MANY MORE...



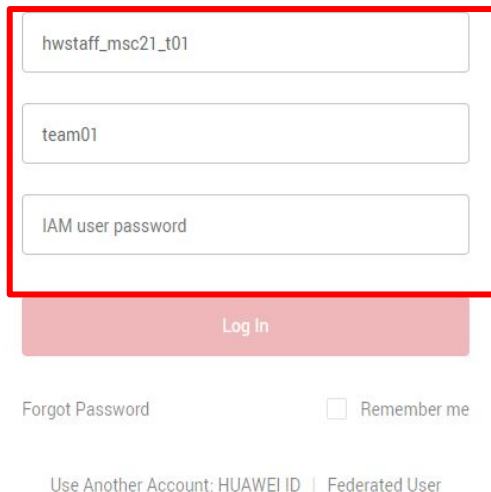
# Hands on time!

Get your user\_id from Discord !



Press IAM User in Login Page

IAM User Login

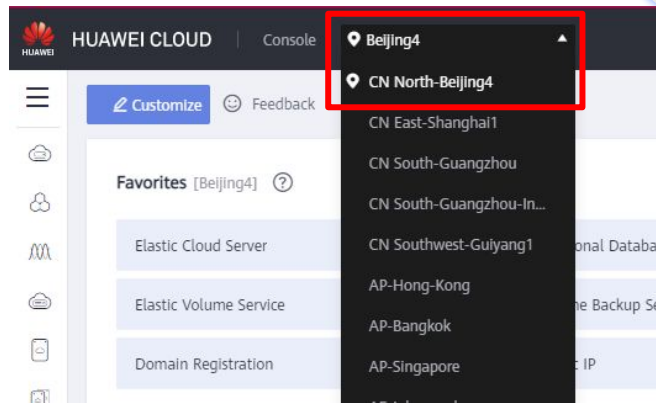


Login with Credentials!

Username: hwstaff\_msc21\_tutor

Iam: user\_XX

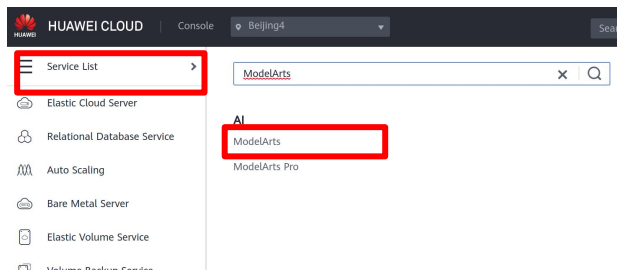
Password: **msc2021!**



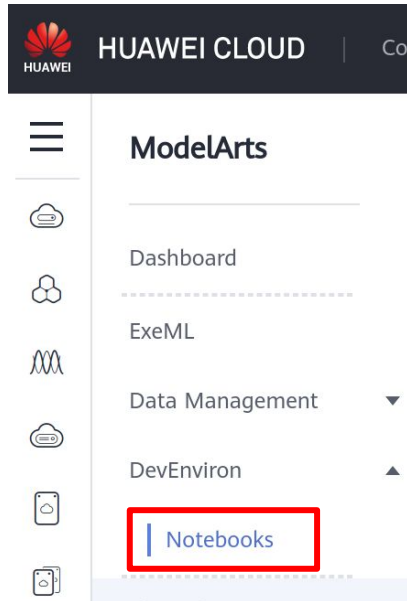
Change the Region to  
CN-North-Beijing4

[https://auth.huaweicloud.com/authui/login?id=hwstaff\\_msc21\\_tutor](https://auth.huaweicloud.com/authui/login?id=hwstaff_msc21_tutor)

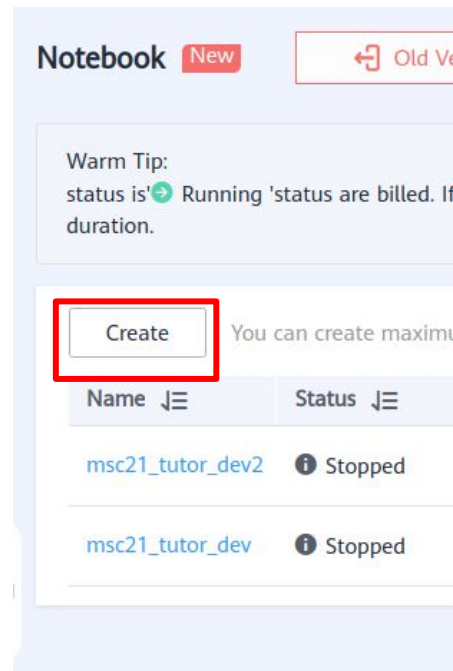
# Hands on time!



**Go to Service List,  
Search ModelArts**



**Click DevEnviron > Notebooks**



**Create your own notebook**



# Hands on time!

★ Name

user\_09

Change to your user\_id

★ Auto Stop



If you enable auto stop, the notebook instance automatically stops when th

☐ 1Hour

☒ 2Hour

☐ 4Hour

☐ 6Hour

☐ Customize

★ Work Environment

Public Image

Dedicate Image

Name	Description
<input type="radio"/> pytorch1.4-cuda10.1-cudnn7-ubuntu18.04	CPU and GPU general algorithm development and training, preconfigured with ...
<input type="radio"/> tensorflow1.2-cuda10.1-cudnn7-ubuntu18.04	CPU and GPU general algorithm development and training, preconfigured with ...
<input type="radio"/> mindspore1.2.0-openmpi2.1.1-ubuntu18.04	CPU algorithm development and training, preconfigured with the AI engine Min...
<input type="radio"/> mindspore1.2.0-cuda10.1-cudnn7-ubuntu18.04	GPU algorithm development and training, preconfigured with the AI engine Min...
<input type="radio"/> mlstudio-pyspark2.3.2-ubuntu16.04	CPU algorithm development and training, including the MLStudio tool for graph...
<input type="radio"/> mindstudio3.0.1-ascend910-cann3.3.0-ubuntu18.04-aarch64	Ascend operator development. The professional operator development tool Min...
<input checked="" type="radio"/> tensorflow1.15-mindspore1.2.0-cann20.2-euler2.8-aarch64	Ascend+ARM algorithm development and training. TensorFlow and MindSpore ...
<input type="radio"/> modelbox-tensorrt5.1.5.0-tf1.15-pytorch1.6-cuda10.1-cudnn7-eu	AI Inference application development, preconfigured ModelBox, AI engine PyTor...
<input type="radio"/> cyp0.91.4-cbcpy2.10-ortools9.0-cplex20.1.0-ubuntu18.04	CPU operations research development, preconfigured with cyp, cbcpy, ortools, c...
<input type="radio"/> rlstudio1.0.0-ray1.3.0-cuda10.1-ubuntu18.04	CPU and GPU algorithm development and training, preconfigured with AI engin...

Name : user\_XX

Work Environment:  
Choose, Ascend + ARM ....

Flavour:  
Ascend: 1\*Ascend 910|CPU: 24vCPUs  
96GB

★ Resource Pool

Public Resource Pool

Dedicated Resource Pool

★ Type

ASCEND

★ Flavor

Ascend: 1\*Ascend 910|CPU: 24vCPUs 96GB

Ascend: 2\*Ascend 910|CPU: 48vCPUs 192GB

Ascend: 1\*Ascend 910|CPU: 24vCPUs 96GB

★ Storage

50GB free, for experience or experiment only

Created	Operations
2021/08/27 13:55:33 GMT+08:00	<a href="#">Open</a>   <a href="#">Start</a>   <a href="#">Stop</a>   <a href="#">Delete</a>
2021/08/27 13:51:52 GMT+08:00	<a href="#">Open</a>   <a href="#">Start</a>   <a href="#">Stop</a>   <a href="#">Delete</a>

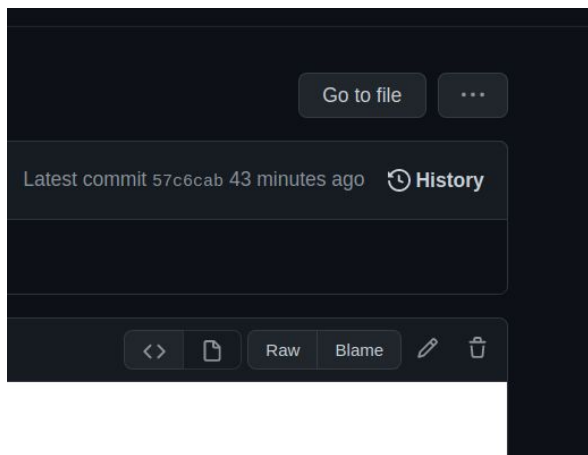
Wait for the creation to finish and you can click Open



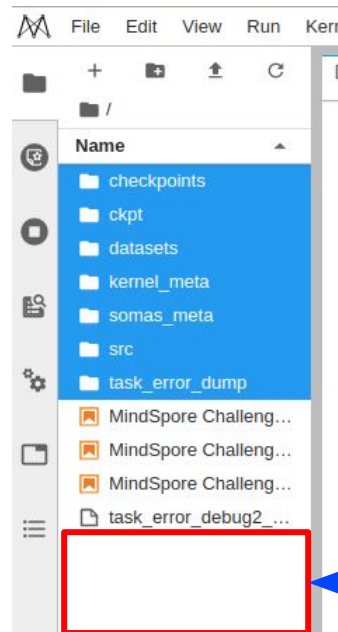
# Hands on time!

<https://github.com/MindSporeChallenge21/resources>

**Download required notebooks**  
In **notebooks** folder.



**Right Click RAW > save link as ....**



EMPTY  
REGION

**Drag and drop the file into the  
empty region to upload!**



# MindSpore

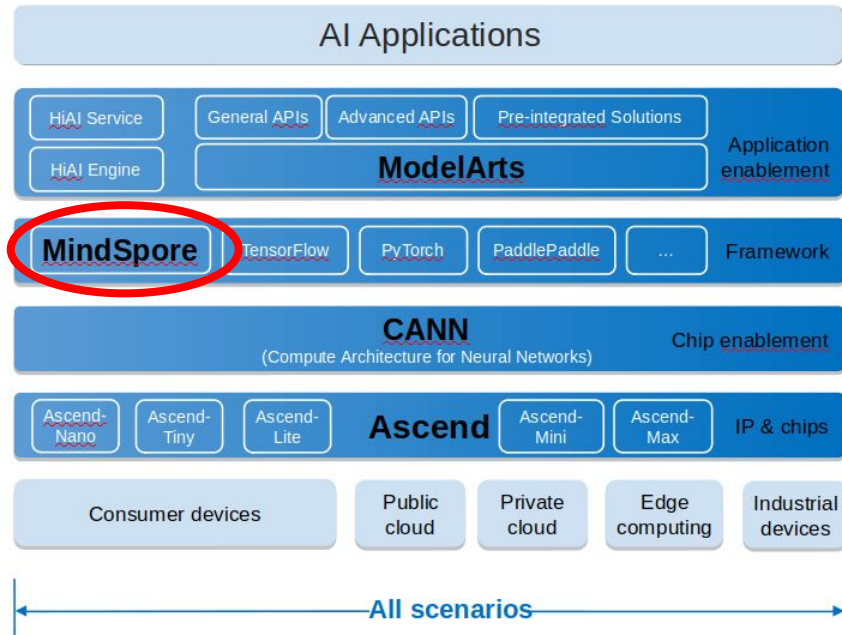
Introduction and Examples

# What is MindSpore?



An **Open AI-framework** that supports the multi-processor architectures developed by Huawei.

It provides a unified APIs and end-to-end AI capabilities for AI model development, execution and deployment in all scenarios, including cloud, edge and devices.



Friendly Development Experience



Flexible Debugging





Fully Unleashing Hardware Performance



Quick Deployment in All Scenarios

# DL Python Modules

	Dataset Preparation and Preprocessing	Network Construction and Training	Explainable XAI
<p>MindSpore Modules</p>  <p>MindSpore</p>	<p><code>mindspore.dataset:</code> Complete solution equipped with vision and text operators.</p>	<p><code>mindspore.nn:</code> network constructions</p> <p><code>mindspore.ops:</code> common operators in neural networks</p> <p><code>mindspore.model:</code> defining model, optimizers and loss function</p> <p><code>mindspore.train:</code> provides common training utilities</p>	<p><b><code>mindspore.explainer:</code></b> Provides methods to evaluate generate saliency maps/other explainable figures from inputs.</p>
<p>Tensorflow Pytorch Modules</p> 	<p><code>tf.data</code> <code>torch.utils.data</code></p>	<p><code>tf.keras.Model</code> <code>torch.nn</code></p>	-

# MindSpore Model Design and Training

## Dataset

```
dataset = ms.dataset.MnistDataset()

dataset.batch # batching data
dataset.map # preprocessing data
```

## Network

```
class Net(ms.nn.Cell):
    def __init__(self):
        super(Net, self).__init__()
        self.flatten = ms.nn.Flatten()
        self.dense = ms.nn.Dense(1024, 10)

    def construct(self, x):
        x = self.flatten(x)
        x = self.dense(x)
        return x

net = Net()
```

```
import mindspore as ms
```

## Model

```
loss = ms.nn.SoftmaxCrossEntropyWithLogits()
optimizers = ms.nn.Adam(
    net.trainable_params(),
    learning_rate=0.01
)

model = ms.Model(
    net,
    loss,
    optimizers,
    metrics={"Accuracy": ms.nn.Accuracy()})

model.train(epoch=10, dataset)
```

AI APPS

# ***Agenda***

## **Part I - Beginner Tutorial**

- MindSpore Dataset
- MindSpore Neural Network Design
- MindSpore Model Training

## **Part II - Intermediate Tutorial**

- Training a YoloV3 model
- Using ModelArts, OBS and Moxing Framework
- Submission to Portal