
# The 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 Rounds** | Qualification and Final Rounds |

**Organizers**:

HUAWEI HUAWEI CLOUD HKSTP 爱病理

# Competition Timeline

1

**Training Workshop**

17/09

2

**Model Training**

MODELARTS + MINDSPORE

3

**Model Evaluation**

SUBMIT TO PORTAL

4

**Final Submission**

08/10

5

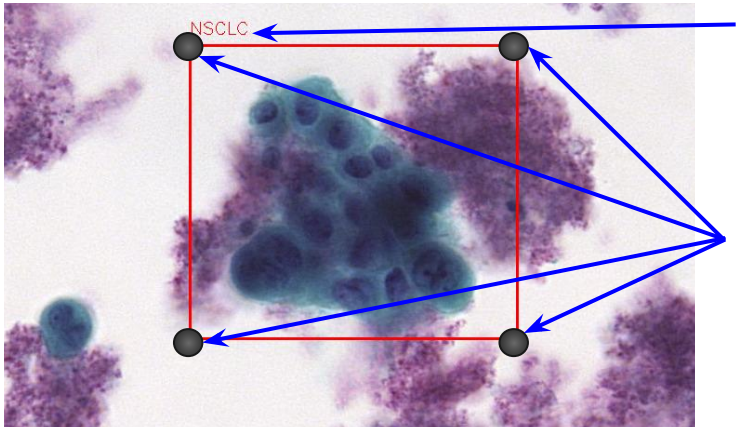
**Final Pitching**

15/10

# Qualification Round - Problem Statement

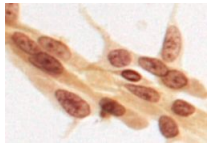
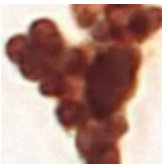
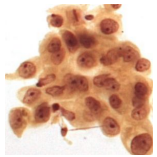
Training a **MindSpore** AI model to **identify locations and classifications** of cancer cells in pathological images. The AI Models will **assist pathologists** in the diagnosis of **peripheral pulmonary diseases**.

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




***Classification:***
- Class of diagnosed cell

***Location:***
- Bounding Boxes

| Class | English Name | Subclass | Example |
|---|---|---|---|
| **SCC** | *Squamous Cell Carcinoma* | *NSCLC* |  |
| **AC** | *Adenocarcinoma* | *NSCLC* |  |
| **SCLC** | *Small Cell Lung Cancer* | - |  |
| **NSCLC** | *Non-Small Cell Lung Cancer* | - |  |

# Qualification Round - Evaluation

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

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

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 ROUND**

# Final Round & Ceremony

## Pitching

Date **15 October 2021**

Venue **Charles K Kao Auditorium HKSTP**

Time 2 - 6pm

Agenda

- Welcoming Speech
- Solution Pitching
- On-site Evaluation
- Result Announcement

Charles K Kao Auditorium HKSTP

## Award Ceremony

Event **Huawei Cloud Summit 2021**

Date **26 October 2021**

Venue TBD

Time Afternoon

# *Prizes!*

| Winning Teams Award | Prizes per Team |
|---|---|
| *Model Score Winner* | **HKD 70,000** |
| *Model Score Runner-up* | **HKD 50,000** |
| *Pitching Score Winner* | **HKD 50,000** |
| *Pitching Score Runner-up* | **HKD 35,000** |
| *Special Price for Explainability* | **HKD 2,000 (max: 30 winners)** |

# *Register Now!*

OFFICIAL WEBSITE

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DISCORD

**Get Connected**

GITHUB

**Get Resources**

RULE BOOK & GUIDELINES

**Get Informed**

# MindSpore

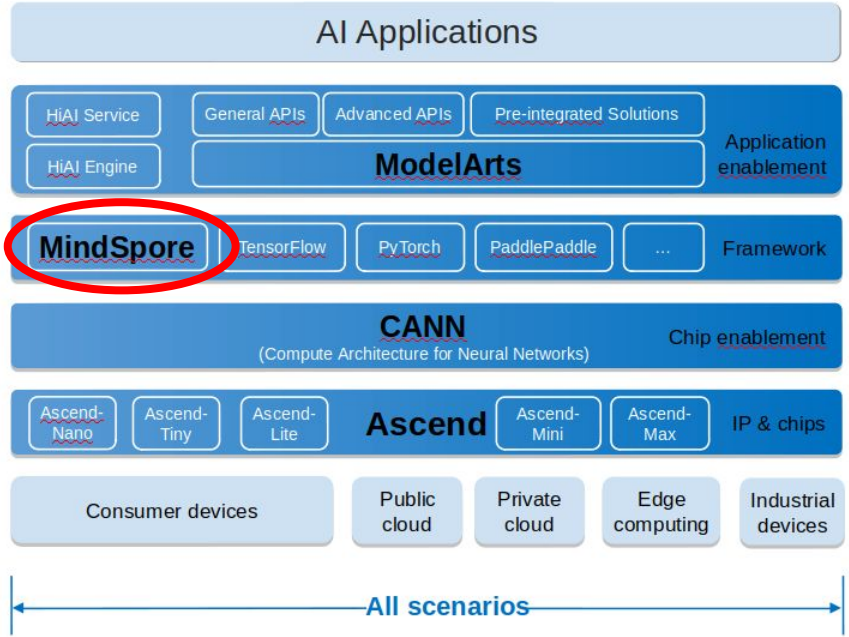
Introduction and Examples

# What is MindSpore?

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.

# DL Python Modules

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

# MindSpore Model Design and Training

```
import mindspore as ms
```

## 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()
```

## 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

# Huawei Cloud

Elastic Cloud Server

## ELASTIC CLOUD SERVICE (ECS)

A powerful compute engine for you to deploy any application

Object Storage Service

## OBJECT STORAGE SERVICE (OBS)

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

HUAWEI

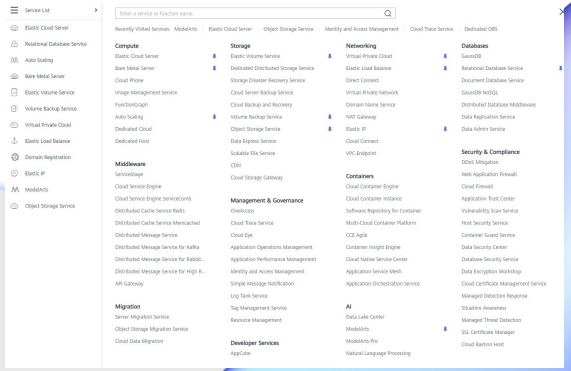
## HUAWEI CLOUD

ModelArts

## MODELARTS

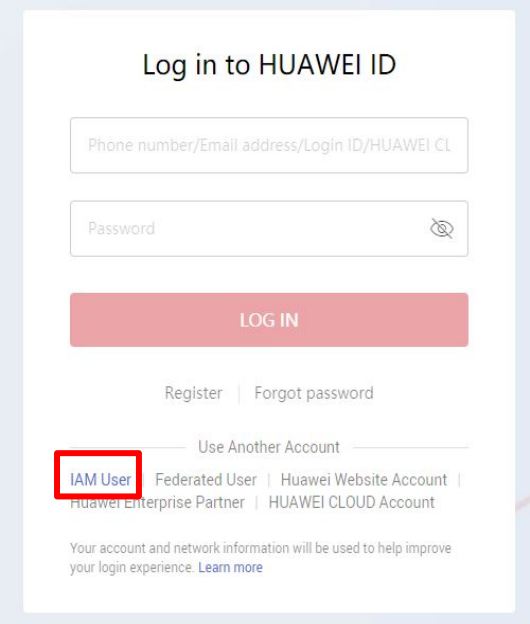
A one-stop **development platform** for AI developers

## AND MANY MORE...

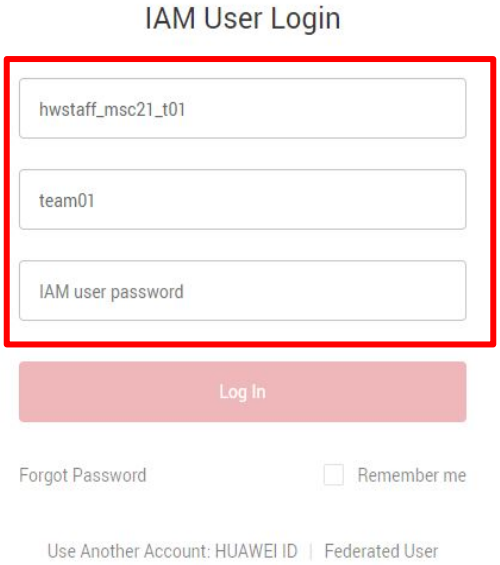


# Hands on time!

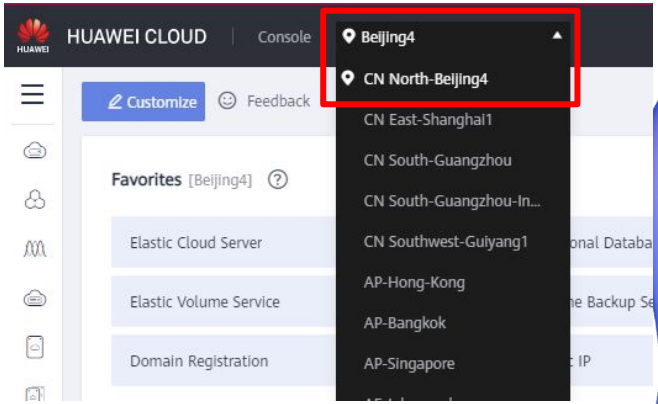
**Get your user_id from Discord !**




**Press IAM User in Login Page**

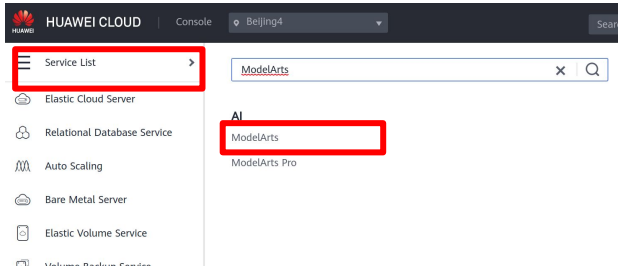



**Login with Credentials!**
Username: hwstaff_msc21_tutor
Iam: user_XX
Password: ***msc2021!***

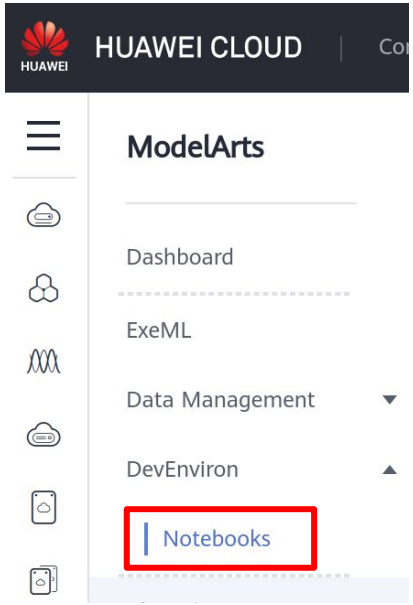



**Change the Region to CN-North-Beijing4**

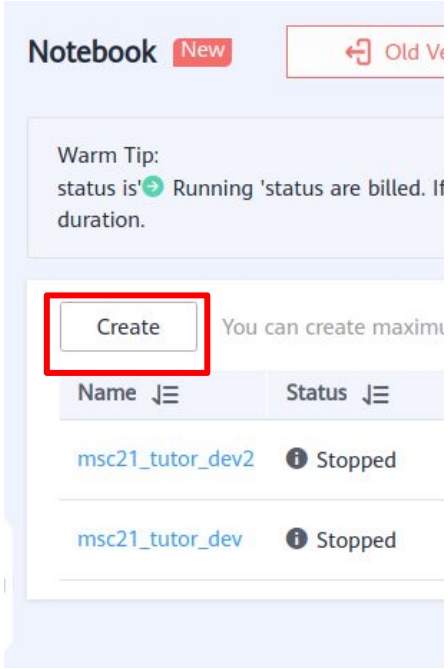
# Hands on time!




**Go to Service List, Search ModelArts**

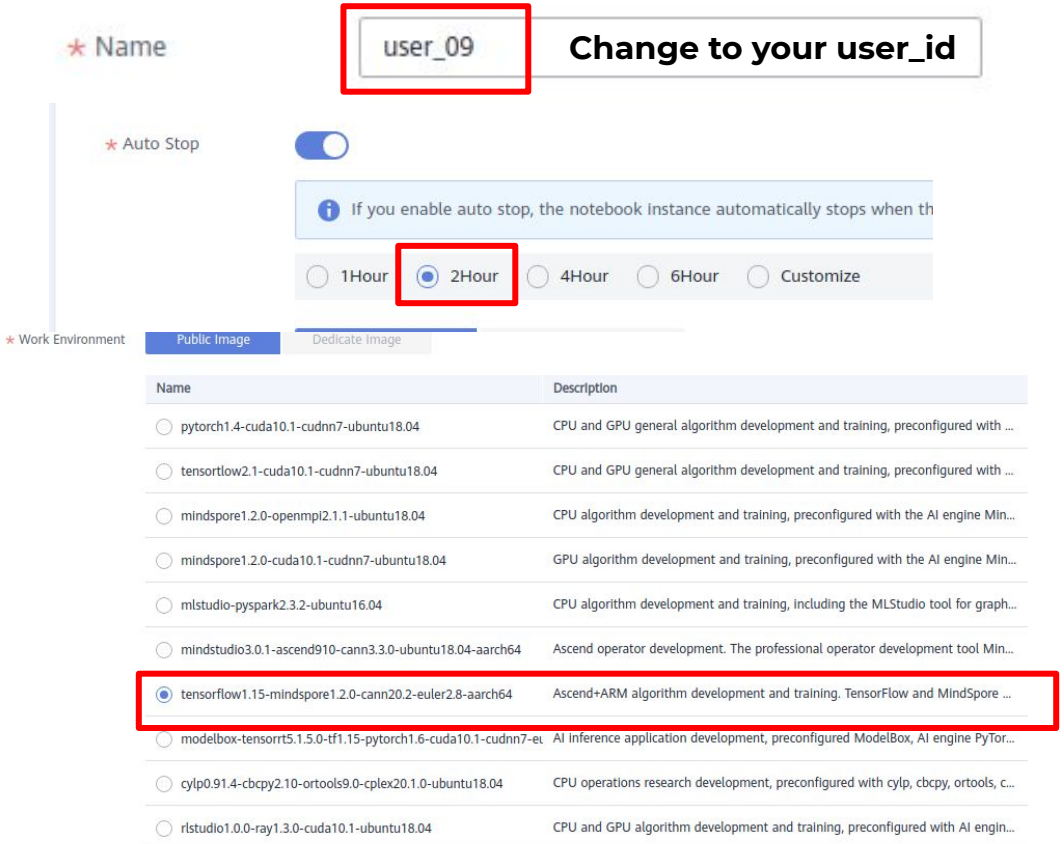



**Click DevEnviron > Notebooks**




**Create your own notebook**

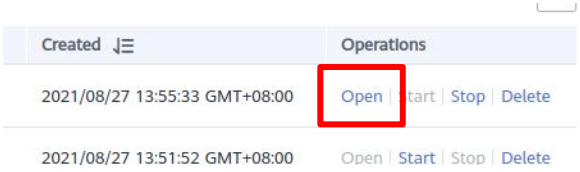
# Hands on time!




**Name : user_XX**

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

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

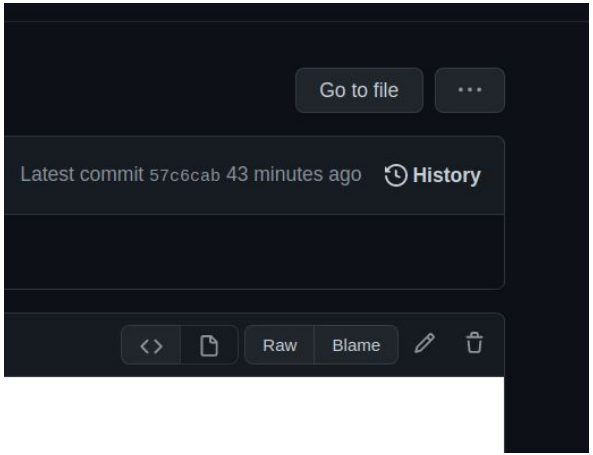




**Wait for the creation to finish and you can click Open**

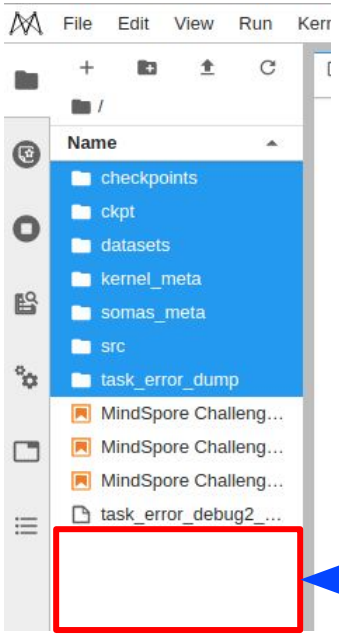
# Hands on time!

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!**

# 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