

T-Systems, AI Provider | 2022

Building Practical AI Solutions in the Biggest European OpenStack Cloud

Héctor López Romero & Ferenc Kukucska | Open Telekom Cloud

World of AI Summit, October 12-13th, 2022

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higher performance



Who we are:



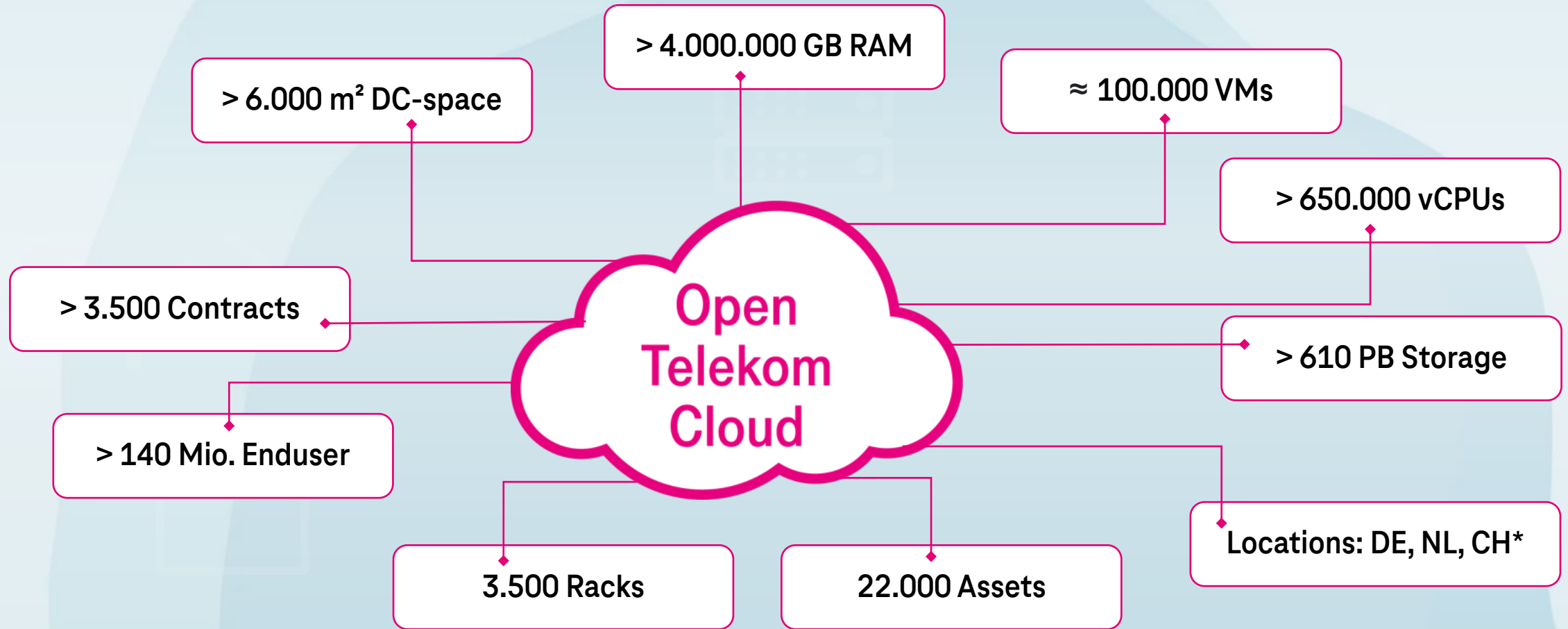
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The Open Telekom Cloud in Figures



*CH Region is a Community Cloud



From Europe for Europe



§ **GDPR compliant**



Sovereign



Secure



Reliable

- Operation in European data centers
- Managed by Telekom (EU only)
- Audited data protection according to European law

- Sovereignty over data & encryption - data sovereign
- Open platform due to OpenStack - technology sovereign
- Operated by Telekom - operationally sovereign

- Independently tested security
- Meets industry-specific requirements

- 99,95% Availability
- 24/7 available
- Zero Outage – Quality Assurance Program

✓ **Data privacy**

✓ **Data security**

✓ **Legal certainty**

✓ **Schrems II compliant**



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ModelArts AI DEVELOPER FRAMEWORK

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AI Development Lifecycle with ModelArts



Lifecycle management

For different AI developers:

○ Application developers

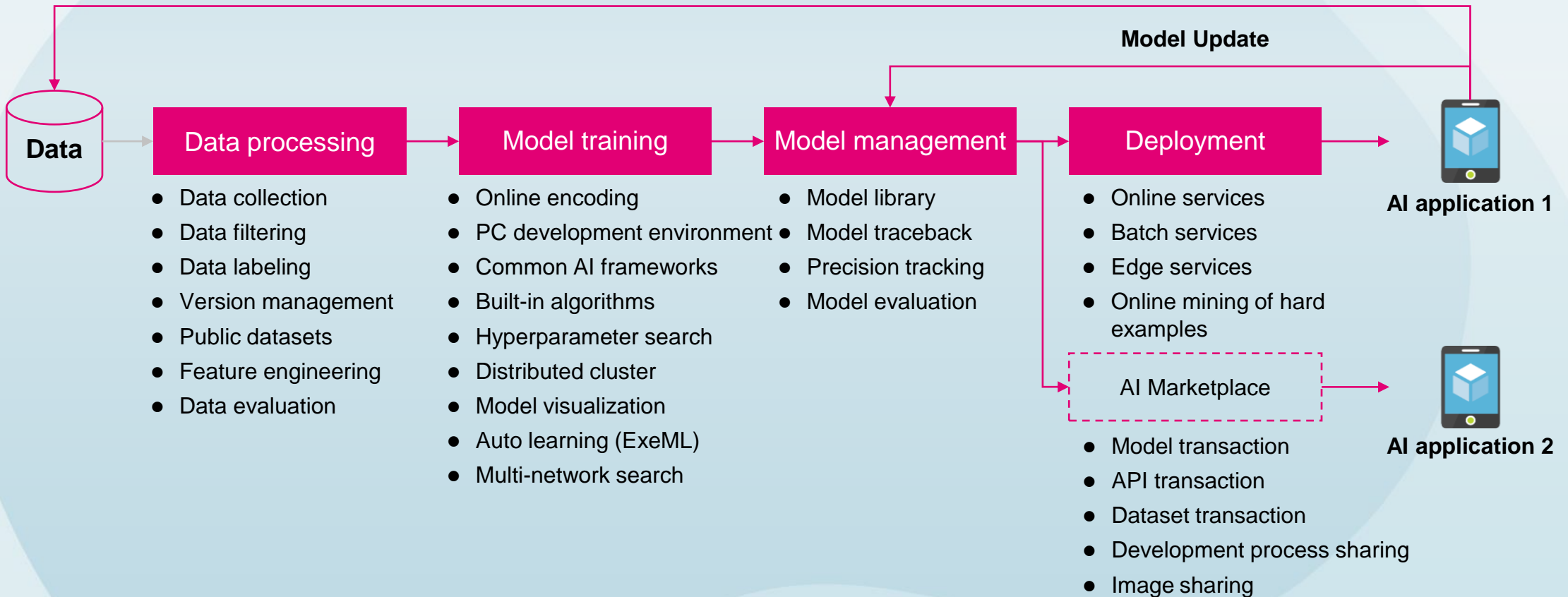
○ Data Scientists

○ AI Architect

○ ML Engineer

Data Optimization

Model Update



ModelArts Offers AI Development for Various “developer” groups



Case 1:
I love coding



Case 2:
I just want to
build a model quickly



Case 3:
I just want to
use a model

Better coding experience



TensorFlow, MXNet,
Caffe, Spark ML, Scikit,
XGBoost, ...

Built-in algorithms



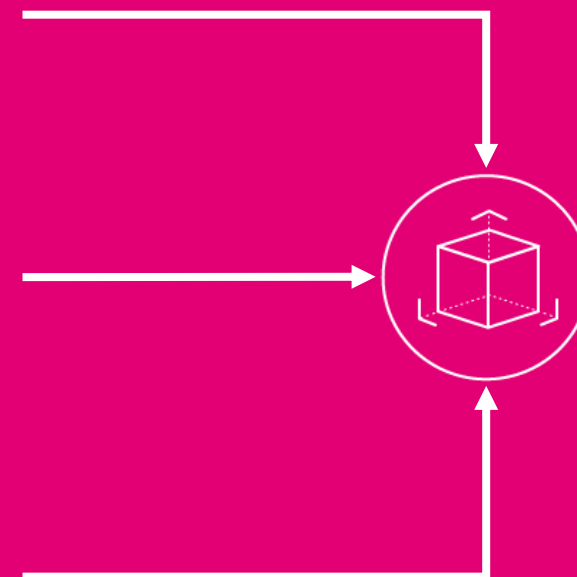
ResNet50, Faster-RCNN,
VGG_16, SegNet_VGG, ...

Ready to use Model



Image classification,
object detection,
predictive analytics

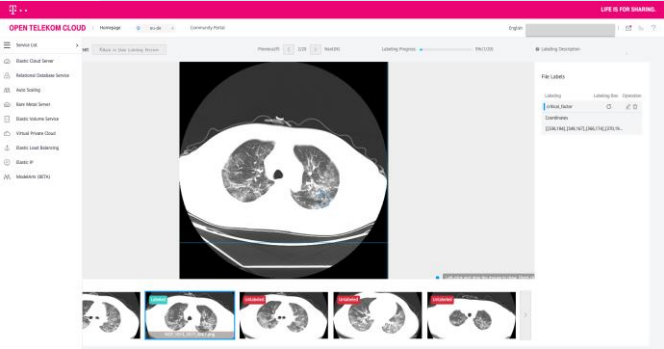
One-click training



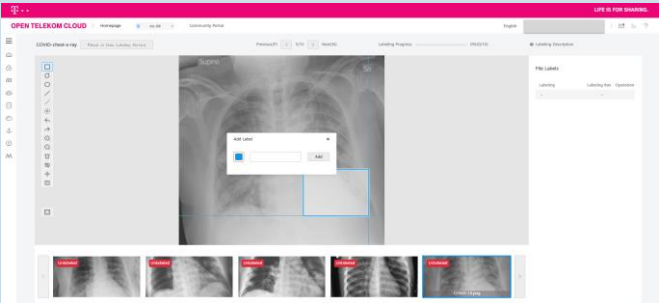
Applications

Image Annotation

CT lung disease area annotation



X-ray lung disease area annotation



Notebook

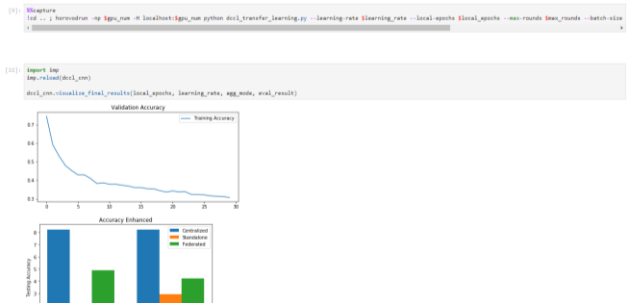
Pulmonary disease modeling

```
[1]: image = Image.open(data_filename)
plt.imshow(image)
plt.show()

[2]: session = Session()
predictor_instance = Predictor(session, service_id='63b5123-2022-4a08-bb12-f0ba2802ca3f')
service_info_resp = predictor_instance.get_service_info()
print(service_info_resp['status'])
concerning

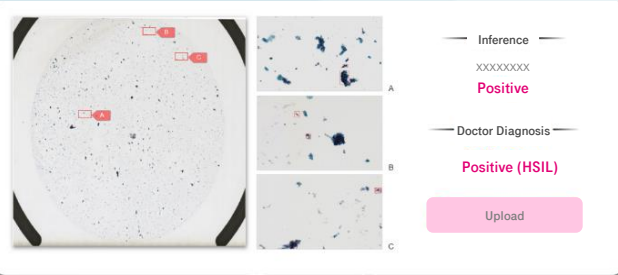
[3]: predict_result = predictor_instance.predict(data=data_filename, data_type='Images')
print(predict_result)
("diagnosis": ["Cardiomegaly", "Pneum", "Nodule"])
```

Training

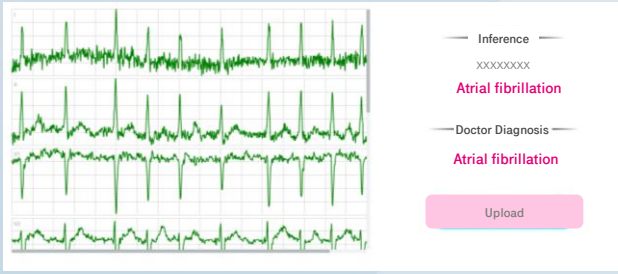


Auxiliary Diagnosis

Auxiliary diagnosis of cervical cancer



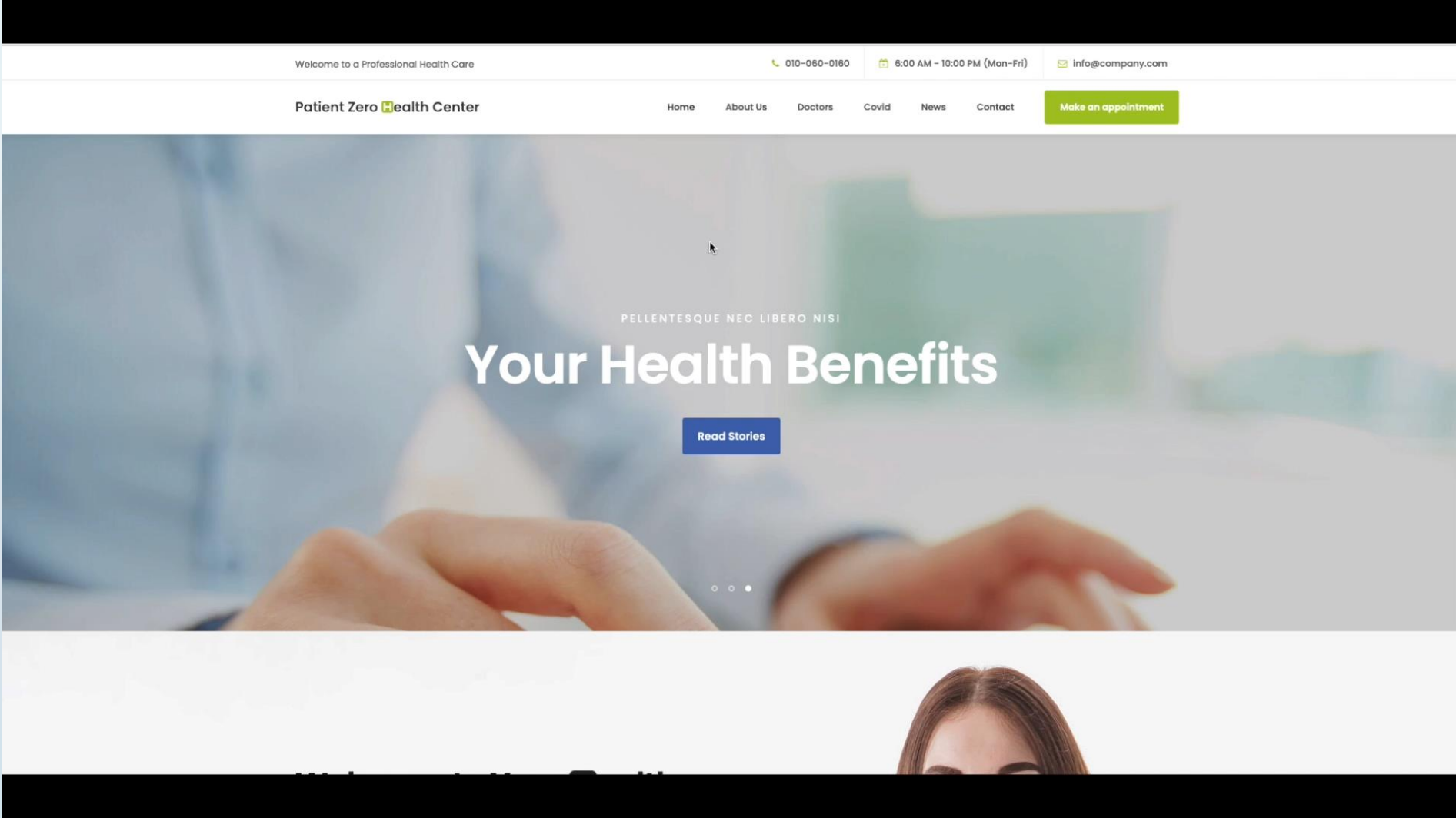
ECG-aided diagnosis





DEMO TIME!

AI Application with ModelArts - CovidDet



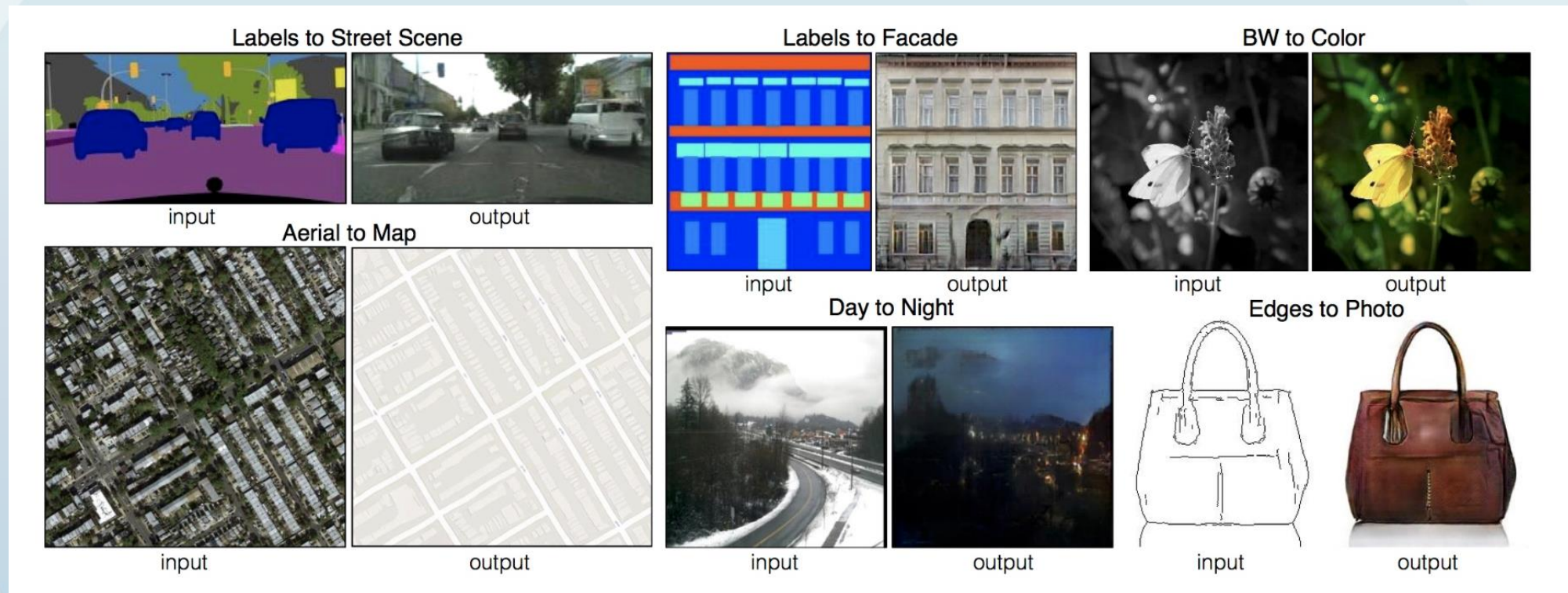
Data source: Gunraj, Wang, Wong. *Frontiers in Medicine* 2020.



Solution GAN (Generative Adversarial Networks)

- Used e.g., in the media industry for up-scaling low-resolution 2D textures in old video games

Source <https://phillipi.github.io/pix2pix>



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FutureGAN

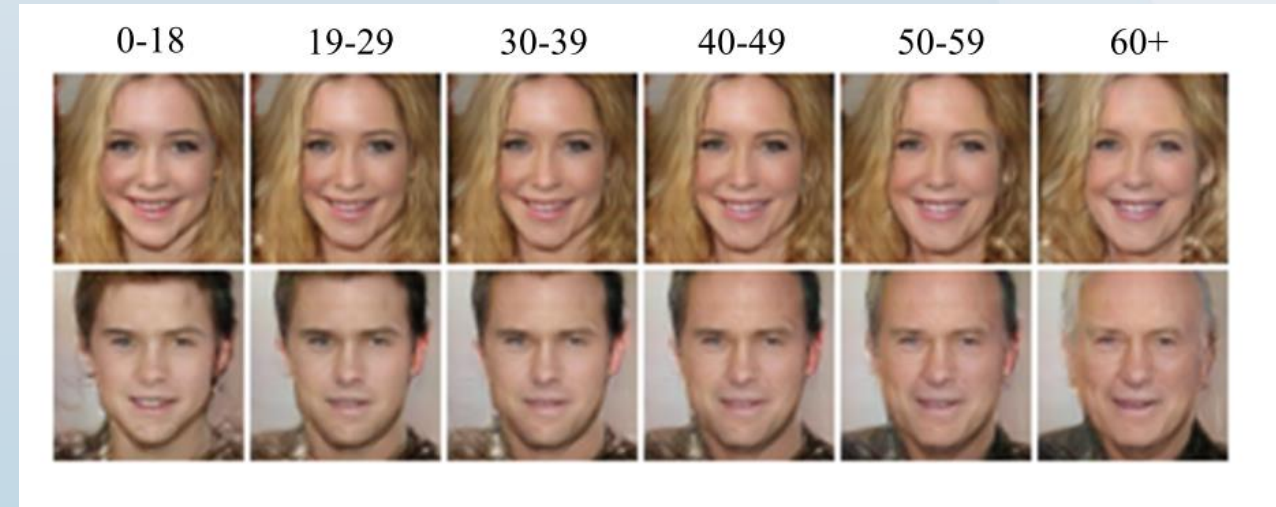
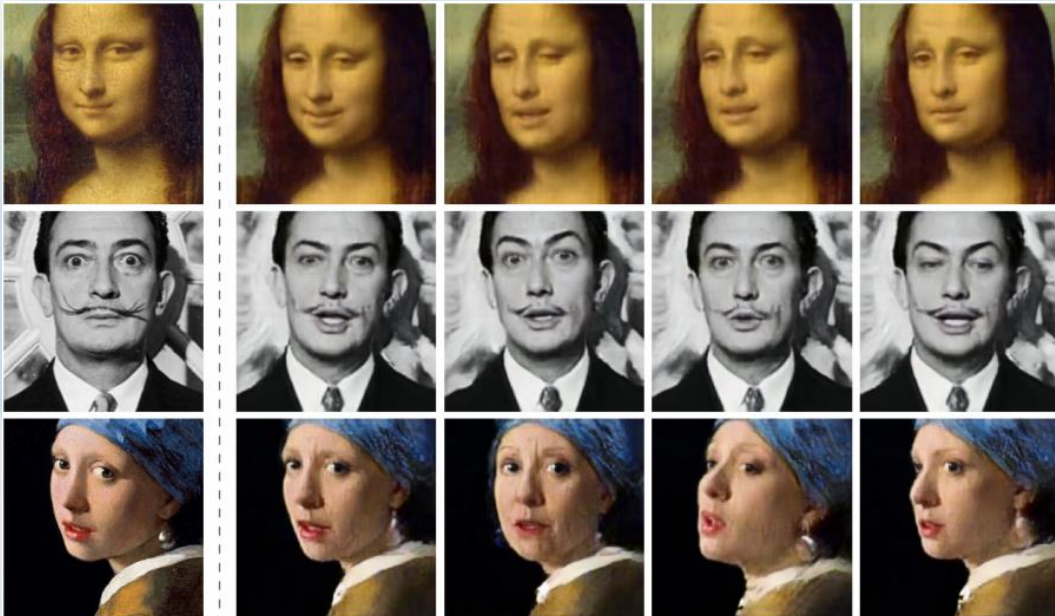
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After OTCGAN

- lot of other possibilities with Generative Adversarial Networks
- Cutting edge technology
- State of the Art GANs: StyleGAN, CGAN, CycleGAN
- Nature-consciousness
- (source: <https://www.justinpinkney.com/stylegan-network-blending>)
- https://miro.medium.com/max/1400/0*NhwRRO2_zC0o0SSd.
- https://media.wired.com/photos/5ce837fc3cd5de8fe355e337/191:100/w_1280,c_limit/Deep-Fake-1905.08233-13.jpg



CycleGAN

- Unpaired Image-to-Image Translation
- Goal: learn the mapping between input image and output image
- Original code: Pytorch/Torch
- should only be used with great care and calibration
- <https://junyanz.github.io/CycleGAN/>
- Licence: <https://github.com/junyanz/CycleGAN/blob/master/LICENSE>



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OTC AI Image

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Machine/Deep Learning Using OTC AI IMAGES

OTC AI Image for Elastic Cloud Server

- EU-DE available as *(Preview)*
- EU-NL available (Beta)



**preview (based on OTC service description chapter 3.12.1
"Besondere Bedingungen für Preview- und Beta Versionen")*

Summary

- **ECS Image** with preinstalled popular open-source **deep learning frameworks**
- **train custom models**, experiment with new algorithms, even JupyterLab can be used
- **no additional charge** to use OTC AI Image, pay only for the ECS resources needed to store and run applications

Available frameworks

- Tensorflow 1.15 (GPU)
- Tensorflow 2.7 (GPU)
- Pytorch 1.6 (GPU)
- Pytorch 1.10 (GPU)
- Pytorch 1.10 (CPU)
- Mxnet 1.6 (GPU)
- Mxnet 1.9 (GPU)
- Otclabenv (Jupyterlabs)
- Additional frameworks based on demand

More details and supported ECS flavors are available in the

OTCLabEnv setup using OTC AI images

1. Virtual Machine creation
2. Logging into the VM
3. Activating the virtual environment
4. Running jupyterlab
5. Develop in OTClabenv



JupyterLab setup



OtcLabEnv demo

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WITH BUILT-IN
PRIVACY

Multitenant Login

.....

.....

.....

Remember username

Log In

Register Forgot password?

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FutureGAN training setup using OTC AI images

1. Virtual Machine creation
2. Logging into the VM
3. Activating the virtual environment
4. Installing the requirements in the env
5. Run the training



FutureGAN training setup



FutureGAN training setup using OTC AI images(demo)

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Modelarts – Full AI Pipeline

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Demo Full AI Pipeline

OpenStack based extensions & script

1. Dataset creation
2. Dataset labeling
3. Training job creation
4. Model creation
5. Service deployment



FULL AI pipeline automated



In this bash script openstack commands are listed to invoke services thus creating a full AI pipeline

```
#!/bin/bash

name="ma_chain"
postfix="$1"
dataset_name="${name}ds${postfix}"
trainjob_name="${name}_tj${postfix}"
model_name="${name}_mo${postfix}"
service_name="${name}_se${postfix}"

# both of these should be empty folders
data_url="/testpipeline/data/"
work_path="/testpipeline/work/"

echo "*****"
create_dataset='openstack ma dataset create --dataset_name $dataset_name \
--dataset_type 0 \
--data_path $data_url \
--work_path $work_path \
--name fsad44 \
--data_type 0'

echo "*****"
sleep 10
dataset_id='openstack ma dataset list -f value | grep $dataset_name | awk '{print $2}'`

show_dataset='openstack ma dataset show $dataset_id'

echo "*****"
echo "CREATING THE LABEL"
create_label='openstack ma data import task create --import_path s3://fkukucsk/manda/ --import_annotations True --import_type dir --dataset_id $dataset_id'
#exit 1
echo "*****"
echo "SLEEPING FOR 15 SECONDS"
sleep 15
```


Certified & proven secure

Security



C5 Typ 2
Cloud Computing
Compliance Criteria
Catalogue

ISO 9001
Quality management
standards



SOC 1 Typ 2
Controls over financial
reporting



SOC 3
Public report on security,
availability and confidentiality

ISO 27001
Information security
management system

ISO 27017
Cloud-specific
controls



SOC 2 Typ 2
Proof of effectiveness of the
„Service Trust“ Principles

ISO 22301
Business continuity
management system

ISO 20000-1
Service management
systems

ISO 14001
Environmental
management

Data privacy

ISO 27018
Protection of personal
data in the cloud

ISO 27701
Expansion of data
protection-specific
processes & controls
in accordance with
ISO 27001



Trusted Cloud
Data protection
requirements of the
BDSG according to
BMWK



**Trusted Cloud
Datenschutz**
Test standard for
data protection
requirements of the
BDSG for cloud
computing

Industry regulations

StGB §203
Obligation according
to StGB §203
Professional secrecy
carriers (doctors,
lawyers, ...)

SGB §35
Obligation according
to SGB §35 para. 1
Social data
(KV, medical clearing
offices)

Finance
Conditions for
BaFin, ECB or
EIOPA supervised
entities

TISAX
IT applications for
networked
automotive industry
of the German
Association of the
Automotive Industry
(VDA)

Trustworthy AI according to the AIC4 criteria catalog



AI Cloud Service Compliance Criteria Catalogue (AIC4)

- specifies minimum requirements for the secure use of machine learning methods in cloud services

subdivided into eight areas

1. Preliminary Criteria (PC)
2. Security & Robustness (SR)
3. Performance & Functionality (PF)
4. Reliability (RE)
5. Data Quality (DQ)
6. Data Management (DM)
7. Explainability (EX)
8. Bias (BI)



Trustworthy AI according to the AIC4 criteria catalog



AI Cloud Service Compliance Criteria Catalogue (AIC4)

“specifies minimum requirements for the secure use of machine learning methods in cloud services,” according to the BSI



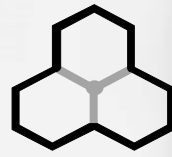
Cognigy.AI classified as trustworthy AI according to the AIC4 criteria catalog
one of the first solutions in Germany



hosted and operated in the Open Telekom Cloud

BSI C5-compliant (Cloud Computing Compliance Criteria Catalogue)

THANK YOU!



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Questions?