Practical AI Masterclass in the biggest European OpenStack Cloud with LLM and ML

Héctor López Romero & Ferenc Kukucska | Amsterdam | October 2024

Open Telekom Cloud

Who we are:

World Summit AI

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Open Telekom Cloud

Content

- OTC & ModelArts
- LLM Chatbot
- People Counter App
- Landslide Detector App

The leading European Cloud

Open Telekom Cloud

Leader

Hyperscale Infrastructure and Platform Services

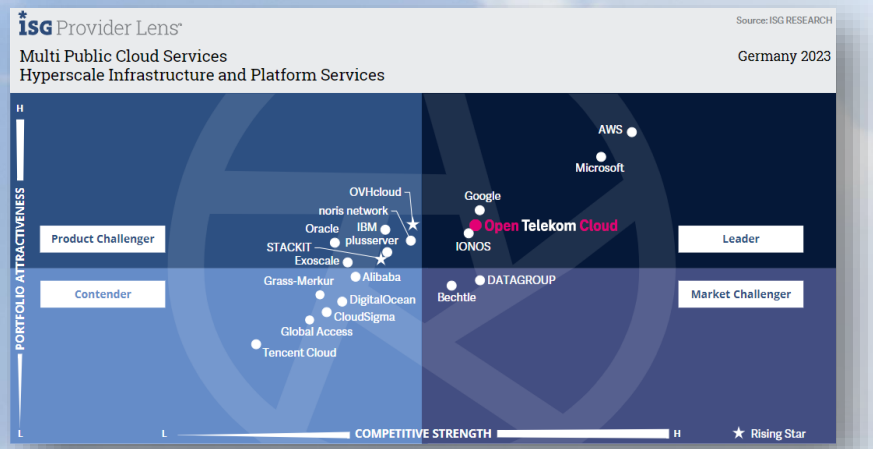
ISG Provider Lens: Multi Public Cloud Services 2023

Leader in Hyperscale Infrastructure and Platform Services

"... based on open standards (OpenStack), ... offer business customers a secure European public cloud environment .."

Strength:

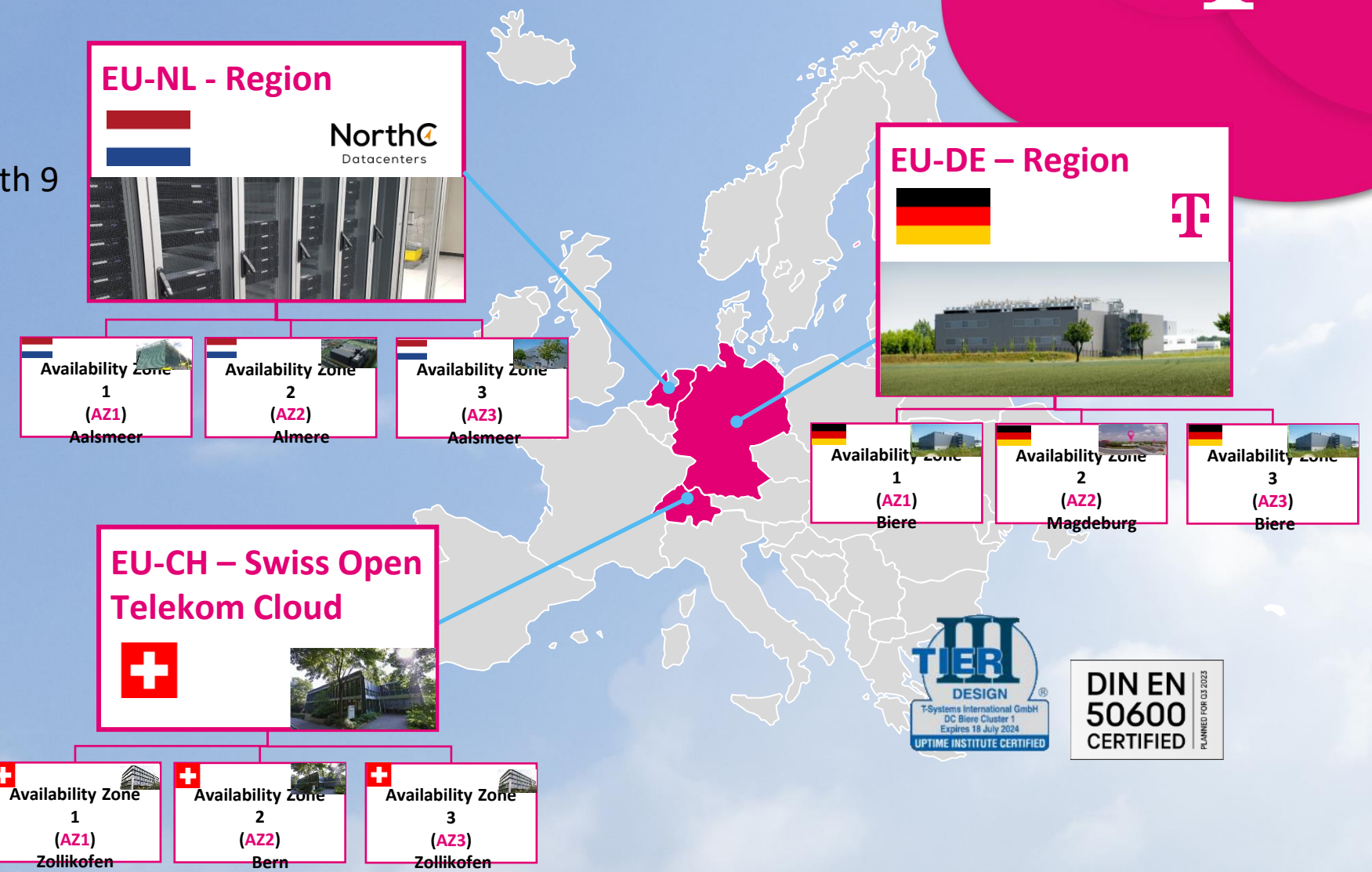
- „guarantees that the **data is processed in Germany** and hosted in **highly available** in-house and colocation **data centers** in the country and the Netherlands."
- "It is expanding the sovereign cloud further to **assure customers** that their **data will not leave the country**"
- „adopts a **strict sustainability strategy** that is constantly improved to **reduce CO2 emissions**.



Learn more https://www.open-telekom-cloud.com/en/blog/benefits/hyperscale-infrastructure-platform-services

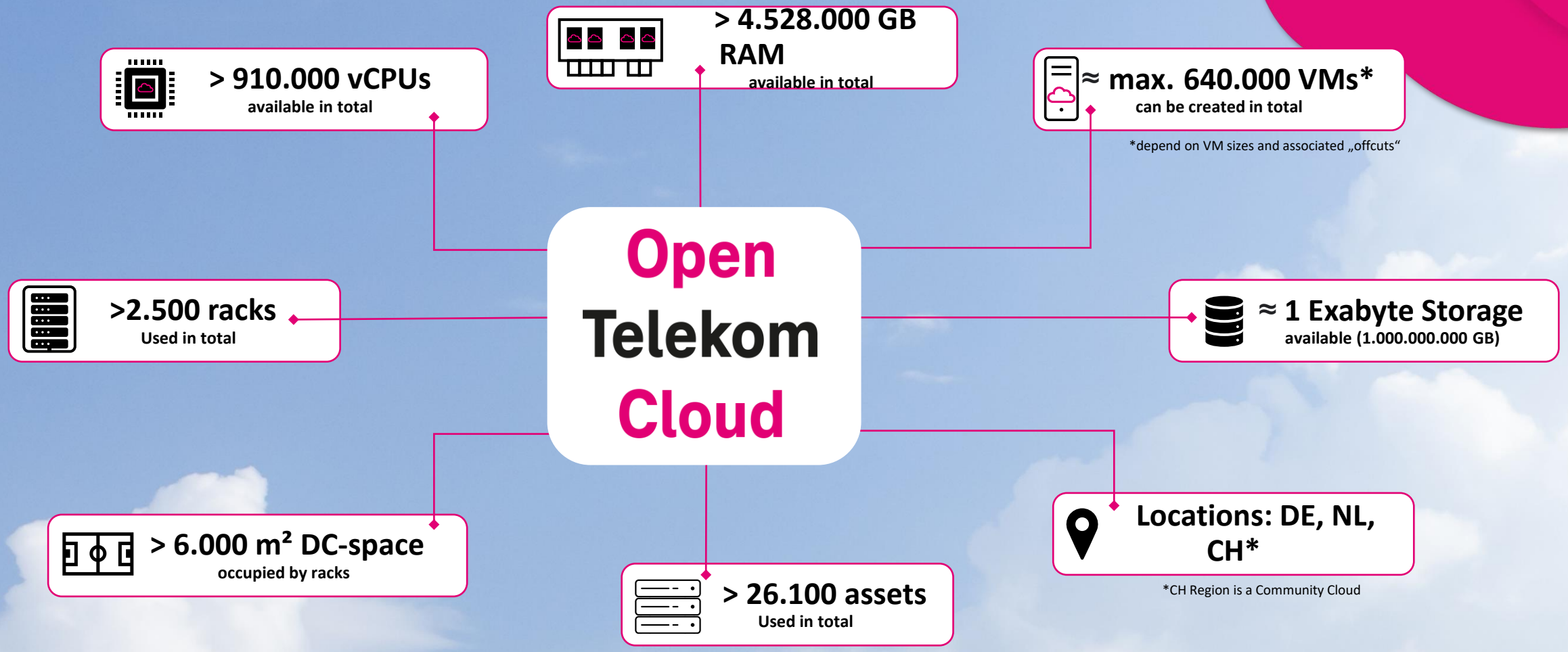
Our Datacenters

- 3 **twin core data centers** with 9 availability zones for **short latencies** and **zero outage**
- Regions **DE & NL** fulfil requirements for **georedundancy**
- **High security locations**
- **Swiss cloud** as an autarkic **Community cloud** for Swiss customers



Open Telekom Cloud

The Open Telekom Cloud in figures



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**

Open Telekom Cloud

Open Telekom Cloud – Our services in comparison

Open Telekom Cloud	Azure	Google Cloud	aws
Elastic Cloud Server	Virtual Machine	Compute Engine	Elastic Compute Cloud (EC2)
Bare Metal Server	BareMetal Instances	BareMetal Instances	EC2 Bare Metal Instances
Image Management Service	VM Image Builder	Artifact Registry	EC2 Image Builder
Auto Scaling	Scale Set	Managed Instance Group	Auto Scaling
Dedicated Host	Dedicated Host	Sole-Tenant Node	EC2 Dedicated Host
Cloud Container Engine	Kubernetes Service	Kubernetes Engine	Elastic Kubernetes Service
Software Repository for Container	Container Registry	Container Registry	Elastic Container Registry
Object Storage	Blob Storage	Cloud Storage	Simple Storage Service (S3)
Elastic Volume Service	Disk Storage	Persistent Disk	Elastic Block Storage (EBS)
Scalable File Service	Azure Files	Filestore	Elastic File System
Cloud Backup & Recovery	Azure Backup	Backup & DR Service	AWS Backup
Storage Disaster Recovery	Azure Site Recovery	Backup & DR Service	AWS Elastic Disaster Recovery
Mobile Storage Solution	Azure Data Box	Transfer Appliance	AWS Snow Family
Virtual Private Cloud	Virtual Network	Virtual Private Cloud	Virtual Private Cloud
Elastic Load Balancer	Load Balancing	Cloud Load Balancing	Elastic Load Balancing
Virtual Private Network	VPN Gateway	Cloud VPN	VPN
Direct Connect	Express Route	Cloud Interconnect	Direct Connect
Private Link Access Service	Private Link	Private Service Connect	Private Link
DNS	DNS	Cloud DNS	Route 53
Identity & Access Management	Azure Active Directory	Identity & Access Management	Identity & Access Management

Key Management Service	Key Vault	Key Management Service	Key Management Service
Web Application Firewall	Azure WAF	Cloud Armor	WAF
Anti-DDoS	DDoS Protection	Cloud Armor	Shield
VPC Firewall	Firewall Manager	-/-	Network Firewall
Relational Database Service	SQL Database / Database for MySQL / PostgreSQL servers	Cloud SQL	RDS
Distributed Cache Service	Cache for Redis	Cloud MemoryStore	MemoryDB for Redis
Document Database Service	CosmosDB	Cloud Firestore	DocumentDB
Data Replication Service	Database Migration Service	Database Migration Service	Database Migration Service
Data Warehouse Service	Synapse Analytics	BigQuery	Redshift
Cloud Search Service	Cognitive Search	Cloud Search	Elastic Search
ModelArts	Machine Learning	AutoML	SageMaker
MapReduce Service	HDInsight	Cloud DataProc	EMR
Data Ingestion Service	Data Factory	Cloud Composer	Data Pipeline
Application Operations Management	Log Analytics	Monitoring	X-Ray
Simple Message Notification	Notification Hub	Firebase Cloud Messaging	Simple Notification Service
Distributed Message Notification	Service Bus	Cloud Pub/Sub	Simple Queue Service
Cloud Trace Service	Log Analytics	Logging	CloudTrail
Cloud Eye	Log Analytics	Monitoring	CloudWatch
Log Tank Service	Log Analytics	Logging	CloudTrail
Ressource Management Service	Management Groups	-/-	-/-

Open Telekom Cloud

ModelArts

AI DEVELOPER FRAMEWORK

Advantages of ModelArts as AI Developer Framework

Ultra-fast

10 mins

Training ResNet50 on millions of ImageNet images with 128 nodes

Ultra-simple

0 coding **0** AI experience

Semi-automatic labelling, automatic parameter optimization, automatic network design

- 100x higher data preparation efficiency
- Pre-trained models speed up model building
- 50% less time for model training
- One-click deployment to everywhere
- ExeML Auto-Learning
- End-to-end process management

✓ Fast to learn ✓ Fast training ✓ Fast deployment

OPEN TELEKOM CLOUD

Creating a Secure Connected World

Offering a Full-Stack AI Portfolio for all Organizations

AI Services

Platforms

ModelArts | Deep Learning | ML | ExeML | Interferencing | GES | Batch

Frameworks

MXNet | Spark MLlib | PyTorch | dmlc XGBoost + scikit learn | Caffe | Pre-installed Frameworks on ECS

Infrastructures

Tesla V100 (GPU) | Tesla A100 (GPU) ** | Tesla T4 (GPU) | Ascend 910 (NPU)

*Elastic Cloud Server (ECS) | Bare Metal Server (BMS) | Dedicated Host (DeH)

Public Cloud / Hybrid Solution in your/TSI Datacenter

Data Processing

Data Ingestion Service (DIS) | Data Warehouse Service (DWS) | MapReduce Service (MRS) | Cloud Search Service (CSS) | Distributed Message Service (DMS)

Our Partners

intel | Adaptive Computing | NVIDIA | mundi Web Services | hww | openstack

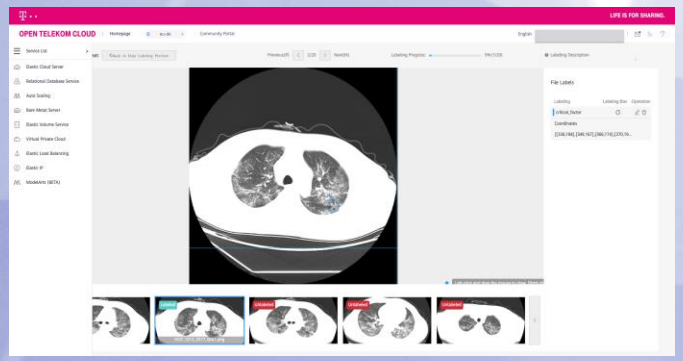
https://open-telekom-cloud.com/en/solutions/artificial-intelligence * available Q4/2024

** available Q1/2025

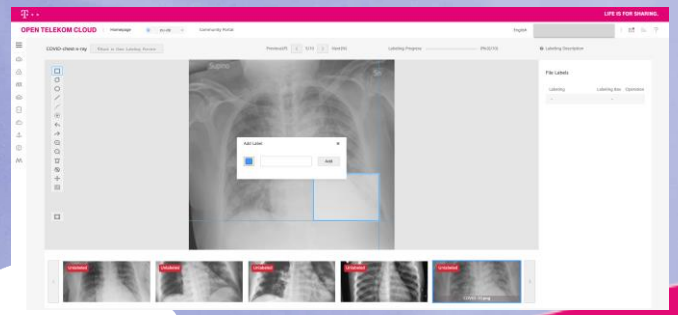
Applications Scenarios

Image Classification

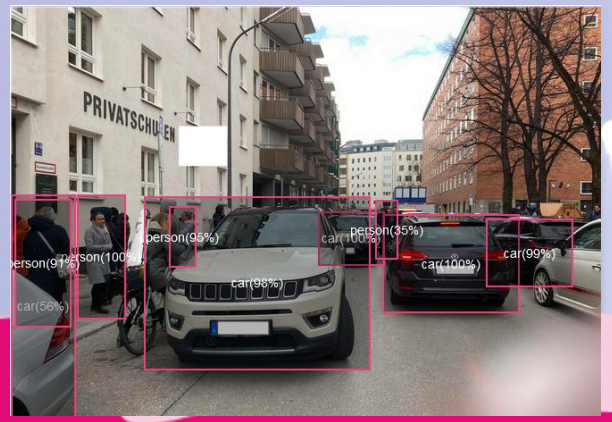
CT lung disease area annotation



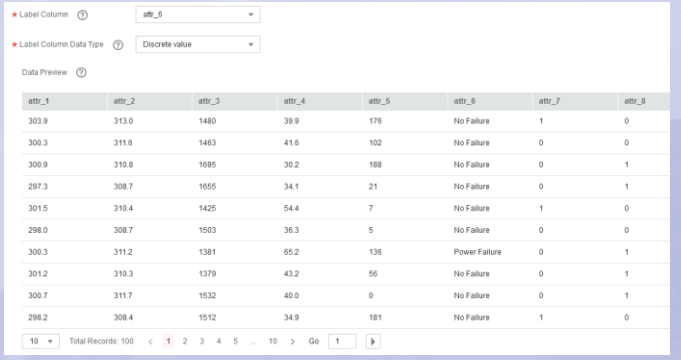
X-ray lung disease area annotation



Object Detection



Predictive Analytics



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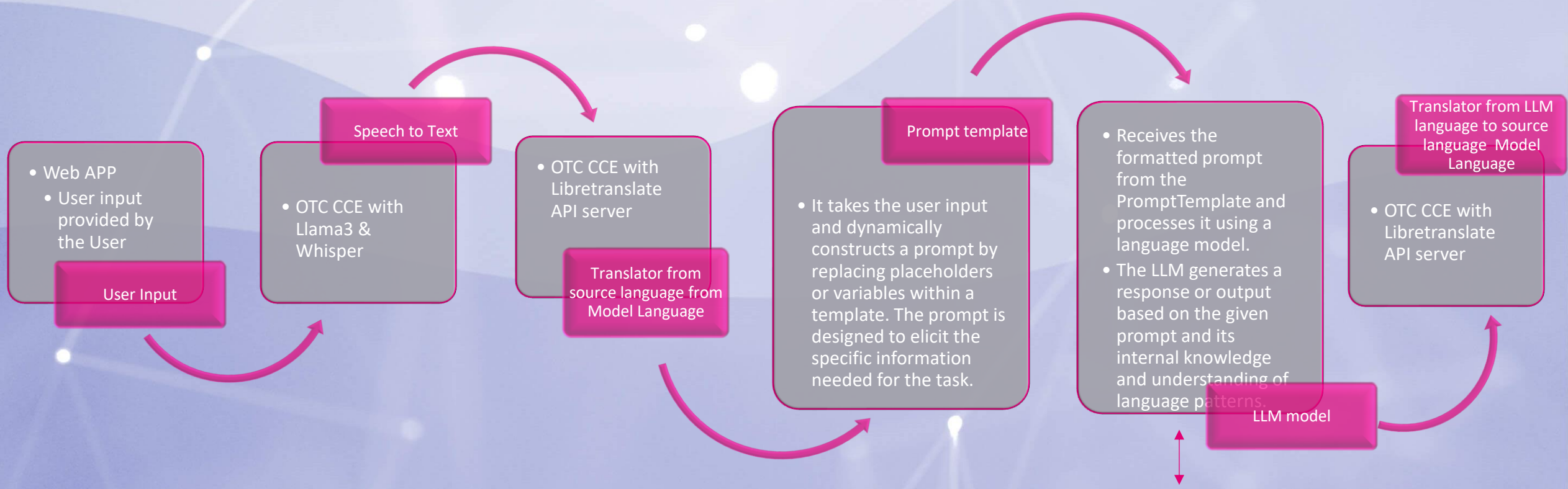
ModelArts

INTEGRATION USE CASES

LLM Chatbot on OTC

- LLM integration with RAG
  - AI Translator
  - Integrated into webapp supporting
    - Text to Speech
    - Speech to Text
- Infrastructure: Docker, K8s, Helm, SWR, CCE

LLM Chatbot on OTC

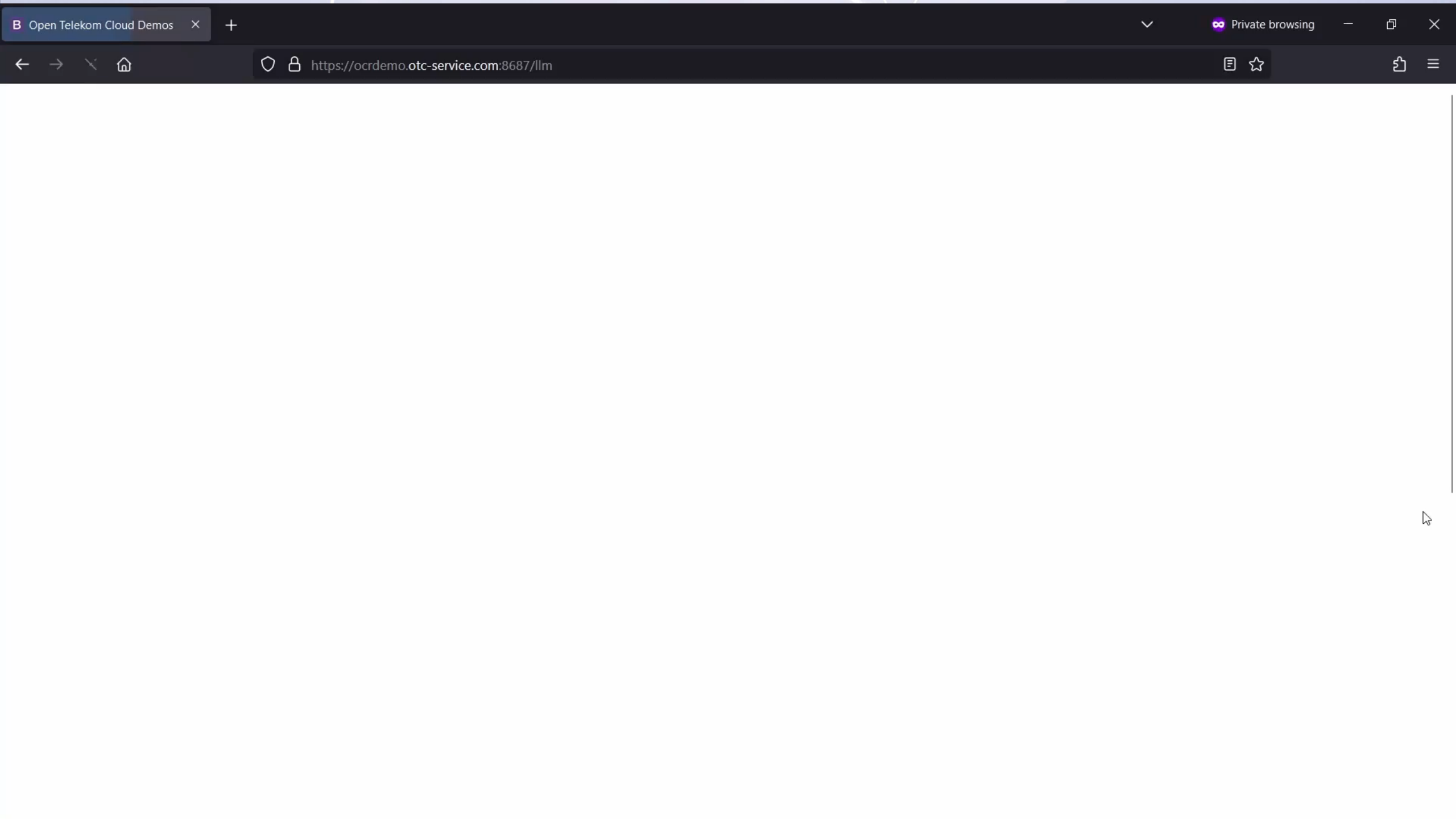


- Source used: https://ollama.com/library/mxbai-embed-large

RAG
With OTC doc

LLM Chatbot on OTC Technology Stack

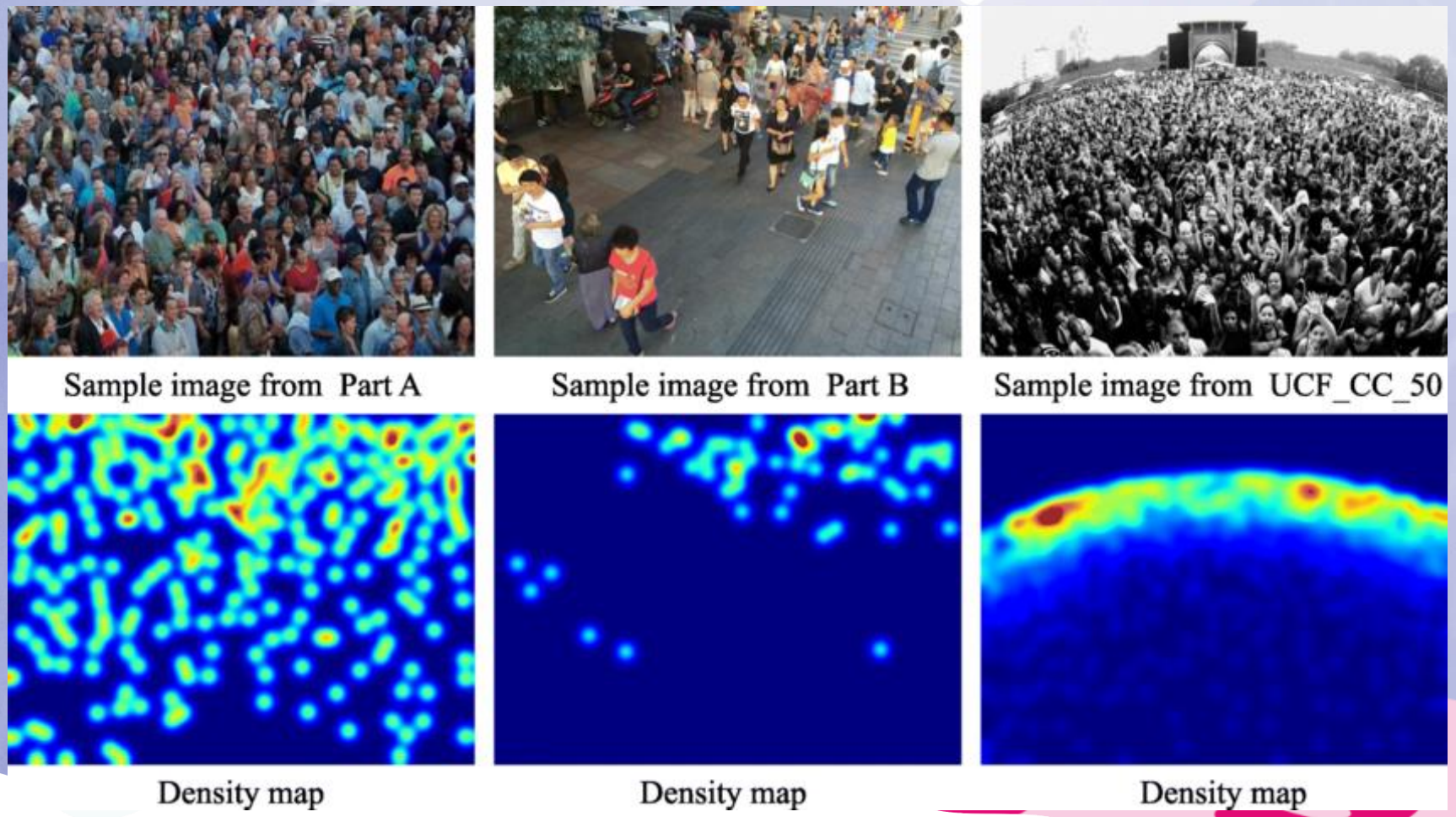
Item	Technology
Base model	LLAMA3
Training	OTC – ModelArts Custom Container
AI inference	OTC – ModelArts – CCE container Real-time service
Deployment	OTC - Cloud Container Engine + ModelArts
Deployment	Docker, Kubernetes, ArgoCD
Package Manager	Helm
Libraries	Ollama, SimpleDirectoryReader, VectorStoreIndex, OllamaEmbedding

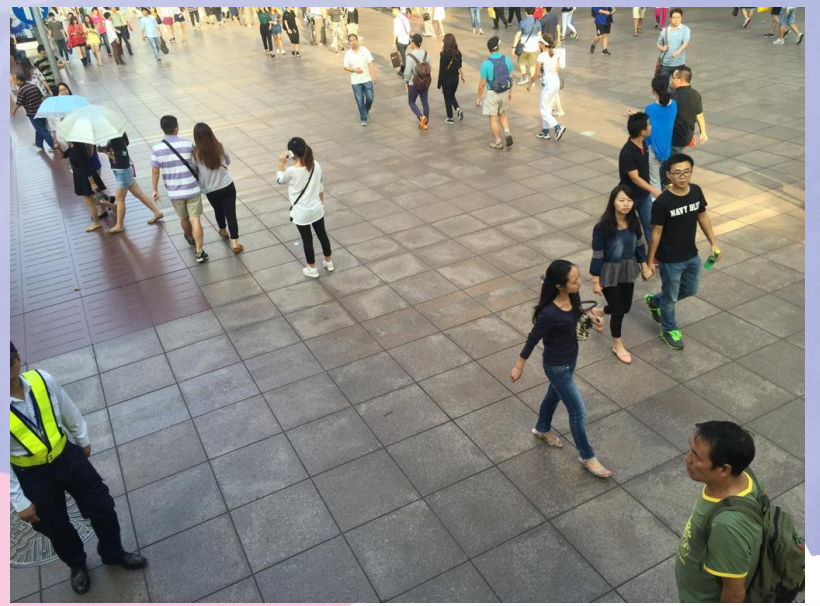

Open Telekom Cloud Demos
Private browsing
https://ocrdemo.otc-service.com:8687/llm

People Counter App

- Computer Vision approaches for
  - detecting and counting people
- Trained
  - on ShanghaiTech dataset: 1200 pictures
  - in OTC – ModelArts – Custom Container
  - Utilized data augmentation
- Webapp + Mobile app
- Infrastructure: Docker, K8s, ArgoCD, SWR, CCE

People Counter App Dataset





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People Counter App Technology Stack

Item	Technology
Dataset	OTC - Object Storage Service
Training	OTC – ModelArts – Training Management
AI inference	OTC – ModelArts – Real-time service
Deployment	OTC - Cloud Container Engine → (Kubernetes cluster)
Deployment	Docker, Kubernetes, ArgoCD
Package Manager	Helm
Libraries	Pytorch, VGG16, CSRNET

Log In - Open Telekom Cloud

console.otc.t-systems.com/

Incognito

We can find the app on this url

LIFE IS FOR SHARING.

OPEN TELEKOM CLOUD
WITH BUILT-IN
PRIVACY

Multitenant Login

Domain name

Username/Email address/Mobile number

Password

Remember username

Log In

Register

Forgot password?

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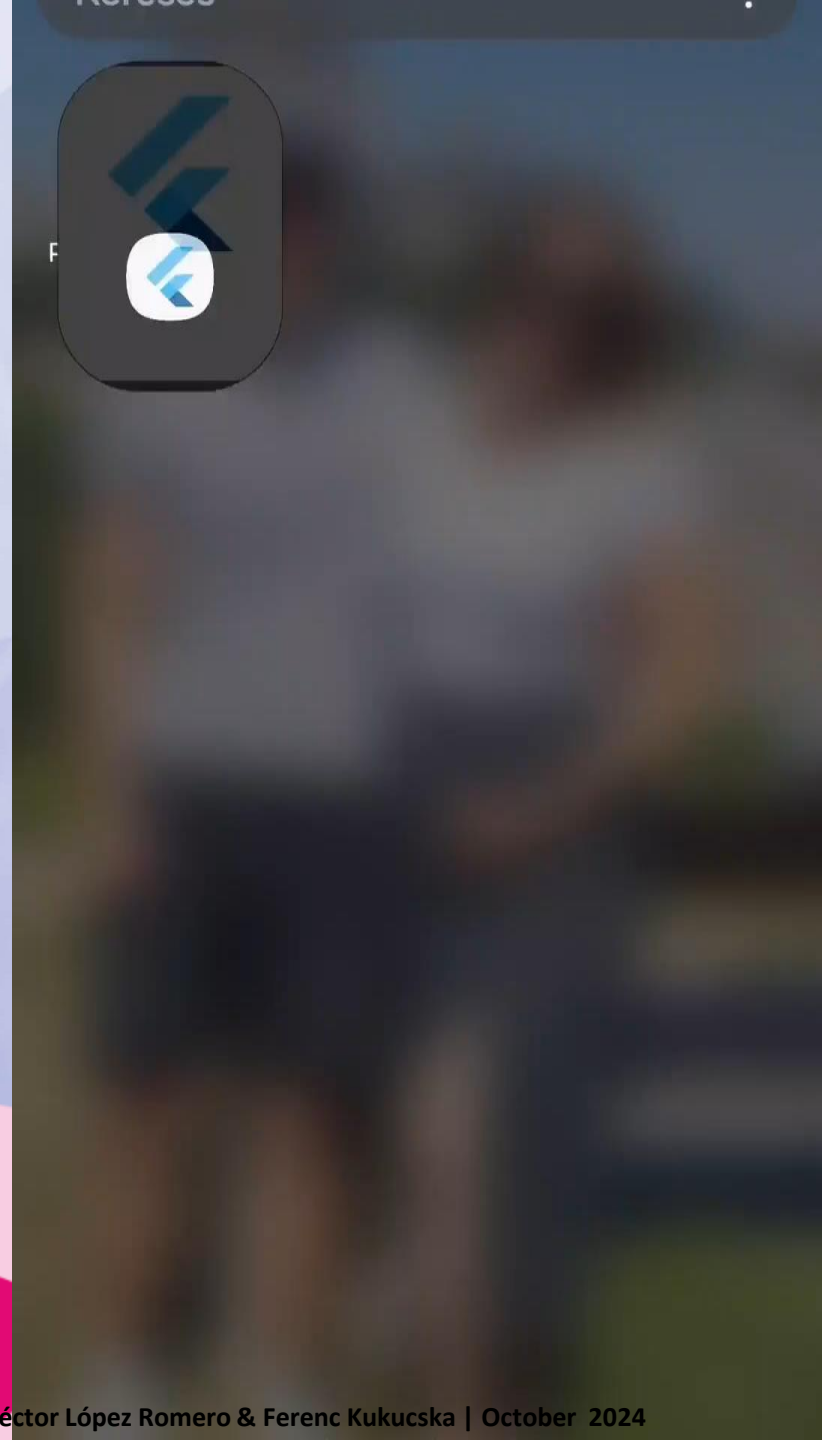
People Counter Mobile App Example

1. Take a picture of the people.
2. Upload the image into the application.
3. ModelArts counts the number of people.
4. ModelArts sends back the number of the people.
6. The app shows the photo taken by the user and the number predicted by ModelArts.



Landslide Detector App

- Computer Vision approaches for
  - Detecting landslides based on satellite images
- Trained on
  - Bijie dataset: 2700 pictures
  - Used dataset augmentation
  - OTC – ModelArts – ExeML
- Webapp
- Infrastructure: Docker, K8s, ArgoCD, SWR, CCE

Landslide Detector Dataset

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Source: http://gpcv.whu.edu.cn/data/Bijie_pages.html

Log In - Open Telekom Cloud

console.otc.t-systems.com

Incognito

You can find the landslide predictor on this url

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Questions?