

# Data-efficient Deep Learning for Earth Observation

## Introduction

Michael Mommert, Joëlle Hanna, Linus Scheibenreif, Damian Borth  
University of St. Gallen



# What this tutorial is about

# What this tutorial is about

As part of this tutorial, we will introduce and discuss different techniques to make more efficient use of data in Deep Learning for Earth observation.

# What this tutorial is about

As part of this tutorial, we will introduce and discuss different techniques to make more efficient use of data in Deep Learning for Earth observation.

In detail, we will focus on three different aspects:

# What this tutorial is about

As part of this tutorial, we will introduce and discuss different techniques to make more efficient use of data in Deep Learning for Earth observation.

In detail, we will focus on three different aspects:

- Data efficiency: “How can we use (freely) available data most efficiently?”

# What this tutorial is about

As part of this tutorial, we will introduce and discuss different techniques to make more efficient use of data in Deep Learning for Earth observation.

In detail, we will focus on three different aspects:

- Data efficiency: “How can we use (freely) available data most efficiently?”
- Label efficiency: “How can we use available labels most efficiently?”

# What this tutorial is about

As part of this tutorial, we will introduce and discuss different techniques to make more efficient use of data in Deep Learning for Earth observation.

In detail, we will focus on three different aspects:

- Data efficiency: “How can we use (freely) available data most efficiently?”
- Label efficiency: “How can we use available labels most efficiently?”
- Model efficiency: “What can we do to make our models learn efficiently?”

# What this tutorial is about

As part of this tutorial, we will introduce and discuss different techniques to make more efficient use of data in Deep Learning for Earth observation.

In detail, we will focus on three different aspects:

- Data efficiency: “How can we use (freely) available data most efficiently?”
- Label efficiency: “How can we use available labels most efficiently?”
- Model efficiency: “What can we do to make our models learn efficiently?”

We will address these questions in lecture-style presentations of the fundamentals, hands-on coding labs and discussions.



# Who we are

# Who we are



**Joëlle Hanna**

PhD student

"Multi-modal Representation  
Learning for Remote Sensing"

# Who we are



**Joëlle Hanna**

PhD student  
"Multi-modal Representation  
Learning for Remote Sensing"



**Linus Scheibenreif**

PhD student  
"Self-supervised Deep Learning  
for Earth Observation"

# Who we are



**Joëlle Hanna**

PhD student  
"Multi-modal Representation  
Learning for Remote Sensing"



**Linus Scheibenreif**

PhD student  
"Self-supervised Deep Learning  
for Earth Observation"



**Damian Borth**

Professor for AI and ML

# Who we are



**Joëlle Hanna**

PhD student  
"Multi-modal Representation  
Learning for Remote Sensing"



**Linus Scheibenreif**

PhD student  
"Self-supervised Deep Learning  
for Earth Observation"



**Damian Borth**

Professor for AI and ML



**Michael Mommert**

Asst. Prof for Computer Vision

# Who we are



**Joëlle Hanna**

PhD student  
"Multi-modal Representation  
Learning for Remote Sensing"



**Linus Scheibenreif**

PhD student  
"Self-supervised Deep Learning  
for Earth Observation"



**Damian Borth**

Professor for AI and ML



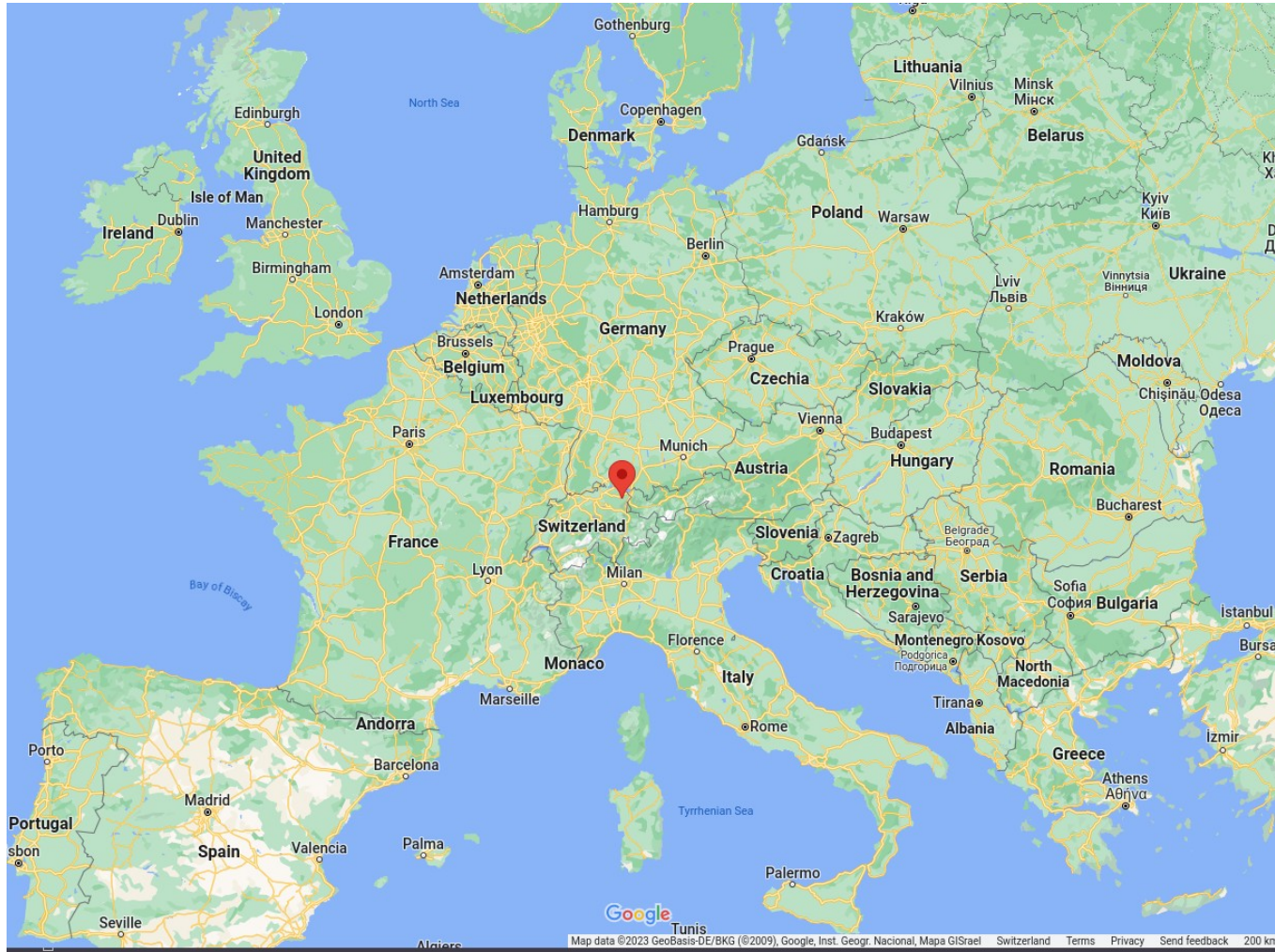
**Michael Mommert**

Asst. Prof for Computer Vision

Artificial Intelligence and Machine Learning Chair  
(email: [firstname.lastname@unisg.ch](mailto:firstname.lastname@unisg.ch))

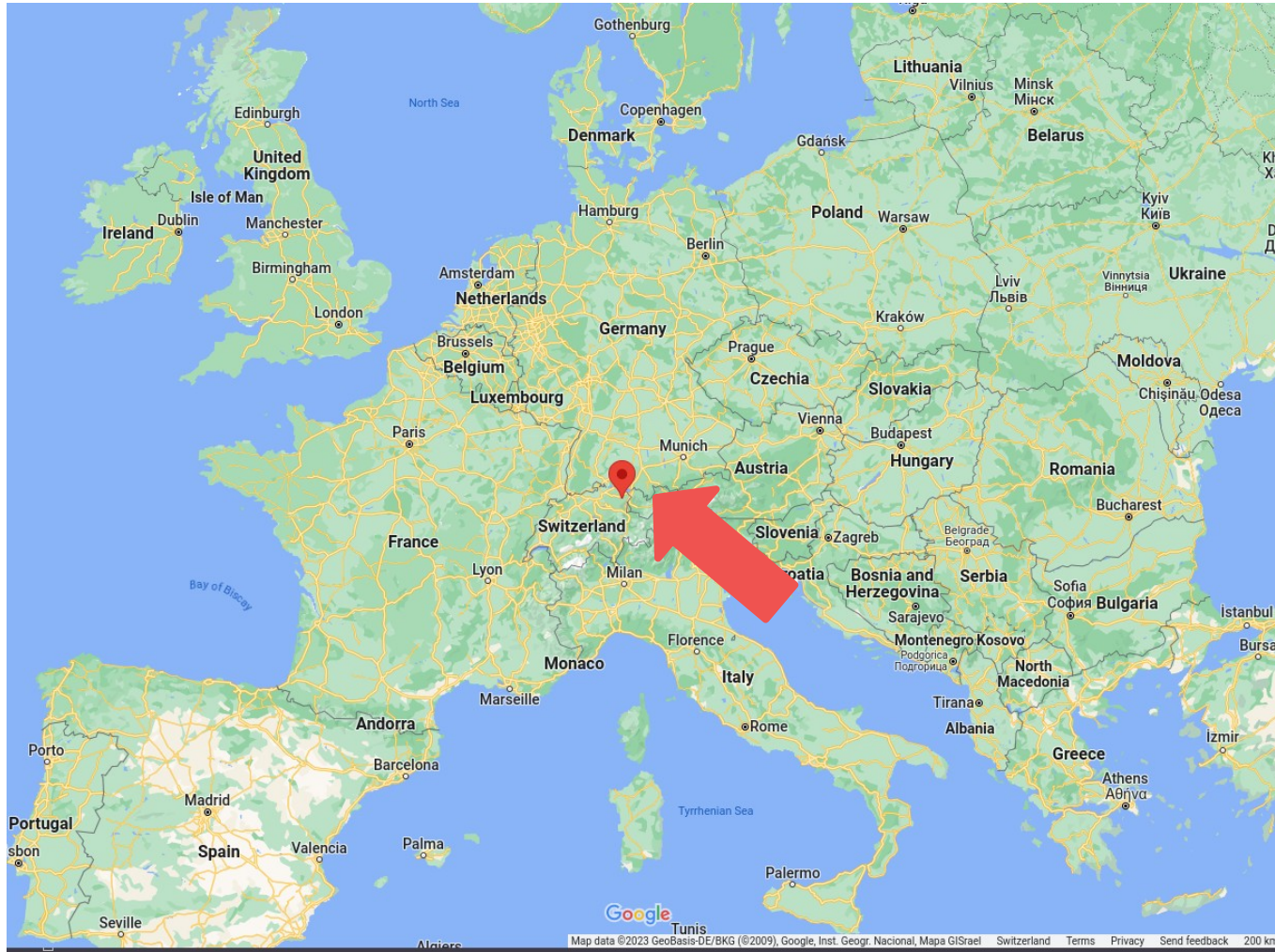


# St. Gallen?!



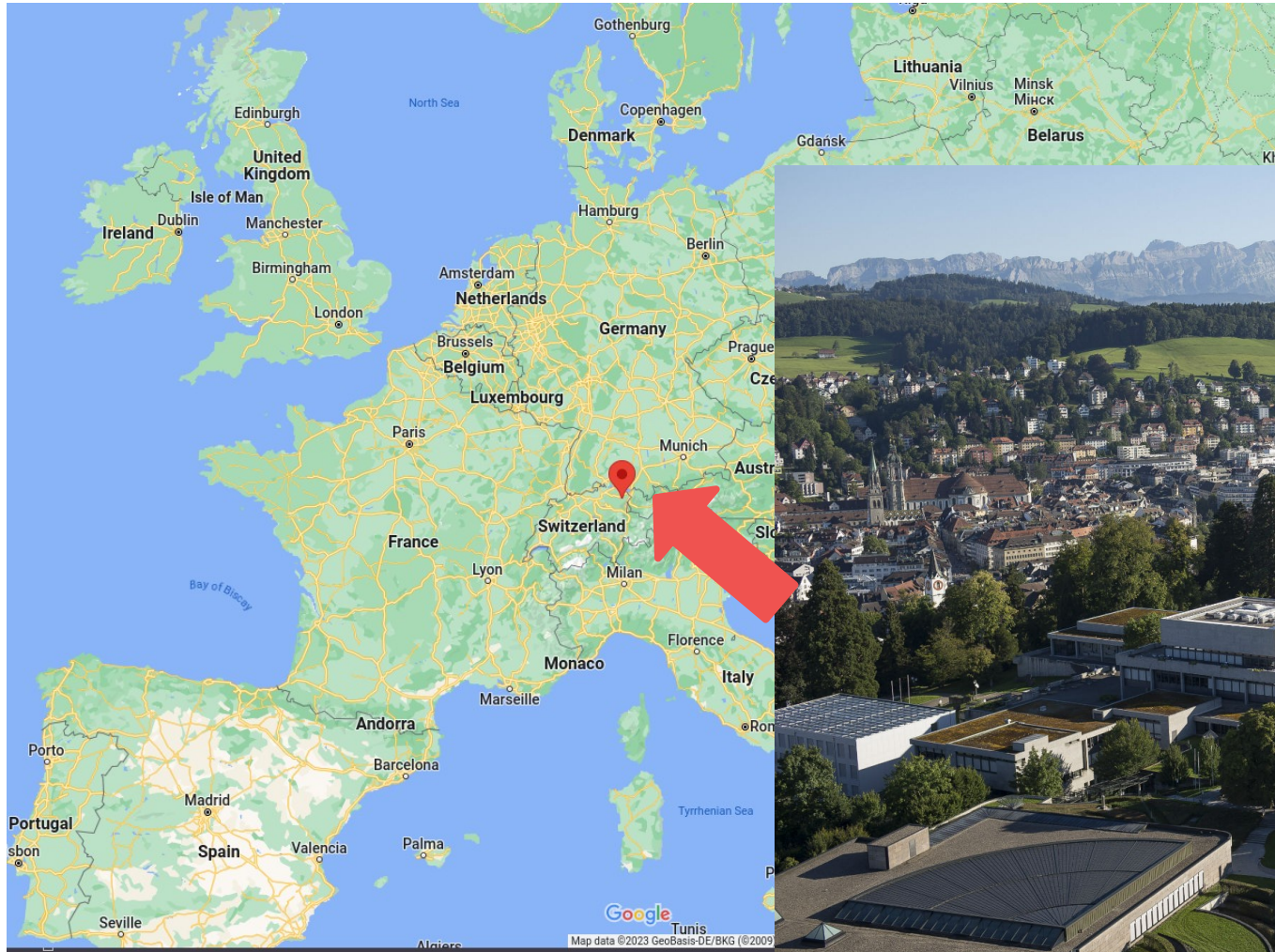


# St. Gallen?!



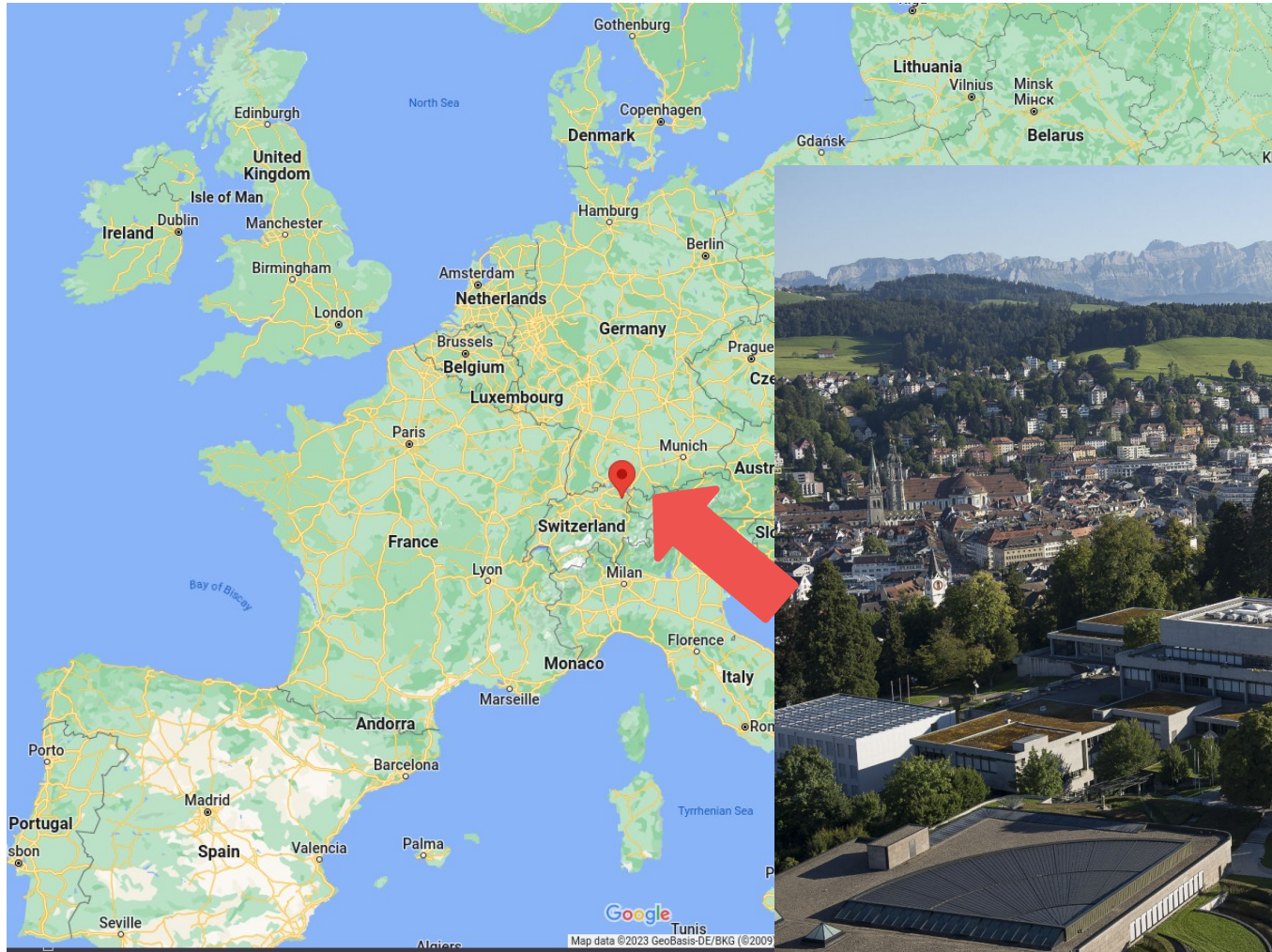


# St. Gallen?!



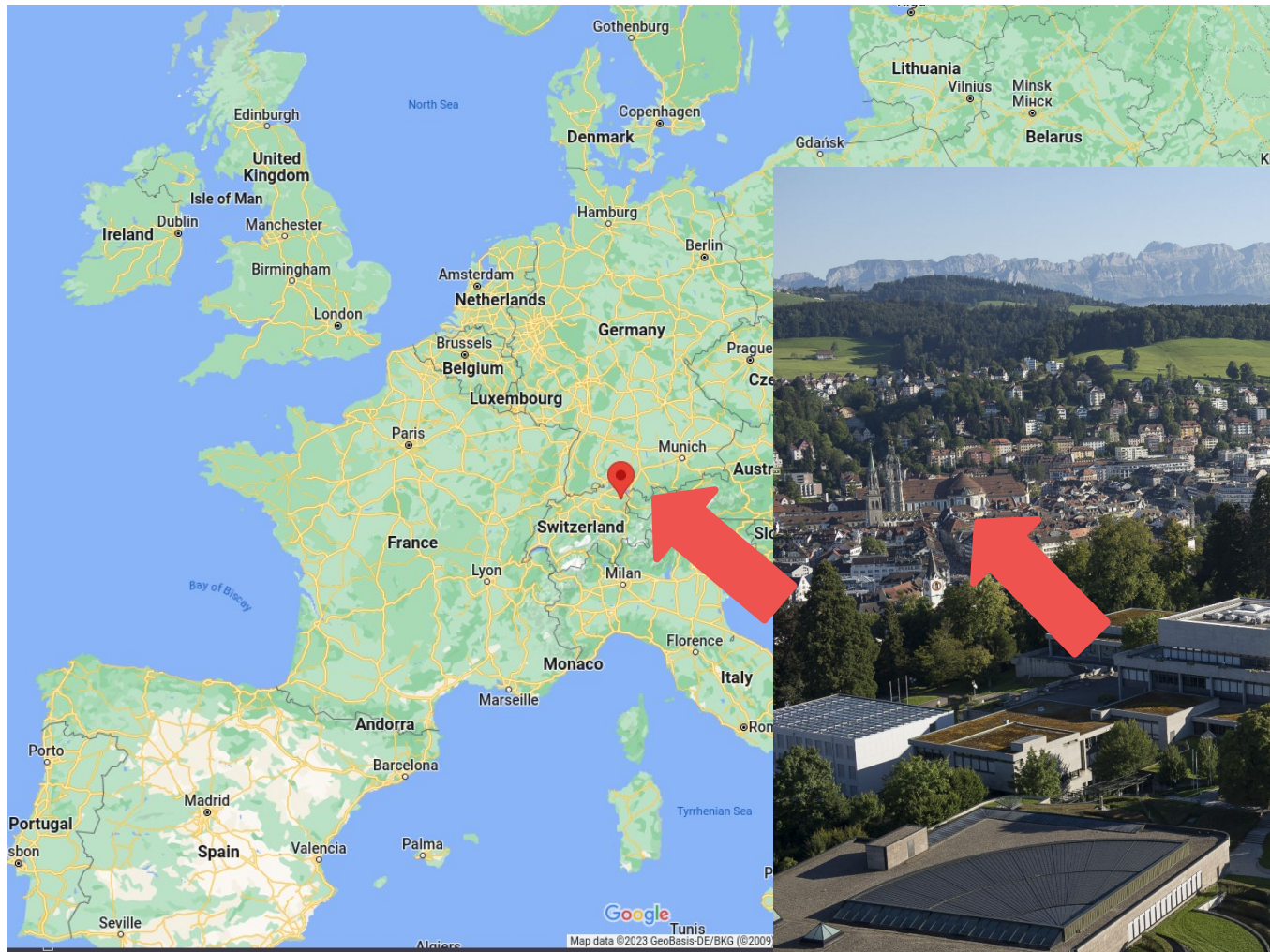


# St. Gallen?!



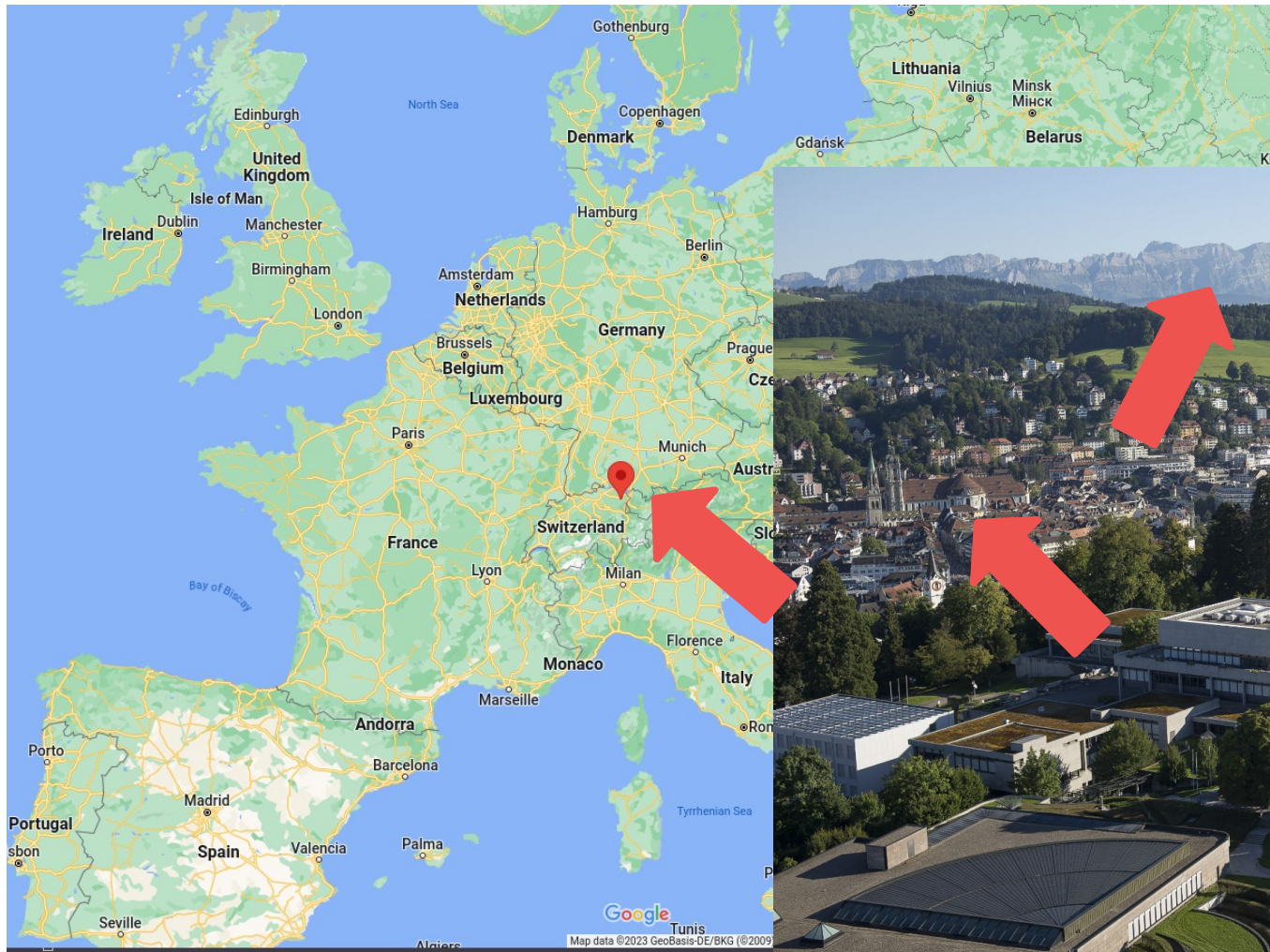


# St. Gallen?!





# St. Gallen?!



# Today's syllabus

Time	Content
9:00 – 10:20	<b>Intro, Deep Learning Recap, Data Fusion</b> (Michael)
10:20 – 10:40	<i>Coffee Break</i>
10:40 – 12:00	<b>Multitask Learning</b> (Joëlle)
12:00 – 13:30	<i>Lunch Break</i>
13:30 – 15:20	<b>Self-supervised Learning Theory</b> (Damian)
15:20 – 15:40	<i>Coffee Break</i>
15:40 – 17:00	<b>Self-supervised Learning Lab</b> (Linus)

# Resources for this tutorial

- All coding will be done in Jupyter Notebooks. You can access these Notebooks through:  
[https://github.com/HSG-AIML/IGARSS2023\\_EfficientDeepLearningEO](https://github.com/HSG-AIML/IGARSS2023_EfficientDeepLearningEO)
- We will run the Jupyter Notebooks in the cloud. If possible, we prefer to use Google Colab for this purpose. If you do not have a Google account, please let us know.
- The data that we will be using is the ben-ge dataset (see <https://github.com/HSG-AIML/ben-ge> for more information). In this tutorial, we will use a tiny version of ben-ge, which will be made accessible for the time of the tutorial. If you are following this tutorial at some other time, feel free to use the ben-ge-8k dataset (see ben-ge website).