ETH zürich

FinsureTech Hub

CAS ETH in Machine Learning in Finance and Insurance

D-MATH

```
#import keras
from keras import losses
def custom_loss(y_true,y_pred):
#return losses.mean_squared_error(y_true[0], y_pred[0])
z = y_pred[:,0]-y_true[:,0]
z=K.mean(K.square(z))
return z

model_hedge_strat.compile(optimizer=›adam›,loss=custom_loss)
model_hedge_strat_red.compile(optimizer=›adam›,loss=custom_loss)

import matplotlib.pyplot as plt

for i in range(5):
....model_hedge_strat.fit(x=xtrain,y=ytrain,epochs=1,
verbose=True,batch_size=100)
weights = model_hedge_strat.get_weights()
model_hedge_strat_red.set_weights(weights)
```


Welcome

The fascinating success of Machine Learning (ML) in language processing or image recognition and lately also generation have triggered many fantasies to apply these technologies in other fields as well, including the area of finance, banking and insurance. This tremendous opportunity requires a new generation of leaders who combine deep industry knowledge to the understanding of machine learning methods in order to harness the power of innovation.

Our programme aims to produce graduates who have a deep understanding of the intersection between ML technology and applications. The skills and knowledge learned at the CAS ETH in ML in Finance and Insurance will help participants to lead machine learning-driven projects in their organisation and foster innovation in the rapidly changing financial services landscape.

In the following pages, we invite you to explore in some detail what the CAS ETH in Machine Learning in Finance and Insurance has to offer.

Sincerely,
Bastian, Patrick and Josef

Patrick Cheridito
Professor of Mathematics

Josef Teichmann
Professor of Mathematics

Bastian Bergmann
Executive Director
ETH FinsureTech Hub

Your journey into Machine Learning

In this era of innovation and digital transformation in finance, banking and insurance, you need to get hold of the potential of emerging technologies.

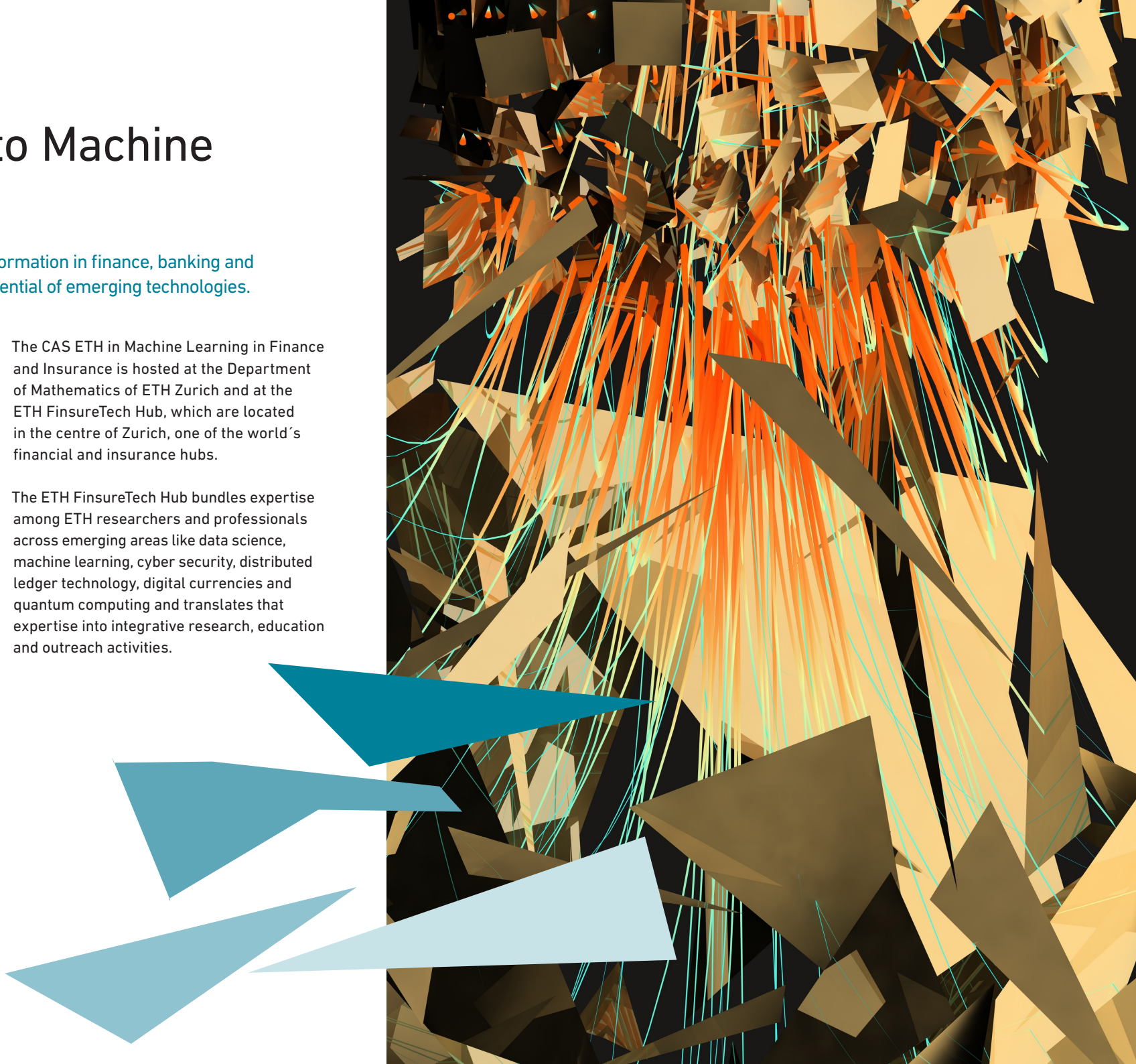
The relevance of machine learning methods in the finance and insurance business is growing by the day. Data scientists and professionals, such as risk managers and actuaries, increasingly collaborate to promote innovative services and products. At its core, this methodology-driven change is transforming the way mathematical modelling serves industries that traditionally have been relying upon quantitative finance and actuarial methods.

The urgent need to systematically explore the opportunities of machine learning in finance and insurance is going to grow. This trend is likely to continue, as larger data sets, greater computing power and more efficient algorithms all conspire to unleash the golden age of machine learning in finance and insurance.

The CAS ETH in Machine Learning in Finance and Insurance offers a unique and engaging interdisciplinary curriculum. Theory-based and hands-on sessions guide the students through a highly-rewarding learning experience. Understanding what machine learning methods can deliver to finance, banking and insurance, students will be able to chase after and lead the development of innovative, responsible solutions.

The CAS ETH in Machine Learning in Finance and Insurance is hosted at the Department of Mathematics of ETH Zurich and at the ETH FinsureTech Hub, which are located in the centre of Zurich, one of the world´s financial and insurance hubs.

The ETH FinsureTech Hub bundles expertise among ETH researchers and professionals across emerging areas like data science, machine learning, cyber security, distributed ledger technology, digital currencies and quantum computing and translates that expertise into integrative research, education and outreach activities.



Block I: Offered as interactive lecture sessions with simple coding exercises to get you onboard:
8 Sessions à 4h at ETH Zurich or hybrid on Friday morning.

BLOCK I: Intro to ML

Provides you with a comprehensive introduction to the fundamentals of machine learning, including key concepts, algorithms, and practical applications.

You will gain a solid foundation in machine learning and develop the skills to build and evaluate machine learning models for various tasks in the following blocks and modules.

Block II: Structured as an interactive workshop with guest speakers from academia and industry. One Friday in June and one Friday in September.

BLOCK II: Ethics of AI

Reflect on the the integration of ML which raises profound ethical questions about trust, explainability, accountability, and the regulations that support the use of ML empowered technology in different applications.

Block III: Structured as interactive workshop format over Fridays and Saturdays. Students select 4 out of 5 workshops offered between June, July and September. Workshops take place at ETH or at corporate facilities.

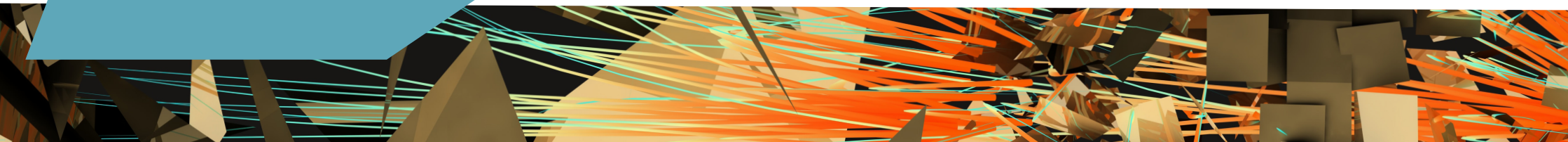
BLOCK III: Cases in ML

Get exposure to real-world case studies and projects in finance and insurance where ML techniques have been successfully applied

Gain insights and understanding of the overall system landscape & architecture in which your machine learning model is embedded.

Choose and deep dive into cases and applications guided by ETH faculty and professionals from finance, banking and insurance.

The interactive set-up of the CAS ETH in ML in Finance and Insurance allows you to interact and network with leading professionals and academics connected through the FinsureTech Hub at ETH Zurich.



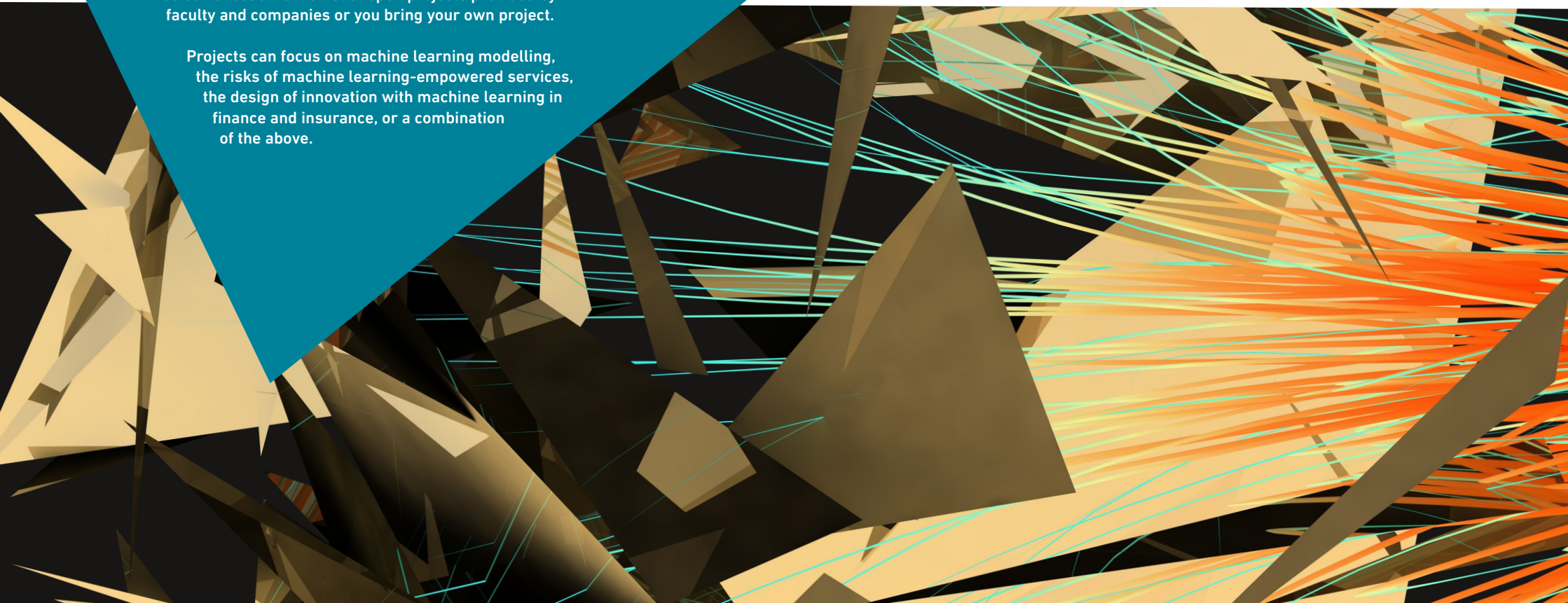
Block IV: This Block starts with a one-day workshop about creating innovation in finance, banking and insurance with ML. Afterwards, during 6-8 weeks you work on a project, guided by faculty and a pool of mentors from industry.

BLOCK IV: Your innovation project

Gain insights on key concepts creating innovation, like defining ideas, prototyping, iteration, growth, scaling, to create an innovation plan for a ML-driven project in finance, banking or insurance.

You can choose from a list of open projects provided by faculty and companies or you bring your own project.

Projects can focus on machine learning modelling, the risks of machine learning-empowered services, the design of innovation with machine learning in finance and insurance, or a combination of the above.



Your innovation project

The direct feedback and review of progress on a project that you define together with your mentor at the beginning of Block IV will help to develop your ML competencies and also allow to facilitate further the application of the knowledge components.

Deliverables: Choose between a working machine learning-driven application or a detailed project report for implementation,

Share your findings and recommendations to non-technical stakeholders effectively during a final presentation session.

The CAS ETH in ML in Finance and Insurance aims to build a community of learners that also interact with each other outside of the CAS sessions to facilitate peer-learning opportunities.

During the programme you will learn:

– The basics of machine learning, with a deep dive into selected cases of supervised and unsupervised learning problems in finance and insurance, as well as deep learning methods and large language models.

– The value chain of a machine learning project in industry, including the discussion of the IT architectures supporting machine learning models, their training, validation, deployment and maintenance.

– The most relevant interpretability methods, current strategies to foster trust in services using machine learning and ensure their trustworthiness, as well as relevant regulations for a responsible use of machine learning-empowered technology.

– The typical phases of the innovation process of a ML project in a corporate or Fintech innovation setting.

About you

You are an ambitious individual seeking to enhance your technical skills and gain a deeper understanding of the scope and limits of ML technologies.

You are looking for a programme that provides a comprehensive education, practical learning experiences, where you can apply your skills and knowledge to realworld scenarios.

You are looking for a programme that offers opportunities for networking, collaboration, and mentorship, helping you to build valuable relationships that will support your career.

You may be seeking to transition into a more senior role in your organisation, e.g. to lead a team of data scientist, or starting your own technology-focused business.

Requirements:
Master´s degree acknowledged by ETH or equivalent educational qualifications, at least two years of professional experience in finance, banking and insurance, and good command of English.

Coding requirements:
Prior coding experience is welcome but not mandatory. During the course you are expected to follow basic coding examples as a basic requirement for the credits. In addition, you have the opportunity to deep dive into coding for a specific project guided by faculty and professionals.

Workload, programme details

The CAS ETH in ML in Finance and Insurance is intended to be completed within 9 months, starting in March for 15 ETCS credits.

Hybrid lecturer sessions: The first block will be offered as 8 sessions on Friday morning (offered hybrid) between March and June. (24 hrs in class/hybrid, about 40 hrs of self learning)

In-person workshops: Block II and III will be held as 2-3 full day workshops (Thursday, Friday, Saturday) during June, July and September. You select 4 out of 5 workshops. (per workshop: 16-20 hrs in class, about 8 hrs of self learning)

Individual project work: Block IV will kick off with a one day workshop followed by individual project work and individual exchange with mentors and faculty. (8 hrs in class, about 30 hrs of individual project work)

Sessions will be offered at ETH main building, which is located in the city centre of Zurich, and in walking distance from the main station and 20 minutes train ride from Zurich airport.

Not from Zurich or Switzerland? The structure of the programme allows you to travel to Zurich for specific sessions and to complement with hybrid sessions.

Degree: Certificate of Advanced Studies ETH in Machine Learning in Finance and Insurance
ECTS credits: 15
Tuition fee: CHF 13,000
Programme start: 1 March 2024
Duration: 9 months
Application window: 1 November 2023 to 31 January 2024
How to apply: https://sce.ethz.ch
Qualifications: Academic Background in Engineering, Natural Science, Mathematics, Finance or Economics and minimum of 2 years of professional experience.

Find out more
We are pleased to answer any questions you may have, and are available for a personal consultation. You are also invited to explore our program at our information events.
Link: www.cas-ml-finance.ethz.ch
Contact: bbergmann@ethz.ch

Lecturers, mentors & partners

The CAS ETH in ML in Finance and Insurance is offered at the ETH FinsureTech Hub. The hub bundles expertise among ETH researchers and professionals across emerging areas like data science, machine learning, cyber security, distributed ledger technology, digital currencies and quantum computing.

Modules are typically run by a group of lecturers, who contribute with their specific knowledge to components within a module. We aim to have modules generally co-taught by research-active academics and practitioner guest speakers to allow a confluence of research insights with practical examples and application. Each module will be under the overall leadership of an ETH faculty member, who will be responsible for the quality of the module and the productive interaction of different session contributors who the module leader will curate.

Experienced faculty: The CAS ETH in ML in Finance and Insurance leverages ETH´s research strengths, incorporating the latest insights and findings into the curriculum. This provides students with a cutting-edge education that prepares them to be leaders in the industry.
www.cas-ml-finance.ethz.ch

Professionals: Building on the network of the FinsureTech Hub we integrate leading industry professionals (also Alumni of ETH) to provide expertise, experience and insights from real applications to the programme.
www.cas-ml-finance.ethz.ch

Mentors: We put together a pool of mentors – ranging from mentors with a more technical background and function in data science as well as mentors with a more strategic role and senior experience. This will allow to offer individualized mentoring, tailored to the individual projects.

FinsureTech Hub academic partners:
– Asian Institute of Digital Finance (AIDF) at National University Singapore, Singapore

– Center for Digital Finance and Technologies at Columbia University, New York, USA.

ETH Zurich – Studying in the heart of Europe

Ever since it was first founded, ETH Zurich has been a driving force behind Swiss industry, whose innovative products and services are in demand worldwide.

At ETH Zurich, students discover an ideal environment for independent thinking, researchers a climate which inspires top performance. Situated in the heart of Europe, yet forging connections all over the world, ETH Zurich is pioneering effective solutions to the global challenges of today and tomorrow.

Freedom and individual responsibility, entrepreneurial spirit and openmindedness: ETH Zurich stands on a bedrock of true Swiss values. Our university for science and technology dates back to the year 1855, when the founders of modern-day Switzerland created it as a centre of innovation and knowledge. To date, 22 Nobel Prizes have been awarded to researchers, who have or have had an association with ETH Zurich.

Founded

1855

ETH Zurich is ranked

7th

QS World University Ranking 2023

The Department of Mathematics is ranked

1st

in continental Europe QS World University Ranking (8th worldwide)

ETH Zurich
FinsureTech Hub, Department of Mathematics
Rämistrasse 101
8092 Zurich

www.finsuretech.ethz.ch

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