



UNIVERSITÉ
CAEN
NORMANDIE



Blended Intensive Program AI for Science

From 26 to 30 August 2024, Caen, France
(arrival Sunday 25/08-departure Saturday 31/08)

This intensive training program aims to cover key concepts of AI for science and provide practical examples. It targets PhD students in science who want to learn both theoretical and practical aspects of machine learning from scratch.

Participants will delve into supervised and unsupervised machine learning, neural network architectures, and study the use of AI models for various applications in fields like nuclear physics, medicine, and material science.

Theoretical sessions will alternate with practical labs, a hackathon, and a final project presentation. The program also includes social events, such as a guided city tour, as well as group work on student projects.

Participants will brainstorm their own project ideas to apply the learned concepts. They are encouraged to bring their own data.

The summer school is organized as follows: morning sessions are devoted to courses and presentations, while afternoon sessions are composed of lab sessions, a hackathon, and participant final presentations.

The first part of the week, Monday and Tuesday, is dedicated to machine learning and deep learning. The second part, on Wednesday, addresses generative modeling with neural networks and applications in inverse problems. The last part, on Thursday and Friday, focuses on AI models, such as Large Language Models, Foundation models, and Physical Informed Models, in various scientific domains.

What are Blended Intensive Programs?

A European Blended Intensive Program (BIP) is an educational program that combines online learning with short-term physical mobility components. The majority of the coursework is delivered online, while intensive on-site periods at partner institutions facilitate face-to-face activities, collaboration, and cultural exchange among participants from different European universities (from at least three different EU countries).

This Blended Intensive Program is organized within the framework of the AcrossEU alliance. AcrossEU is a network of nine universities from eight EU countries that collaborate in various ways, including facilitating mobilities for students, academics, and administrative staff, conducting joint research projects, offering doctoral studies, engaging with regional environments, and promoting entrepreneurship projects, as well as social and cultural activities. For more information, visit <http://www.acrosseu.org>.

Who can participate?

This Blended Intensive Program on AI for Science is open to a diverse group of participants from across Europe. The program aims to bring together 15 to 25 students from various partner universities within the European Union.

Eligible participants must be enrolled as doctoral students at one of the partner universities, representing various disciplines relevant to the program's focus on AI and scientific research. A good command of English is required, as the program will be conducted in English.

Highly talented master's students or recently graduate students about to start a PhD may also apply, provided they demonstrate exceptional academic performance and a keen interest in the program's interdisciplinary approach.

Above all, participants should be enthusiastic about connecting with international students, exchanging ideas, and fostering cross-cultural collaboration within the context of this unique learning experience.

Registration, Funding and practical information

Registration

To attend this Blended Intensive Program (BIP) on AI for Science, we kindly ask you to fill out the registration form available at:

<https://unicaen.moveonfr.com/form/651fcf4cabd14bc918074bce/eng>

The registration deadline is June 30, 2024.

Successful candidates will be notified by July 10, 2024.

Participants can be funded by European mobility programs to support their participation in the physical mobility aspects of the BIP. Please note that to cover your travel and accommodation expenses, you should contact your university's international office responsible for staff and student mobility to apply for an Erasmus+ Blended Mobility grant. This grant is specifically designed to support participants in Blended Intensive Programs like ours, allowing you to benefit from this learning experience while minimizing financial barriers.

Participants will have to book their accommodation.

Some rooms with 2 single beds=90€ /Breakfast =12,5€ / have been pre-booked at:

The People Caen
15 Av. Victor Hugo,
14000 Caen
02 61 53 69 40
groupes@bhcreation.net.

If you choose this option, please mention the UNICAEN reservation.

List of hotels in Caen:

<https://www.unicaen.fr/se-rendre-et-sejourner-a-caen/>

Timetable

Monday, August 26, 2024

- 8:30 - 10:00: Introduction to Machine Learning (supervised, unsupervised, linear regression, logistic regression)
- 10:00 - 10:15: Break
- 10:15 - 11:30: Fundamentals of Neural Networks (perceptron, layers, activation functions)
- 11:30 - 13:15: Lunch break
- 13:15 - 16:15: Hands-on Lab Session 1: Deep Learning for Particle Physics (neutrino classification)
- 16:30 - 17:30: Guided City Tour of Caen

Tuesday, August 27, 2024

- 8:30 - 10:00: Deep Learning Architectures (autoencoders, ResNet, convolutional networks)
- 10:00 - 10:15: Break
- 10:15 - 11:30: Advanced Deep Learning Techniques (RNNs, transformers, graph networks)
- 11:30 - 13:15: Lunch break
- 13:15 - 16:15: Hands-on Lab Session 2: Deep Learning for Physics Data Analysis
- 16:30 - 17:30: Brainstorming Session for Student Group Projects

Wednesday, August 28, 2024

- 8:30 - 10:00: Generative Models Part 1 (VAEs, GANs, diffusion models)
- 10:00 - 10:15: Break
- 10:15 - 11:30: Generative Models Part 2 (inverse problems, scientific applications)
- 11:30 - 13:15: Lunch break
- 13:15 - 16:15: Hands-on Lab Session 3: Generative Models for Scientific Problems
- 16:30 - 17:30: Social Activities

Thursday, August 29, 2024

- 8:30 - 9:15: Invited Talk: Large Language Models and their Applications
- 9:30 - 10:15: Invited Talk: Physics-Informed Neural Networks (PINNs)
- 10:30 - 11:15: Invited Talk: Machine Learning in Healthcare and Medicine
- 11:30 - 13:15: Lunch break
- 13:15 - 16:15: Hands-on Lab Session 4: PINNs for Solving Differential Equations
- 16:30 - 17:30: Brainstorming Session for Student Group Projects

Friday, August 30, 2024

- 8:30 - 9:15: Invited Talk: AI in Nuclear and Particle Physics
- 9:30 - 10:15: Invited Talk: Foundation Models and their Scientific Applications
- 10:30 - 11:15: Invited Talk: Machine Learning for Materials Science
- 11:30 - 13:15: Lunch break
- 13:15 - 16:15: Hackathon and Presentation of Student Group Projects
- 16:15: Closing Remarks and Farewell

Assessment of knowledge and skills

The assessment of knowledge and skills acquired during this program will be conducted through the following three components:

1. **Preparatory Study Work (20%):** Participants will be required to complete preparatory work prior to the program, such as reading assignments or exercises, and submit reports or summaries, which will account for 20% of the final grade.
2. **Practical Lab Sessions (40%):** During the hands-on laboratory sessions, participants will work on practical exercises and submit reports documenting their work and findings. These lab reports will contribute 40% to the overall assessment.
3. **Group Project (40%):** Participants will work on a group project applying the skills and knowledge acquired throughout the program to solve a real-world scientific problem using AI techniques. The project will involve a written report and an oral presentation, accounting for 40% of the final grade.

This combination of theoretical preparatory work, practical lab exercises, and a comprehensive group project will ensure a comprehensive evaluation of the participants' understanding and ability to apply AI methods in scientific research.

Successful completion of the program will be rewarded with the attribution of 3 ECTS (European Credit Transfer and Accumulation System) credits.

Discover Caen and Normandy

The Blended Intensive Program on AI for Science will take place in Caen, a city located in the Normandy region of northwestern France. Caen offers participants a blend of historical and cultural attractions, along with modern amenities.

Caen has a rich historical background, evident in its well-preserved architectural landmarks. Notable sites include the Château de Caen, a medieval castle dating back to William the Conqueror, and the Abbaye aux Hommes and Abbaye aux Dames, two Romanesque abbeys showcasing the region's religious heritage. Beyond its historical treasures, Caen features a lively cultural scene. The city center has pedestrian streets lined with cafés, shops, and restaurants showcasing local cuisine. Visitors can explore the Musée des Beaux-Arts, which houses an impressive collection of paintings and sculptures, or attend performances at the Théâtre de Caen.

Caen's location in Normandy provides easy access to other notable destinations in the region. The D-Day beaches, where the Allied forces landed during World War II, are a short distance away. Participants can visit sites like the Normandy American Cemetery

and Memorial. The coastal towns of Honfleur and Deauville, known for their harbors, seafood markets, and seaside resorts, are also nearby.

Normandy is renowned for its culinary traditions, including Camembert and Livarot cheeses, apple-based beverages, and fresh seafood caught off the Normandy coast.

With its combination of historical significance, cultural attractions, and proximity to other notable sites in the region, Caen and Normandy provide an engaging backdrop for the Blended Intensive Program on AI for Science.

Discover Normandy:

- <https://www.youtube.com/watch?v=skGsyKQYyHw>
- <https://www.calameo.com/read/0020594281ee424812210>

Contacts

- Scientific program: frederic.jurie@unicaen.fr, romain.herault@unicaen.fr, julien.rabin@unicaen.fr
- Mobility grants: isabelle.triniac@unicaen.fr / intl.erasmus.entrants@unicaen.fr
- International office: Clotilde.nicolle@unicaen.fr / (+33) 231 565 324 / (+33) 699 340 231