CSBM INTERNATIONA SUMMER SCHOOL

Applied Science and Technology for Real-world Apps - 2023

"ASTRA-2023: AI AND COMPLEXITY FOR GLOBAL POLITICAL DYNAMICS"

This document highlights the main objectives of the "AI and Complexity for Global Political Dynamics" summer school organised at the Romanian-American University.

The summer school is jointly organized, under the auspices of the School of Computer Science for Business Management, by the "Computational Science and Machine Intelligence" (CSMI) and the "Center for Research in Artificial Intelligence" (CRAI) research centers.

This is a transdisciplinary school aiming to provide participants with an overview of computational tools used for studying complexity and adaptive systems. Moreover, the school will show participants how these tools and techniques could be used for investigating different pressing open questions related to international relations, global politics, cooperation, or conflict.

Complexity theory, also known as complex systems theory, is a field of study that focuses on understanding the behaviour of physical and social systems. It differs from conventional approaches in that it recognizes the non-linear, adaptive, co-evolutionary, networked, and emergent nature of systems. This approach has gained popularity in recent years and is being increasingly applied to the study of global politics by scholars in various disciplines, such as international relations, global governance, public policy, security studies, critical security studies, peace and conflict studies, political economy, and environmental governance. The goal is to provide a more comprehensive understanding of the behaviour of these systems and the factors that influence their behaviour.

Complexity theory is based on the idea that the behaviour of a system cannot be fully understood by examining its individual components in isolation. Rather, it is necessary to consider the relationships between these components and the way they interact with each other to understand the overall behaviour

of the system. This approach has proven to be particularly useful in the study of complex systems such as ecosystems, economies, and societies, which exhibit behaviour that is difficult to explain using traditional approaches.

The application of complexity theory to the study of global politics provides a unique perspective on the challenges and opportunities facing the global community. It highlights the interconnectedness and interdependence of political, economic, and social systems and the need for an integrated approach to address global issues such as climate change, conflict, and poverty. Additionally, it recognizes the importance of considering the historical and cultural context in which these systems are operating, as well as the role of power and agency in shaping their behaviour.

Overall, complexity theory provides a valuable tool for scholars of global politics and related disciplines, offering a fresh perspective on complex and interrelated systems and the challenges facing the global community.

The topics included in the summer school are:

- Complexity Theory and Complex Adaptive Systems
- Agent based modelling and simulations
- Machine Learning and artificial intelligence
- Competitive and collaborative behaviour
- International relations, political science, and political economy

The "AI and Complexity for Global Political Dynamics" summer school at the Romanian-American University is an exciting and unique opportunity for students and professionals to delve deeper into the fascinating world of complexity and adaptive systems. By providing a wide range of topics and practical training, participants will gain a deeper understanding of the challenges and opportunities facing the global community and the tools available to analyse these complex systems. The school aims to be a valuable educational experience that will provide participants with a unique perspective and skills that can be applied in their future academic and professional pursuits.

Requirements

This school is open to undergraduate and graduate students from any domain or field of study. Ideally, participants will have a basic understanding of computer programming, undergraduate level mathematics, and some experience in working with data.

Syllabus (covers 4 ECTS)

Day 1 - Agent Based Modelling (ABM)

- Morning session:
  - Introduction to agent-based modelling
  - Building ABMs using NetLogo
- Afternoon session:
  - Introduction to Java
  - Building ABMs using Java

Day 2 – Learning and Multi-Agent Systems

- Morning session:
  - Introduction to machine learning
  - Reinforcement learning
- Afternoon session:
  - Learning agents

Day 3 – Computer Simulations

- Morning session:
  - Computer simulations with Java
  - Data analytics and visualisation using Java
- Afternoon session:
  - Examples of simulations for social sciences
    - Network-based simulations
    - Spatial and temporal simulations

Day 4 – Competition, and Cooperation

- Morning session:
  - Introduction to Game Theory
- Afternoon session:

- Agents, competition, and cooperation

Day 5 – ABMs and Global Political Dynamics

- Morning session (research results and examples):
  - Understanding fake news dynamics using ABMs
  - Understanding international trade and cooperation using ABMs
  - Understanding malicious behaviour using ABMs
- Afternoon session:
  - Student presentations

Evaluation

To successfully complete the programme, the participants will have to present a group project.

Schedule

- 01 – 09 July 2023
- Monday – Friday (03 – 07 July), 2 sessions per day
  - Morning session: 9:30 – 13:00
  - Afternoon session: 14:00 – 16:30
- Lunch break: 13.00 - 14.00
- Each session has a 10 min. coffee break every 1h and 20 min.
- Saturday / Sunday (01 – 02 July and 08 – 09 July) – Trips or Group/Individual activities

Funding

Grants:

- 2021-1-RO01-KA131-HED-000005162, Call 2021

Private:

- Simona Livescu Foundation

OTHER DETAILS

Accommodation & food

The participants cover their accommodation and meals, from the Erasmus grant received from their home universities Erasmus Offices. However, RAU can provide competitive in-campus options. We can provide accommodation, for those that would like to use our hostel, with a price of 40 EUR/night per double-room, meaning 20 EUR/night/pers. The hostel is inside the campus and there are also different meal options available close-by (inside our hostel is a cafeteria, there are 3 other restaurant/cafeterias in a range of 5 minutes-walk from the school).

Lecturers

A group of core lecturers that will present the core of the material. Core lecturers are always on campus for the duration of the school, to interact with and support the student participants. The invited/guest lecturers will be present for at least two consecutive days on campus, to enhance students' chances to interact with them outside the courses also.

Core lecturers

- Andrei Luchici, PhD – School Scientific Director
- Alexandru Tabusca, PhD – School Executive Director
- *Erasmus partner university representative*
- *Erasmus university partner representative*
- *Erasmus university partner representative*

Guest lecturers

- *Business environment/researcher - TBC*
- *Business environment/researcher - TBC*
- *Business environment/researcher - TBC*
- *Business environment/researcher - TBC*
- *Business environment/researcher - TBC*

Lecturers from the business environment/NGOs (but NOT professors from universities), will be reimbursed from RAU Erasmus Office funds, under the following regulations: 140 EUR/day (with a minimum of 2-day participation) + transport, with the transport covered within the below "bands":

Travel distances	In case of standard travel	In case of green travel
Between 10 and 99 KM:	23 EUR per participant	
Between 100 and 499 KM:	180 EUR per participant	210 EUR per participant
Between 500 and 1999 KM:	275 EUR per participant	320 EUR per participant
Between 2000 and 2999 KM:	360 EUR per participant	410 EUR per participant
Between 3000 and 3999 KM:	530 EUR per participant	610 EUR per participant
Between 4000 and 7999 KM:	820 EUR per participant	
8000 KM or more:	1500 EUR per participant	

Participants

- The Summer School will gather at least 15 students from EU countries (except Romanians).
- Student participants receive 70 EUR/day for their time in Romania – from their university's Erasmus Office budget. As a result, they should receive 630 EUR for the current summer school schedule. The Erasmus Office of their institution has the legal bases to fund them for 2 supplementary days besides the actual number of days of the summer school, if they can afford and wish to further support the students. This amount is considered to cover daily expenses (food, lodging) and transport to/from Romania (so the extra 2 days might help the students).
- If any of the summer school partner universities wish to also send lecturers for school activities, they should be financed by the partner university Erasmus Office.