

Symposium on Complex Systems, Data, and Topology

ICMS Sofia — Bulgarian Academy of Sciences

November 8–11, 2025

Overview

How do knots teach us about data? Can sandpiles reveal, through complex systems, a deeper understanding of mathematical logic? What lies beyond the Church–Turing boundary in our age of quantum algorithms and polymodels?

The **Symposium on Complex Systems, Data, and Topology** explores the living frontier where mathematics, machine learning, and geometry meet the logic of complex systems. Set within the vibrant intellectual atmosphere of ICMS Sofia, it continues the **Atanasoff Memorial Lecture Series**—a celebration of Bulgaria’s scientific legacy and its enduring dialogue with the world.

Over four days, leading researchers and emerging voices will trace new pathways between topology, probability, and computation. Our sessions weave together four threads:

- **Young Talents** — emerging directions at the intersection of topology, geometry, and data science.
- **Complexity Group Sessions** — insights from the ICMS team exploring sandpiles, networks, and emergent structures.
- **Atanasoff Memorial Day** — keynote lectures by world leaders in mathematics and machine learning.
- **Data and Finance Forum** — real-world complexity, models of risk, and the geometry of modern economics.

Together they form an entanglement of ideas—bridging logic, data, and complexity—in pursuit of a deeper mathematical understanding of our computational universe.

Programme Schedule

Saturday, November 8 — *Foundations of Complexity and Geometry*

- 10:00–10:40 **Mikhail Shkolnikov** (ICMS Sofia, Complexity Group)
10:50–11:30 **Higinio Serrano** (ICMS Sofia, Complexity Group)
11:40–12:20 **Konstantin Delchev** (IMI–BAS Sofia)
12:30–13:10 **Carlos Ruiz** (Escuela Bourbaki, Mexico)
13:10–14:30 *Lunch break*
14:30–15:10 **Pedro Olivares** (ITAM, Mexico)
15:20–16:00 **Aldo Guzmán** (IBM Research, Spain)
16:15–17:00 **Round Table I: *Topology meets Complex Systems*** (moderated by Ernesto Lupercio)

Sunday, November 9 — *Dialogues on Complexity and Finance*

- 10:00–11:30 **Round Table II: *Complexity & Finance*** (moderators Ernesto Lupercio & Gerardo Hernández)
11:30–12:30 Coffee / Networking
Afternoon Arrival of Atanasoff Lecturer (Amaury Hayat)

Monday, November 10 — *Atanasoff Memorial Day: Mathematics and Machine Learning*

- 10:00–10:50 **Public Lecture — Ernesto Lupercio** (CINVESTAV & ICMS Sofia)
13:00–13:50 **Raphaël Douady** (Stony Brook University / LabEx ReFi)
14:00–14:50 **Carlos Simpson** (CNRS, Université Côte d’Azur)
15:00–15:50 **Atanasoff Keynote Lecture (50 min) — Amaury Hayat** (École des Ponts – IP Paris)
16:00–16:50 **Yuri Tschinkel** (Simons Foundation / Courant NYU)
17:00–17:50 **Phillip Griffiths** (Institute for Advanced Study, Princeton)
19:00–19:45 Reception

Tuesday, November 11 — *Data, Institutions, and the Geometry of Markets*

- 09:00–09:30 **Edison Vázquez** (CINVESTAV, Mexico)
09:40–10:10 **Daniel Sánchez** (BBVA Barcelona)
10:20–10:50 **Paloma Marín** (BBVA Madrid)
11:00–11:30 **León Palafox** (GBM, Mexico)
11:30–12:00 **Gerardo Hernández** (CEMLA, Mexico)
12:00–12:15 *Closing Remarks / Farewell* — Ernesto Lupercio & Organising Team

Cultural Program — Exploring Sofia

Participants arriving early are invited to experience the city through the celebrated **Free Sofia Tour** (<https://freesofiatour.com>), the number-one rated attraction in Sofia. Organized by the 365 Association and led by professional local guides, the tour offers a lively and informative introduction to Bulgaria’s capital—its architecture, history, and

hidden corners. Tours are offered every day in English and Spanish; participation is free and based on voluntary donations.

We suggest the **2:00 PM tour on Sunday, November 9**, which departs from the **Palace of Justice (Sofia City Court)**, just off Vitosha Boulevard, a few minutes from most hotels. No booking is required, though guests can register in advance on the website.

After the tour, participants can enjoy the cafés and restaurants along **Vitosha Boulevard** or visit nearby landmarks such as the **Alexander Nevsky Cathedral**, the **National Art Gallery**, and the ancient **Serdica ruins** beneath the city center.

Venue: ICMS Sofia, Acad. G. Bonchev St. Bl. 8, Sofia

Admission: Free (registration suggested; limited capacity)