Complexity science research at CPG and future goals

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The Computational Physics Group (CPG)

CPG is the lead partner of the project.

CPG Belongs to the Aristotle University of Thessaloniki (AUTH), Physics Department, Solid state physics section.

The Computational Physics Group (CPG)

- The group deals with problems of Complexity science:
  - Physics
  - Physical chemistry
  - Networks (Biological, social, collaboration)
  - Financial systems (Econophysics)
  - Language Evolution
  - Geolocalization
- The staff:
  - Almost all staff members are physicists with strong programming background.

The Computational Physics Group (CPG)

- Each group member has a personal computer with:
  - Quad-core processors
  - 6 GB RAM
  - Over 2 TB of self storage
- The group has a private computational cluster:
  - 128-core computational power
  - 2 GB RAM / core
  - Over 30 TB of storage
- All group members have an access to the GRID infrastructure with:
  - 30.000 computational cores
  - 5000 TB of storage
  - Over 100.000 jobs/day

Research at CPG

- The group has several research publications in scientific journals and international conferences.
  - Journals: 165
  - Conferences: 175

  - Conferences the group has participated the last three years:
    - International CONFERENCE on ADVANCED OPTOELECTRONICS and LASERS.
    - International Conference in Statistical Physics.
    - International Conference on EconoPhysics
    - Dynamic properties of complex systems using Grid computing.
    - International Conference on Nanosciences & Nanotechnologies.
    - European Conference on Complex Systems

Research at CPG

List of some of the scientific journals CPG publishes:

- Physics
  - Physical Review Letters
  - Surface Science
  - Physica A
  - Organic Electronics
  - Journal of Luminescence
- Physical Chemistry
  - Journal of Physical Chemistry B
  - European Physical Journal B
  - Chemical Physics Letters
- Networks
  - Europhysics Letters
  - Physical Review B , E
  - Applied Mathematical Sciences
  - Neural Processing Letters
  - Basic and Clinical Pharmacology & Toxicology
  - Biophysical Journal
  - International Journal of Computer Mathematics
- Econophysics
  - Journal of Engineering Science and Technology Review
  - New Journal of Physics
- Language evolution
  - Journal of Statistical Mechanics
- Geolocalization
  - Europhysics Letters
  - Physical Review B , E
  - New Journal of Physics

Research at CPG

Some recent research publications:

- “Simulation of charge separation in organic photovoltaic cells.” (2013)
- “Random walk with priorities in communication-like networks.” (2013)
- “Nature of segregation of reactants in diffusion controlled A+B reactions: Role of mobility in forming compact clusters.” (2013)
- “Towards a living earth simulator.” (2012)
- “Memory effects in strongly interacting lattice gases: self-intermediate scattering function studies.” (2011)
- “Worldwide spreading of economic crisis.” (2010)
- “A random matrix approach to Language acquisition.” (2009)
- “A network approach for the scientific collaboration in the European Framework Programs.” (2008)
- “The structural role of weak and strong links in a financial market network.” (2008)
- “Evolution of vocabulary on scale-free and random networks.” (2007)
- “Language time series analysis.” (2006)
- “Language evolution and population dynamics in a system of two interacting species.” (2005)
- “Distribution of infected mass in disease spreading in scale-free networks.” (2003)

European Collaborations

The group has participated in several European projects with a large number of partners making good friends!

Past EU projects

- DYSONET
  - Human behavior through DYnamics of complex SOcial NETworks: an interdisciplinary approach.
  - Used quantitative characterization of complex social networks by analyzing a number of real-world phenomena, including: crowd behavior, search strategies, traffic flow, dynamics of human relationship networks, spread of epidemics, as well as dynamic patterns in other disciplines, such as Economics and Finance, and Environmental networks.
  - Took real life data!
  - Partners:
    - Greece
    - Israel
    - Sweden
    - Germany
    - Portugal
    - Italy
    - U.S.A.

DYSONET

http://dysonet.physics.auth.gr

Past EU projects

- INTERCONY
  - INTERface COntrolled Nucleation and Crystallisation for Nanoparticle Synthesis.
  - Enable the utilization of partially crystalline materials as photonic components, especially for novel photonic applications.
  - Strong Interdisciplinary group. Partners were specialized in:
    - Experiment
    - Theory
    - Simulation
  - Partners:
    - Germany
    - Bulgaria
    - Greece
    - Spain

Running EU projects

- MULTIPLEX
  - Foundational Research on MULTIlevel comPLEX networks and systems.
  - Uses huge and heterogeneous datasets available at different levels.
  - The main aim of this project is oriented to use the mathematical framework of Complex Networks and Algorithmics to establish a theoretical basis for the understanding, prediction and possibly control of the Complex Systems.
  - Partners:

Italy	Switzerland	Croatia
Portugal	Finland	Netherlands
Spain	Germany	
Israel	Austria	
UK	Greece	
Hungary	Poland	
France	Slovenia	

http://www.multiplexproject.eu

Running EU projects

- Interregional project ICoSCIS
  - Interregional Cooperation at Scientific Computing in Interdisciplinary Science
  - Transferring know-how and helping other institutes to use HPC infrastructures.
    - Courses on Complexity Science.
  - Partners:

    Greece

    Bulgaria

http://icoscis.physics.auth.gr

CPG and future goals…

- Through “HORIZON 2020”
- International/European/Regional/National Collaborations
- Collaborations with:
  - Universities
  - Research groups
  - Companies (*HORIZON loves SME’s!!*)
- Applying the knowledge of Multiplex Networks and in general in Complexity science in:
  - Transportation
  - Telecommunication
  - Social networks
  - … (any other HORIZON’s call for proposals)

HORIZON 2020

- Calls that we are interested in..
  - Smart Cities
    - Smart transportation methods and tools
  - FET
    - FET OPEN
    - Global systems science
  - Nanotechnology
    - Smart materials/sensors
  - Health
    - Disease spreading
  - Society
    - ICT related social systems
  - Security
    - Rapid report systems
  - Telecommunications
    - Communication Networks

For more info about us…

- You can find more information about the group for:
  - Research interests
  - Staff CVs
  - Publications
  - Collaborations

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Thank you

Our website