



INSTITUTE OF INFORMATION AND  
COMMUNICATION TECHNOLOGIES  
BULGARIAN ACADEMY OF SCIENCES



# AComIn Research & User Communities in “Image Processing and 3D Technologies”

a presentation by D. Dimov

at the AComIn Steering Committee Meeting year 1  
24 October 2013, Starosel, Bulgaria

## Following AComIn Issues: Research News from the Site and the Bulletin:

- *WP3: Mobilities:*

02 July 2013, IICT: [Prof. Virginio Cantoni](#) - Univ. of Pavia, Italy, Lecture: [A Few Applications of Pattern Recognition Techniques to Proteomics](#),

24-26 July 2013, IICT: [Prof. Petia Radeva](#), Universitat Autònoma de Barcelona, Course: [Computational Vision and its Application to Medical Diagnosis](#) (1<sup>st</sup> AComIn TT Seminar),

07 August 2013, IICT &, IBPhBME-BAS: [Prof. Lubomir Hadjiiski](#), Department of Radiology, University of Michigan, Ann Arbor, MI, USA, Lecture: [Can Intelligent Pattern Recognition help in Cancer Diagnosis and Treatment Response Monitoring?](#),

02-05 September 2013, IICT: [D-r Petar Gulev](#), Course: [Appling Advanced 3D Technologies in the Textile Industry and Fashion](#) (2<sup>d</sup> AComIn TT Seminar).

- *WP3: Mobilities – Secondments:*

13 May – 12 June 2013: [Prof. Dimo Dimov's](#) visit CVML, Univ. of Pavia, Italy.

- *WP3: Mobilities - Participation in scientific events.*

## Contributions to Building User Communities (WP2&WP5).



## A Few Applications of Pattern Recognition Techniques to Proteomics

a lecture at SP&PR seminar of IICT (02 July, 2013, block 2, BAS)

**Lecturer: Prof. Virginio Cantoni:**

**From** Dep. Industrial and Information Engineering of the University of Pavia (UNIPV), Italy;

He heads the Computer Vision & Multimedia Lab of UNIPV that is a partner of AComIn project.

( <http://vision.unipv.it/people/cantoni/index.html> )

**The lecture resume can be found at:**

[http://iict.bas.bg/acomin/bg/news/02-07-2013-V\\_Cantoni.pdf](http://iict.bas.bg/acomin/bg/news/02-07-2013-V_Cantoni.pdf)

...Being morphology a basic issue for the functionality of macromolecules such as proteins, the achievements of the PR and computer vision community could be profitable in structural and computational biology. Some fundamentals of the basic PR techniques that look to me the most promising biological applications are here discussed...

**The lecture presentation can be found at**

[http://iict.bas.bg/acomin/news/2-July-2013-VCantoni\\_ppt.pdf](http://iict.bas.bg/acomin/news/2-July-2013-VCantoni_ppt.pdf)

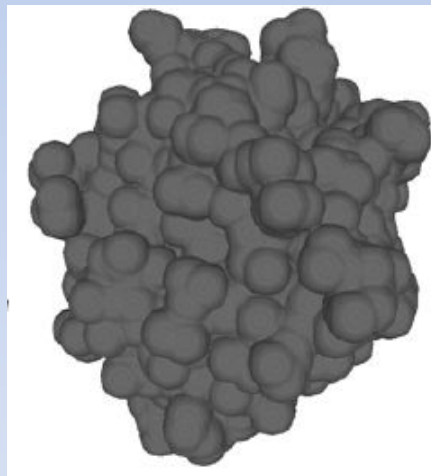
**The auditory:** generally from the IICT departments: SP&PR and MMSDP.



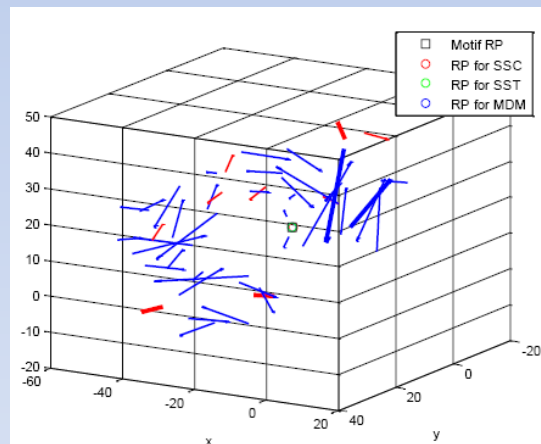
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## The lecture content:

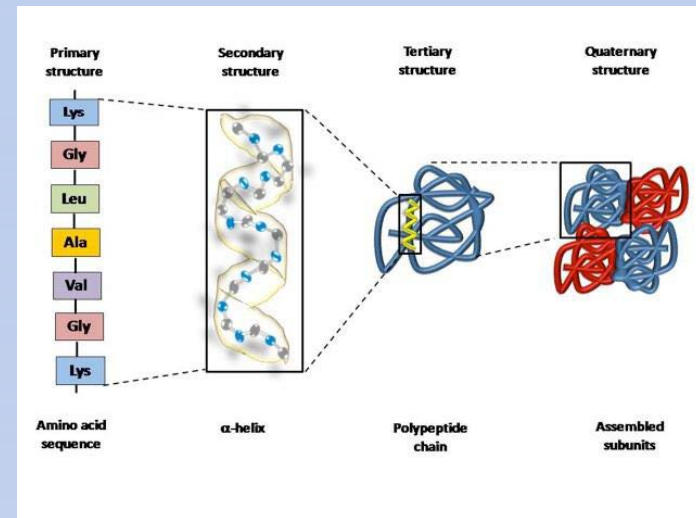
- Searching in a database of protein structures
  - Search for a structural “motif”
  - Pairwise comparison
  - All-to-All comparison
- Study the interaction between structures and other molecules (Protein Docking)
  - Molecular surface representation
  - Protein surface comparison
  - Geometric shape descriptors
  - Shape matching algorithms



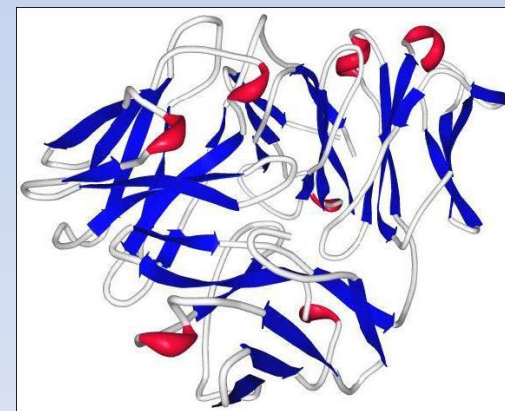
Mathematical morphology models, etc. ...



Secondary structures representation;



Levels of protein structure representation;



SS general elements: helixes and sheets;





## Computational Vision and its Application to Medical Diagnosis

3 days' seminar (24-26 July, 2013), block 25-A, IICT-BAS:

**Lecturer: Prof. Petia Radeva:**

**From** the University of Barcelona, Spain;  
She is Head of Barcelona Perceptual Computing Lab., and Head of MiLab of Computer Vision Center in Barcelona.

**The seminar program (14 hours):**

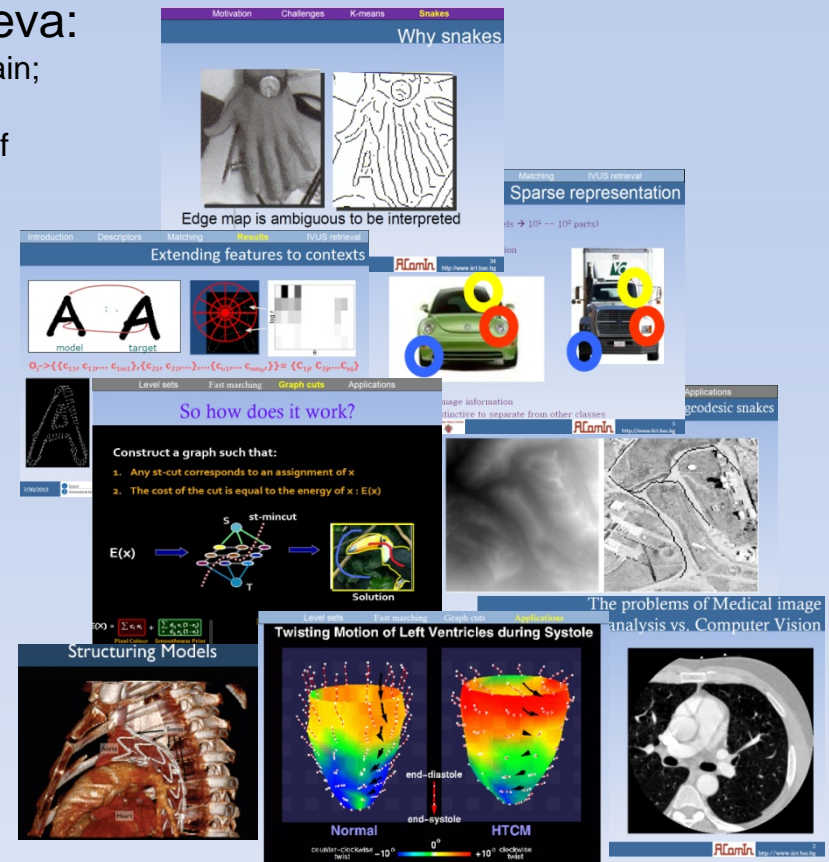
([http://iict.bas.bg/acomin/news/24-26-07-2013-P\\_Radeva.pdf](http://iict.bas.bg/acomin/news/24-26-07-2013-P_Radeva.pdf))

1<sup>st</sup> day: Introduction: Computer Vision in Barcelona University;  
Segmentation techniques: Snakes and level set, and Graph-cuts;

2<sup>d</sup> day: Image context analysis: Shape context, Active shape models and Active appearance models; Bayesian context modeling;

Applications to medical diagnosis and treatment – two real clinical projects: Introduction to Medical imaging;  
Arteriosclerotic plaque analysis in intravascular ultrasound images of coronary vessels; Stent detection;

3<sup>th</sup> day: Neuroimaging; Intestinal motility analysis in wireless endoscopic images.





1<sup>st</sup> day listeners...

2<sup>d</sup> day participants interested in...

3<sup>th</sup> day discussions.



The presentations of the lectures are freely accessible at the AComIn site (<http://iict.bas.bg/acomin/news.html>).

The lectures auditory:  
33 participants from:

- four private companies (MMSolutions AD, 3PS-SIMULIA, AVIQ Bulgaria Ltd., and Vitronic GmbH);
- two Bulgarian universities (Technical University of Sofia and Technical University of Veliko Tarnovo);
- seventeen participants from IICT-BAS;
- as well as representatives from six other institutes of the Bulgarian Academy of Sciences.





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На 7 август 2013 г. (сряда), от 11:00 часа в Заседателната зала на Института по биофизика и биомедицинско инженерство – „Акад. Г. Бончев“ бл. 105 (I етаж), ще се проведе съвместен семинар на тема:

## **Can Intelligent Pattern Recognition help in Cancer Diagnosis and Treatment Response Monitoring?**

Лектор ще бъде Professor Lubomir Hadjiiski, Department of Radiology, University of Michigan, US

Cancer is the second leading cause of death in the US. Early detection and diagnosis of cancer is crucial for patient survival. The rapid development of imaging technologies such as fast and high resolution computed tomography (CT) and magnetic resonance imaging (MRI) scanners combined with advanced image processing and intelligent pattern recognition methods allow the development of powerful tools that can assist physicians in cancer detection, diagnosis and monitoring of treatment response. Computer-aided diagnosis systems (CAD) are such decision support tools that can provide objective and reproducible second opinion or information to the physicians. However, in order to evaluate the effect of CAD on physicians' performance in cancer detection, diagnosis and treatment response monitoring, it is critically important to study and understand the interaction between physicians and CAD, and determine whether CAD will improve patient care.

Professor Lubomir Hadjiiski has authored or coauthored 95 publications in peer-reviewed journals and more than 240 abstracts and presentations. He has been the principle investigator on National Institute of Health (NIH) and Department of Defense (DOD) grants. He has served as a grant reviewer for NIH, Food and Drug Administration, Dutch Cancer Society, and Dutch Technology Foundation.

8/1/2013



ACoMin: Advanced Computing for Innovation

<http://www.iict.bas.bg/acomin>





## Applying Advanced 3D Technologies in the Textile Industry and Fashion

4 days' seminar (02-05 Sept., 2013), block 25-A, IICT-BAS:

**Lecturer: Dr. Petar Gulev:**

**From** the London School of Fashion in the University of the Arts – London;

**With the help of** the Ministry of Education and Science of the R of Bulgaria, and the British Council in the R of Bulgaria.

### **The seminar program**

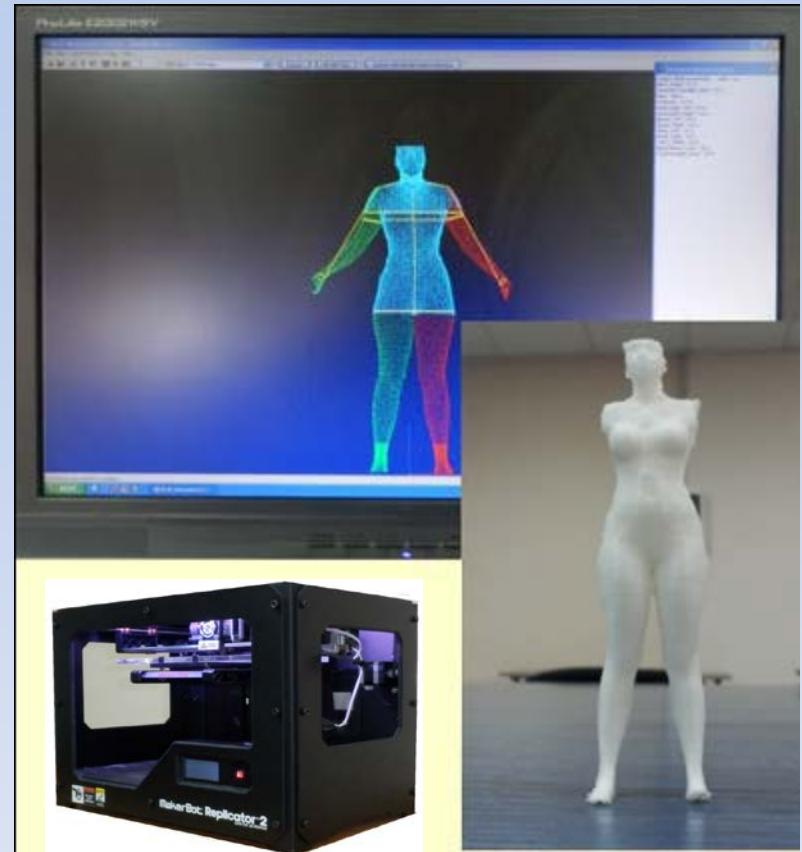
(<http://www.iict.bas.bg/acomin/news.html>)

- 1<sup>st</sup> day: Approaches to study customers' opinion;
- 2<sup>d</sup> day: Scanning and creating 3D models of human body;
- 3<sup>th</sup> day: 3D design of clothes and accessories;
- 4<sup>th</sup> day: Use of 3D models for e-commerce in fashion.

### **On the Figures:**

(Up): A human body model (in *3D Body Measurement System*, v.7.4.1) used during seminar exercises;

(Down): 3D Printing of the human body model, by the help of Print3D Ltd., BG.







(left): The lectures auditory;



(right): Exercises in the computer room;

(down): 3D scanning of an object through a ZScanner 800 (of the Team Ltd, BG)



The seminar auditory:

22 listeners, half of them from the fashion sector in the country.

**Host institution:** Computer Vision & Multimedia Lab (CVML) at Univ. of Pavia, our partner in AComIn project;

**Host leader:** Prof. Viginio Cantoni, Director of CVML;

**Visit plan:** "...a joint work and further discussions about our collaboration in the frames of AComIn project..." and "...a few lectures in the scope of research activities of SP&PR department in IICT";

**Visitor:** Dr. Dimo Dimov, Assoc.Prof., Head of SP&PR dep. of IICT;

**Visit duration:** 1 month (13 May - 12 June, 2013).c



## **Talks conducted by the visitor:**

(20 May, 2013): IICT, BAS, Sofia, AComIn, and SP&PR department;

(29 May, 2013): Rapid and Reliable Content Based Image Retrieval (or FANTIR – Fast & Noise Tolerant Image Retrieval);

(04 June, 2013): From 2D CBIR to Multi View Based 3D Recognition;

(10 June, 2013): Precise Approximation of  $(\rho, \theta)$ -Hough Transform over a Rectangular Grid.

(presentations are available at <http://vision.unipv.it/events/>):

The last presentation reflects a concrete opportunity for a collaboration in Proteomics area. Later, at the Prof. Cantoni's visiting IICT in June, this opportunity has been materialized in a paper in collaboration:

Virginio Cantoni, Dimo T. Dimov, "Structural Blocks Retrieval in Macromolecules: Saliency and Precision Aspects", LNCS, Volume 8158, 2013, pp 372-380,

The paper has been presented at **PRPSBB'2013** workshop of **ICIAP'2013**, Naples, Italy.



The idea of the talks conducted: To attract experienced researchers to work in IICT in the AComIn frames, the principal attention of the vizitor was directed generally to young scientists in CVML.

24 June – 04 July, 2013: Prof. Virginio Cantoni - Univ. of Pavia, Italy,  
Topic: [A Few Applications of Pattern Recognition Techniques to Proteomics.](#)

21 July – 10 August, 2013: Prof. Petia Radeva, Universitat Autònoma de Barcelona,  
Topic: [Computational Vision and its Application to Medical Diagnosis.](#)



### More that 10 publications:

Hristov V, G. Agre (2013). A Software System for Classification of Archaeological Artefacts Represented by 2D Plans. Cybernetics and Information Technologies, Vol. 13, № 2, ISSN 1311-9702, pp. 82-96.

Koprinkova-Hristova, P., Alexiev, K. (2013), Echo State Networks in Dynamic Data Clustering In: Mladenov, V., Koprinkova-Hristova, P., Palm, G, Villa, A.E.P., Appollini, B., Kasabov, N. (Eds.) ICANN 2013, Lecture Notes in Computer Science, vol. 8131, ISSN: 0302-9743, ISBN: 978-3-642-40727-7, DOI: 10.1007/978-3-642-40728-4, Springer-Verlag Berlin Heidelberg, pp. 343-350.

Behar V., Chr. Kabakchiev, I. Garvanov (2013), Sound Source Localization in a Security System using a Microphone Array”, In: Proc. of the 2nd Intern., Conf. on Telecommunications & Remote Sensing - ICTRS'2013, 11-12 July, 2013, Noordwijkerhout, the Netherlands, ISBN: 978-989-8565-57-0, pp. 85-94.

Garvanov I., (2013), EXC CFAR BI Processor with Polar Hough Transform in the Presence of Binominal Impulse Interference, In: Proc of the Signal Processing Symposium SPS-2013, 5-7 June 2013, Jachranka, Poland, ISBN: 978-1-4673-6319-8-13- 2013 IEEE, 4 pages.

Garvanov I. , V. Behar, Chr. Kabakchiev (2013), Sound Parameter Estimation in a Security System, In: Proc. of the 2nd Intern., Conf. on Telecommunications & Remote Sensing - ICTRS'2013, 11-12 July, 2013, Noordwijkerhout, the Netherlands, ISBN: 978-989-8565-57-0, pp.140-144.

Kabakchiev C., I. Garvanov, V. Behar, H. Rohling (2013), The Experimental Study of Possibility for Radar Target Detection in FSR using L1-Based Non-Cooperative Transmitter, In: Proc. of the 14th Intern. Radar Symposium ISR'2013, June 19-21, 2013, Dresden, Germany, ISBN: 978-3-95404-223-4, pp. 625-630.

Kabakchiev C., I. Garvanov, V. Behar, H. Rohling, A. Lazarov, (2013), The Experimental Study of Target FSR Shadows Detection using GPS signals, In: Proc. of the Third International Symposium on Radio Systems and Space Plasma, 28-30 August 2013, Sofia, Bulgaria, ISBN: 978-619-90124-1-3, pp. 64-73, 2013.

Koprinkova-Hristova, P., Angelova, D., Borisova, D., Jelev, G. (2013), Clustering of spectral images using Echo state networks, 2013 IEEE International Symposium on Innovations in Intelligent Systems and Applications, IEEE INISTA 2013, June 19-21, Albena, Bulgaria, ISBN: 978-147990661-1, DOI: 10.1109/INISTA.2013.6577633

Strandjeve, B., G. Agre. On applicability of Principal Component Analysis to concept learning from images. In: Proc. of IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA), 9-21 June 2013, Albena, Bulgaria, IEEE Xplore, 1-5, ISBN 978-1-4799-0659-8, DOI: 10.1109/INISTA.2013.6577623.

... also at least 5 publications are in preparation stage.

# Thank you