Bilkent University
Computer Engineering Department

MSc and PhD Programs

Prof. Dr. H. Altay Güvenir

Research Areas

- Algorithms, artificial intelligence, big data, bioinformatics, cloud computing, computational biology, computational geometry, computer architecture, computer graphics, computer networks, computer vision, cryptography, data mining, data science, data security, database systems, graph visualization, high performance computing, image analysis, information retrieval, machine learning, mobile systems, parallel and distributed systems, pattern recognition, performance evaluation, scientific computing, virtual reality.

Applications

- Application Deadlines:
  Early: April 9, 2018; Regular: June 8, 2018
- Online Application:
  https://stars.bilkent.edu.tr/gradapp/
- Requirements for application:
  - CGPA ≥ 2.80 / 4.00
  - ALES (Turkish citizens) or GRE (Foreign applicants)
    - ALES: Quantitative ≥ 55 (for MS), 80 (for PhD w/o BS)
    - GRE: Quantitative ≥ 153 (MS), 157 (PhD)
  - English Proficiency: TOEFL (IBT) ≥ 87 or IELTS avg ≥ 6.5 (and min 5.5 in each section)
  - And YDS ≥ 55 (for Turkish citizen applying PhD).

Interview

- Date: April 16, 2018; June 18,19, 2018
- Hard copy documents to be submitted during interview:
  - Transcript
  - ALES or GRE score report
  - Proof of English Proficiency (TOFLE, IELTS or YDS report)

Acceptance requirements

- At least one faculty member willing to work with the applicant towards thesis
- Department approval
- Graduate School of Engineering and Science approval

Scholarship Options

- Department scholarship
  - Tuition waiver
  - Stipend
  - Accommodation support
  - Health Insurance
  - Additional Scholarship for Teaching Assistantship
  - Office (shared)
- TÜBİTAK Scholarship or TÜBİTAK projects
  - Tuition waiver
  - Accommodation
  - Health Insurance
  - Office (shared)

Scholarship Options

- Project grants (except TÜBİTAK projects)
  - Tuition waiver
  - Stipend (paid from the project budget)
  - Accommodation
  - Health Insurance (paid from the project budget)
  - Additional Scholarship for Teaching Assistantship
  - Office (shared)
- Graduate School scholarship
  - Tuition waiver
  - Additional Scholarship for Teaching Assistantship

Degree Requirements

- MSc
  - 7 technical elective courses + Seminar +
    MS Thesis +
    Research Methods and Academic Publication Ethics course
- PhD
  - 7 technical elective courses + Seminar +
    Qual Exam + PhD Thesis + Journal Publication
    Research Methods and Academic Publication Ethics course

Faculty Members

- In alphabetic order

  (Please contact with them in person for details)

VAROL AKMAN

- http://www.cs.bilkent.edu.tr/~akman
- email: akman@bilkent.edu.tr

My current research is two pronged:

i. contextual reasoning in AI
ii. public implications of the Internet

Contextual reasoning in AI

Problems originating from natural language processing and understanding, especially those caused by the lack of explicit context:

> When we say a particular thing, we do so in a context. Thus, there are embedded background assumptions available only through the context. We are also good at shifting between contexts. Can context be formalized in a formal framework? This would lead to improved software not only in Natural Language Understanding but also in knowledge-based systems, robotics, search engines, and personal assistants like Siri, Cortana, OK Google.

My grad courses CS 563 and CS 661 examine contexts, as well as other AI topics.

Public implications of the Internet

Problems caused by tensions between local versus global, individual versus corporate, and democratic versus authoritarian in the framework of the Internet. More specifically:

> Basic concepts and history of the Internet as a socio-political medium. Free access to information in the networked world. The Internet as a trusted communications medium in light of security and privacy issues. Censorship and politics of the Internet vis-à-vis interventions by oppressive governments. Social movements in the 21st century marked by rapid broadcast of ideas and images.

My grad course CS 513 treats such societal aspects of the Internet.

Selim Aksoy

saksoy@cs.bilkent.edu.tr
http://www.cs.bilkent.edu.tr/~saksoy
Office: EA 423 (4th floor)

Research interests:

- Computer vision
- Pattern recognition
- Machine learning
- Data mining

Current topics:

- Remote sensing image analysis
- Image and video mining
- Medical image analysis

RETINA Vision and Learning Group

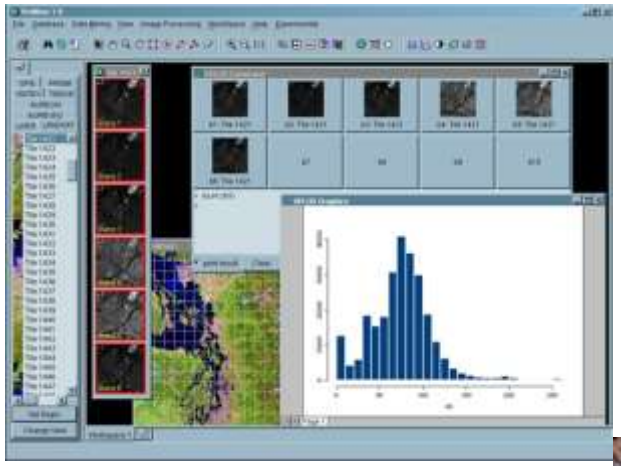
http://retina.cs.bilkent.edu.tr

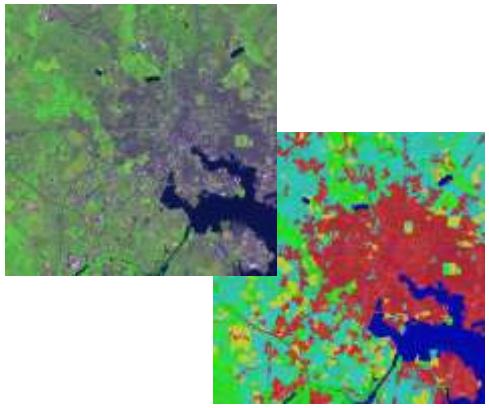
Sponsored Research Projects

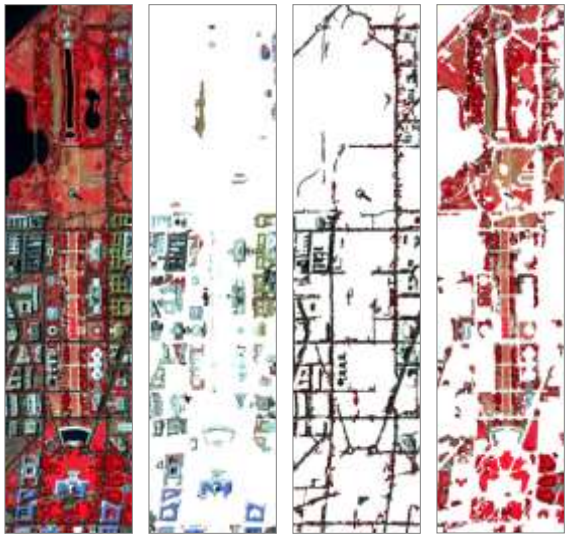
- Remote sensing image analysis
  - TÜBİTAK CAREER Grant, 158,000 YTL, 2005-2010
  - EC Joint Research Centre, 35,000 Euro, 2008
  - FP6 Marie Curie Grant, 80,000 Euro, 2005-2007
  - U.S. Army, $850,000, 2003-2005
  - NASA Goddard Space Flight Center, $430,000, 2001-2004
- Image and video mining
  - TÜBİTAK and COST 292 Action, 102,060 YTL, 2004-2008
  - DPT, 2004-2005
- Medical image analysis
  - TÜBİTAK CAREER Grant, 158,000 YTL, 2005-2010
  - U.S. National Library of Medicine, $750,000, 2001-2004

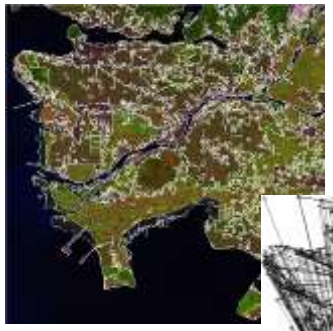
Remote Sensing Image Analysis

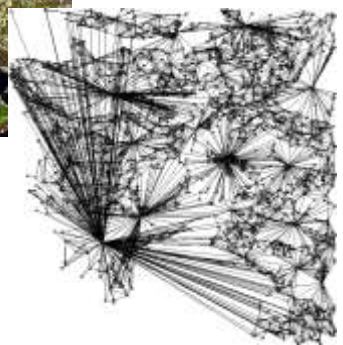
- Increasing resolution in space and time (NASA receives 3 TB/day)
- Object recognition, classification and retrieval (Have you tried Google Earth?)

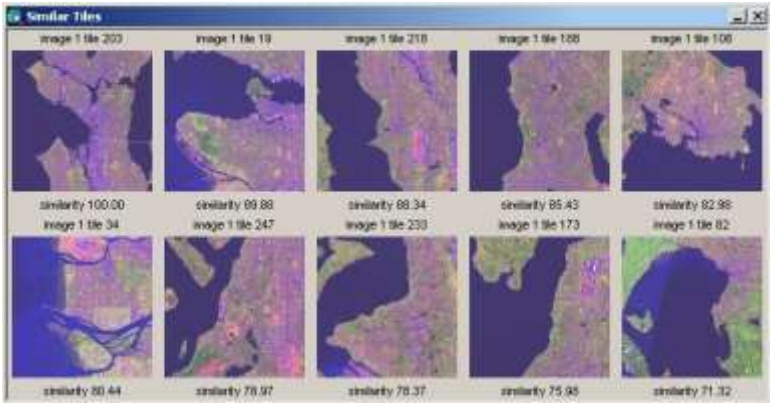












- Urban planning / monitoring
- Effects of natural disasters
- Environmental monitoring

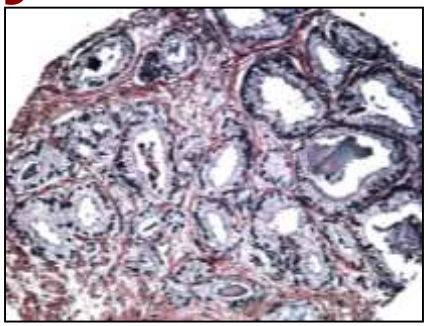
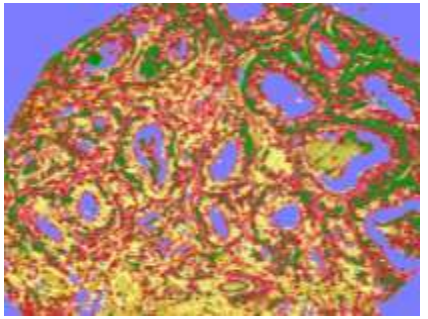
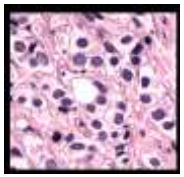
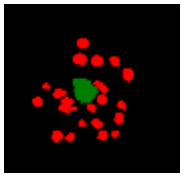
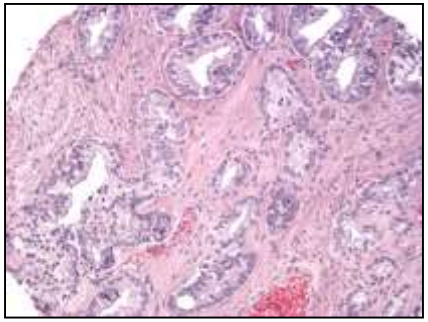
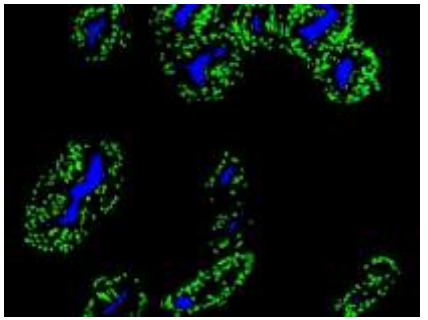
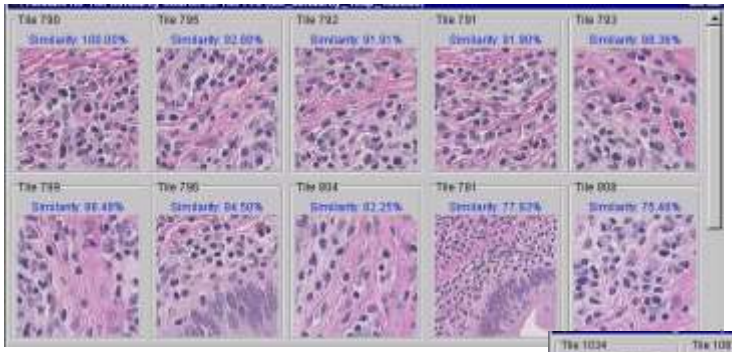
Image and Video Mining

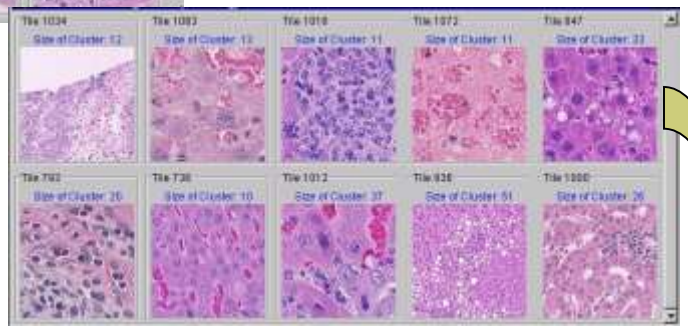
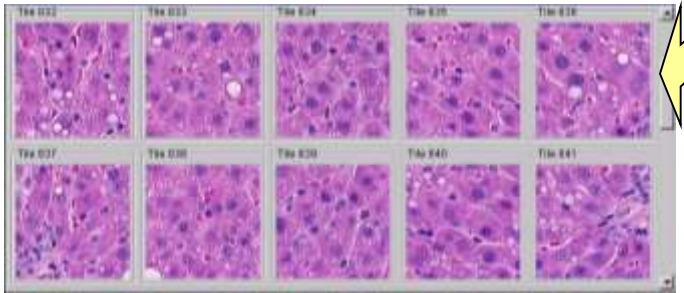
- Huge amounts of multimedia data (personal, commercial, free, …)
- Semantic classification and retrieval (Have you tried Google Video?)

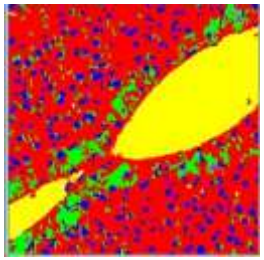
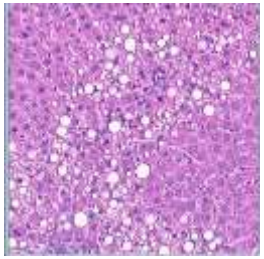
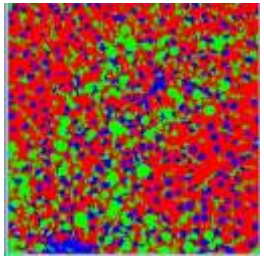
- Object recognition
- Scene classification
- Combining image/audio/motion/text

Medical Image Analysis

- Microscopic image classification
- Cancer detection / grading
- Content-based searching of past cases
- Automatic report generation


Dr. Selim Aksoy

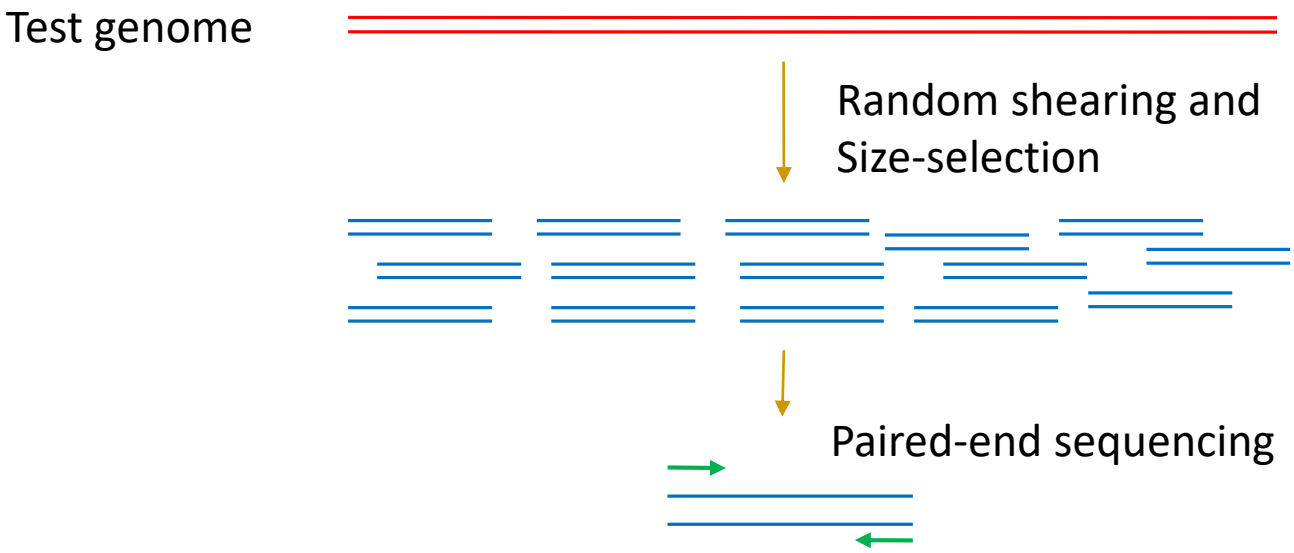
Can Alkan

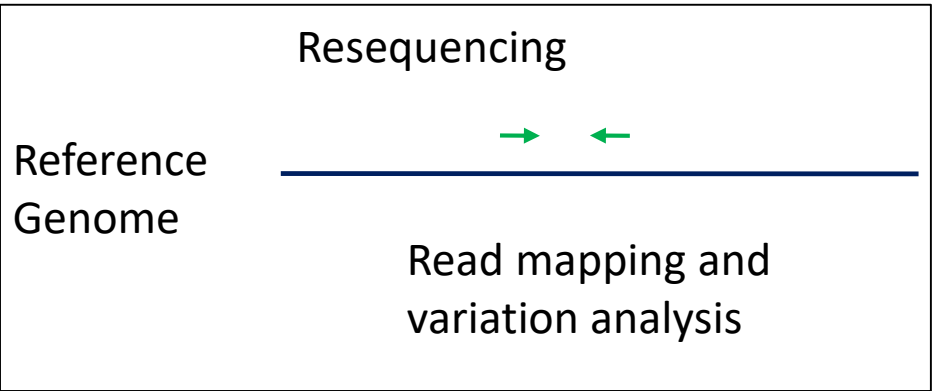
calkan@cs.bilkent.edu.tr

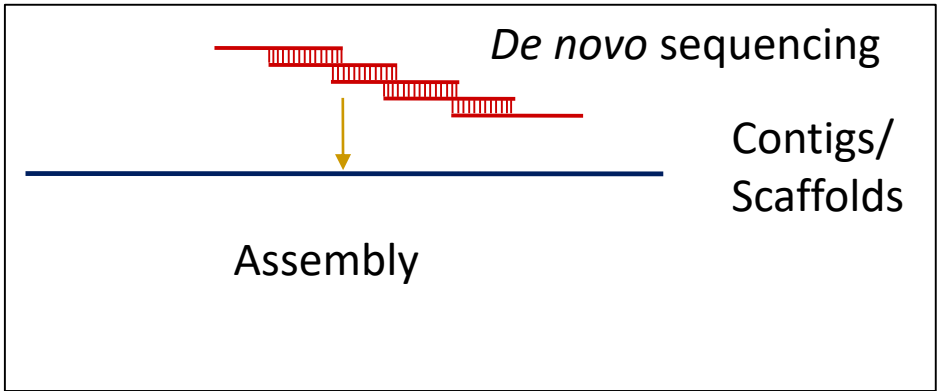
Lab for Bioinformatics and Computational Genomics

http://www.cs.bilkent.edu.tr/~calkan/compgen

Combinatorial algorithms to analyze high throughput sequence data to discover, genotype, and phase genomic variants, assemble genomes and transcriptomes.







Types of genomic variants

SNP: Single nucleotide polymorphism (substitutions)
Indel: Insertions and deletions of sequence of length 1 to 50 basepairs

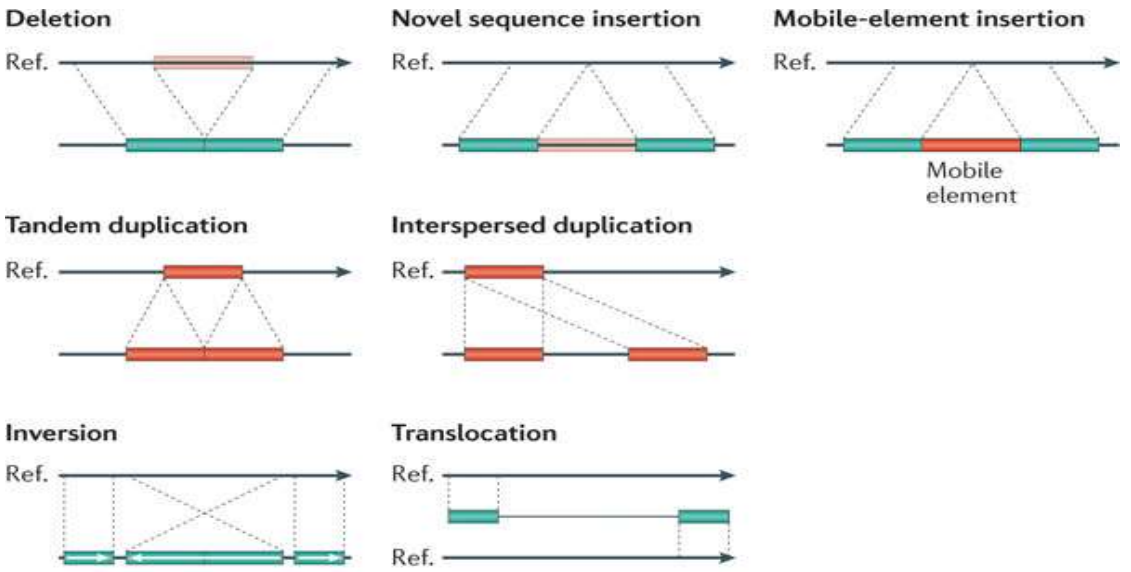
reference: C A C A G T G C G C - T
sample: C A C C G T G - G C A T

SNP *deletion* *insertion*

Short tandem repeats: microsatellites, minisatellites, alpha & beta satellites, etc.

reference: C A G C A G C A G C A G
sample: C A G C A G C A G *C A G* C A G

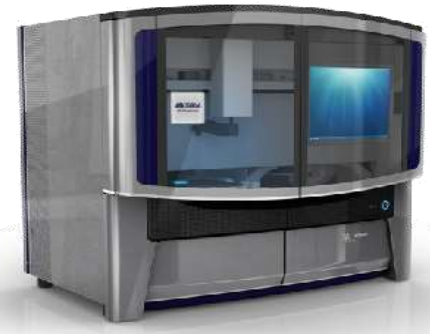
Structural variation:
Genomic alterations > 50 bp
Deletions, insertions, mobile elements, duplications, inversions and translocations



Nature Reviews | Genetics

Genome sequencers

Roche/454



AB SOLiD

Illumina MiSeq

Complete Genomics

Oxford Nanopore MinION

Illumina HiSeq2000

Pacific Biosciences RS

Oxford Nanopore GridION

Ion Torrent PGM

Ion Torrent Proton

… and more! All produce data with different properties.

Selected publications

Personalized copy number and segmental duplication maps using next-generation sequencing. *Nature Genetics,* Oct, 41(10):1061-1067, 2009.
*** Highlighted** in News and Views, "Mapping duplicated sequences", DY Chiang and SA McCarroll, *Nature Biotechnology,* Nov; 27(11):1001-2, 2009.

Combinatorial algorithms for structural variation detection in high throughput sequenced genomes. *Genome Research*, Jul, 19(7):1270-8, 2009.

Detection and characterization of novel sequence insertions using paired-end next-generation sequencing. *Bioinformatics,* May 15; 26(10):1277-83, 2010.

A draft sequence of the Neandertal genome *Science*, 7 May, 328 (5979):710-722, 2010.
Recipient of the 2010 AAAS Newcomb Cleveland Prize.

mrsFAST: a cache-oblivious algorithm for short-read mapping. *Nature Methods*, Aug;7(8):576-7, 2010.

A map of human genome variation from population-scale sequencing. 1000 Genomes Project Consortium. *Nature*, Oct 28;467(7319):1061-73, 2010.

Genetic history of an archaic hominin group from Denisova Cave in Siberia. *Nature*, Dec; 468(7327):1053-1060, 2010.

Limitations of next-generation genome sequence assembly. *Nature Methods,* 8(1):61-65, 2011.
* **Highlighted** in Commentary, "Assemblies: the good, the bad, the ugly", E. Birney, *Nature Methods*, 8(1):59-60, 2011.

Mapping copy number variation by population-scale genome sequencing. *Nature,* 470(7332):59-65, 2011.

Genome structural variation discovery and genotyping. *Nature Reviews Genetics,* May;12(5):363-76, 2011.

Sensitive and fast mapping of di-base encoded reads. *Bioinformatics*, Jul 15;27(14):1915-21, 2011.

Detection of structural variants and indels within exome data. *Nature Methods*, 9(2): 176-178, 2012.

Projects

- Discovery and characterization of genomic variation
  - Funded by EU Marie Curie Actions Career Integration Grant
- Algorithms and hardware designs for ultra-fast mapping of HTS reads to reference genome assemblies
  - Funded by US National Institutes of Health
- De novo and hybrid (multi-platform) sequence assembly.
- Genomic repeat discovery, classification and annotation.
- Distributed algorithms for genome assembly.

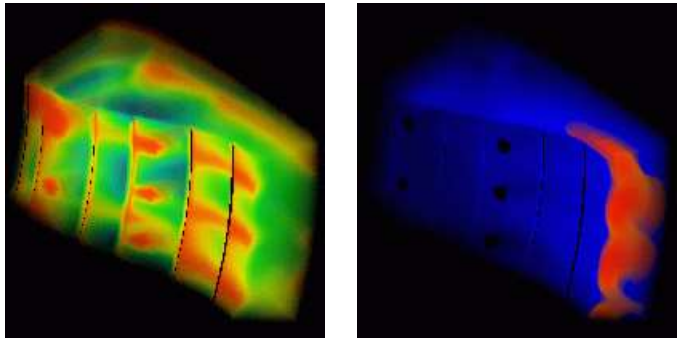
Positions available. Contact if you have B.Sc. or M.Sc. degree in computer science, computer engineering, electrical engineering, or mathematics, and if you are interested in combinatorial optimization, approximation algorithms, and graph theory. Strong programming skills in C/C++ are highly desired.

Successful applicants will also have a chance to contribute to many international consortiums such as the 1000 Genomes Project and the Genome 10K, and will involve in other international collaborations with researchers in Vancouver, Seattle, Barcelona, Bari, Pittsburgh, and more.

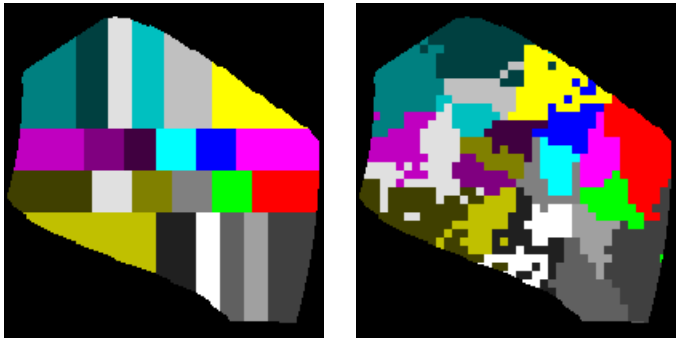
Basic understanding of biology/genetics/genomics is a *plus*, but **not required**.

Parallel and Grid Computing Group

Prof. Dr. Cevdet Aykanat



Volume rendering of a combustion chamber: pressure and velocity fields.

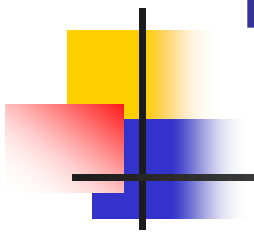


Screen assignments for 24 processors: jagged and hypergraph partitionings.

Paralel and Grid Computing Group

- Projects funded by TUBITAK, Intel and European Union
  - EU-funded FP6 SEE-GRID2 project (2006-2009)
  - Parallel Text Retrieval &Query Processing (TÜBİTAK, 2006-2008)
  - EU-funded FP6 EUMedGrid project (2006-2008)
  - EU-funded FP6 SEE-GRID project (SE4SEE application) (2004-2006)
  - Efficient Parallel Web Crawling (TÜBİTAK, 2004-2006)
  - Task scheduling for PC clusters (TÜBİTAK, 1999-2002)
  - Unstructured domain mapping (EU ITDC , 1995-1998)
  - Parallel direct volume rendering (TÜBİTAK EEAG, 1995-1997)
  - Real-time realistic image generation (TÜBİTAK & Intel SSD,1991-1994)

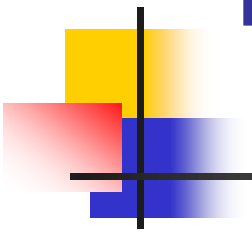
Paralel and Grid Computing Group



- Paralel computing architectures
  - Intel iPSC/2 hypercube (32 nodes)
  - Parsytec CC24 (24 nodes)
  - PC cluster (Borg) (32 nodes)
  - PC cluster (Skynet) (48 nodes)
  - Grid cluster (16 nodes)

Paralel and Grid Computing Group

Paralel and Grid Computing Group



- Current research topics
  - Algorithm design for parallel and distributed computing applications
  - Parallel text retrieval, query processing
  - Parallel and distributed Web crawling
  - High-performance geographical information systems
  - Parallel scientific computing
  - Inverted index compression
  - Parallel and distributed data mining
  - Task allocation and scheduling for Grid systems
  - Grid-enabled Web search
  - Parallel direct volume rendering

Journal Publications (2006-2008)

1. C. Aykanat, B.B. Cambazoglu and B. Ucar, "Multi-level Direct K-way Hypergraph Partitioning with Multiple Constraints and Fixed vertices," **Journal of Parallel and Distributed Computing,** 2008.
2. T, Kucukyilmaz, B.B. Cambazoğlu, C. Aykanat, and F. Can, "Chat Mining: Predicting User and Message Attributes in Computer-Mediated Communication", **Information Processing & Management**, 2008.
3. A. Pinar, E.K. Tabak and C. Aykanat, "One-Dimensional Partitioning for Heterogeneous Systems: Theory and Practice," **Journal of Parallel and Distributed Computing**, 2008.
4. E. Demir, C. Aykanat and B. B. Cambazoglu, "Clustering Spatial Networks for Aggregate Query Processing, a Hypergarph Approach," **Information Systems**, 2008.
5. B. Ucar and C. Aykanat, "Revisiting Hypergraph Models for Sparse Matrix Partitioning," **SIAM Review**, 2007.
6. B. Uçar and C. Aykanat, "Partitioning Sparse Matrices for Parallel Preconditioned Iterative Methods," **SIAM Journal on Scientific Computing**, 2007.
7. B.B. Cambazoğlu and C. Aykanat, "Hypergraph-Partioning-Based Remapping Models for Image-Space-Parallel Direct Volume Rendering of Unstructured Grids," **IEEE Transactions on Parallel and Distributed Systems**, 2007.
8. K. Kaya, B. Uçar and C. Aykanat, "Heuristics for Scheduling File-Sharing Tasks on Heterogeneous Systems with Distributed Repositories," **Journal of Parallel and Distributed Computing**, 2007.
9. B.B. Cambazoğlu, E. Karaca, T. Kucukyilmaz, A. Turk and C. Aykanat "Architecture of a Grid-Enabled Search Engine, **Information Processing & Management**, 2007.
10. B. Uçar, C. Aykanat, M. Pınar and T. Malas, "Parallel Image Restoration Using Surrogate Constraint Methods," **Journal of Parallel and Distributed Computing**, 2007.
11. C. Aykanat, B. B. Cambazoğlu, F. Findik, and T.M. Kurc, "Adaptive Decomposition and Remapping Algorithms for Object-Space-Parallel Direct Volume Rendering of Unstructured Grids," **Journal of Parallel and Distributed Computing**, 2006.
12. B.B. Cambazoğlu and C. Aykanat, "Performance of Query Processing Implementations in Ranking-Based Text Retrieval Systems Using Inverted indices," **Information Processing & Management**, 2006.
13. K. Kaya and C. Aykanat, "Iterative-Improvement-Based Heuristics for Adaptive Scheduling of Tasks Sharing Files on Heterogeneous Systems," **IEEE Transactions on Parallel and Distributed Systems**, 2006.
14. B. Ucar, C. Aykanat, K. Kaya and M. İkinci, "Task Assignment in Heterogeneous Systems," **Journal of Parallel and Distributed Computing**, 2006.

Paralel and Grid Computing Group

- Contact information
  - Cevdet Aykanat
  - Phone: 312 290 1625
  - Email: *aykanat@.cs.bilkent.edu.tr*
  - Homepage: http://www.cs.bilkent.edu/~aykanat

BILKENT INFORMATION RETRIEVAL GROUP

Bilkent Information Retrieval Group

Faculty

Fazlı Can

Seyit Koçberber

Graduate Students

Cem Aksoy

Ceyhun Karbeyaz

Çagrı Toraman

Anıl Türel

Ahmet Yeniçağ

Undergraduate Students

Turgut Işık

Oğuz Kaya

Harun Özden

Abdullah Şahin

Volunteers

Aykut Bal

Akif Buğday

Bilge Köroğlu

Hasan Can Tuncay

Some Prev. Members

Erman Balçık

Ahmet Buğdaycı

Tunay Gür

Cihan Kaynak

Levent Koç

İbrahim Uysal

Other Contributors

Cevdet Aykanat

Pınar Duygulu

Özgür Ulusoy

İsmail Şengör Altıngövde

Özgür Bağlıoglu

Ethem F. Can

Gönenç Ercan

Süleyman Kardaş

H. Çağdas Öcalan

Erkan Uyar

Research Interests

- New Event Detection and Tracking
- Novelty Detection
- Information Retrieval
- Information Filtering
- News Categorization
- Text Mining &Processing

Bilkent News Portal

Bilkent Haber Portalı

BILKENT BILGI ERIŞIM GRUBU 13.05.10

Ana Sayfa | Ürünler | Yardım | Hakkımızda

[TR] [EN] HESAP OLUŞTUR GIRIŞ

Türkçe Haber Arama

Haber Ara: Arşivde Ara

KATEGORİLER

- Ekonomi
- Politika
- Türkiye
- Dünya
- Spor
- Kültür - Sanat
- Sağlık
- Bilim Teknoloji
- Yazarlar

SON HABERLER

KÜÇÜK TAMIL ASKERLER SINIFLARINA DÖNÜYOR...
Sri Lanka'da 30 yıllık çatışmaların ardından hükümet tarafından eski topraklarına döndürülen ülkenin doğu ve kuzey Devamı...

KÜTAHYA'DA GÖÇÜK MEYDANA GELEN MADEN...
Kütahya'nın Tavşanlı ilçesinde, göçük meydana gelen maden ocağı hakkında Valilikçe yaklaşık 2.5 ay önce eksikleri Devamı...

KURUYEMIŞIN AZI KARAR, ÇOĞU ZARAR...
Tüketiminde dünya ikincisi olduğumuz kuru yemişi, ölçülü miktarda almanın sağlıklı yaşama katkı sağlayacağı bildirildi.
Devamı...

VALI GÜLER: DEVLETIN VERDIĞI GÖREVIN...

GÜNCEL & GEÇMİŞ OLAYLAR

Güncel Olaylar | Geçmis Olaylar

- KEITA MILLI TAKIMDA..... İZLEYENLER (54)
- YENI BIR SERI KATIL... İZLEYENLER (7)
- AĞLAYAN ÖĞRENCI VALIYE ZOR... İZLEYENLER (6)
- GÜNEYDE PLAJLAR DOLDU TAŞTI... İZLEYENLER (7)
- ÇORUM'DA KENEDEN 1 ÖLÜM... İZLEYENLER (9)
- ŞOK IDDIA: MICHAEL JACKSON... İZLEYENLER (9)
- PAPAKOSTANDINU: YENI ÖNLEMLER ALINMASI... İZLEYENLER (7)
- 10 PROJENIN ŞAMPIYONU VARYAP... İZLEYENLER (5)
- ARNAVUTLUK'TA SIYASI KRIZ... İZLEYENLER (6)
- TÜRKIYE VE YUNANISTAN, ORTAK... İZLEYENLER (5)
- KARAPARADA "İNCELEME HAVUZU"NDAYIZ... İZLEYENLER (7)
- KONUT KREDISI FAIZINDE YÜKSELIŞ... İZLEYENLER (8)
- HINTLI DÜŞMAN KARDESLER MALLARI... İZLEYENLER (15)

EN ÇOK OKUNANLAR

You are the right person for our group

- If you are good at four core practices of CS
  - programming,
  - systems thinking,
  - modeling, and
  - innovation.
- If you
  - "can dream,"
  - "can do," and
  - "can write."

A. Ercument Cicek

cicek@cs.bilkent.edu.tr

cs.bilkent.edu.tr/~cicek

My research focuses on building algorithms for analyzing biological data using various biochemical networks. Even though it took 13 years and ~$1b to sequence the first genome, right now, it takes a day and ~$1k. This has resulted in accumulation of vast amounts of information. Consequently, biosciences have faced the problem of "big data". Today, the bottleneck in the bio-research is the lack of computational power and algorithms that can efficiently analyze the data and make discoveries. Central dogma in molecular biology dictates the information flow from DNA -> RNA --> Protein --> Metabolite. Each layer introduces 20k, 100k, 1m, and 3k variables respectively. The search space for even a basic pattern discovery is clearly intractable. I design machine learning algorithms that use biological networks to prune the search space and discover biomarkers in particular for genetic Diseases.

A. Ercument Cicek
cicek@cs.bilkent.edu.tr
cs.bilkent.edu.tr/~cicek

Gene Discovery for Autism Spectrum Disorder

-Broken interplay between 1000 genes lead to autism.

-So far we have only discovered ~50 of them, Biological networks along with intelligent search algorithms needed to discover new genes to understand the genetic architecture.

A. Ercument Cicek
cicek@cs.bilkent.edu.tr
cs.bilkent.edu.tr/~cicek

Using Dynamic Network Algorithms to Model Neurodevelopment.

-Autism is a neurodevelopmental disorder and affects evolving the gene interaction networks of the fetal period to early childhood.

-We design algorithms that analyze the dynamic networks to understand the functionality autism affects.

A. Ercument Cicek
cicek@cs.bilkent.edu.tr
cs.bilkent.edu.tr/~cicek

Metabolic Networks to Understand Cancer

Metabolites are the small compounds in the body and have been found to be key biomarkers to define certain tumors.

We use network algorithms and build online systems that analyze metabolic signatures in tumors and understand the differences within the subtypes of the same cancer.

A. Ercument Cicek

cicek@cs.bilkent.edu.tr

cs.bilkent.edu.tr/~cicek

Selected Publications:

- *De Novo Chip-Seq Analysis.* **Genome Biology** 2015, 16:205.
- *Insights into autism spectrum disorder genomic architecture and biology from 71 risk loci* **NEURON** 2015, 87(6):1215–33.
- *Exome analyses reveal new autism genes in synaptic, transcriptional, and chromatin networks.* **NATURE** 2014, 515(7526):209-15
- *MIRA: Mutual Information-based Reporter Algorithm for Metabolic Networks* **Bioinformatics** 2014, 30(12): i175-i184.
- *DAWN: A framework to identify autism genes and subnetworks using gene expression and genetics* **Molecular Autism** 2014 5:22.
- *ADEMA: An Algorithm to Determine Expected Metabolite Level Changes Using Mutual Information* **PLoS Computational Biology** 2013, 9(1) : e1002859.

Tuğrul Dayar

(tugrul@cs.bilkent.edu.tr)

- **Performance modeling and analysis**
- **Scientific computing (especially numerical linear algebra for stochastic matrices)**
- **Bioinformatics**
- **Computer networks**

requires solid background:

1) in computer engineering

2) specifically in probability theory, linear algebra, numerical analysis, and high-level programming,

which one must either have or be willing to develop

Visit:

www.cs.bilkent.edu.tr/~tugrul/tugrul.html

for further information

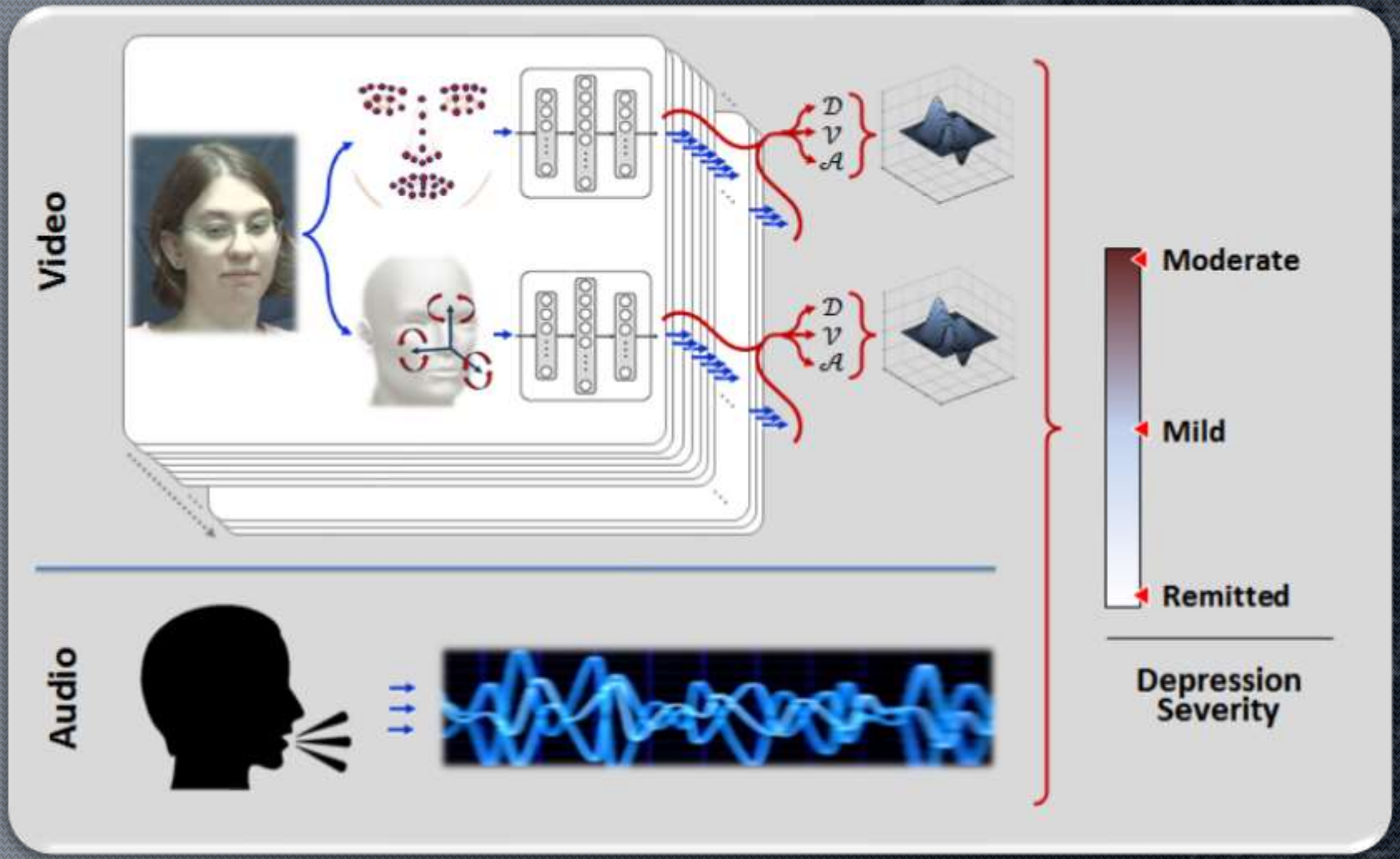
Hamdi Dibeklioğlu

dibeklioglu@cs.bilkent.edu.tr
http://www.cs.bilkent.edu.tr/~dibeklioglu/

I work in the fields of Affective Computing, Computer Vision, and Pattern Recognition.

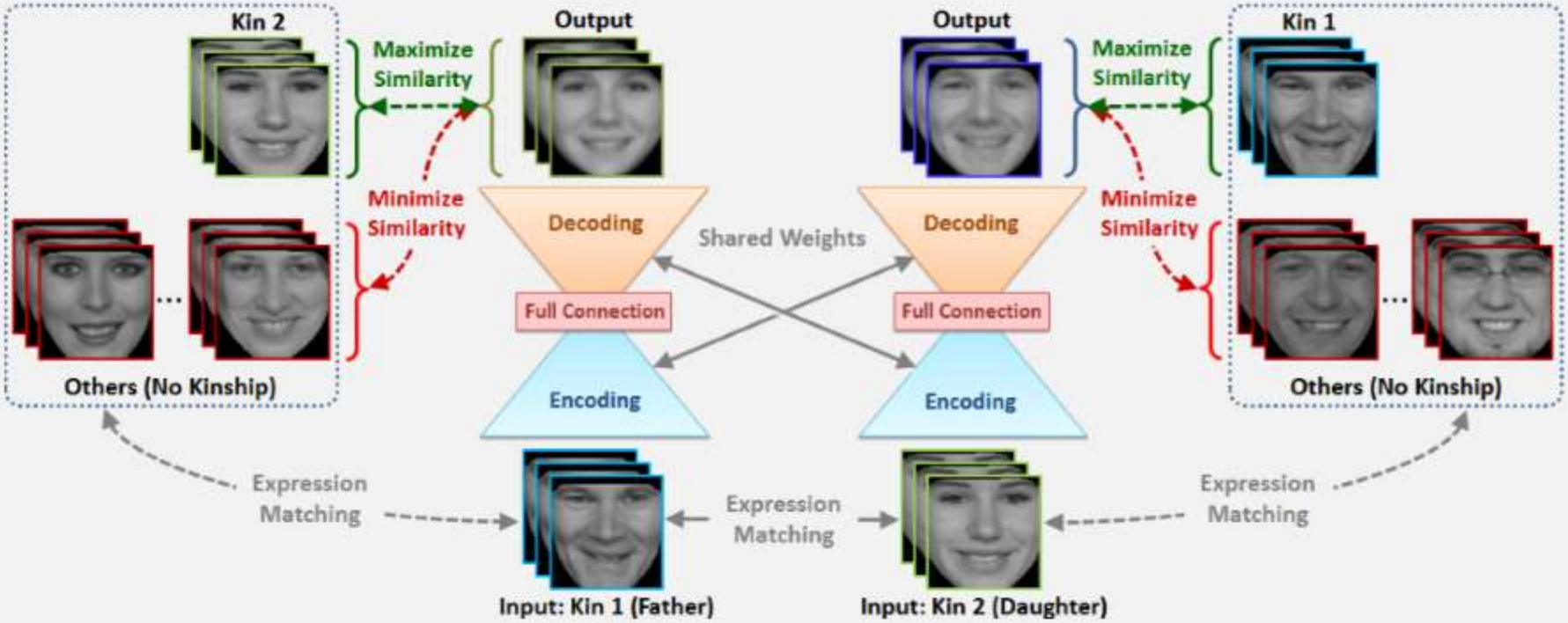
My current research mainly focuses on multimodal analysis of non-verbal human behavior (e.g. face analysis, gesture recognition, etc.) and deep learning of temporal representations.

Assessment of Depression Severity



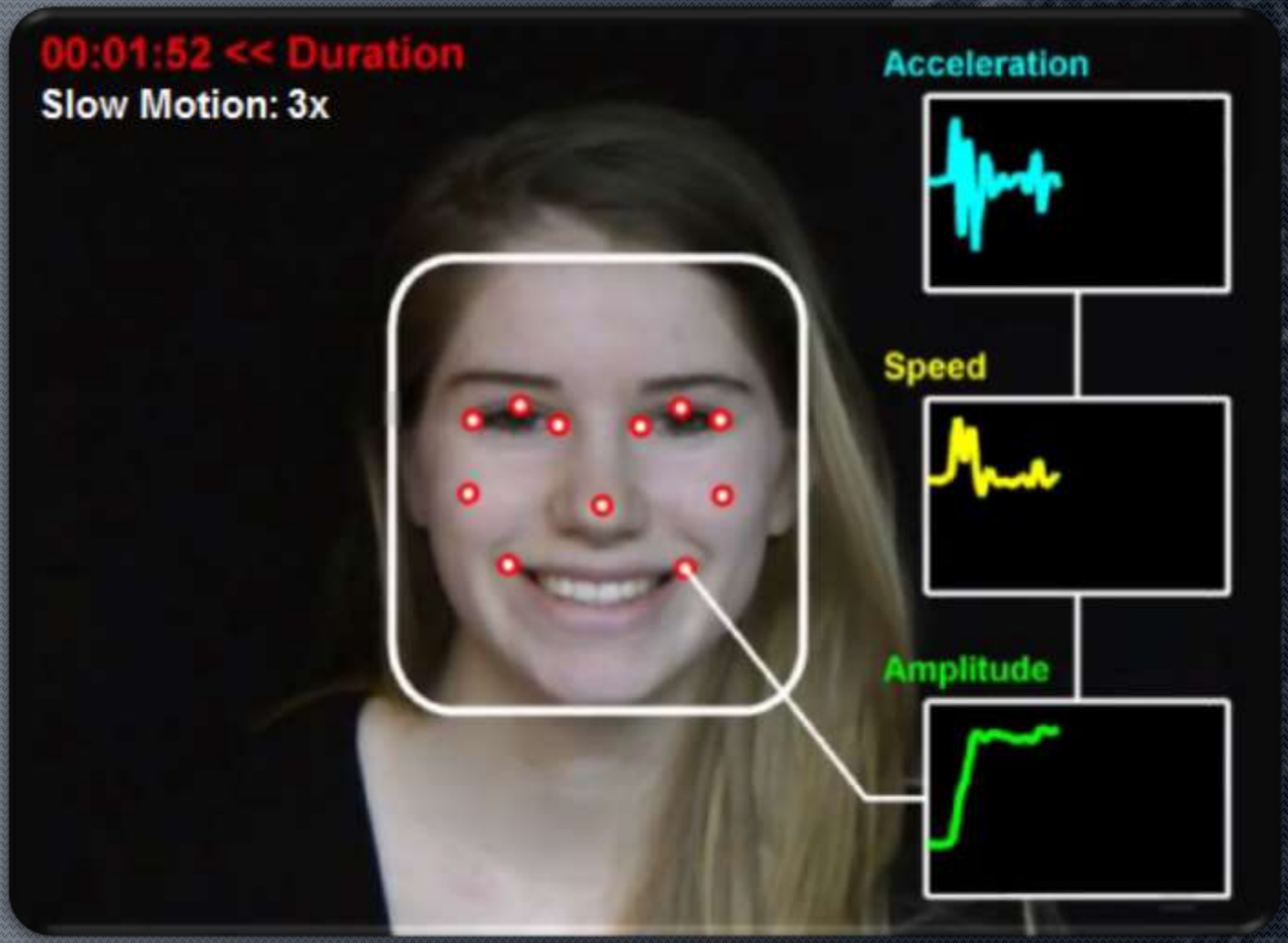
dibeklioglu@cs.bilkent.edu.tr | http://www.cs.bilkent.edu.tr/~dibeklioglu/

Kinship Verification



dibeklioglu@cs.bilkent.edu.tr | http://www.cs.bilkent.edu.tr/~dibeklioglu/

Age Estimation through Facial Dynamics



dibeklioglu@cs.bilkent.edu.tr | http://www.cs.bilkent.edu.tr/~dibeklioglu/

Facial Expression Recognition

dibeklioglu@cs.bilkent.edu.tr | http://www.cs.bilkent.edu.tr/~dibeklioglu/

Selected Publications

- *Dynamic multimodal measurement of depression severity using deep autoencoding*. **IEEE Journal of Biomedical and Health Informatics**, 2018, 22(2):525-536.
- *Multivariate time series classification using the hidden-unit logistic model.* **IEEE Transactions on Neural Networks and Learning Systems**, 2018, 29(4):920-931.
- *Visual transformation aided contrastive learning for video-based kinship verification*. **IEEE International Conference on Computer Vision**, 2017, 2459-2468.
- *Combining facial dynamics with appearance for age estimation.* **IEEE Transactions on Image Processing**, 2015, 24(6):1928-1943.
- *Recognition of genuine smiles.* **IEEE Transactions on Multimedia**, 2015, 17(3):279-294.

dibeklioglu@cs.bilkent.edu.tr | http://www.cs.bilkent.edu.tr/~dibeklioglu/

Uğur Doğrusöz

On Research of **i-Vis**

Information Visualization Research Group

For us, **research** is ***practical solutions*** to ***real problems*** using ***strong theory***!

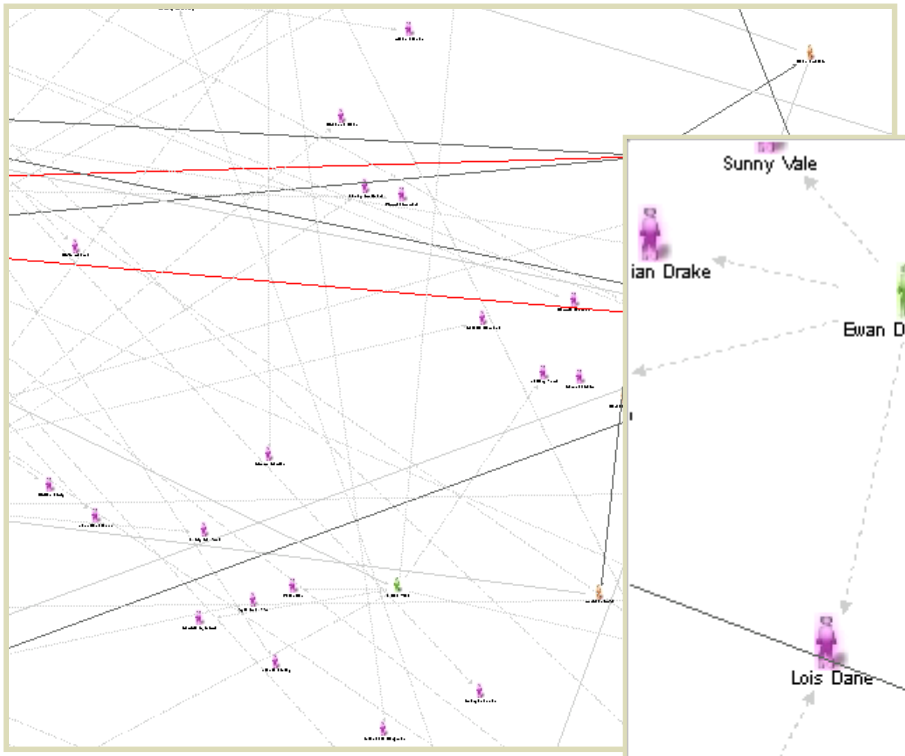
Topics: *Graph visualization*, *bioinformatics* & *graph algorithms*

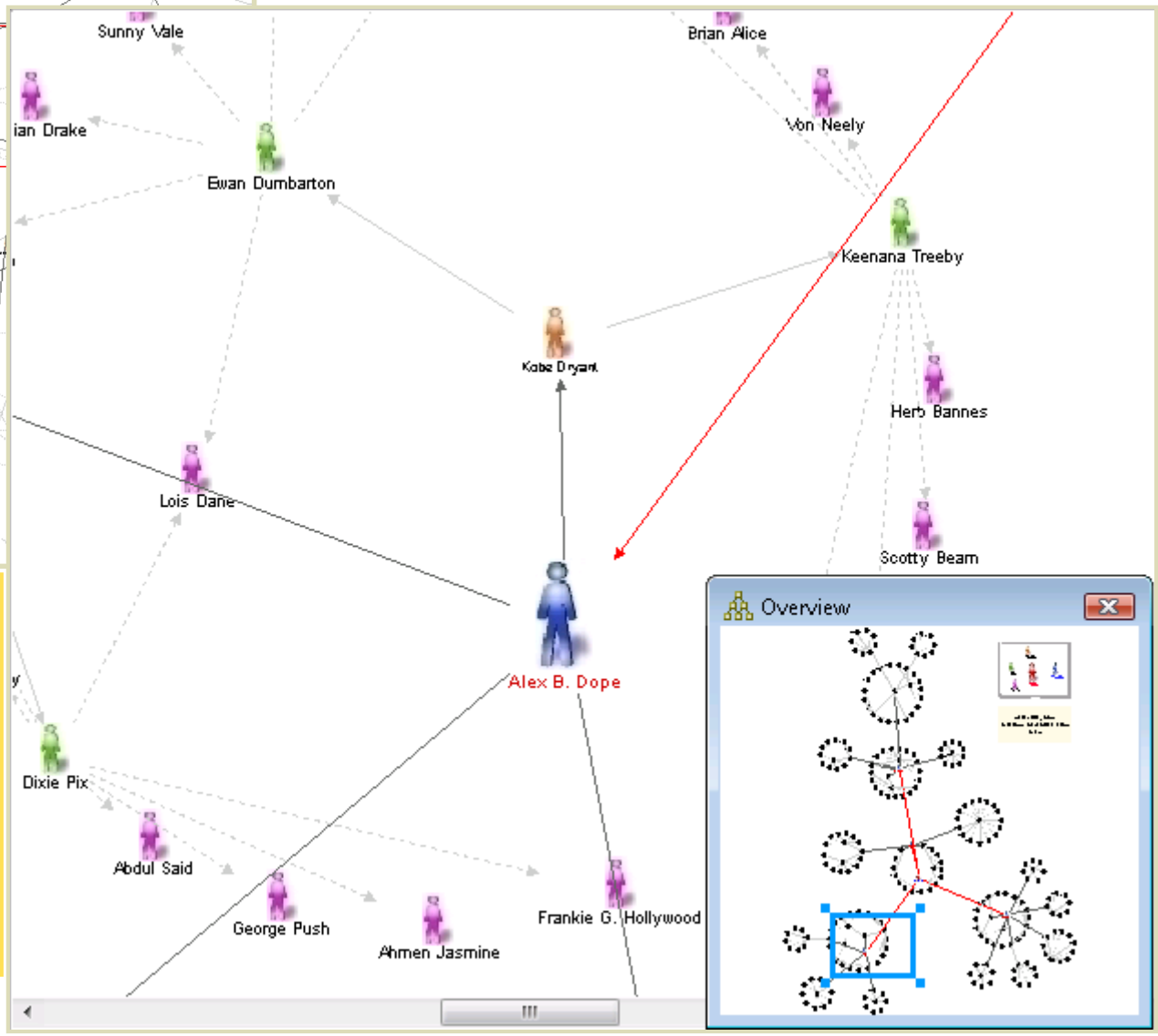
Projects:

- **PATIKA** & **Visibio** [Pathway Modeling, Analysis & Visualization Tools]
- **Chisio** [Graph Visualization Tool]

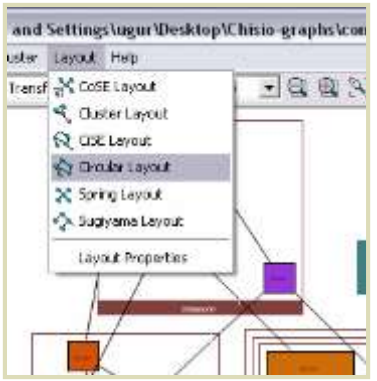
Our projects have been supported by TÜBİTAK and Tom Sawyer Software (CA, USA)

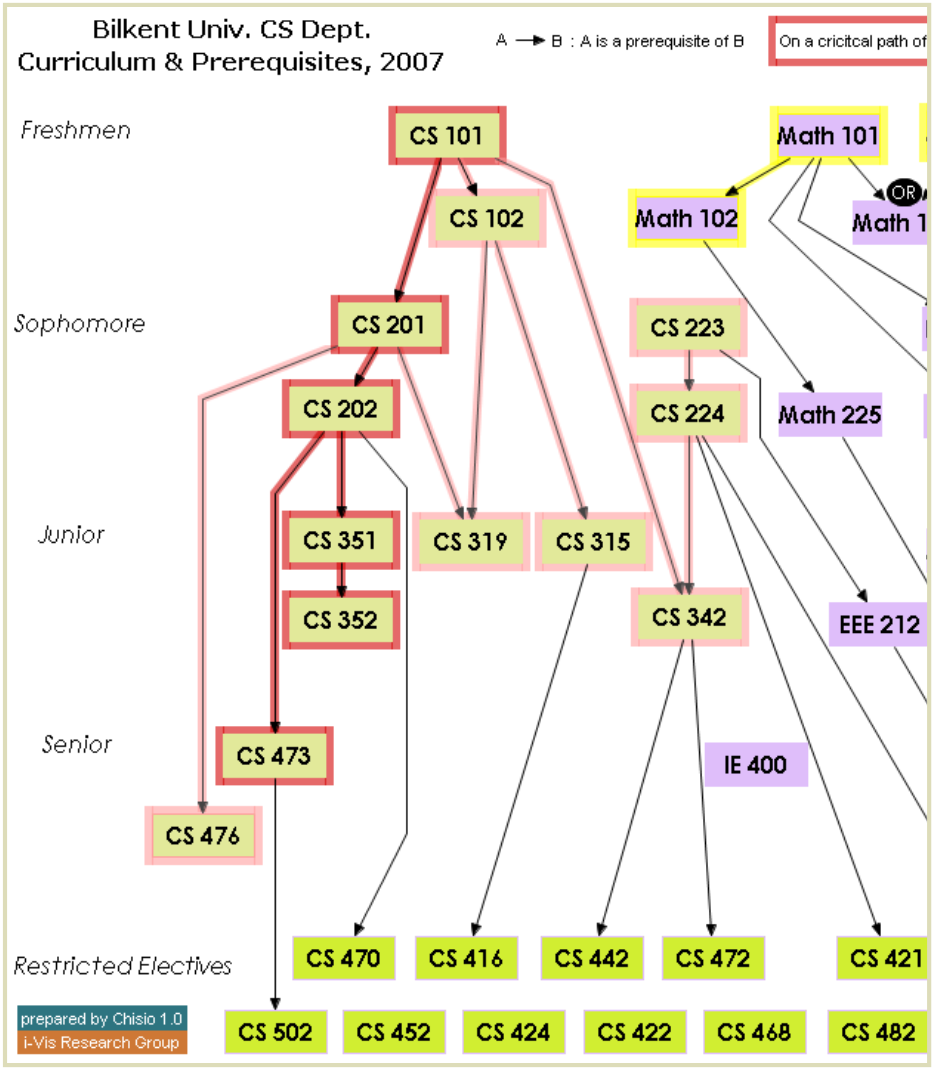
Social Network of Drug Traffickers

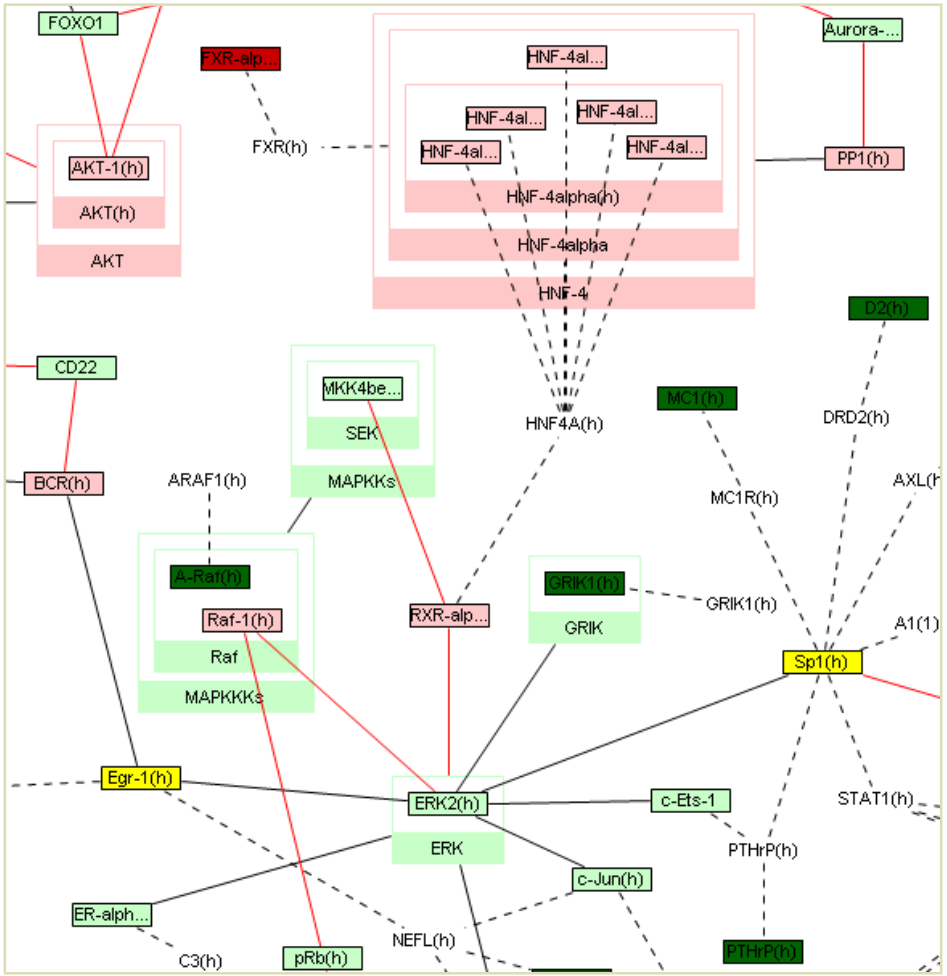




Chisio Drawing Tool







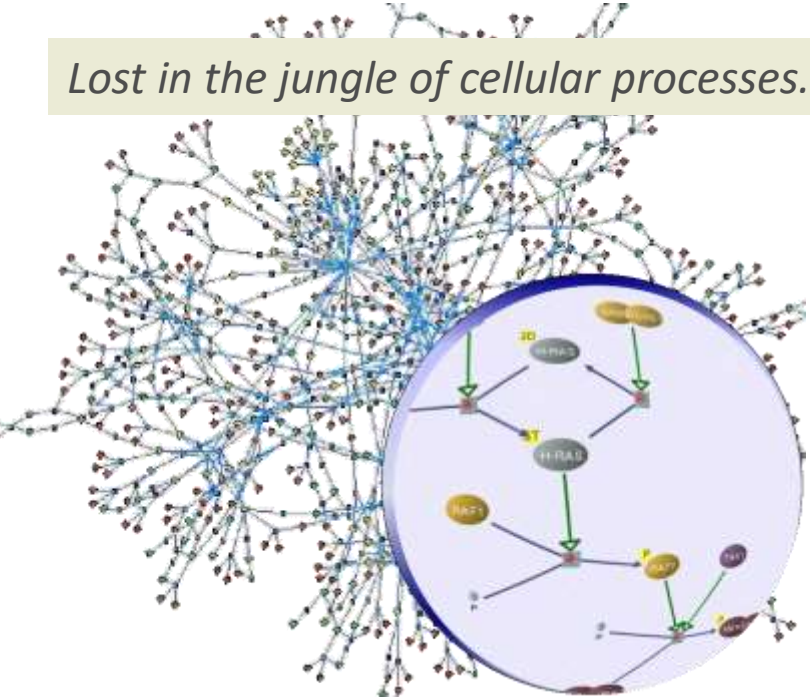
The PATIKA Project

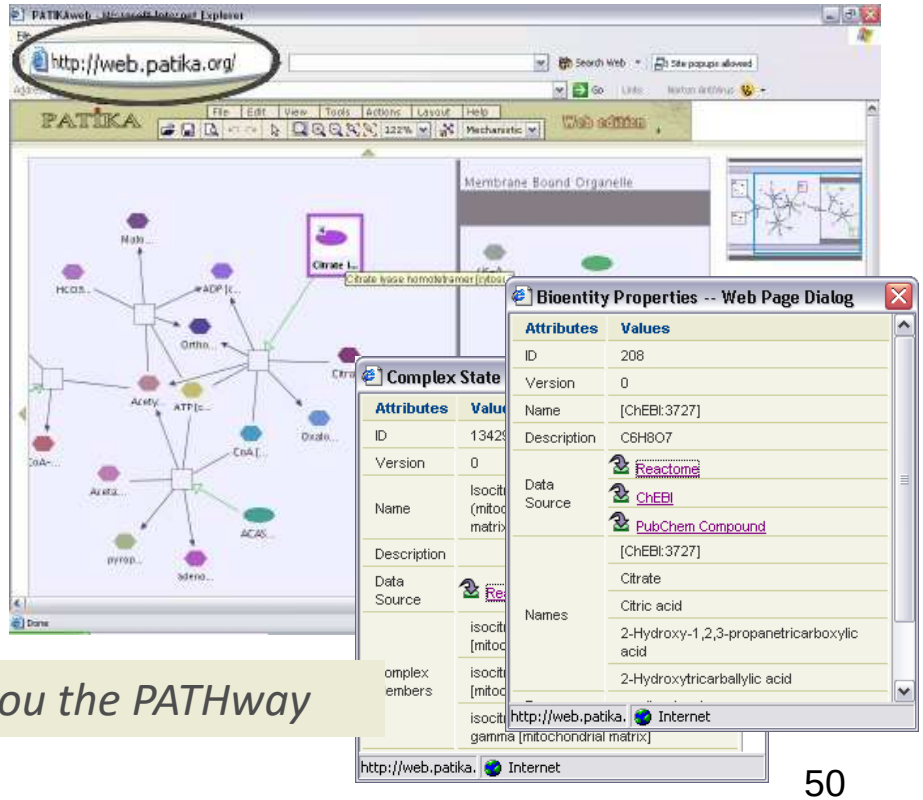
www.patika.org

Patikans

Sample PATIKA Tool: PATIKA*web*

Lost in the jungle of cellular processes…?





PATIKA*web* *can show you the PATHway*

Uğur Doğrusöz

i-Vis Research Group

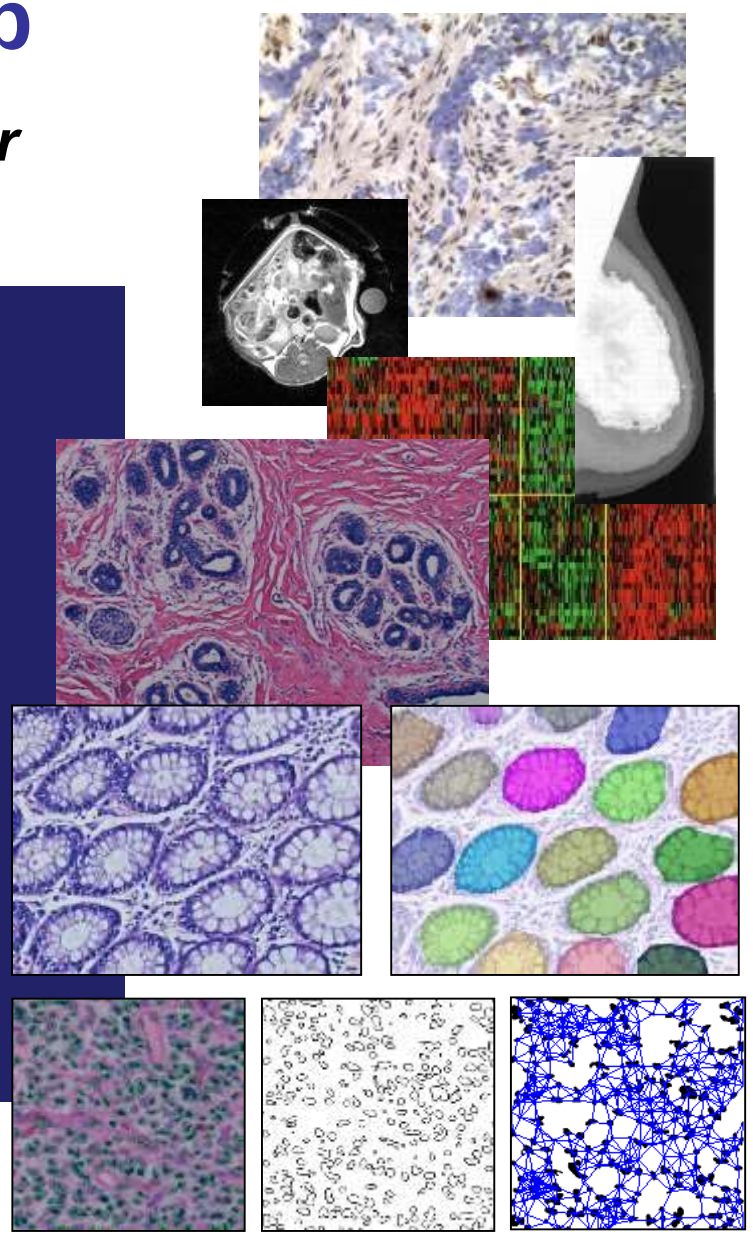
www.cs.bilkent.edu.tr/~ugur

Interested in being part of this kind of research & development?

Then join us! Please **contact me** at **ugur@cs.bilkent.edu.tr**

Computational Biology Research Group

Çiğdem Gündüz Demir

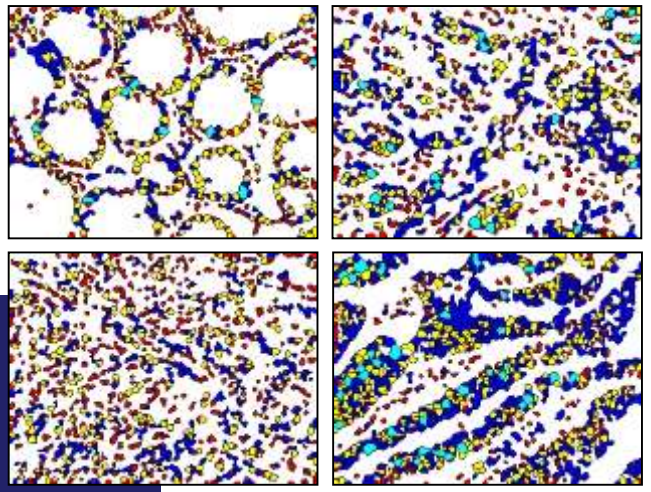


Main research interests:

- Medical image analysis for **automatic cancer diagnosis, grading, and prognosis**
- Machine learning for **intelligent medical systems**

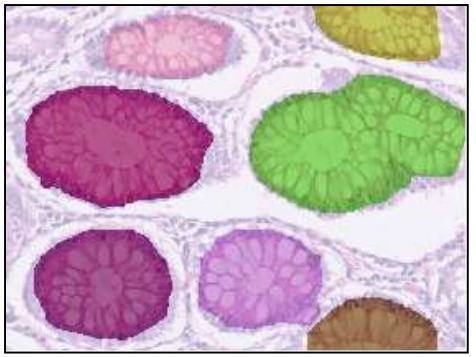
Computational Biology Research Group

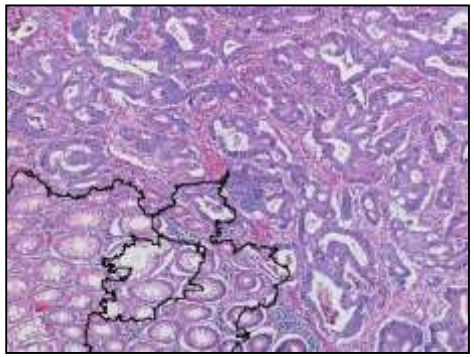
Çiğdem Gündüz Demir



Current projects:

- Diagnosis and grading of colon cancer
  - Construction of new biocomputational methods
  - Colon cancer diagnosis
  - Colon cancer grading
  - Tissue image segmentation
  - Colon gland segmentation
- Designing medical diagnostic systems
  - Cost-sensitive classification
  - Qualitative decision theory
  - Dynamic model selection and combination





Computer Graphics

Uğur Güdükbay

http://www.cs.bilkent.edu.tr/~gudukbay

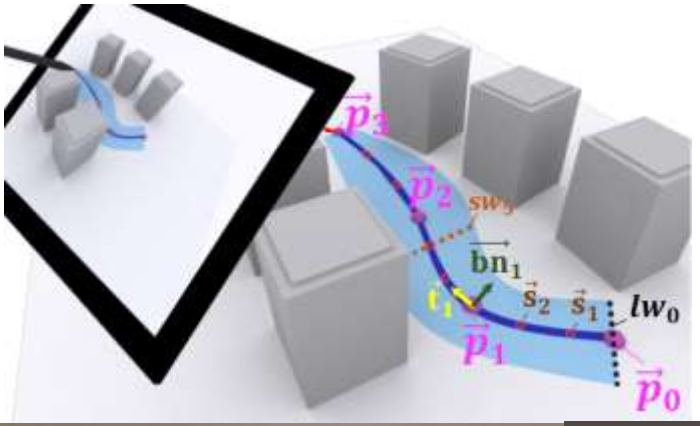
gudukbay@cs.bilkent.edu.tr

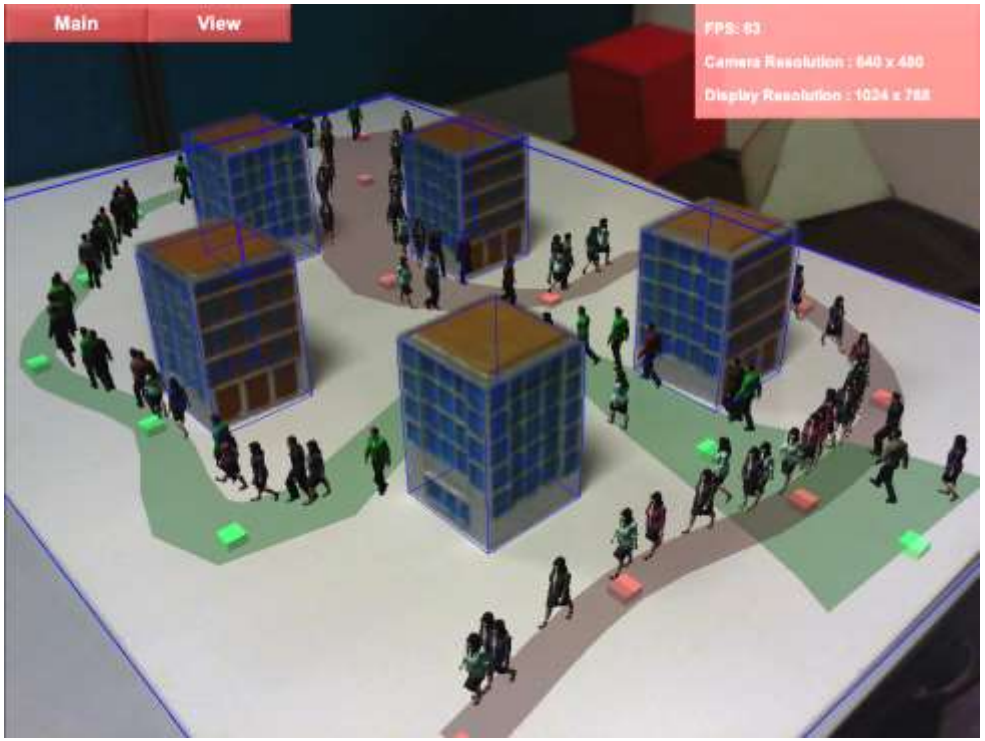
Research Topics:

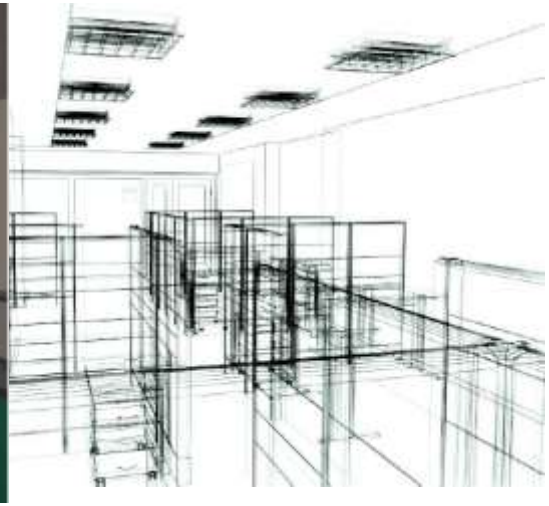
1. Augmented and Virtual Reality
2. Terrain and Urban Modeling and Visualization
3. Human Modeling and Animation

Augmented and Virtual Reality

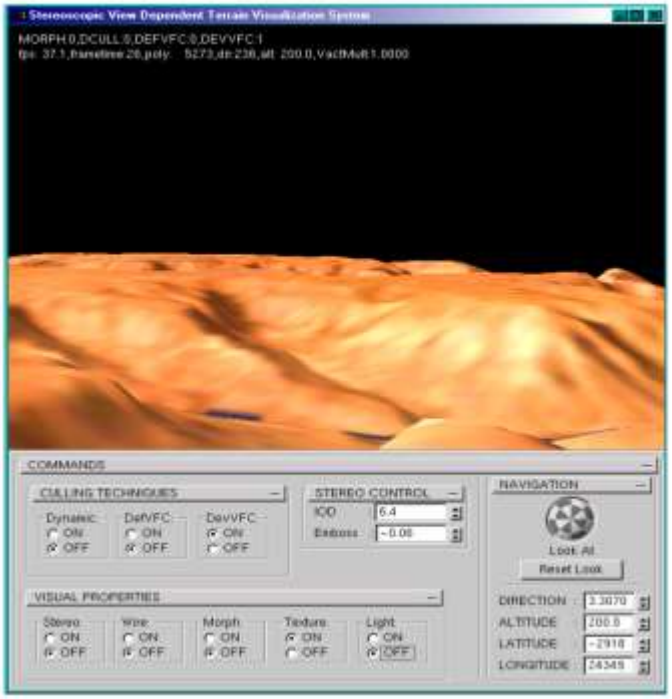
- Crowd Simulation
- Realistic Lighting
- Camera Registration and Tracking
- Augmented Reality on Mobile Devices



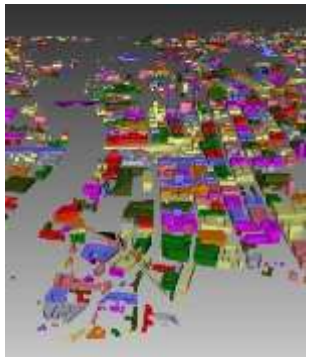


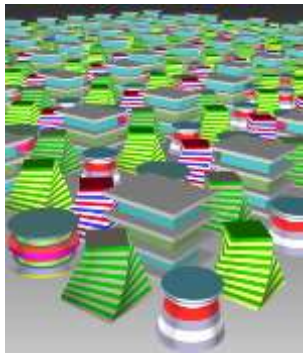


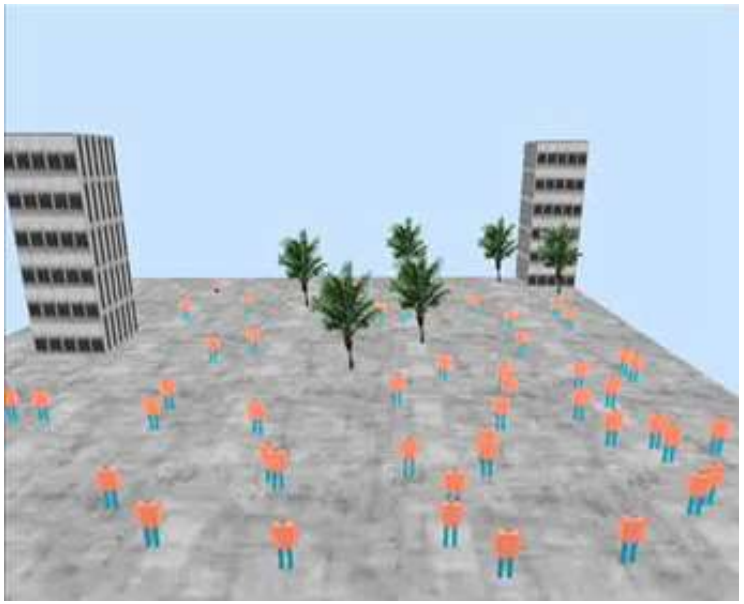
Terrain and Urban Modeling and Visualization



- Level-of-detail management
- View-dependent refinement
- Stereoscopic visualization
- GPU-based tessellation
- Crowd simulation in urban environments







Human Modeling and Animation

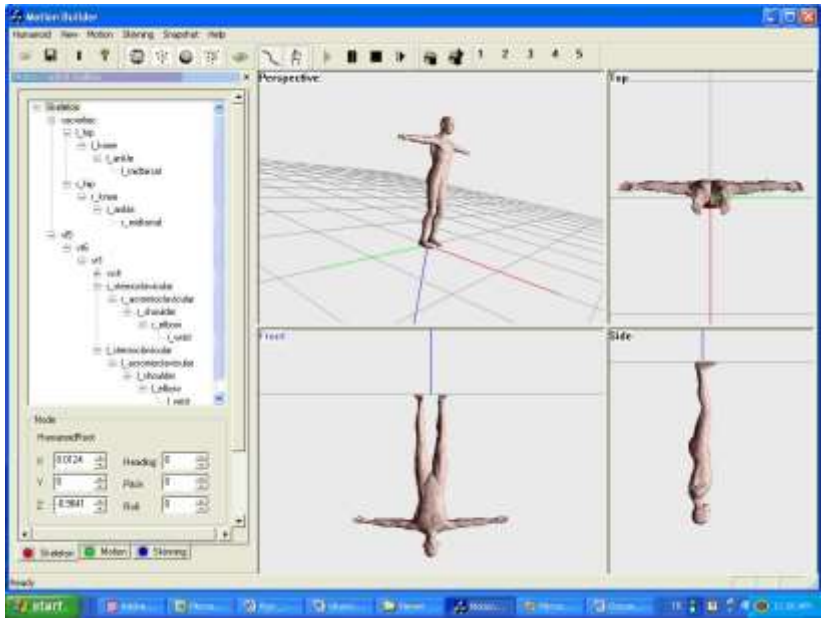
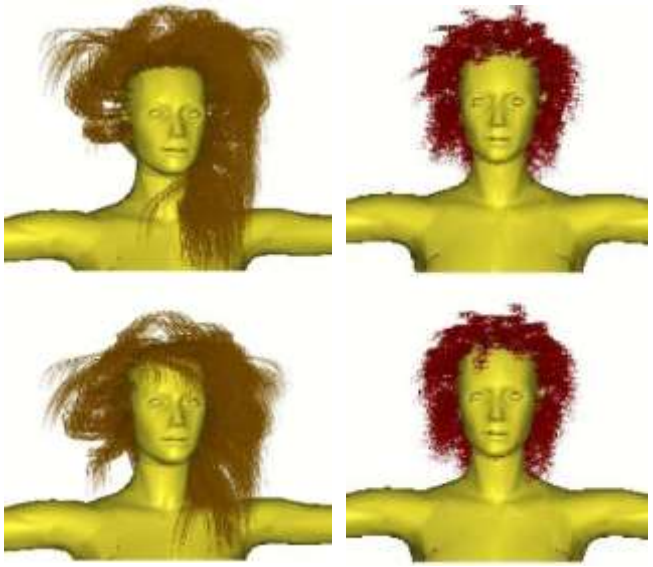


Figure 2: Different facial expressions and expression combinations: from left-to-right and top-to-bottom (rowwise order): neutral, happiness, surprise, fear, anger, sadness, disgust, happy_surprise, anger_surprise, disgust_surprise, happy_anger, anger_fear, anger_sadness_surprise, anger_sadness_disgust, anger_sadness_surprise_disgust



Real-time Virtual Garment Fitting
Using Depth Sensor Data

Realistic Rendering of Joint Regions
Using Bone Splitting

A Model Wearing a Sundress with Different Postures

A Model Wearing a Vest and Jeans with Different Postures

Machine Learning and Data Mining

Current research topics include

Learning to

- rank instances
- model risk factors
- estimate risks
- suggest to increase success

Application areas: Medical, Social Networks

Networks and Systems Research Group

Bilkent University – Department of Computer Engineering

Faculty Member

Ibrahim Korpeoglu

Assoc. Professor
Dept of Computer Engineering
Bilkent University

Email: korpe@cs.bilkent.edu.tr
Web: http://www.cs.bilkent.edu.tr
Office: Engineering EA 409
Phone: 290 25 99

Working on Problems and Projects related with Computer Networks and Computer Systems

- Research Areas:
  - Computer **Networks**
  - Computer **Systems**
  - Network and Distributed **Algorithms**
  - **Wireless** Networks
  - **Distributed** Systems
  - **Cloud** Computing
  - **P2P** Networks
  - **Sensor** Networks
  - **Internet** of Things
  - **WiFi** and Bluetooth
  - Big **Data Systems**

Networks and Systems Research Group

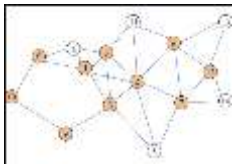
Sample Funded Projects

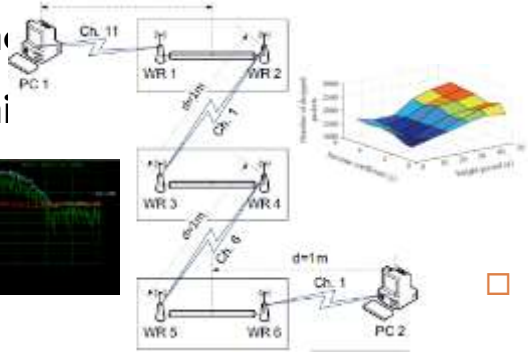
- Efficient **Resource Allocation in Heterogeneous Cloud Infrastructures**
  Sponsor: TUBITAK
- Supporting Real-time Traffic in **Wireless Ad Hoc and Sensor Networks**
  Sponsor: TUBITAK
- *Bluetooth Scatternet Construction* and Bluetooth Applications
  Sponsor: TUBITAK
- Network Middleware for Environmental Monitoring and Control with **Wireless Ad hoc, Mesh and Sensor Networks**
  Sponsor: IBM Corporation
- Intel WCNC, **Wireless Networking** Curriculum Enhancement Project
  Sponsor: Intel Corporation
- FIRESENSE Fire Detection and Management through a **Multi-Sensor Network** for the Protection of Cultural Heritage Areas from the Risk of Fire and Extreme Weather Conditions
  Sponsor: European Commission FP7 Programme, ENV
- Network of Excellence in **Wireless Communications** (NEWCOM and NEWCOM++)
  Sponsor: European Commission FP7 Programme, ICT

Networks and Systems Research Group

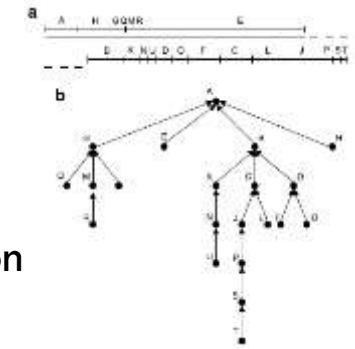
Sample Current Work

- **Wireless Mesh Networks**
  - Routing
  - Channel assignment
  - Interference m
  - Interference mi



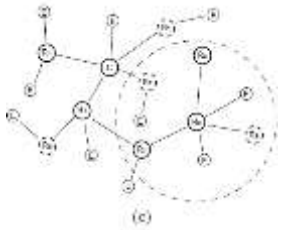


- **Testbeds**
- **Cloud Computing**
  - Resource allocation
  - VM placement
  - Network virtualization
  - Network embedding



- **Sensor Networks**
  - Energy efficient routing
  - Activity scheduling
  - Channel access scheduling
  - ZigBee wireless technology
  - ZigBee routing

- **P2P Networks**
  - Query forwarding
  - Free riding
  - File sharing and lookup



- **Delay tolerant networks**
  - Routing and Scheduling

Networks and Systems Research Group

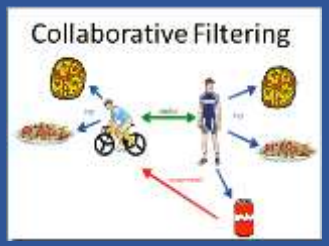
Sample Publications

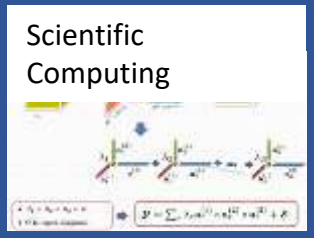
- Hidayet Aksu, Mustafa Canim, Yuan-chi Chang, **Ibrahim Korpeoglu**, Ozgur Ulusoy, ***Distributed k-Core View Materialization and Maintenance for Large Dynamic Graphs***, *IEEE Transactions on Knowledge and Data Engineering*, 2014.
- Hakki Bagci, **Ibrahim Korpeoglu**, Adnan Yazici, **A Distributed Fault-Tolerant Topology Control Algorithm for Heterogeneous Wireless Sensor Networks**, *IEEE Transactions on Parallel and Distributed Systems*, 2014.
- Metin Tekkalmaz, **Ibrahim Korpeoglu**. **PSAR: Power-Source-Aware Routing in ZigBee Networks**, *ACM Wireless Networks Journal*, 2012.
- Huseyin Ozgur Tan, **Ibrahim Korpeoglu**, Ivan Stojmenovic, **Computing Localized Power Efficient Data Aggregation Trees for Sensor Networks**, *IEEE Transactions on Parallel and Distributed Systems*, 2011.
- Eyuphan Bulut, **Ibrahim Korpeoglu**, **Sleep Scheduling with Expected Common Coverage in Wireless Sensor Networks**, *ACM Wireless Networks Journal*, 2011.
- Metin Tekkalmaz, Hasan Sozer, **Ibrahim Korpeoglu**, **Distributed Construction and Maintenance of Bandwidth and Energy Efficient Bluetooth Scatternets**, *IEEE Transactions on Parallel and Distributed Systems*, 2006.

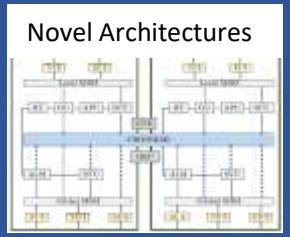
Mustafa Ozdal
www.cs.bilkent.edu.tr/~mustafa.ozdal

High-Performance and Energy Efficient Computing

Algorithms, Systems, and Applications







Mustafa Ozdal

www.cs.bilkent.edu.tr/~mustafa.ozdal

Active projects:

- Energy efficient FPGA accelerators for big data applications *(supported by European Commission, in collaboration with Intel, Oregon)*
- Parallelizing Collaborative Filtering algorithms for recommender systems
- Parallel and vectorized scientific computing algorithms
- Optimizing memory architecture for graph analytics applications for large datasets.

I am interested in graduate student candidates who have one or more of the following:

- Strong algorithmic background and analytical skills
- Interest in solving programming puzzles
- C++ programming skills
- Experience with multi-core, GPU, and/or FPGA programming

For more information, see www.bilkent.edu.tr/~mustafa.ozdal. You can send an email to mustafa.ozdal@cs.bilkent.edu.tr to set up an appointment.

Özcan Öztürk

Office: EA 421 Phone: 290-3444
Email: ozturk@cs.bilkent.edu.tr
URL: http://www.cs.bilkent.edu.tr/~ozturk

- **Computer architecture** - memory scheduling, memory hierarchy design, metrics to consider energy, performance, reliability....
- **Multicore/Manycore architecture** - design of multicore systems, application mapping, data mapping, communication
- **Heterogeneous computing** - heterogeneous multicore design, core and cache selection, application execution
- **Parallel programming/systems/applications** - OpenMP, MPI, GPGPU, application characterization, automatic parallelization, scheduling
- **Cloud computing** - at the system level and architectural optimizations, heterogeneity aware scheduling
- **Embedded computing** - energy, performance, ...
- **Compiler optimizations** - code modifications and optimizations to generate better applications

Current Projects

- Heterogeneous Multicore Design
  Funding: **EC FP7**
- Parallelization for Heterogeneous Multicore Architectures
  Funding: **IBM**
- Utilizing Accelerator Technologies in the Cloud
  Funding: **Türk Telekom**
- Parallelizing Data Mining applications using GPUs
  Funding: **Nvidia**
- **Accelerator Design for Graph Parallel Applications**
  Funding: **Intel**

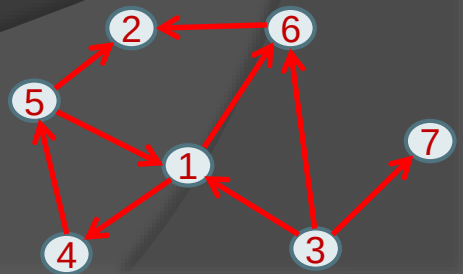
SEVENTH FRAMEWORK PROGRAMME

IBM

TÜRK TELE KOM

NVIDIA CUDA RESEARCH CENTER

intel



Database Research

Özgür Ulusoy

http://www.cs.bilkent.edu.tr/~oulusoy/

- **Web Databases and Search Engines**
- **Multimedia Databases**
- **Big Data and Social Network Analysis**

Web Databases and Search Engines

- Social Web search and personalization
- Domain-specific search engines
- Efficiency and scalability issues for Web Search Engines (caching, index pruning)
- Web information extraction
- Modeling and querying of Web resources
- XML querying & searching

- ***http://www.cs.bilkent.edu.tr/~bilweb***

Search Engines are the key to access Web Data

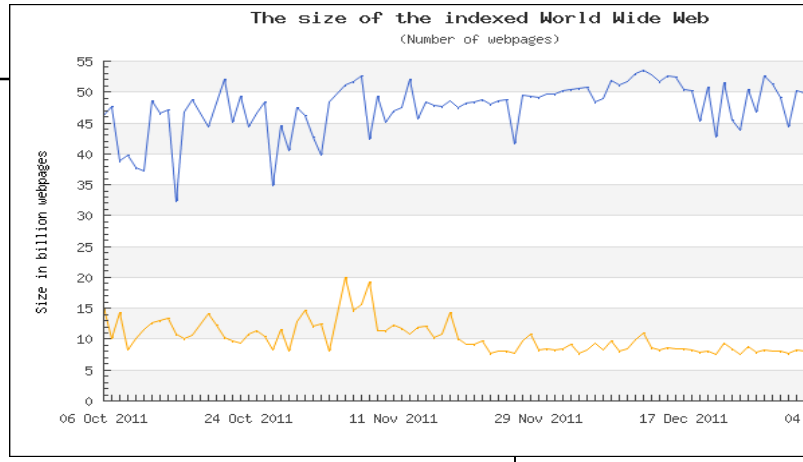
1995 S. Brin meets L. Page

1998 Birth of Google

2000 First **billion-URL** index
The world's largest!
≈5000 PCs in clusters!

2004 Index grows to **4.2 billion** pages

2008 Google counts **1 trillion** unique URLs



2009 TBs or PBs of data/index
Tens of thousands of PCs

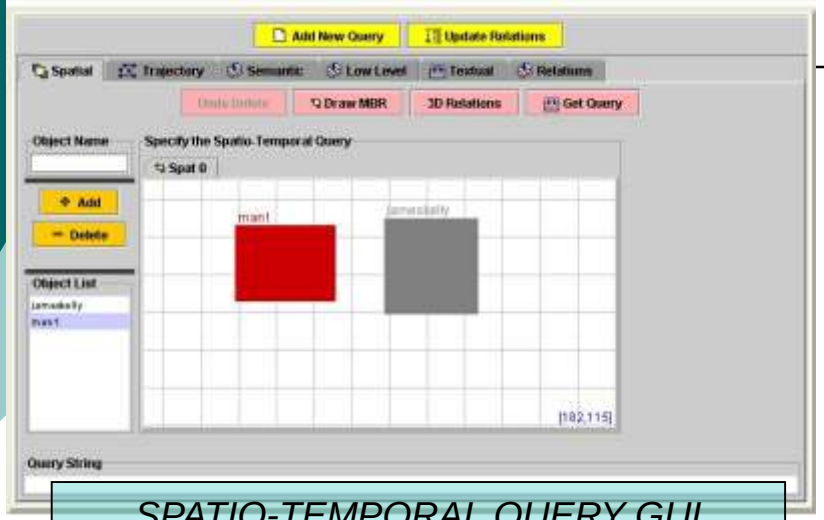
1995 — 2015

Efficient and scalable strategies are of vital importance !

Multimedia Databases
(joint work with Prof. Uğur Güdükbay)

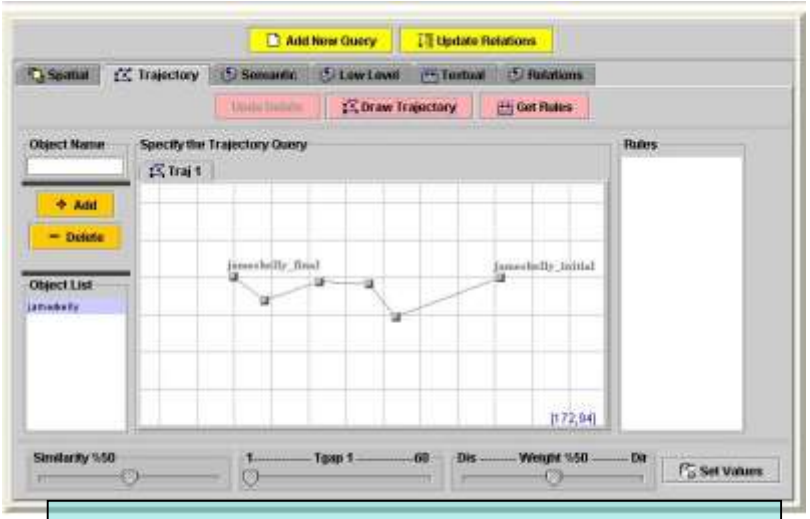
- **Video Retrieval Systems**
- **Mobile Visual Search**
- **Ottoman Archive Content-Based Retrieval System**
- ***http://www.cs.bilkent.edu.tr/~bilmdg***

BilVideo: Integrated video DBMS supporting low-level, spatio-temporal, motion and semantic querying of videos

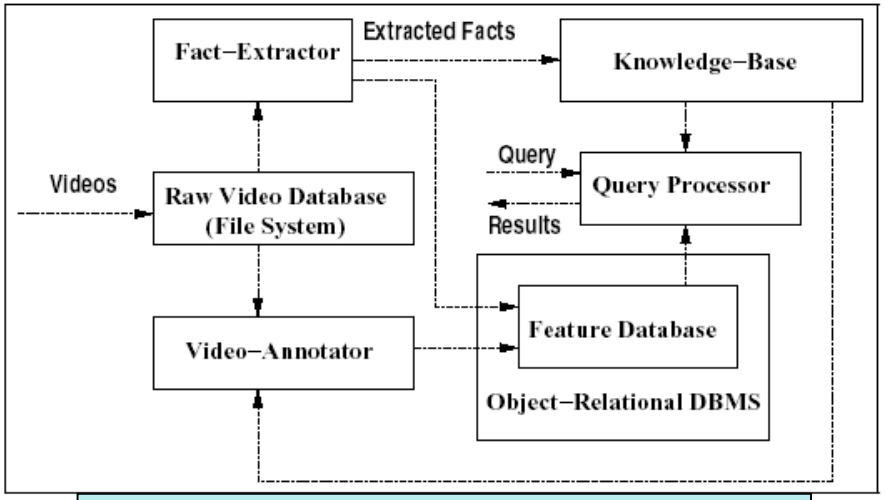


SPATIO-TEMPORAL QUERY GUI

SEMANTIC QUERY GUI

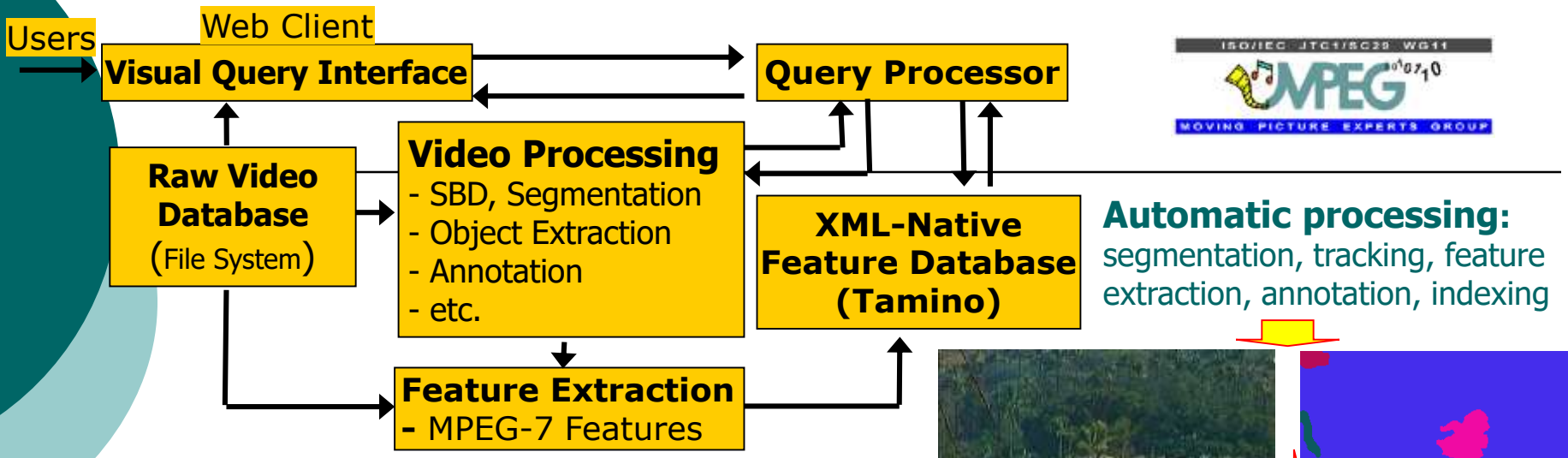


TRAJECTORY QUERY GUI



SYSTEM ARCHITECTURE

BilVideo-7: An MPEG-7 Compatible Video Retrieval System



Automatic processing:
segmentation, tracking, feature extraction, annotation, indexing

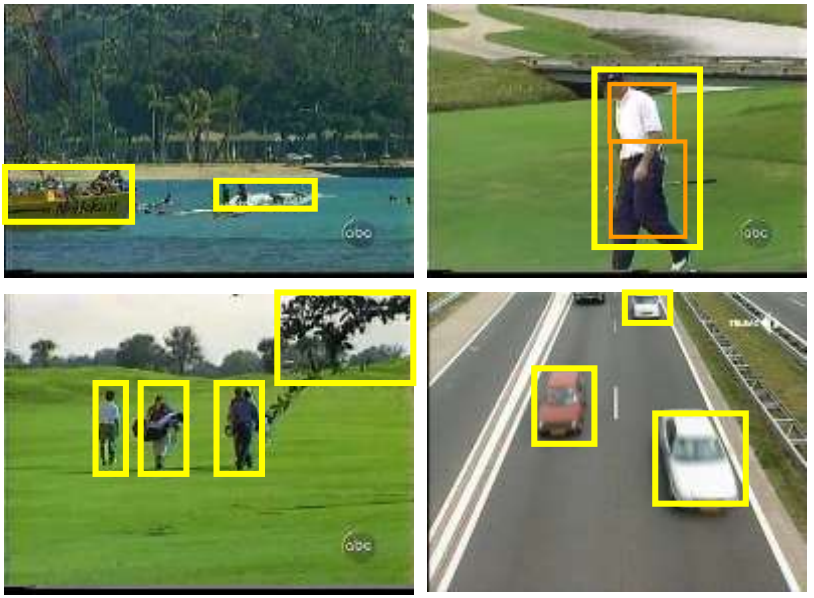
segmentation

Powerful querying capability for video data

- keyword and content-based queries
- spatio-temporal object queries

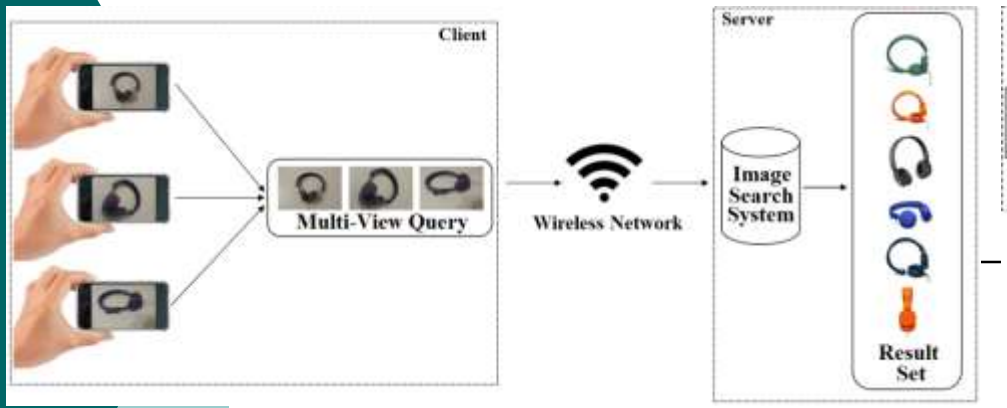
Example query formulation

keywords: trees, greenery, sky – bush, putin, dog

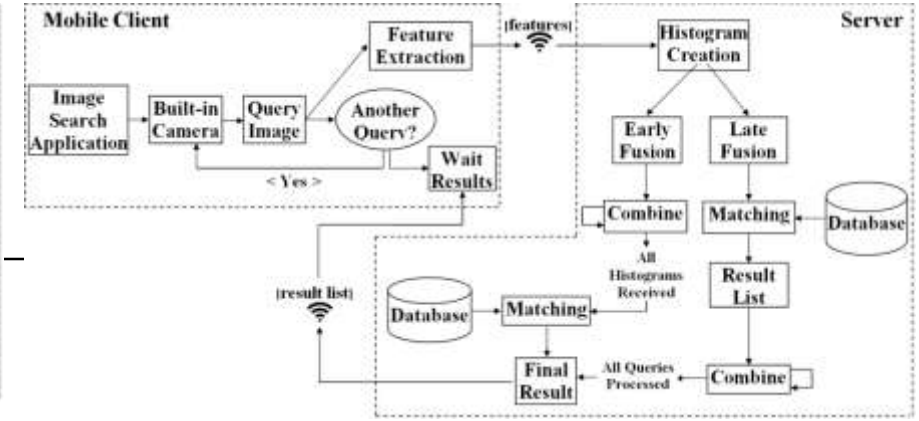


Salient video object extraction

Mobile Image Search Using Multi-Image Queries



Workflow of the Search System



Early and Late fusion methods

Multi-View Dataset and Queries

Single (a) and multi-view queries and corresponding result lists using early (b) and late (c) fusion methods.

Big Data and Social Network Analysis

- **Social Network Data Analysis on Big Data Processing Platforms**
  - **Development, implementation and evaluation of algorithms/methods to process/analyze social network data for various social network problems.**
    (joint work with Prof. İbrahim Körpeoğlu)
- **Decentralized Social Networks**
  - **Development, implementation and evaluation of algorithms/methods for peer-to-peer social networks.**
    (joint work with Prof. Hakan Ferhatosmanoğlu)