



# Bilkent University Computer Engineering Department



## MS and PhD Programs

<https://w3.cs.bilkent.edu.tr/graduate-programs/>

# Research Areas

- Algorithms
- Artificial intelligence
- Big data
- Bioinformatics
- Cloud computing
- Computational biology
- Computational geometry
- Computer architecture
- Computer graphics
- Computer networks
- Computer vision
- Cryptography & Security
- Data mining
- Data science
- Data privacy
- Database systems
- Graph visualization
- High performance computing
- Image analysis
- Information retrieval
- Machine learning
- Mobile systems
- Parallel and distributed systems
- Pattern recognition
- Robotics
- Scientific computing
- Software engineering
- Virtual reality

# Applications

- **Application Deadline:**
  - Regular: June 1, 2026
  - Late: July 1, 2026
- **Online Application:**  
<https://stars.bilkent.edu.tr/gradapp/>
- **Requirements for application:**
  - CGPA  $\geq 2.80 / 4.00$
  - ALES (Turkish citizens) or GRE (Foreign applicants)
    - ALES: Quantitative  $\geq 55$  (for MS), 80 (for PhD w/o BS)
    - GRE: Quantitative  $\geq 153$  (MS), 157 (PhD)
  - English Proficiency: TOEFL (IBT)  $\geq 87$  or IELTS avg  $\geq 6.5$  (and min 5.5 in each section)
  - And YDS  $\geq 55$  (for Turkish citizen applying PhD).

# Interview

- Date: we will inform applicants about interview dates
- If not uploaded during online application, documents need to be submitted during interview:
  - Transcript
  - ALES or GRE score report
  - Proof of English Proficiency  
(TOEFL, IELTS or YDS report)

# Acceptance Requirements

- Grad committee approval
- At least one faculty member willing to work with the applicant towards thesis
- Passing the interview and department approval
- Graduate School of Engineering and Science approval

# Scholarship Options

- Department scholarship
  - Tuition waiver (100%)
  - Stipend (paid by Department)
  - Eligibility for accommodation in dormitories or University housing
  - Health Insurance
  - Office (shared)
  - Meal Card support (for Ph.D. students)

# Scholarship Options

- **Project grants**
  - Tuition waiver (100%)
  - Stipend (paid from the project budget and Department)
  - Eligibility for accommodation in dormitories or University housing
  - Health Insurance
  - Office (shared)
  - Meal Card support (for Ph.D. students)
- **Graduate School scholarship**
  - Tuition waiver (between 80% - 100%)

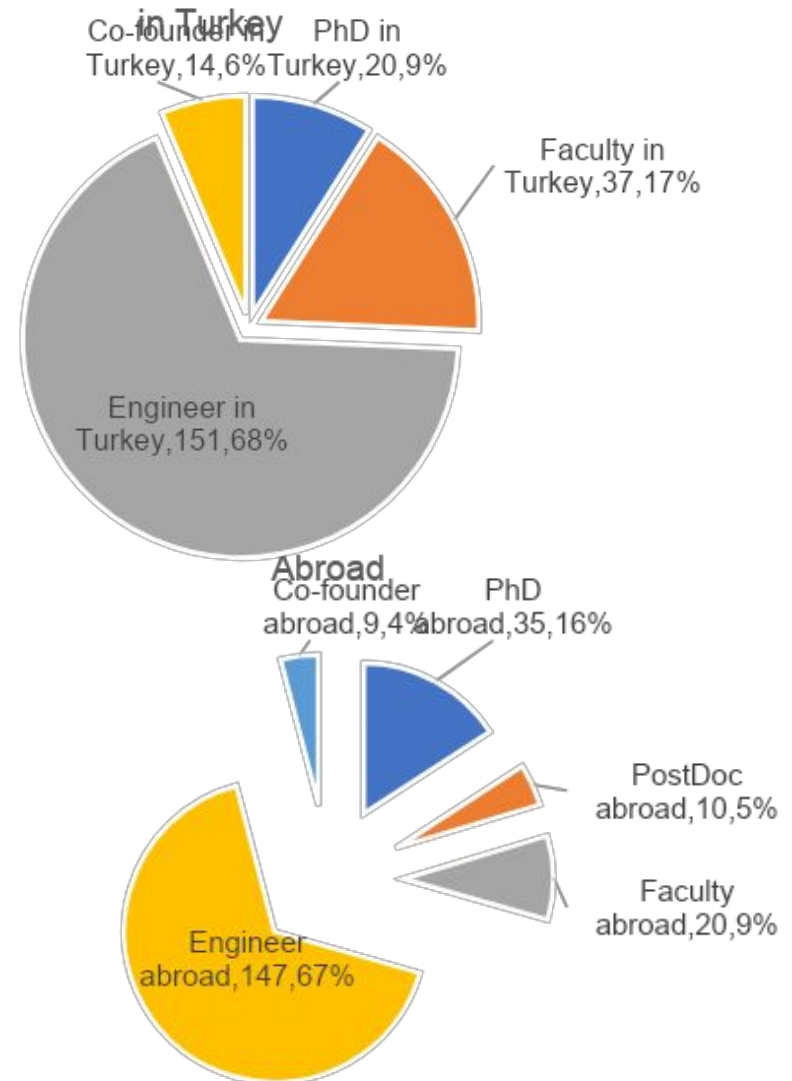
# Degree Requirements

- **MS**
  - 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

# Graduates of MS Program

| Position             | Count | %     |
|----------------------|-------|-------|
| PhD in Turkey        | 20    | 9.0%  |
| Faculty in Turkey    | 37    | 16.7% |
| Engineer in Turkey   | 151   | 68.0% |
| Co-founder in Turkey | 14    | 6.3%  |
| PhD abroad           | 35    | 15.8% |
| PostDoc abroad       | 10    | 4.5%  |
| Faculty abroad       | 20    | 9.0%  |
| Engineer abroad      | 147   | 30.6% |
| Co-founder abroad    | 9     | 4.1%  |
| Unknown              | 37    | 7.7%  |

|           |     |        |
|-----------|-----|--------|
| In Turkey | 222 | 46.3%  |
| Abroad    | 221 | 46.0%  |
| Unknown   | 37  | 7.7%   |
| Total:    | 480 | 100.0% |



# Graduates of MS Program

## in Turkey

|                   |    |
|-------------------|----|
| Bilkent Univ.     | 25 |
| ASELSAN           | 20 |
| HAVELSAN          | 16 |
| TÜBİTAK           | 13 |
| Hacettepe Univ.   | 6  |
| METU              | 6  |
| TSK               | 5  |
| STM               | 4  |
| TCMB              | 4  |
| Vestel            | 4  |
| Cybersoft         | 3  |
| Garanti Teknoloji | 3  |
| MilSOFT           | 3  |
| OpsGenie          | 3  |
| Sabancı Univ.     | 3  |
| Akdeniz Univ.     | 2  |
| Oracle            | 2  |

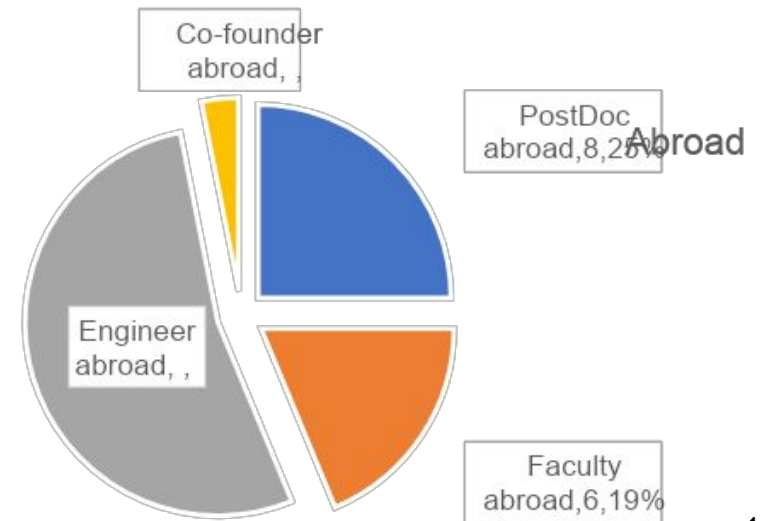
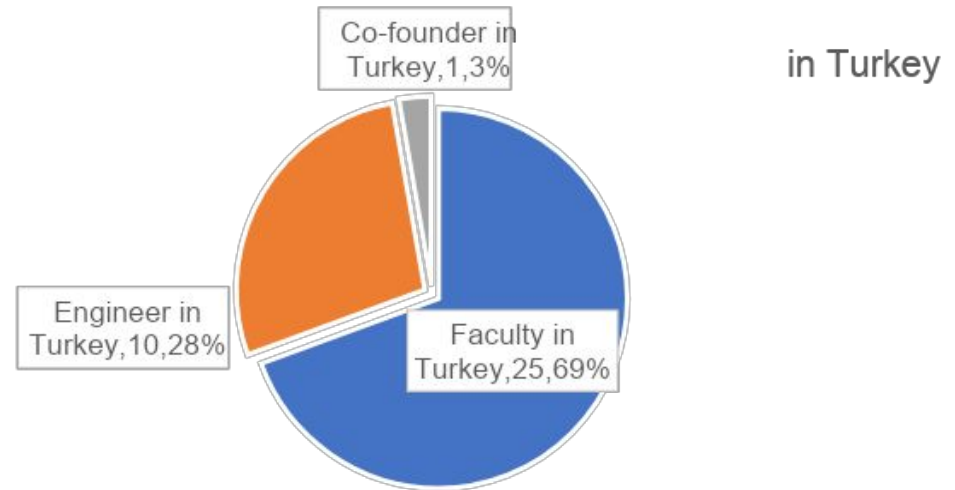
## Abroad

|                                    |    |
|------------------------------------|----|
| Microsoft                          | 23 |
| Google                             | 16 |
| Amazon                             | 6  |
| Booking.com                        | 4  |
| Case Western Reserve Univ.         | 4  |
| Facebook                           | 4  |
| Univ. California                   | 4  |
| SAP                                | 3  |
| U. of Massachusetts Amherst        | 3  |
| UBER                               | 3  |
| EPFL                               | 2  |
| ETH                                | 2  |
| Imperial College                   | 2  |
| Sandia National Labs.              | 2  |
| U. of Texas at San Antonio         | 2  |
| University of Florida              | 2  |
| University of Waterloo             | 2  |
| U. of Illinois at Urbana-Champaign | 1  |
| Washington U. in St. Louis         | 1  |

# Graduates of PhD Program

| Position             | Count | %     |
|----------------------|-------|-------|
| Faculty in Turkey    | 25    | 69.4% |
| Engineer in Turkey   | 10    | 27.8% |
| Co-founder in Turkey | 1     | 2.8%  |
| PostDoc abroad       | 8     | 25.0% |
| Faculty abroad       | 6     | 18.8% |
| Engineer abroad      | 17    | 53.1% |
| Co-founder abroad    | 1     | 3.1%  |

|           |    |        |
|-----------|----|--------|
| In Turkey | 36 | 52.9%  |
| Abroad    | 32 | 47.1%  |
| Total:    | 68 | 100.0% |



# Graduates of PhD Program

## in Turkey

|                       |   |
|-----------------------|---|
| METU                  | 4 |
| Bilkent University    | 3 |
| Hacettepe Univ.       | 3 |
| Akdeniz University    | 2 |
| Sabancı Univ.         | 3 |
| TED University        | 2 |
| Ankara University     | 1 |
| Aselsan               | 1 |
| Atılım University     | 1 |
| Beykent University    | 1 |
| Çukurova Üniversitesi | 1 |
| SAP                   | 1 |
| TAI                   | 1 |
| TCMB                  | 1 |
| Turkcell              | 1 |

## Abroad

|                           |   |
|---------------------------|---|
| Amazon                    | 3 |
| Oregon Health and Sci. U. | 3 |
| Case Western R. U.        | 2 |
| Lawrence Berkeley Lab     | 1 |
| LIP ENS-LYON CNRS         | 1 |
| ETH                       | 1 |
| Facebook                  | 1 |
| Fraunhofer                | 1 |
| Georgia Tech              | 1 |
| Google                    | 1 |
| Microsoft                 | 1 |
| Oracle                    | 1 |
| Salesforce                | 1 |
| Sandia National Labs.     | 1 |
| Stony Brook University    | 1 |
| U. of Central Florida     | 1 |
| Uber                      | 1 |

## Faculty Members

|                                      |
|--------------------------------------|
| Georgia Institute of Technology      |
| Oregon Health and Science University |
| Stony Brook University               |
| University of Calgary                |
| Bilkent University                   |
| Akdeniz University                   |
| Ankara University                    |
| Ankara Yıldırım Beyazıt University   |
| Atatürk University                   |
| Atılım University                    |
| Beykent University                   |
| Celal Bayar University               |
| Çukurova University                  |
| Hacettepe University                 |
| Konya Food & Agriculture University  |
| METU                                 |
| Sabancı University                   |
| Selçuk University                    |
| TED                                  |

# Faculty Members

- In alphabetical order
- Please contact them in person for details.
- Most up-to-date information can be obtained from their websites.

# Selim Aksoy

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Office: EA 422 (4th floor)



## Research interests:

- Computer vision
- Pattern recognition
- Machine learning

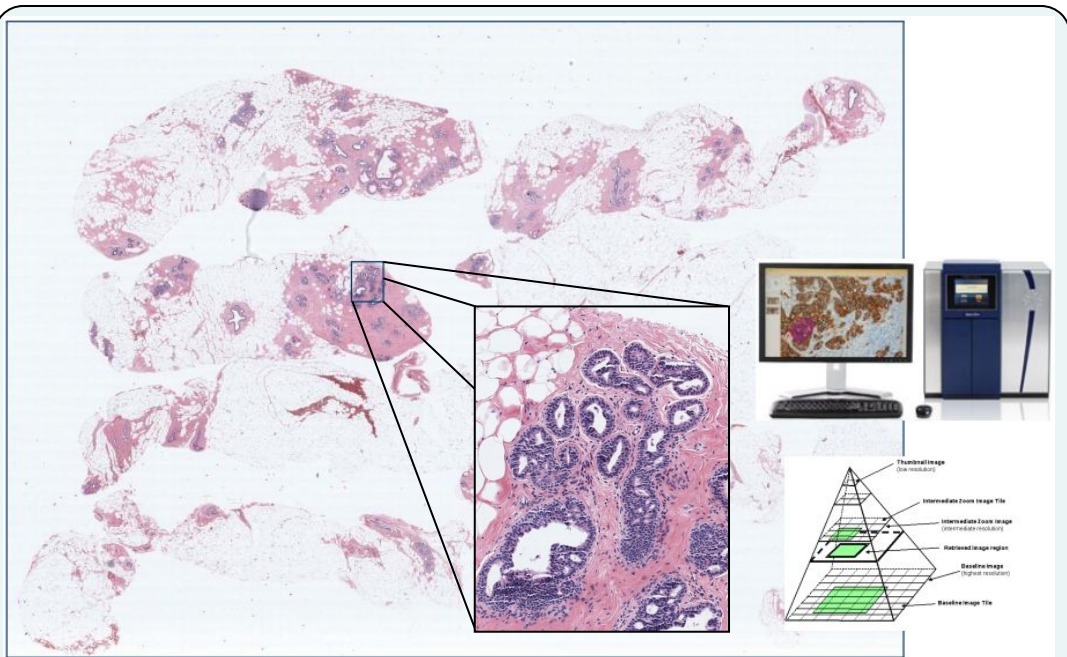
## Current topics:

- Medical image analysis
- Remote sensing image analysis
- Image classification
- Object recognition
- Content-based image retrieval

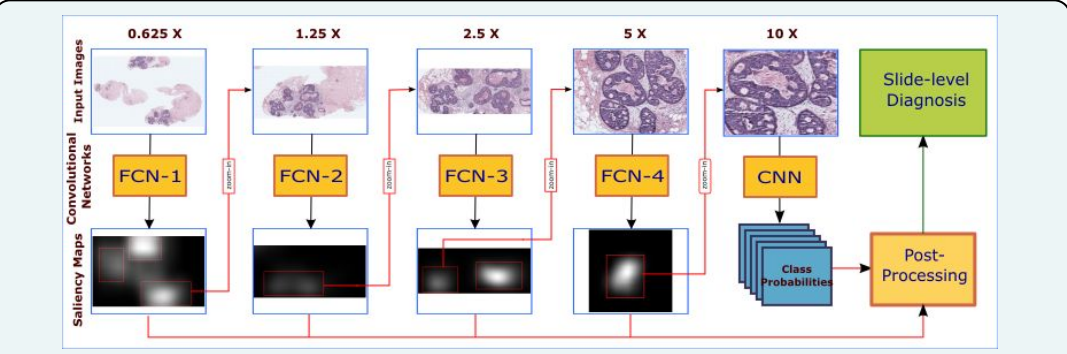
# Sponsored Research Projects

- Medical image analysis
  - General Electric, 2024-2025
  - TÜBİTAK 1001, 2018-2021
  - TÜBİTAK 1001, 2014-2017
  - TÜBİTAK CAREER Grant, 2005-2010
- Remote sensing image analysis
  - TÜBİTAK 1001, 2010-2012
  - European Commission, Joint Research Centre, 2008-2009
  - TÜBİTAK CAREER Grant, 2005-2010
  - FP6 Marie Curie Grant, 2005-2007
- Image and video mining
  - TÜBİTAK and COST 292 Action, 2004-2008
  - DPT, 2004-2005

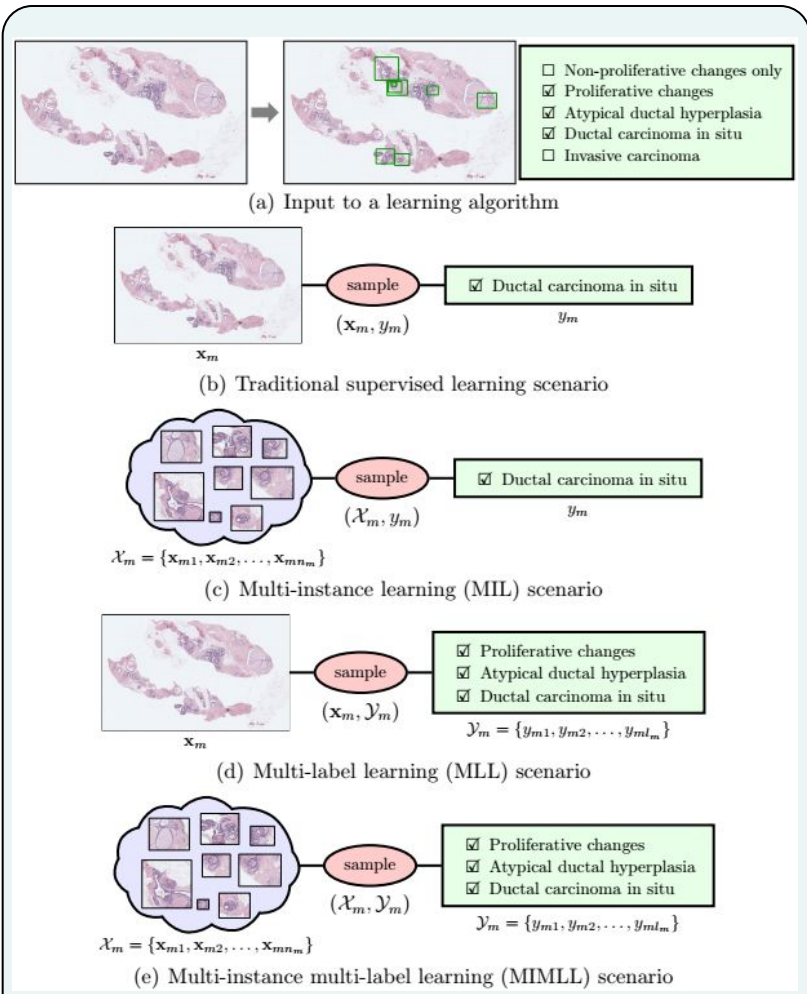
# Medical Image Analysis



Whole slide image analysis  
(100,000 x 100,000 pixels, 30 GB/image)

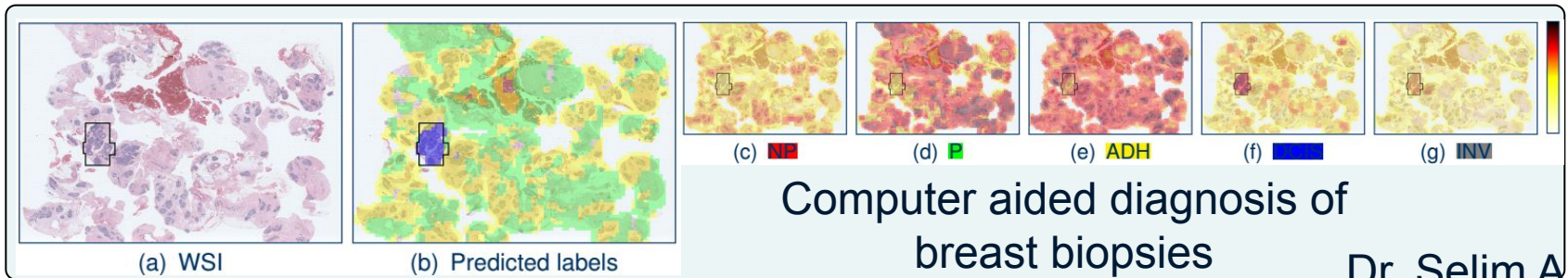
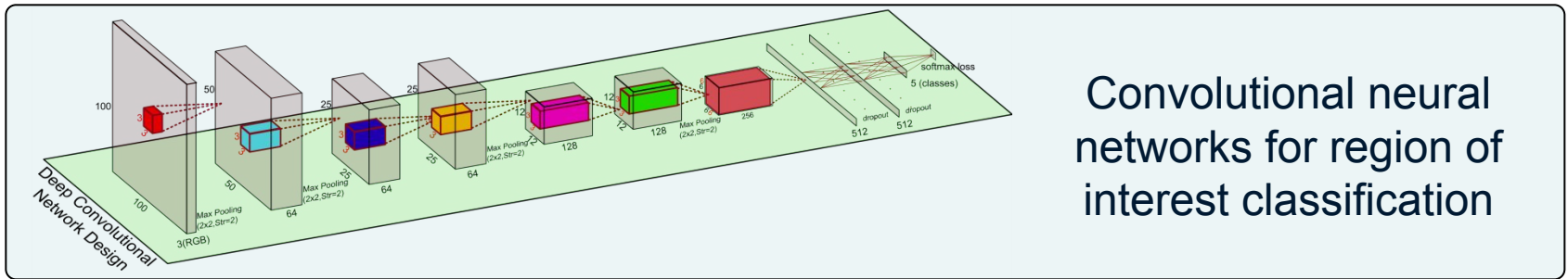
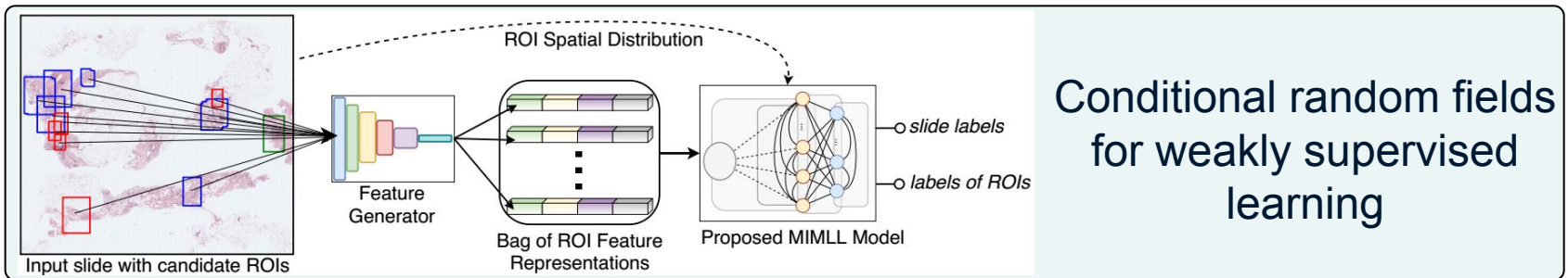
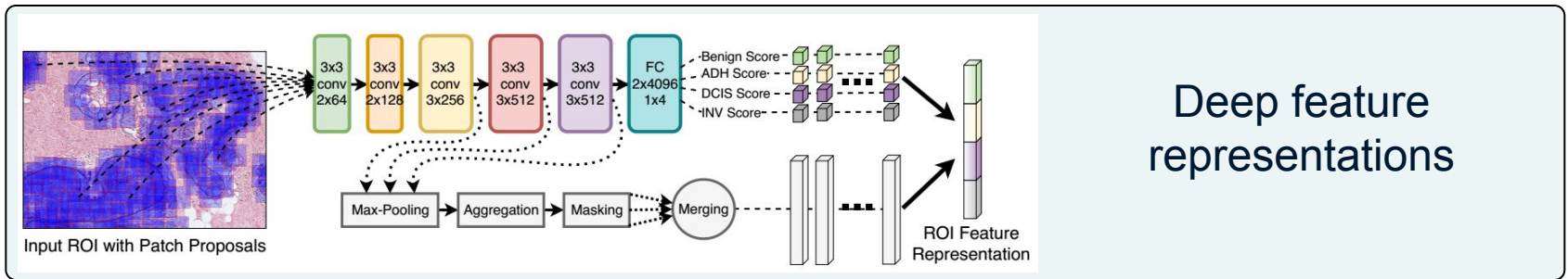


Deep networks for region of interest detection

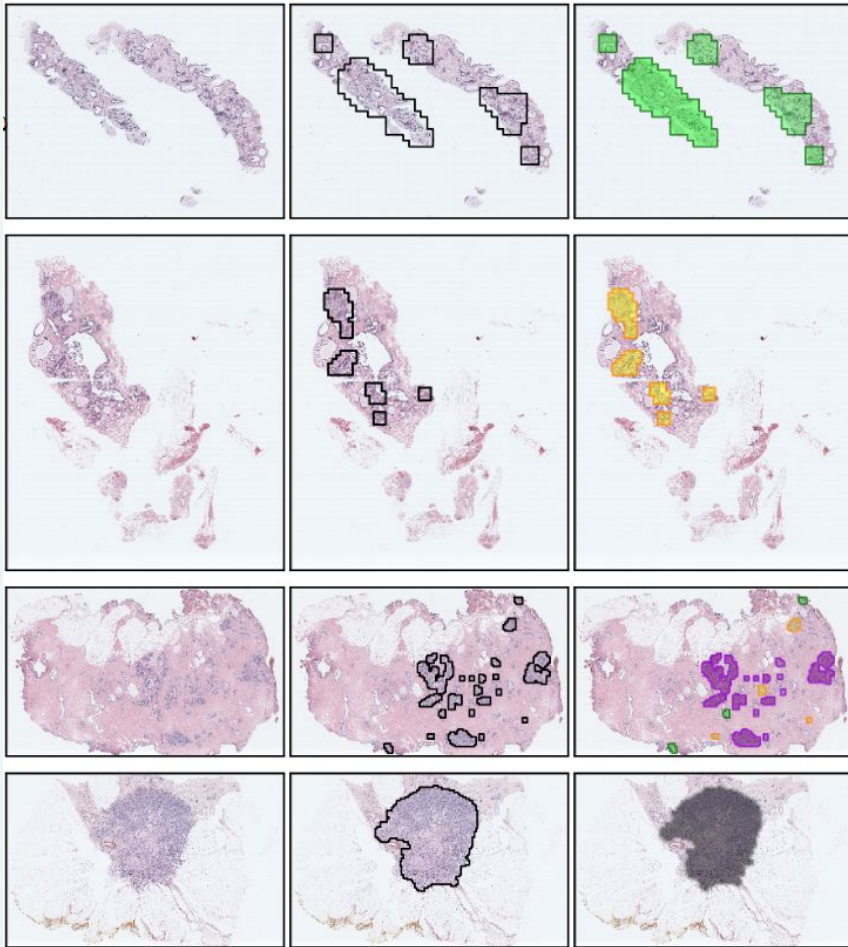


Different weakly supervised learning scenarios

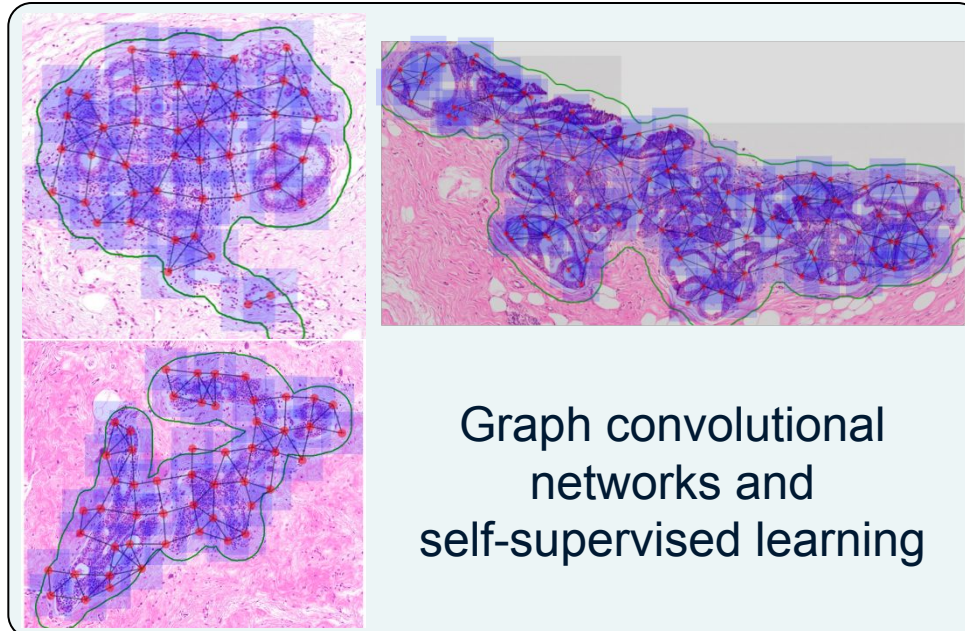
# Medical Image Analysis



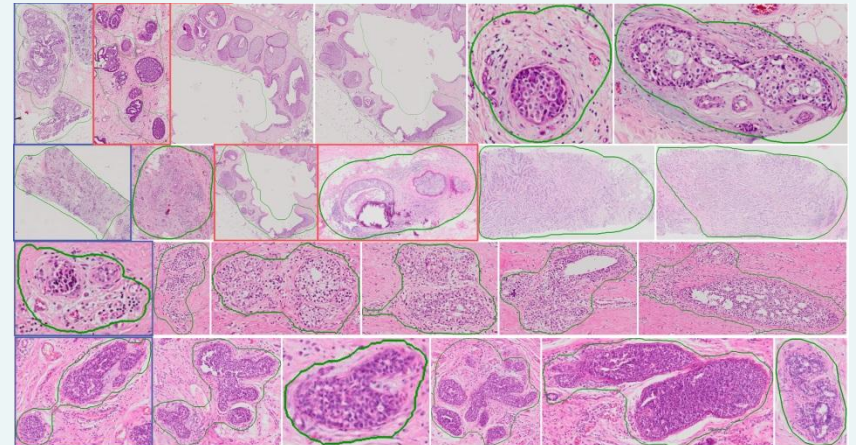
# Medical Image Analysis



Simultaneous localization and classification

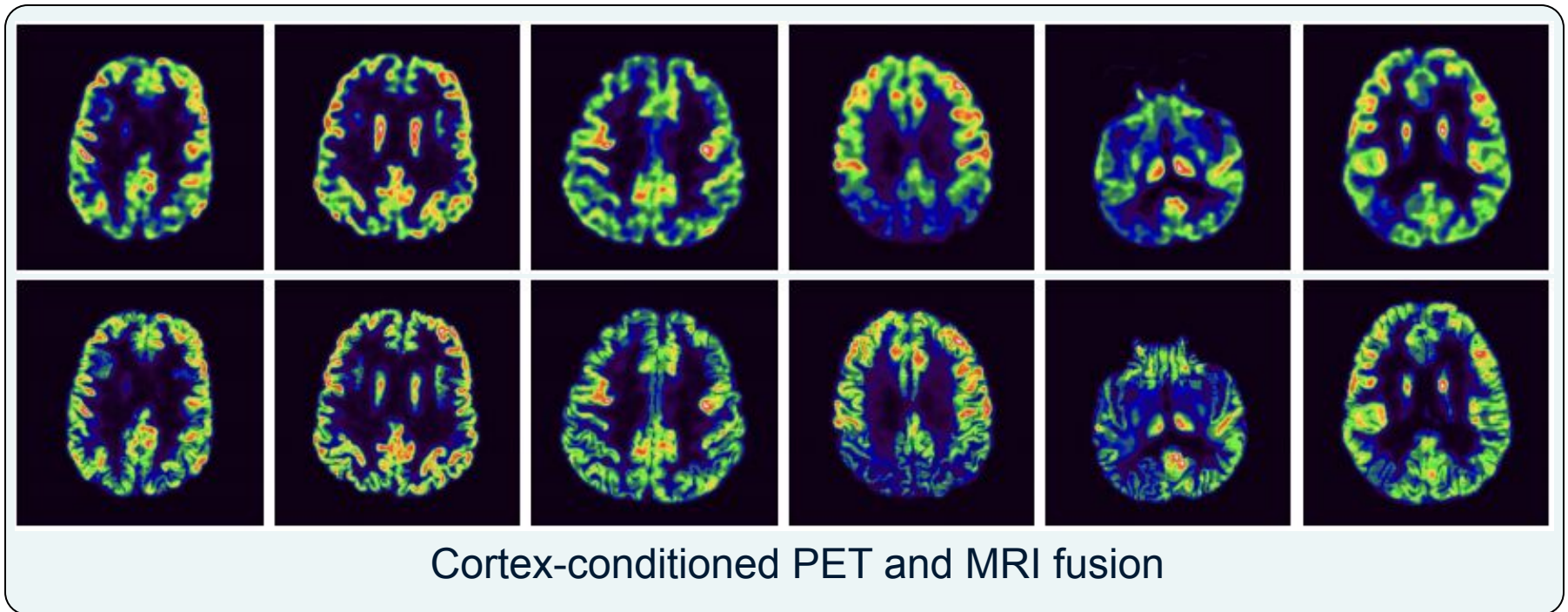
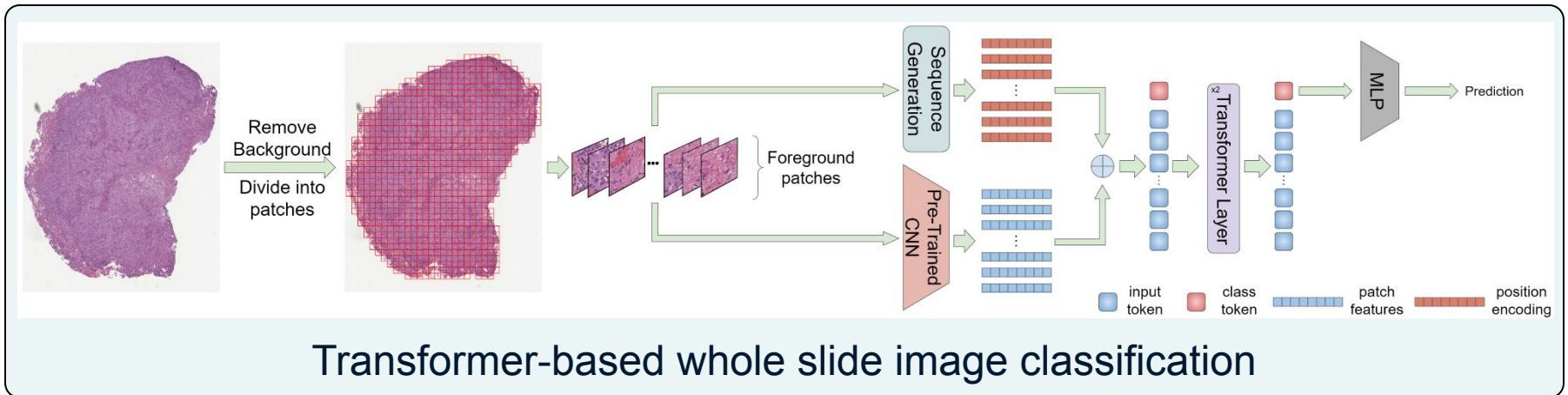


Graph convolutional networks and self-supervised learning



Content-based search of medical archives

# Medical Image Analysis

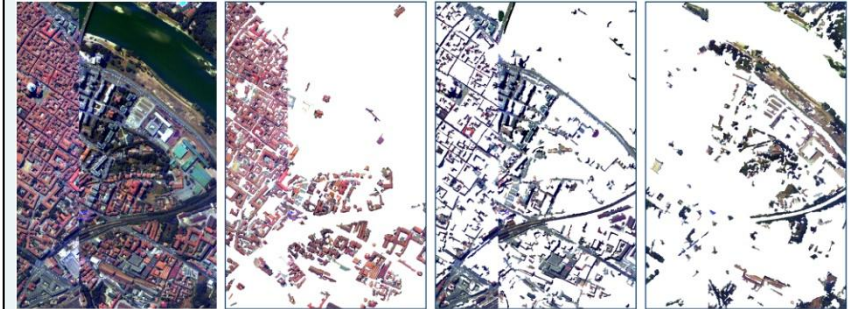


# Remote Sensing Image Analysis



(a) Landsat 5 (30 m) (1984) (b) Spot 5 (5 m) (2002) (c) WorldView-3 (0.31 m) (2014)

Increasing spatial resolution (300m  $\Rightarrow$  1-2cm)



(a) False color (b) Buildings (c) Roads (d) Vegetation

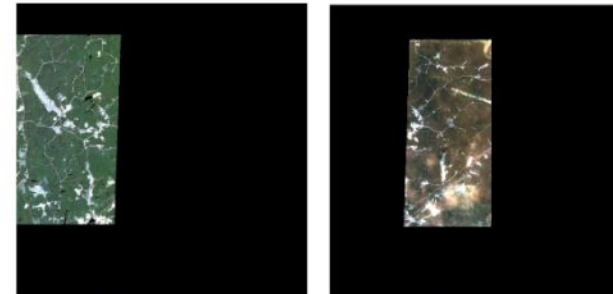
Hyperspectral image analysis



Orchard segmentation and agricultural mapping



(a) Aerial (b) Landsat (c) DEM



(d) Ikonos (e) Ikonos

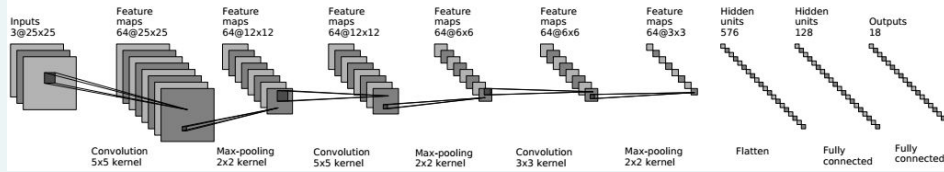
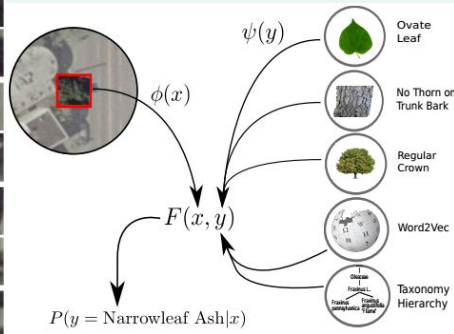
Multi-source fusion and missing data analysis

Dr. Selim Aksoy

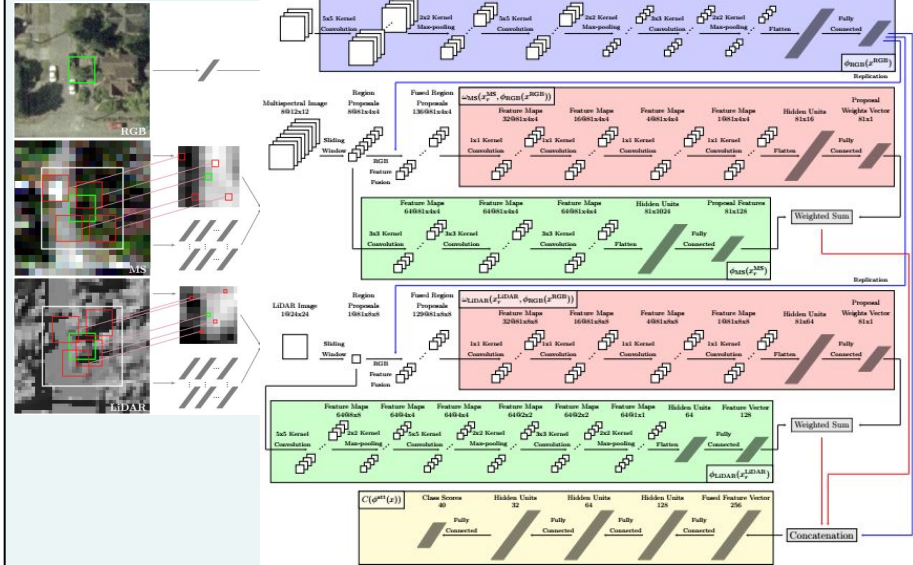
# Remote Sensing Image Analysis



Geospatial data mining

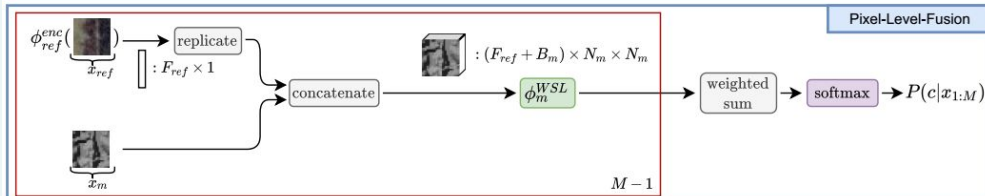
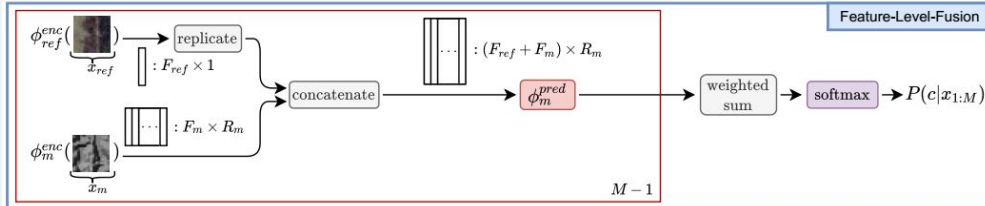
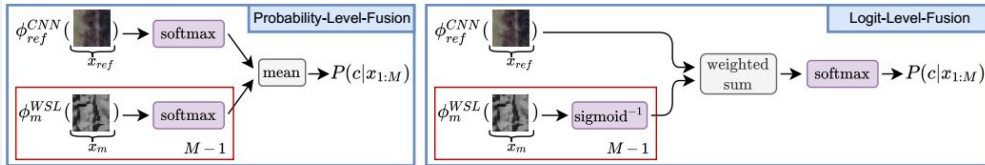


Zero-shot learning for object recognition

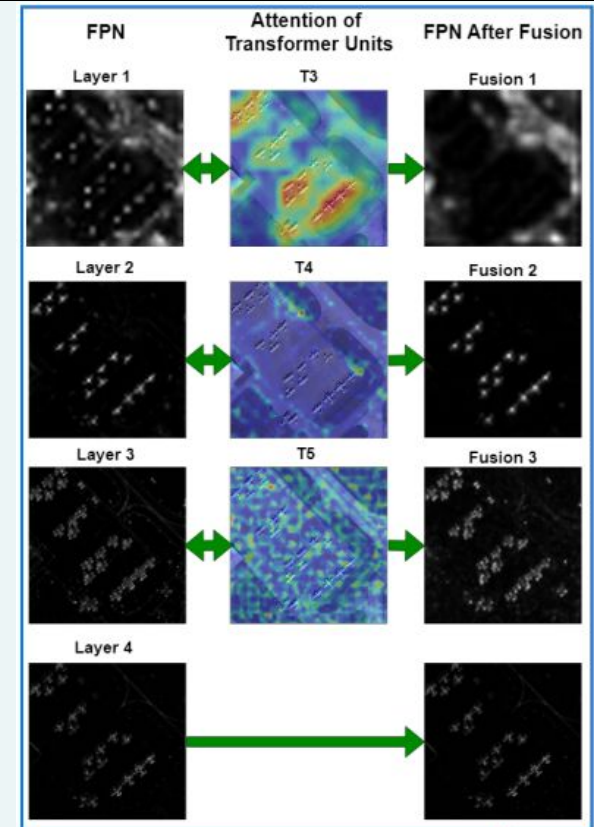


Attention model for multi-source fine-grained object recognition

# Remote Sensing Image Analysis



Weakly supervised multi-source object recognition



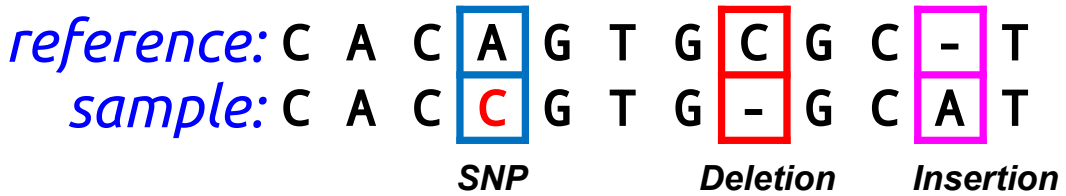
Contextual object detection via image inpainting



# Types of genomic variants

**SNP:** Single nucleotide polymorphism (substitutions)

**Indel:** Insertions and deletions of sequence of length 1 to 50 basepairs

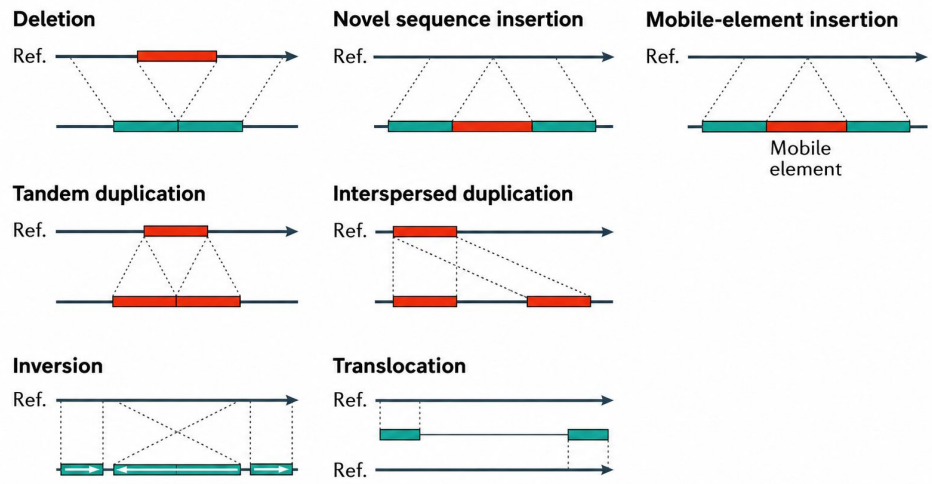


**Short tandem repeats:** microsatellites, minisatellites, alpha & beta satellites, etc.



**Structural variation:**

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



# Sequencing Technologies

## Short-Read



### Illumina

- 100 - 200 bp
- Paired-end
- Billions of reads
- < 0.1% error:
  - substitution dominated

## Long-Read



### PacBio and Oxford Nanopore

- > 20 Kb, up to 1 Mb
- Single-end
- Hundreds of millions of reads
- <1% (HiFi), ~5% (ONT), ~10% (CLR) error:
  - indel dominated

# Edge Computing

## Beelink SER9



### IRON on AMD NPUs

- AMD Ryzen AI 9 HX 370 CPU
  - AIE2 NPU w/ 32 cores
- Spatially distributed NPU memory
- Low level control over task scheduling and data movement

## Jetson Orin Nano



### CUDA on NVIDIA GPUs

- NVIDIA Orin Nano SoC
  - Integrated GPU w/ Ampere uArch (1024 CUDA cores)
- Designed for massively parallel workloads
- Relatively high level programming paradigm

# Selected Publications

- **LCPan: efficient variation graph construction using Locally Consistent Parsing.** Akmuhammet Ashyralyyev, Zülal Bingöl, Begüm Filiz Öz, Kaiyuan Zhu, Salem Malikic, Uzi Vishkin, S. Cenk Sahinalp, **Can Alkan**. *Genome Biology*, early access (Apr 24), 2026.
- **Processing-in-memory for genomics workloads.** William Andrew Simon, Leonid Yavits, Konstantina Koliogeorgi, Yann Falevoz, Yoshihiro Shibuya, Dominique Lavenier, Irem Boybat, **Klea Zambaku, Berkan Şahin**, Mohammad Sadrosadati, Onur Mutlu, Abu Sebastian, Rayan Chikhi, The BioPIM Consortium, **Can Alkan**. *IEEE Micro*, 46 (2): 70-80, 2026.
- **GateKeeper-GPU: Fast and accurate pre-alignment filtering in short read mapping.** Zülal Bingöl, Mohammed Alser, Onur Mutlu, Ozcan Ozturk, **Can Alkan**. *IEEE Transactions on Computers*, 73 (5): 1206-1218, 2024.
- **Identification of protein-protein interaction bridges for multiple sclerosis.** Gözde Yazıcı, Burcu Kurt Vatandaslar, Ilknur Aydin Canturk, Fatmagul I Aydinli, Ozge Arici Duz, Emre Karakoc, Bilal E Kerman, **Can Alkan**. *Bioinformatics*, 39(4): btad175, 2023.
- **SeGraM: a universal hardware accelerator for genomic sequence-to-graph and sequence-to-sequence mapping.** Damla Senol Cali, Konstantinos Kanellopoulos, Joël Lindegger, **Zülal Bingöl**, Gurpreet S. Kalsi, Ziyi Zuo, Can Firtina, Meryem Banu Cavlak, Jeremie Kim, Nika Mansouri Ghiasi, Gagandeep Singh, Juan Gómez-Luna, Nour Almadhoun Alserr, Mohammed Alser, Sreenivas Subramoney, **Can Alkan**, Saugata Ghose, Onur Mutlu. *Proceedings of the 49th Annual International Symposium on Computer Architecture (ISCA 2022)*, pp 638-655, New York, NY, United States, June 18-22, 2022.
- **SneakySnake: a fast and accurate universal genome pre-alignment filter for CPUs, GPUs, and FPGAs.** **Mohammed Alser**, Taha Shahroodi, Juan Gómez-Luna, **Can Alkan\***, Onur Mutlu\*. *Bioinformatics*, 36 (22-23): 5282–5290, 2020.
- **VALOR2: characterization of large-scale structural variants using linked-reads.** **Fatih Karaoglanoglu\***, Camir Ricketts\*, **Ezgi E布伦**, **Marzieh Eslami Rasekh**, Iman Hajirasouliha\*, **Can Alkan\***. *Genome Biology*, 21 (1): 72, 2020.

# Ongoing Projects

- Processing-in-memory for bioinformatics workloads
  - Funded by the Horizon Europe Programme
- Early detection of sepsis-causing pathogens
  - Funded by TÜSEB
- Pathogen detection in resource-strained areas using edge computing
  - Funded by TÜSEB and NVIDIA
- Improving genome assembly via copy-number assessment
- Acceleration frameworks for pangenome analysis
- Locally consistent parsing for genomic applications
  - Building pangenome graphs
  - Data compression
  - Whole genome alignment
  - *De novo* genome assembly.



Qualified candidates holding a B.Sc. or M.Sc. in a computational field (CS/CE) are encouraged to collaborate with us. Strong programming skills in C/C++ are highly desired.

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

# Shervin Rahimzadeh Arashloo

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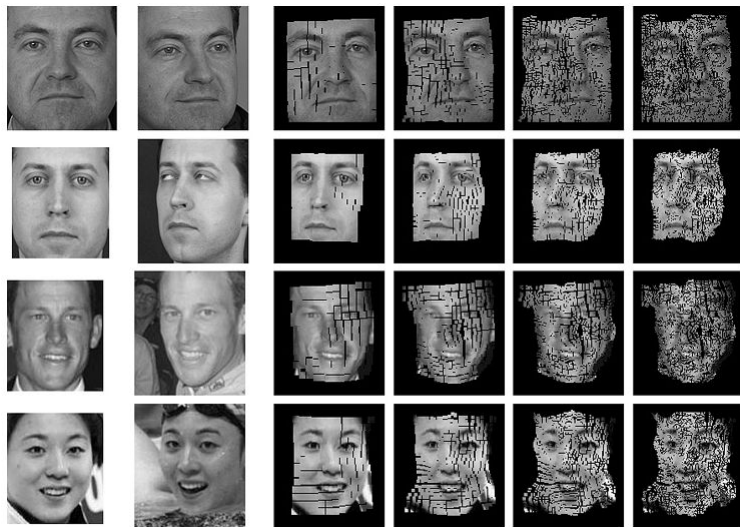
## Research Interests

- Computer Vision
- Pattern Recognition
- Machine Learning

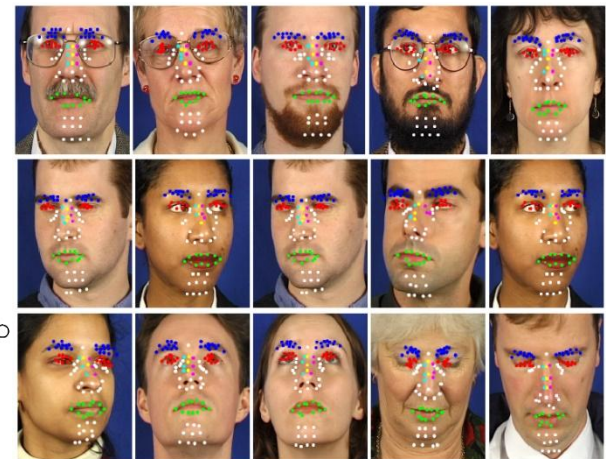
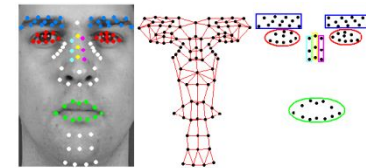
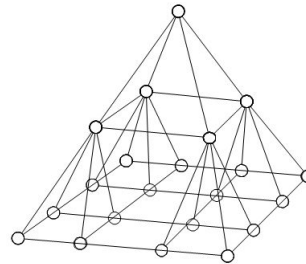
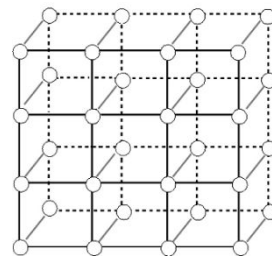
## Current Research Topics

- Face Recognition
- Face Presentation Attack Detection
- Anomaly Detection

# Unconstrained Face Recognition

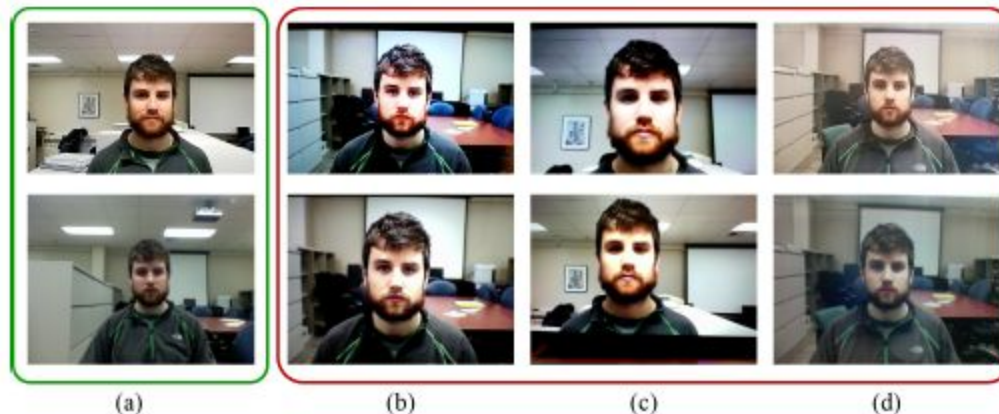
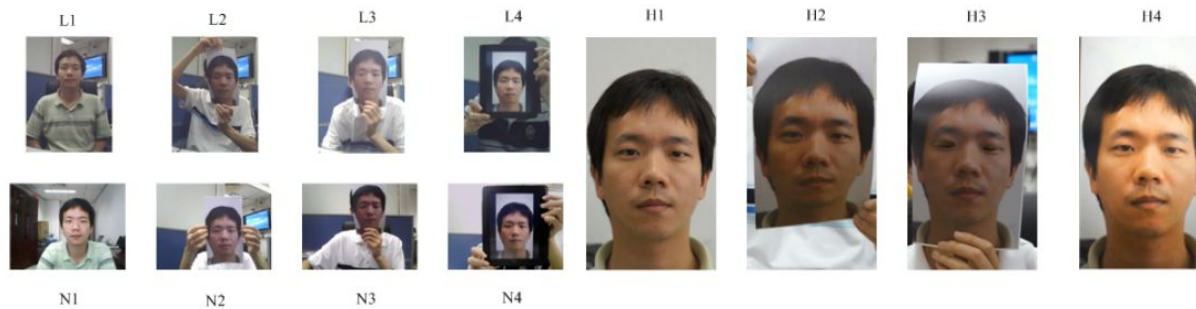


Template      Target      Level 3      Level 2      Level 1      Level 0



# Face Presentation Attack Detection

Securing face recognition systems against security threats made by fake biometric traits



Sample data from the MSU dataset.(a) Genuine faces;  
(b)-(d) Spoof faces.

# Anomaly Detection

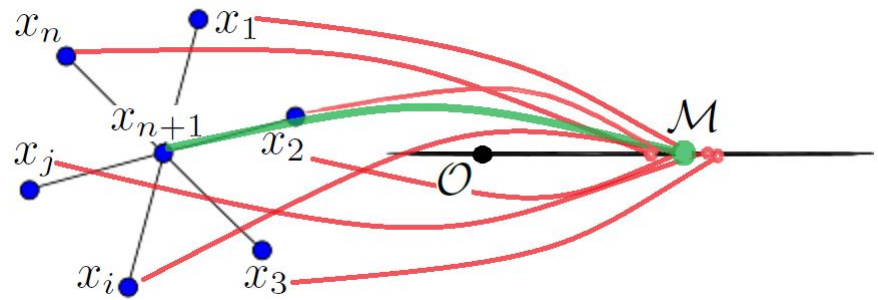
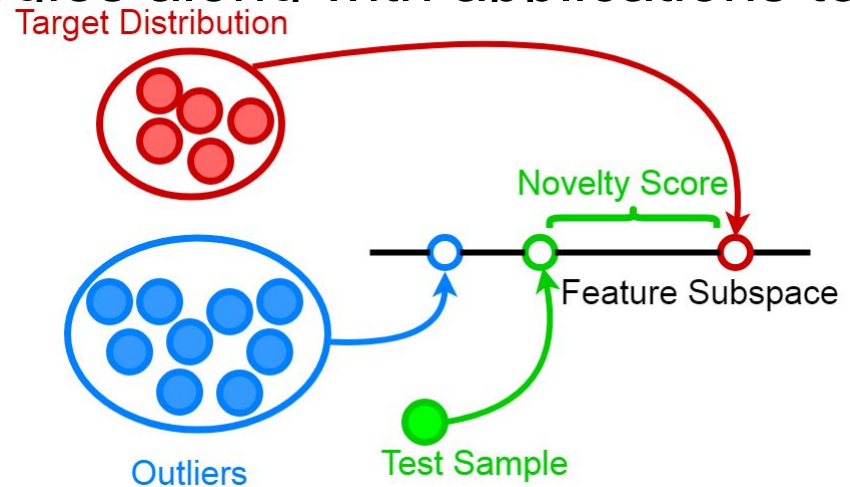
Developing novel methodologies along with applications to:

Surveillance

Novelty detection

Healthcare

etc.



Contact Address:

Prof. **CEVDET**

**AYKANAT**

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# Bilkent University

## High Performance Computing (HPC)

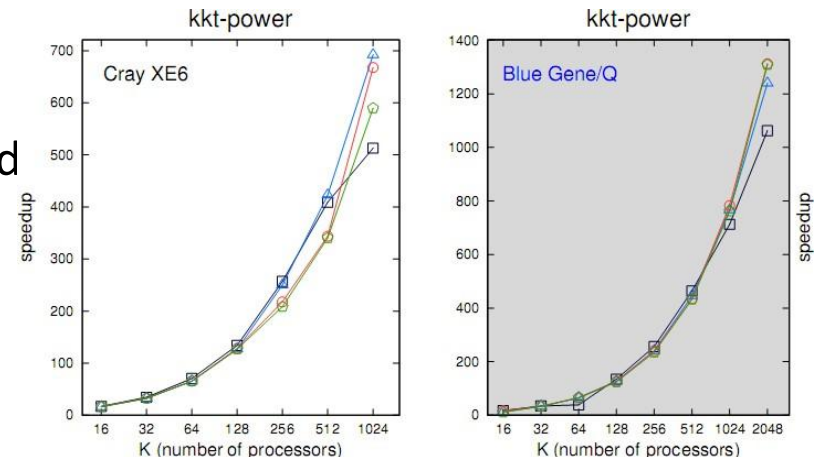


Recent research interest and expertise

- **Combinatorial scientific computing**
- **Iterative solvers**: novel partitioning models, algorithms and software utilities for development of parallel iterative methods for linear-system solutions
- Optimizing latency-centric comm metrics for petascaling **sparse solvers**
- Partitioning **irregular domains** for large-scale parallel processing
- Locality aware scheduling of irregular applications on **Many Core** architectures
- Partitioning models for scaling 1D-,2D- and 3D-parallel **sparse matrix-matrix multiply**
- Partitioning large scale **social networks** and **graph databases**
- **Parallel graph analytics** kernels for big data applications

### –HPC for **Machine Learning Apps**

- Partitioning methods for scalable sparse **Tensor decomposition**
- Scaling parallel **stochastic gradient descent** algorithms for **ML**
- Fast **GNN** on large scale **HPC** systems and **Wafer-ScaleParallel Cerebras**
- **PI INNO4SCALE project EuroHPC-JU**
- Task leader in FP7 / Horizon2020 **PRACE** projects:1IP, 2IP, 3IP, 4IP, 5IP, 6IP



Speedup curves of Conjugate Gradient solver for different methods on a Cray and BlueGene/Q machine (kkt-power matrix: 2 million rows, 12 million nonzeros)

Prof. **Cevdet Aykanat**

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<http://www.cs.bilkent.u.tr/~aykanat/>

# Recent Publications (2020-2026)

- A Flexible Forwarding Scheme to Improve Latency-Bound Irregular P2P Communications in MPI, *Oguz Selvitopi, Nabil Abubaker, Erkin Aydın, Cevdet Aykanat*, **IEEE Transactions on Parallel and Distributed Systems** vol. 37, no. 6, pp. 1265-1279, June 2026.
- A Multilevel Algorithm for Scalable Independent Task Assignment, *Burhan Tabak, Ertugrul Tabak, Cevdet Aykanat*, **Future Generation Computer Systems**, vol. 176, March 2026.
- Stochastic Gradient Descent for Matrix Completion, *Nabil Kemal Büyükkaya, Ozan Karsavuran, Cevdet Aykanat*, **Knowledge Based Systems**, vol. 283, 2024.
- Load Balanced Locality Aware Parallel SGD on Multicore Architectures for Latent Factor Based Collaborative Filtering, *Selcuk Gulcan, Mustafa Ozdal, Cevdet Aykanat*, **Future Generation Computer Systems**, vol. 146, pp. 207-221, 2023.
- Minimizing Staleness and Communication Overhead in Distributed SGD for Collaborative Filtering, *Nabil Abubaker, Orhun Çağlayan, Ozan Karsavuran, Cevdet Aykanat*, **IEEE Transactions on Computers**, vol. 72, no. 10, pp. 292-2937, 2023.
- Scaling Stratified Stochastic Gradient Descent for Distributed Matrix Completion, *Nabil Abubaker, Ozan Karsavuran, Cevdet Aykanat*, **IEEE Transactions on Knowledge and Data Engineering**, vol.35, no: 10, pp. 10603-10615, 2023.
- Enhancing Block Cimmino for Sparse Linear Systems with Dense Columns via Schur Complement, *Sukru Torun, Murat Manguoglu, Cevdet Aykanat*, **SIAM Journal on Scientific Computing**, vol.45, no. 2, pp. C49-C72, 2023.
- Simultaneous Computational and Data Load Balancing in Distributed-Memory Setting, *Mestan Celiktug, Ozan Karsavuran, Seher Acer, Cevdet Aykanat*, **SIAM Journal on Scientific Computing**, vol.44, no. 6, pp. C399-C424, 2022.
- Partitioning and Reordering for Spike-Based Distributed-Memory Parallel Gauss-Seidel, *Tuba Torun, Sukru Torun, Murat Manguoglu, Cevdet Aykanat*, **SIAM Journal on Scientific Computing**, vol.44, no. 2, pp. C99-C123, 2022.
- Scalable Unsupervised ML: Latency Hiding in Distributed Sparse Tensor Computation, *Nabil Abubaker, Ozan Karsavuran, Cevdet Aykanat*, **IEEE Transactions on Parallel and Distributed Systems**, vol.33, no: 11, pp. 3028-3040, 2021.
- True Load Balancing for Matricized Tensor Times Khatri-Rao Product, *Nabil Abubaker, Seher Acer, Cevdet Aykanat*, **IEEE Transactions on Parallel and Distributed Systems** vol. 32, no. 8, pp. 1974-1986, 2021.
- Fast Shared-Memory Streaming Multilevel Graph Partitioning *Oguz Selvitopi, Nazanin Jafari, and Cevdet Aykanat*, **Journal of Parallel and Distributed Computing**, vol. 31, no. 8, pp. 140-151, 2021.
- Partitioning Models for General Medium-Grain Parallel Sparse Tensor Decomposition *M. Ozan Karsavuran, Seher Acer and Cevdet Aykanat*, **IEEE Transactions on Parallel and Distributed Systems**, vol. 32, no. 1, pp. 147-159, 2021.
- Cartesian Partitioning Models for 2D and 3D Parallel SpGEMM Algorithms, *Gunduz V. Demirci and Cevdet Aykanat*, **IEEE Transactions on Parallel and Distributed Systems**, vol. 31, no 12, pp. 2763-2775, 2020.
- Reordering Sparse Matrices into Block-Diagonal Column-Overlapped Form, *Seher Acer and Cevdet Aykanat*, **Journal of Parallel and Distributed Computing**, vol. 140, pp. 99-109, 2020.
- Reduce Operations: Send Volume Balancing While Minimizing Latency, *M. Ozan Karsavuran, Seher Acer, and Cevdet Aykanat*, **IEEE Transactions on Parallel and Distributed Systems**, vol. 31, no. 6, pp. 1461-1473, 2020.
- A Hypergraph Partitioning Model for Profile Minimization, *Seher Acer, Enver Kayaaslan, Cevdet Aykanat*, **SIAM Journal on Scientific Computing**, vol. 41, no. 1, pp. A83-A108, 2020.
- Locality-aware and load-balanced static task scheduling for MapReduce, *Oguz Selvitopi, Gunduz V. Demirci, Ata Turk, Cevdet Aykanat*, **Future Generation Computer Systems**, vol. 90, pp. 49-61, 2020.
- Spatiotemporal Graph and Hypergraph Partitioning Models for Sparse Matrix-Vector Multiplication on Many-Core Architectures, *Nabil Abubaker, Kadir Akbudak, Cevdet Aykanat*, **IEEE Transactions on Parallel and Distributed Systems**, vol. 30, no. 2, pp. 445-458, 2020.

- **TUBITAK/COST Projects**
- 121E391: A Flexible Store-and-Forward Communication Framework for Scaling Latency Bound Programs  
01/01/2022 - 01/03/2025
- 119E035: Parallel Stochastic Gradient Descent Algorithms for Large-Scale Recommendation Systems,  
15/09/2021 - 15/02/2023
- 116E043: High Performance Tensor Decomposition Methods for Distributed and Shared Memory Parallel Systems,  
01/05/2017 – 1/11/2019
- 115E212/COST-CA15109: Improving Sparse Matrix Based Graph Analytics Kernels for Big Data Applications, 01/09/2015 -  
01/03/2018
- 114E545/COST-IC1406: Petascaling Sparse Iterative Solvers via Optimizing Multiple Communication Metrics, 01/04/2015 -  
01/10/2017
- 112E120: Partitioning, Replication and Query Processing in Social Networks, 01/09/2012 - 01/09/2014
- **FP7/HORIZON-2020 Projects**
- INNO4SCALE 2023 01/02/2024 – 01/05/2025
  - **PI** Communication Volume Balancing in Sparse Collectives
- PRACE 6IP 01/01/2020 – 01/01/2024
  - TaskTask 7.2: Evaluation of Benchmark Performance (Code Owner))
- PRACE 5IP 01/01/2017 – 01/05/2019
  - Task 7.2: Preparing for PRACE Exascale Systems
- PRACE 4IP 01/02/2015 - 01/05/2017
  - Task 7.2: Preparing for Future PRACE Exascale Systems, Task 4.3: Evaluation of platforms for the CodeVault
- PRACE 3IP 01/08/2012 - 01/08/2014
  - D7.2.1 HPC Tools and Techniques (Task Leader)
- PRACE 2IP 01/07/2011 - 01/07/2014
  - D12.5 Summary of Novel Programming Techniques Results (Task leader)
- PRACE 1IP-Extension 01/07/2013 - 01/07/2014
  - D7.1.3 Application Enabling for Capability Science in the MIC Architecture
- PRACE 1IP 01/07/2010 - 01/07/2013
  - D7.5 HPC Programming Techniques (Task leader)

Contact Address:

**Prof. Cevdet Aykanat**

[aykanat@cs.bilkent.edu.tr](mailto:aykanat@cs.bilkent.edu.tr)

## Current Positions of Some Former PhD. Students

- Dr. Nabil Abubaker, 2024. **Julich Supercomputing Center**, **Research Scientist**
- Dr. Ozan Karsavuran, 2021. **Lawrence Berkeley Nat. Lab**, **Research Scientist**
- Dr. Seher Acer, 2017. **Oak Ridge National Lab.**, **Research Scientist**
- Dr. Oguz Selvitopi, 2017. **Lawrence Berkeley Nat. Lab.**, **Research Scientist**
- Dr. Şükrü Torun, 2017. **Yıldırım Beyazıt University**, **Assoc Professor**
- Dr. Kadir Akbudak, 2015. **University of Tennessee**, **Research Scientist**
- Dr. Enver Kayaaslan, 2013. **Google Switzerland**, **Researcher**
- Dr. Ertuğrul Tabak, 2013. **Aurea Software**, **Software engineering manager**
- Dr. Eray Özkural, 2013. **Celestial Intellect Cybernetics**, **Software engineer**
- Dr. Tayfun Küçükyılmaz, 2012. **Erasmus University Rotterdam**, **Lecturer**
- Dr. Ata Türk, 2010. **Boston University**, **Research Scientist**,
- Dr. Engin Demir, 2009. **Hacettepe University**, **Assoc Professor**
- Dr. Barla Cambazoğlu, 2006. **RMIT University**, **Senior Research Fellow**
- Dr. Bora Uçar, 2005. **LIP ENS-LYON**, **CNRS researcher**.
- Dr. Ümit Çatalyürek, 1999. **Georgia Institute of Technology**, **Professor**
- Dr. Tahsin Kurc, 1997. **Stony Brook University**, **Associate Professor**

# Bilkent Information Retrieval Group



Fazlı Can

## Faculty

Fazlı Can, PI  
Seyit Koçberber

## Graduate Students

Mert Barkın Er  
Omid Feizi  
Pouya Ghahramanian  
Kadri Gofralılar  
Yağız Özkarahan

## Undergrad. Student

Enes Bektaş (Graduated)

## Previous Members

Soheil Abadifard  
Sepehr Bakhshi  
Sevil Çalışkan  
Ömer Gözüaçık  
Ege Berkay Gülcan  
Oğuzhan Özçelik  
Onur Yıldırım

## Other Contributors

Hamed R. Bonab, Amazon  
Dilek Küçük, TÜBİTAK

# Research Interests



## Information Retrieval (IR)

- Stance Detection & Retrieval
- News Retrieval/Aggregation and Categorization
- Literary & Spoken Text Mining
- Legal Text Mining

## Time Series & Data Streams

- Continual Learning
- Ensemble Models for Stream Classification
- Concept Drift Detection
- Time Series Regression
- Time Series Anomaly Detection
-



# Selected Recent Publications by Our Group



- O. Ozcelik, C. Toraman, F. Can: Detecting Misinformation on Social Media using Community Insights and Contrastive Learning. *ACM Trans. Intell. Syst. Technol.* 16(2): 38:1-38:27 (2025)
- P. Ghahramanian, S. Bakhshi, F. Can: LLM-OFA: On-the-Fly Adaptation of Large Language Models to Address Temporal Drift Across Two Decades of News. *CIKM 2025*: 4728-4732
- O. Yildirim, F. Can: A Quantitative Style Analysis of Four Turkish Authors: Changes Over Time, and Differences. *J. Quant. Linguistics* 31(4): 353-384 (2024)
- S. Bakhshi, F. Can: Balancing efficiency vs. effectiveness and providing missing label robustness in multi-label stream classification. *Knowl. Based Syst.* 289: 111489 (2024)
- P. Ghahramanian, S. Bakhshi, H. R. Bonab, F. Can: A Novel Neural Ensemble Architecture for On-the-fly Classification of Evolving Text Streams. *ACM Trans. Knowl. Discov. Data* 18(4): 101:1-101:24 (2024)
- O. Yildirim, S. Bakhshi, F. Can: Prioritized Binary Transformation Method for Efficient Multi-label Classification of Data Streams with Many Labels. *CIKM 2024*: 4218-4222
- S. Bakhshi, P. Ghahramanian, Hamed R. Bonab, Fazli Can: A Broad Ensemble Learning System for Drifting Stream Classification. *IEEE Access* 11: 89315-89330 (2023)
- E. B. Gulcan, F. Can: Unsupervised concept drift detection for multi-label data streams. *Artif. Intell. Rev.* 56(3): 2401-2434 (2023)
- S. Abadifard, S. Bakhshi, S. Gheibuni, F. Can: DynED: Dynamic Ensemble Diversification in Data Stream Classification. *CIKM 2023*: 3707-3711
- S. Çaliskan, F. Can, H. Akbulut, S. R. Öztürk: Quantitative Analysis of Spoken Discourse Using Memoirs of Old-time Moviegoers. *J. Quant. Linguistics* 29(3): 283-313 (2022)
- E. B. Gulcan, I. S. Ecevit, F. Can: Binary Transformation Method for Multi-Label Stream Classification. *CIKM 2022*: 3968-3972



Ercüment Çiçek

[ercumentcicek.com](http://ercumentcicek.com)

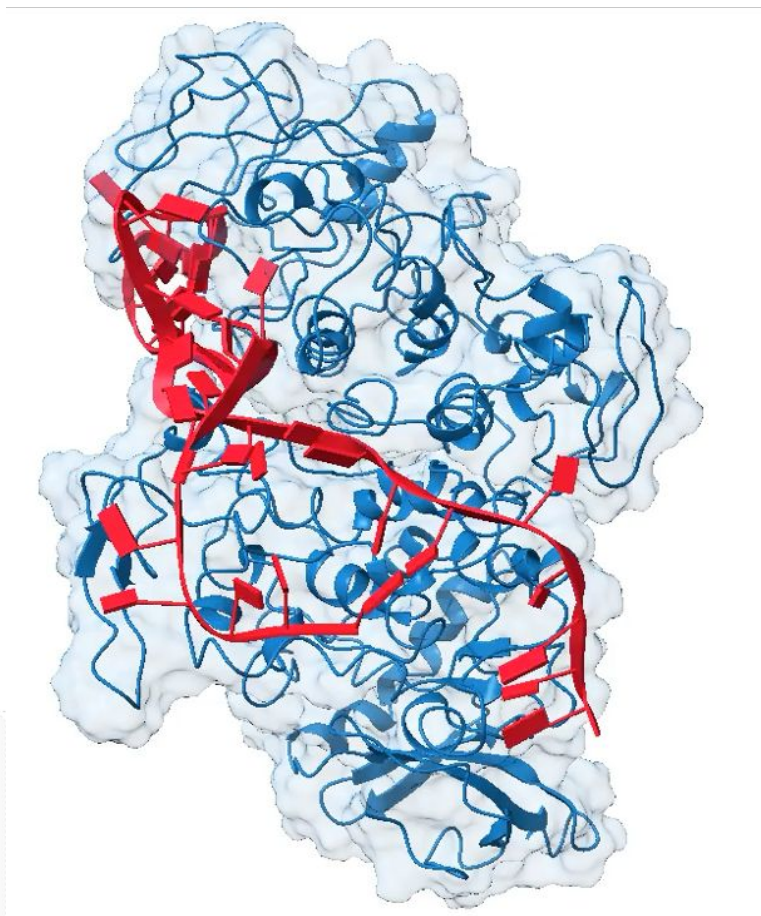
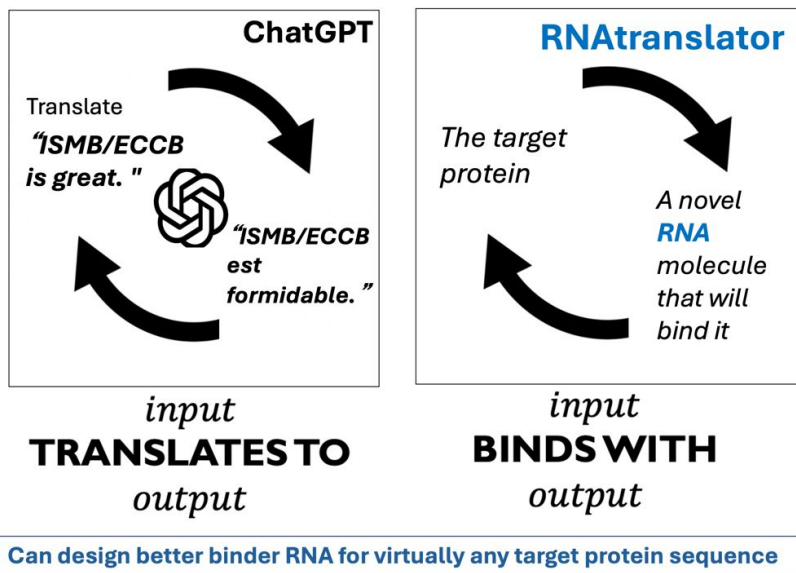


At **CICEKLAB**, we design and develop machine learning models to improve our understanding of genetic diseases and disorders.

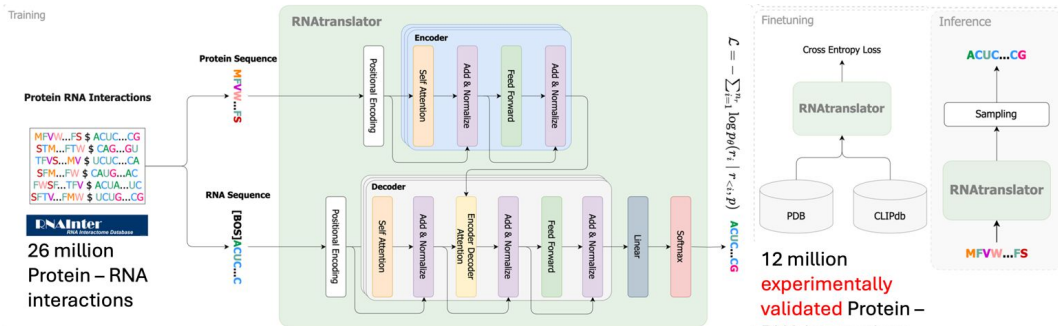
We work on these main tracks:

- (i) Generative modeling of RNA to target other molecules,
- (ii) Genome privacy
- (iii) Learning to detect genomic variants

# Generative language modelling for RNA Design

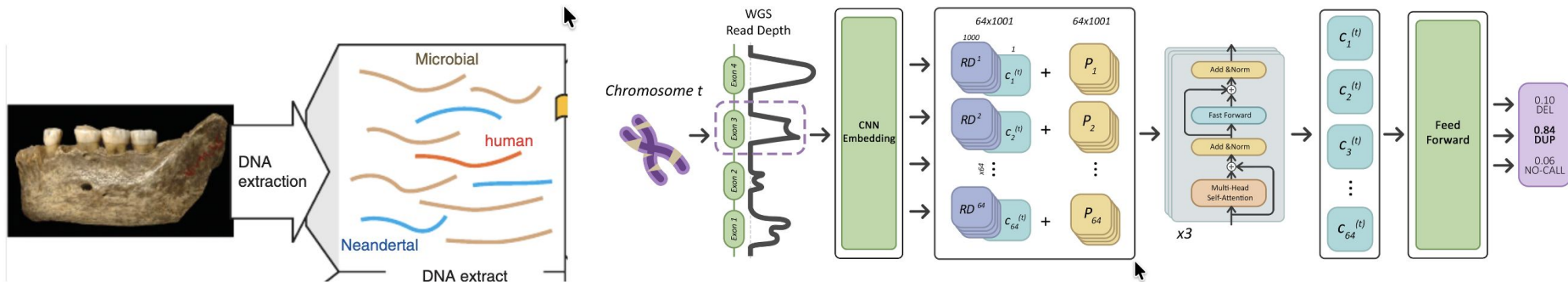


**Result:**  
 Blue: Target protein  
 Red: designed RNA to bind target



Use language models trained on millions of data to design RNA

# Detecting Genomic Variants in Noisy Data such as Ancient Genomes



## Problems with Ancient Genome:

- High contamination
  - Modern Human DNA Contamination
  - Microbial Contamination
- Chemical and Environmental Damage
  - Cytosine Deamination (C → U)
  - Fragmentation and Strand Breaks
  - Depurination
- Low coverage

Use deep learning techniques to predict variants better



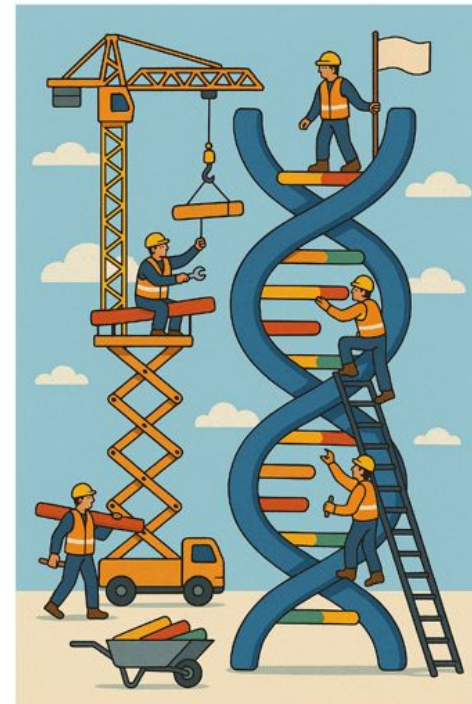
Predictions conform to geographical location of the remains

# Methods to limit privacy vulnerabilities in genomic data sharing protocol

## Membership Inference Attacks



## Genome Reconstruction Attacks



4

# Selected Publications

## **A Reinforcement Learning-based Approach for Dynamic Privacy Protection in Genomic Data Sharing Beacons**

Genome Biology 2025, 26, 400.

Selected Talk at RECOMB Privacy & Equity (P&E) Satellite Meeting 2025

Poorghaffar-aghdam M\*, Shukueian-tabrizi S\*, Ayozy K, Ayday E, Sav S\*, Cicek AE\*

## **LYCEUM: Learning to call copy number variants on low coverage ancient genomes**

Bioinformatics 2025, 41, Supplement 1, i285-i293. In proceedings of ISMB/ECCB 2025 - 33rd Annual International Conference on Intelligent Systems for Molecular Biology, Liverpool, UK

[See video] - In the proceedings of ISMB/ECCB 2025 - 33rd Annual International Conference on Intelligent Systems for Molecular Biology, Liverpool, UK

Yilmaz MA, Ceylan AA, Kaynar G, Cicek AE

## **RNAtranslator: Modeling protein-conditional RNA design as sequence-to-sequence natural language translation**

PLoS Computational Biogy 2025, 21(10): e1013541.

[See video] - Selected talk at ISMB/ECCB 2025 - iRNA Track

Shukueian-tabrizi S, Barazandeh S, Hashemi-aghdam H, Cicek AE

## **ECOLE: Learning to call copy number variants on whole exome sequencing data**

Nature Communications 2024, 15, 132.

Mandiracioglu B\*, Ozden F\*, Kaynar G, Yilmaz MA, Alkan C, Cicek AE

## **Polishing Copy Number Variant Calls on Exome Sequencing Data via Deep Learning**

Genome Research 2022, 32 (6), 1170-1182.

[See video] - Highlight Talk at ISMB 2021 - 29th Annual International Conference on Intelligent Systems for Molecular Biology (HitSeq)

Ozden F, Alkan C\*, Cicek AE\*



# Hamdi Dibeklioglu

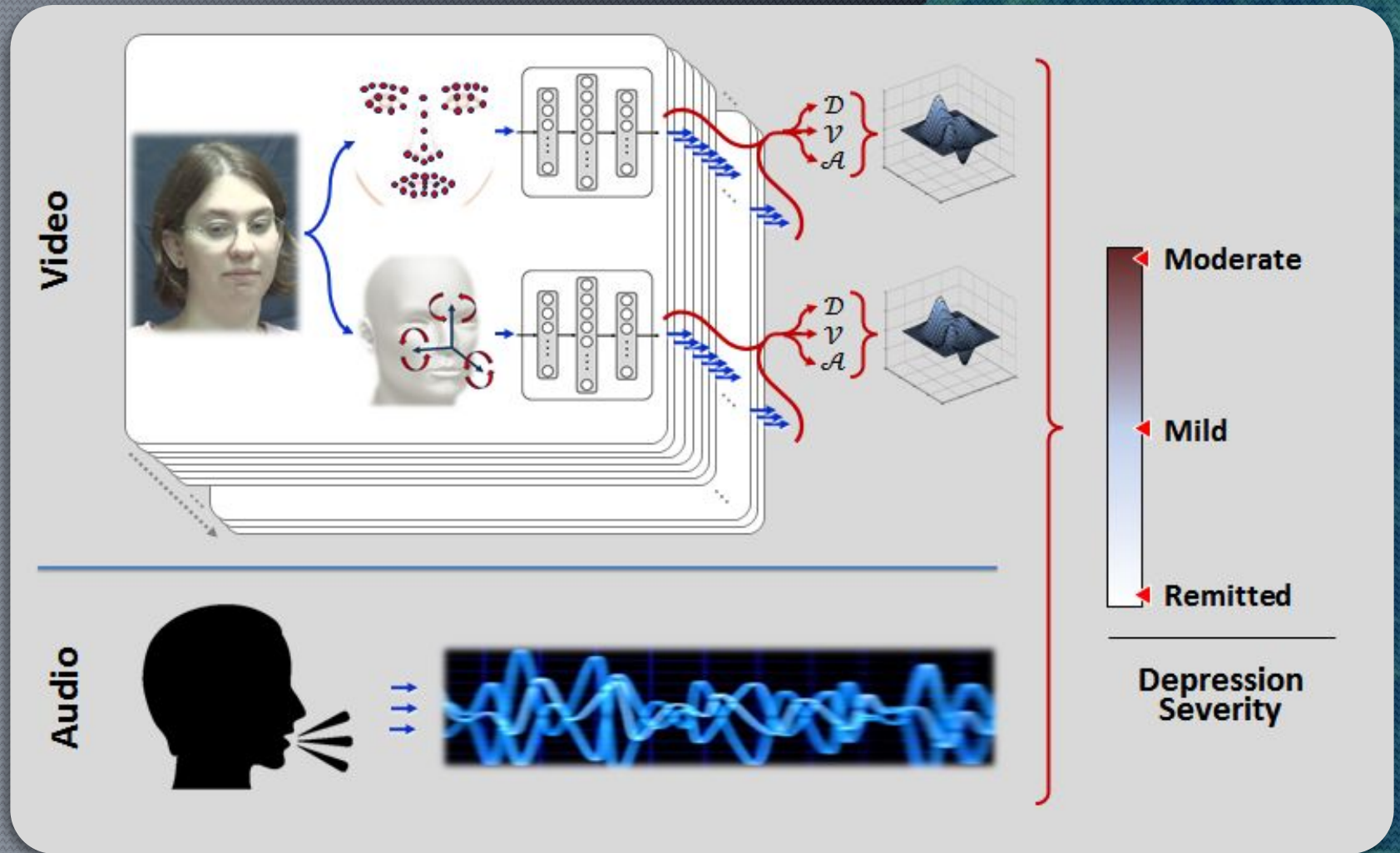
[dibeklioglu@cs.bilkent.edu.tr](mailto:dibeklioglu@cs.bilkent.edu.tr)

<http://www.cs.bilkent.edu.tr/~dibeklioglu/>

Affective Computing, Computer Vision, Language Modeling, and Multimodal Machine Learning

Topics focusing on multimodal analysis of non-verbal human behavior (e.g. face analysis, gesture recognition, speech analysis etc.) and deep learning of temporal representations.

# Assessment of Depression Severity



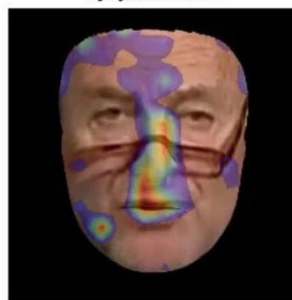
# Deceit Detection

Label: Truth  
Vision: 0.94 Text: 0.01 Audio: 1.00

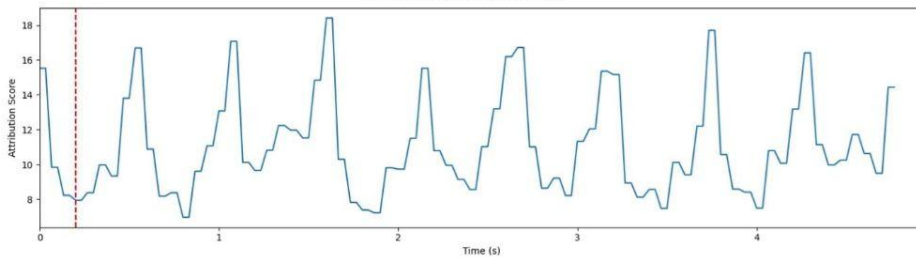
Original Video Frame



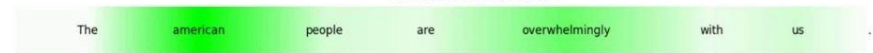
Highlighted Video Frame



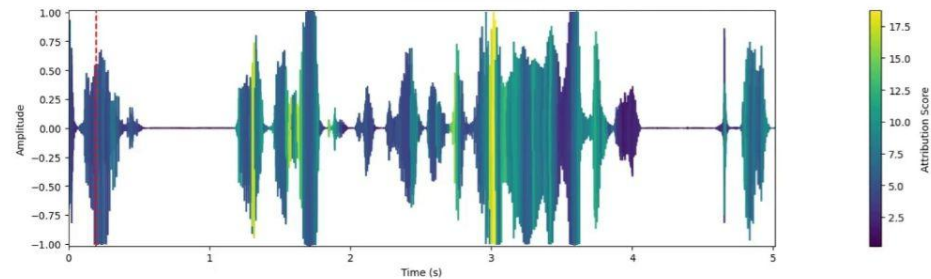
Frame Attribution Scores Over Time



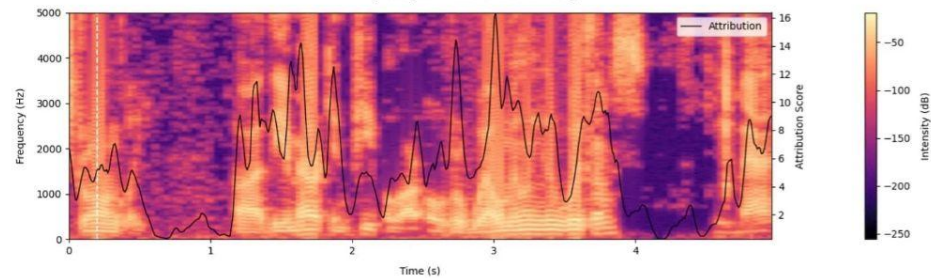
Text Attribution (Highlighted)



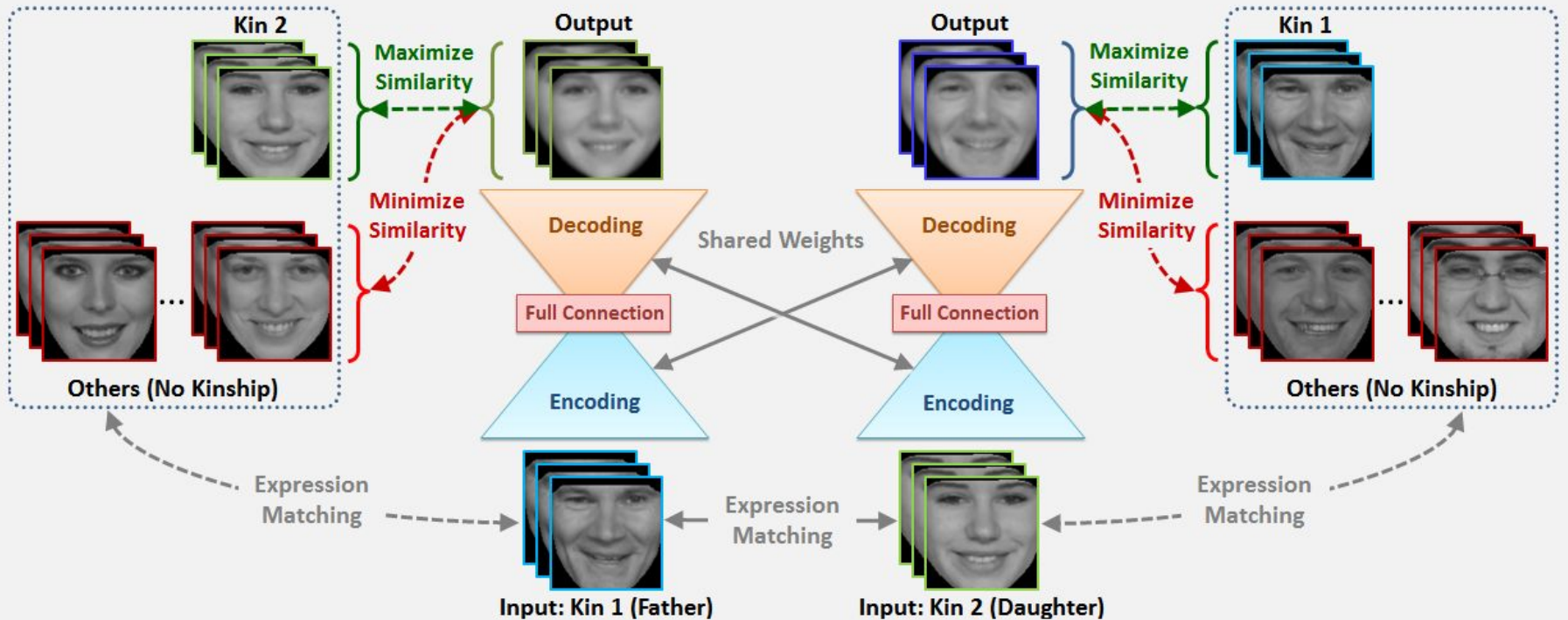
Colored Audio Waveform



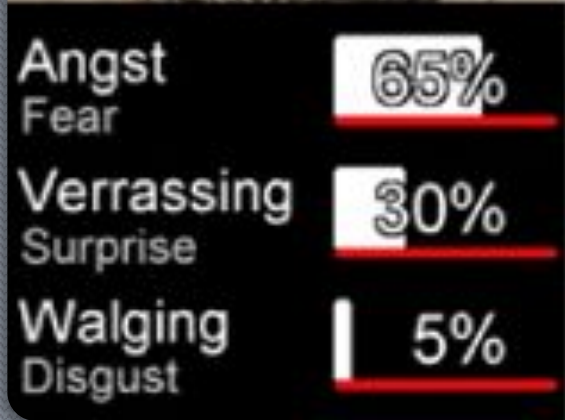
Spectrogram with Attribution Overlay



# Kinship Verification



# Emotional Expression Analysis



## *Selected Recent Publications*

- Shift-ACT: Test-time adaptation via shift-aware class-specific dynamic thresholding for domain generalization, **Neurocomputing**, 2026, 663:132013.
- Affect and personality aided modeling of transcribed speech for depression severity estimation, **IEEE Transactions on Affective Computing**, 2025, 15(3):2334-2351.
- *DECEPTicON: Bridging gaps in in-the-wild deception research*, **IEEE Transactions on Affective Computing**, 2025, 16(4):3452-3464.
- Automatic deceit detection through multimodal analysis of high-stake court trials, **IEEE Transactions on Affective Computing**, 2024, 15(1):342-356.

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# i-Vis @ Bilkent Information Visualization Research Lab at Bilkent University



*i-Vis* Info. Visualization  
Research Lab.

Big data visualization & analytics, Pathway visualization & informatics,  
Graph drawing & layout, Graph database querying algorithms

Ugur Dogrusoz

[\*Click here for live/animated/full presentation\*](#)

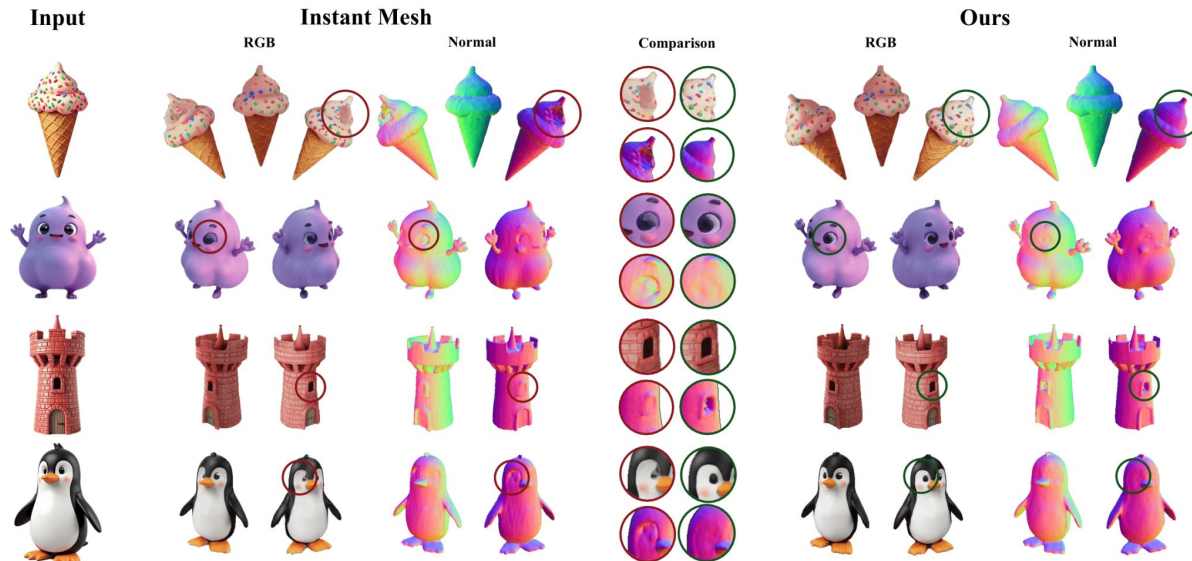


## Generative Learning with Deep Neural Networks

Image Generation and Editing  
Video Generation and Editing  
3D Reconstruction



*remove the boat at the right of the small boat*



Aysegul Dundar  
<http://www.cs.bilkent.edu.tr/~adundar/>  
[adundar@cs.bilkent.edu.tr](mailto:adundar@cs.bilkent.edu.tr)

**Generative**  
Deep Learning Research Lab



Lab web-page: <https://dlr.bilkent.edu.tr/>

## Recent Publications



**RoPECraft: Training-Free Motion Transfer with Trajectory-Guided RoPE Optimization on Diffusion Transformers**

**Authors:** Ahmet Berke Gokmen\*, Yigit Ekin\*, Bahri Batuhan Bilecen\*, Aysegul Dundar

Paper GitHub Website

NeurIPS 2025



**3D Stylization via Large Reconstruction Model**

**Authors:** Ipek Oztas, Duygu Ceylan, Aysegul Dundar

Paper GitHub Website

SIGGRAPH 2025



**Identity Preserving 3D Head Stylization with Multiview Score Distillation**

**Authors:** Bahri Batuhan Bilecen, Ahmet Berke Gokmen, Furkan Guzelant, Aysegul Dundar

Paper GitHub Website

ICCV 2025



**Reference-Based 3D-Aware Image Editing with Triplanes**

**Authors:** Bahri Batuhan Bilecen, Yigit Yalin, Ning Yu, Aysegul Dundar

Paper GitHub Website

CVPR 2025

# Computer Graphics

Uğur Güdükbay

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**<http://www.cs.bilkent.edu.tr/~gudukbay>**

**Modeling and Visualization Research Group**

**<http://www.cs.bilkent.edu.tr/~modvis/>**

# Computer Graphics

**Computer Graphics Research Group** at the Department of Computer Engineering at Bilkent University conducts research on different aspects of computer graphics.

## Human Modeling and Animation

- Motion control, Realistic rendering, Facial animation, Hair simulation, Motion capture
- Augmented Reality
- Crowd simulation
- Agent Personality and Emotion Modeling
- Learning Personality and Emotions

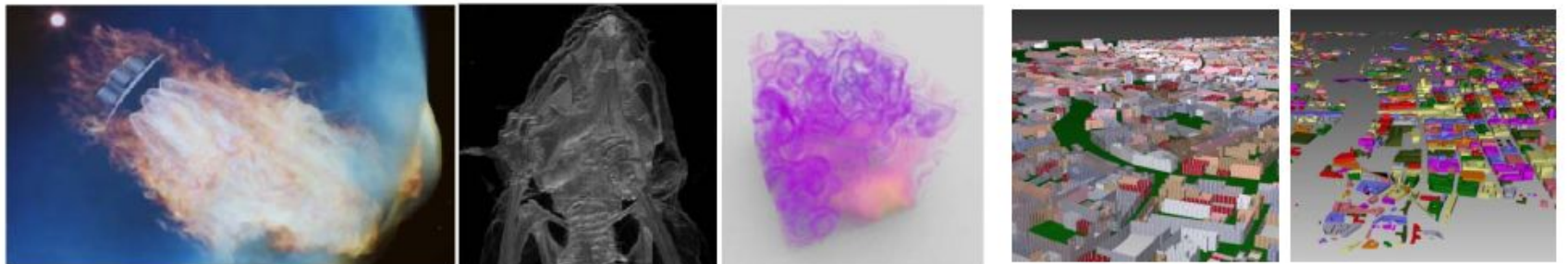


## Three-Dimensional (3D) Modeling

- Tetrahedralization of Large Models
- Terrain and Urban Scenes

## Rendering

- Tetrahedralization-based Acceleration Structures for Raytracing
- Direct Volume Visualization Using Tetrahedralization-based structures



# Automated Program Repair and Tools for Software Maintenance (APR-TSM)

Our Research Vision and Key Topics

---

**Dr. Anil Koyuncu**

Department of Computer Engineering  
Bilkent University

 [aprtsm.github.io](https://aprtsm.github.io)

# Principal Investigator: Dr. Anil Koyuncu

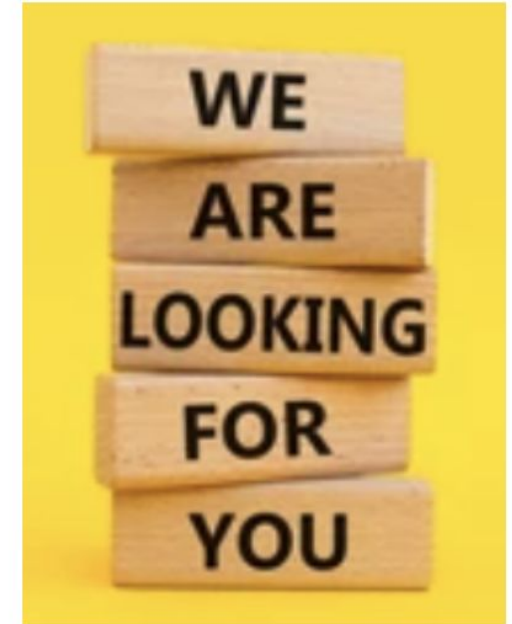
*Assistant Professor, Bilkent University*

## Our Mission

The APR-TSM group's core mission is to **advance software quality** and developer productivity by replacing manual, error-prone tasks with **automation and intelligence**.

## Primary Research Streams:

- Automated Program Repair & Fault Localization
- Applied AI for Software Engineering
- Mining Software Repositories & Ecosystems



Bilkent University

 @anilkoyuncu

# Research Topic #1: Program Repair & Fault Localization

**Objective:** Enable self-healing CI/CD pipelines with automated bug resolution.

## Focus Areas:

- **Fix Pattern Mining:** Reusable templates from historic bug fixes.
- **Semantic Localization:** Deep mapping of bug reports to code blocks.
- **Patch Correctness:** Ensuring fixes are valid, not just overfitting.

## Active Projects

**Bug Reproduction:** Testing reproducibility in plugin ecosystems.

**Automated Patch Evaluation:** Using LLMs to verify fix semantics.

## Research Topic #2: Applied AI & Agentic SE

**Objective:** Use LLMs proactively as reasoning agents in software workflows.

### Focus Areas:

- **Agentic Reasoning:** Structuring LLM interactions to review and reflect on code.
- **Automated Provisioning:** Converting unstructured data into automated build/test environments.

### Active Projects

**Artifact Evaluation Editors:** LLMs role-playing as software reviewers.

**LLM-Driven Environments:** Building robust Docker containers from open-source repos.

## Research Topic #3: Mining Software Repositories

**Objective:** Harvest structural insights from code to characterize ecosystems.

### Focus Areas:

- **Repository Embeddings:** Encoding whole repos to measure benchmark bias.
- **Ecosystem Security:** Tracking vulnerabilities across complex dependencies.

### Active Projects

**Repo-Level Embeddings:** Evaluating the generalizability of SE benchmarks.

**Supply Chain Security:** Identifying supply-chain risks in third-party plugins.

# Networks and Systems Research Group

<http://www.cs.bilkent.edu.tr/~korpe/nsrg/>



Faculty Member

**Ibrahim Korpeoglu**

*Professor*

*Dept of Computer Engineering  
Bilkent University*

Email: [korpe@cs.bilkent.edu.tr](mailto:korpe@cs.bilkent.edu.tr)

Web: <http://www.cs.bilkent.edu.tr>

Office: Engineering EA 401

Phone: 290 2599

- **Research Areas:**
  - Computer Networks
  - Wireless Networks
  - Sensor Networks
  - P2P Networks
  - Computer Systems
  - Distributed Systems
  - Cloud Computing
  - Internet of Things
  - Big Data Systems

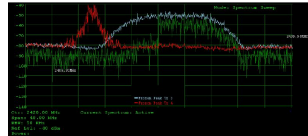
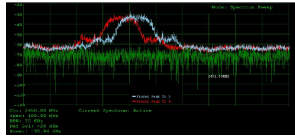
Working on Problems and Projects related with  
**Computer Networks and Computer Systems**

# Networks and Systems Research Group

## Sample Current Work

### Wireless Mesh Networks

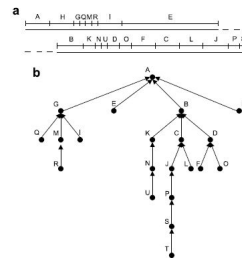
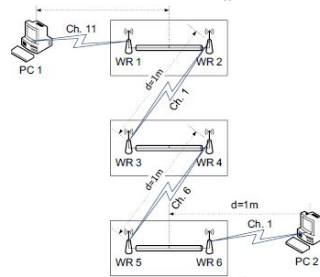
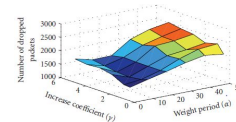
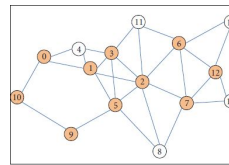
- Routing
- Channel assignment
- Interference modeling
- Interference mitigation



### Testbeds

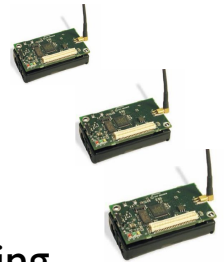
### Cloud Computing

- Resource allocation
- VM placement
- Network virtualization
- Network embedding
- Mobile Edge Computing



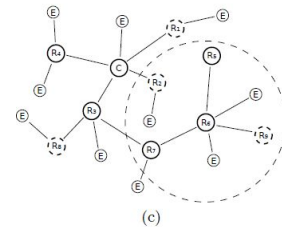
### Sensor Networks

- Energy efficient routing
- Activity scheduling
- Channel access scheduling



### P2P Networks

- Query forwarding
- Free riding



### Internet of Things

- Data and Application Placement

### Wireless Data Center Networking

# 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 Publications

- Cem Mergenci, Ibrahim Korpeoglu, **Fly-path:Traffic-based Multi-hop Routing Approach for Hybrid Wireless Data Centers**, *Computer Communications*, vol.170, March 2021
- Fatih Deniz, Hakki Bagci, Ibrahim Korpeoglu, Adnan Yazici, **Energy-Efficient and Fault-Tolerant Drone-BS Placement in Heterogeneous Wireless Sensor Networks**, *Wireless Networks*, Springer, November 2020.
- Cem Mergenci, Ibrahim Korpeoglu, **Generic Resource Allocation Metrics and Methods for Heterogeneous Cloud Infrastructures**, *Journal of Network and Computer Applications*, Volume 146, November, 2019.
- Firat Karatas, Ibrahim Korpeoglu, **Fog-Based Data Distribution Service (F-DAD) for Internet of Things (IoT) Applications**, *Future Generation Computer Systems*, Volume 93, pages 156-169, April 2019.
- Hidayet Aksu, Ibrahim Korpeoglu, Ozgur Ulusoy, **An Analysis of Social Networks based on Tera-scale Telecommunication Datasets**, *IEEE Transactions on Emerging Topics in Computing*, Volume 7, Issue 2, pages 349-360, April-June 2019.
- Metin Tekkalmaz, Ibrahim Korpeoglu, **Distributed Power-Source-Aware Routing in Wireless Sensor Networks**, *ACM-Springer Wireless Networks Journal*, 22(4), pages 1381-1399, May 2016.
- 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*, 26(4), April 2015.
- 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*, 26(10), pages 2439-2452, 2014.

More information at the group website: <http://www.cs.bilkent.edu.tr/~korpe/nsrg/>



# Özgür S. Ögüz

LiRA Lab

(Learning for Intelligent Robotic Agents)  
<https://lira-lab.github.io/>

Dept. of Computer Engineering  
Bilkent University

- Embodied / Physical A(G)I
- Foundation Models
  - LLMs, VLMs, VLAs
- Deep Reinforcement Learning
- Human-Robot Interaction



*Click [here](#) for full presentation*

# Selected Publications

- [1] B. Cicek, A.S. Yenicesu, C.B. Tuncer, K. Demiray, O.S. Oguz, "H-MaP: Iterative and Hybrid Sequential Manipulation Planner", IEEE RA-L, 2025.
- [2] C.B. Tuncer, D.S. Haliloglu, O.S. Oguz, "Sequential and Guided Manipulation Planner for Robust Planning in 2D Constrained Environments", IEEE\RSJ IROS, 2025.
- [3] C.B. Tuncer, M. Toussaint, O.S. Oguz, "MO-SeGMan: Rearrangement Planning Framework for Multi Objective Sequential and Guided Manipulation in Constrained Environments", IEEE ICRA, 2026.
- [4] V. Hartmann, O.S. Oguz et al., Long-Horizon Multi-Robot Rearrangement Planning for Construction Assembly, IEEE T-RO, 2022.
- [5] D.S. Haliloglu, O.S. Oguz, "Human-Guided Subgoal Learning for Sequential Manipulation in Narrow and Cluttered 2D Maze-like Environments," IEEE RA-L (under rev.).
- [6] B.B. Senol, O.S. Oguz, "TpTf: Leveraging Global Receptive Fields for Visual Manipulation," IEEE Trans. on Cybernetics (under review).
- [7] H.M. Simsir, O.S. Oguz, "Lagrangian Perturbation Diffusion Steering: Latent Reinforcement Learning for Generative Policies," ICML, 2026.
- [8] K. Demiray, E.E. Ceyani, O.S. Oguz, "USPC: Uncertainty-Aware Safety Propagation Critics for Safe Reinforcement Learning," TMLR (under rev.), 2026.
- [9] M. Ozcan, O.S. Oguz, "OpAC: An Optimization-Augmented Control Framework for Single and Coordinated Multi-Arm Robotic Manipulation", IEEE\RSJ IROS, 2025.
- [10] M.. Ozcan, O.S. Oguz, "Push, Press, Slide: Mode-Aware Planar Contact Manipulation via Reduced-Order Models," IEEE/RSJ IROS (under rev.), 2026.
- [11] B. Cicek, M.K. Er, O.S. Oguz, "CoRAL: Contact-Rich Adaptive LLM-Based Control for Robotic Manipulation," RSS, 2026.



# Doruk Öner

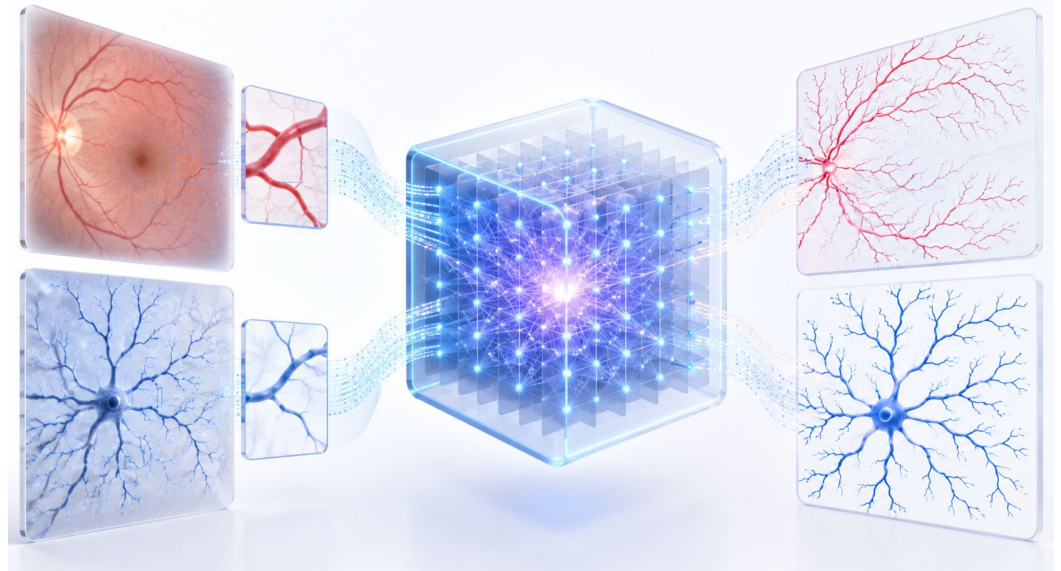
Assistant Professor | Department of Computer Engineering | Bilkent University

## NEURAVISION RESEARCH LAB

[doruk.oner@bilkent.edu.tr](mailto:doruk.oner@bilkent.edu.tr)  
EA521

## Research Topics

- Topology-aware segmentation and connectivity-preserving visual understanding
- 3D scene reconstruction from images, point clouds, neural fields, and Gaussian splatting
- Reliable medical AI: uncertainty, robustness, "OOD detection, and calibration
- Efficient learning and deployment on GPUs, FPGAs, NPUs, and edge devices



# Topology-Aware segmentation

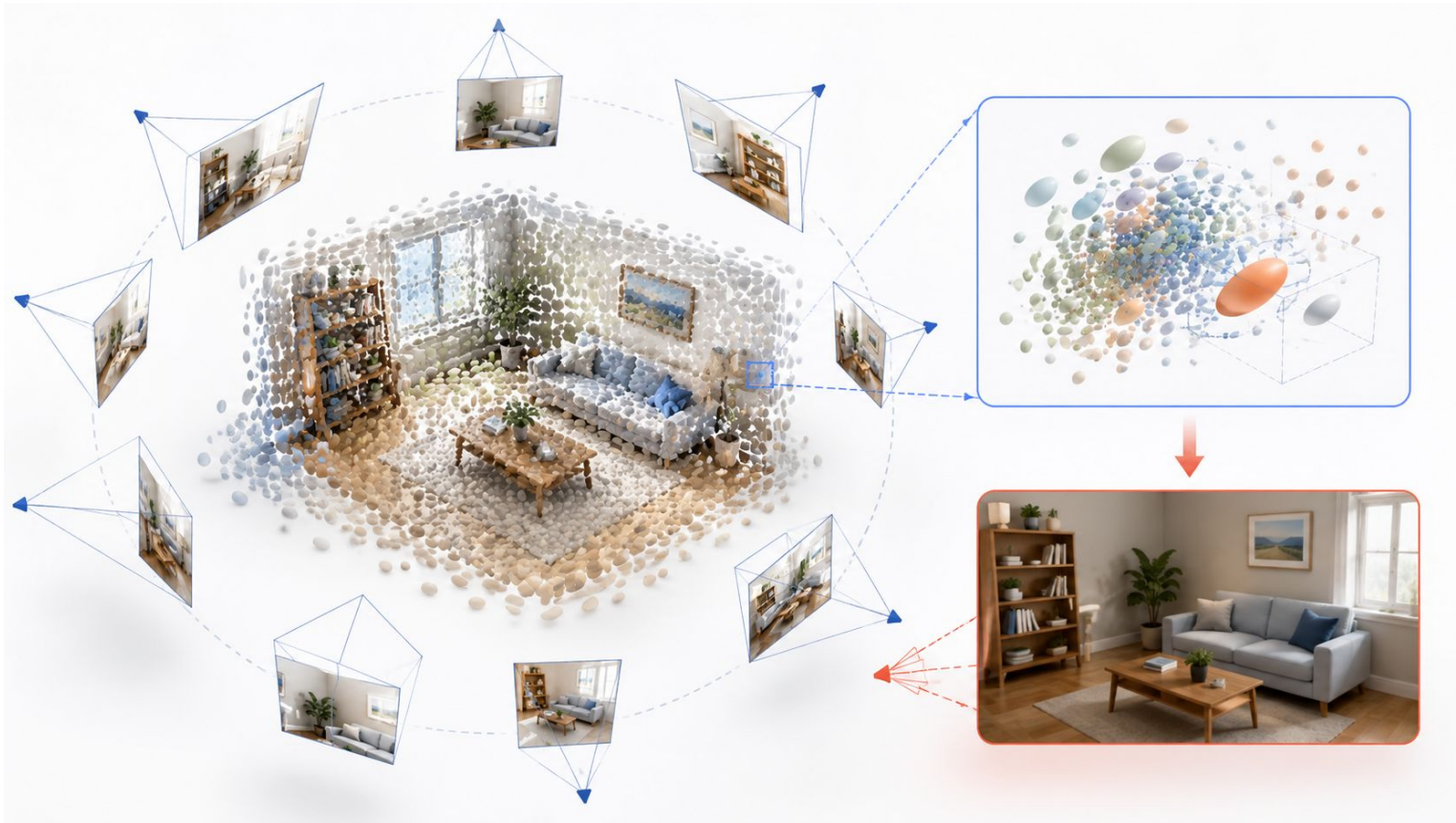
FROM PIXELS TO CONNECTED STRUCTURES



- Learn generic representations for vessels, neurons, roads, and other branching structures.
- Move from pixel-level correctness to topology-level and graph-level correctness.
- Design losses, prompts, and adaptation schemes that preserve connectivity across domains
- Combine foundational-model adaptation with differentiable topology and graph reasoning.

# 3D scene reconstruction using Gaussian splatting

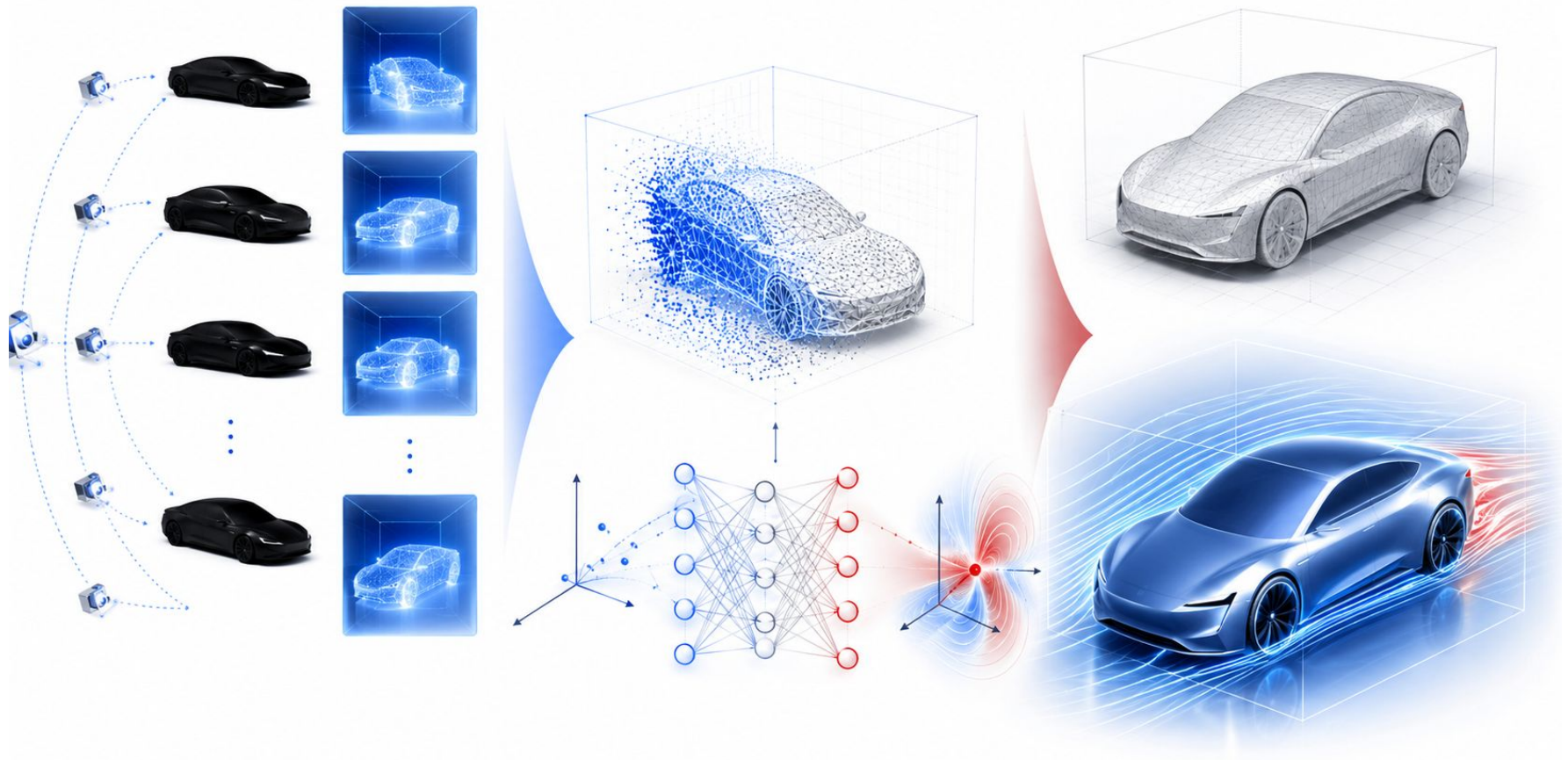
SCENE GEOMETRY FROM MANY VIEWS



- Recover complete 3D scenes from sparse or imperfect image captures.
- Use Gaussian splats as a fast, renderable scene representation.
- Study uncertainty, completeness, and geometric consistency in reconstructed scenes.
- Connect reconstruction quality to downstream navigation, inspection, and measurement tasks.

# 3D shape reconstruction and controllable representations

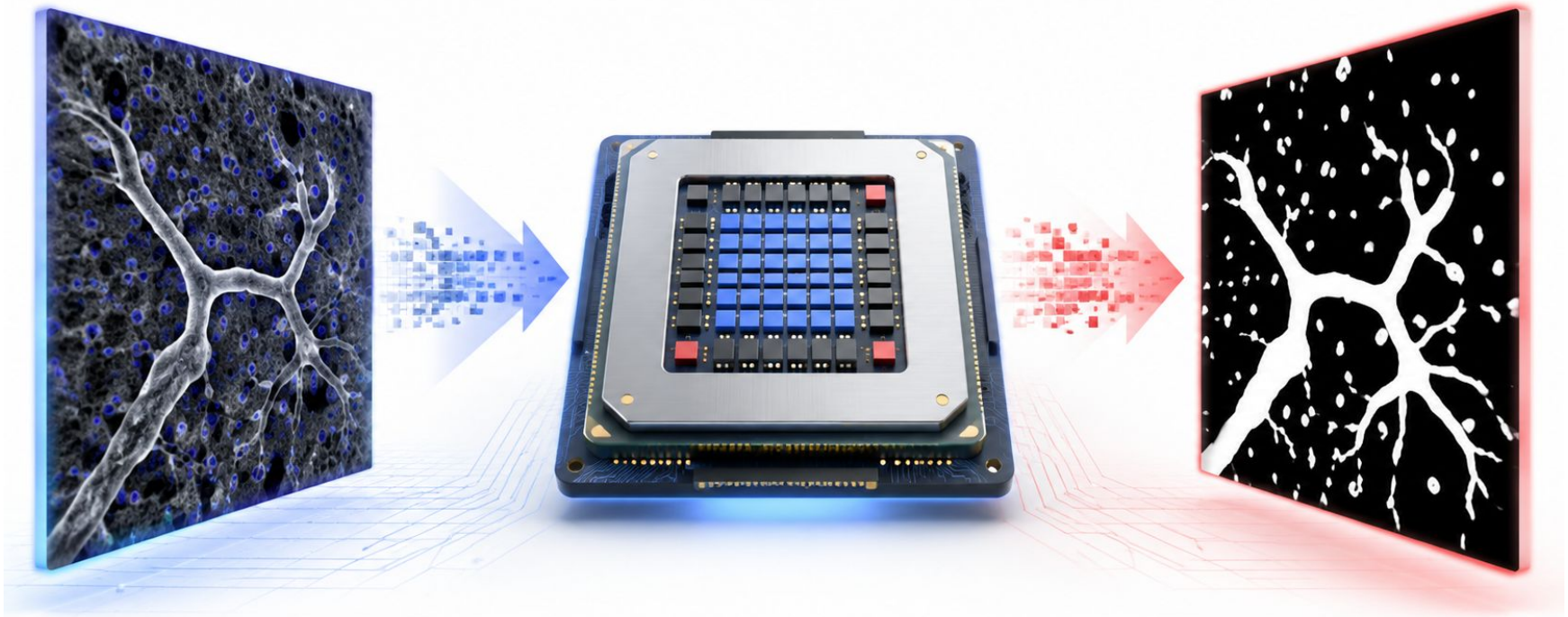
## SHAPE REPRESENTATIONS



- Reconstruct object geometry from images, silhouettes, point clouds, or partial observations.
- Work with meshes, implicit neural fields, signed distance functions, and coarse-to-fine shape priors.
- Explore controllable generative models for compact and editable 3D representations and aerodynamic optimization
- Develop representations that are useful for analysis, simulation, and design.

# Hardware acceleration of biomedical segmentation

EFFICIENT VISION FOR LARGE BIOMEDICAL DATA



- Make segmentation models fast enough for large microscopy and medical-imaging pipelines.
- Compress, approximate, and schedule models for GPUs, FPGAs, or edge devices.
- Study accuracy–latency–memory tradeoffs without losing medically important structures.
- Keep topology-aware and uncertainty-aware models practical for real deployment.

# Reliable AI

FROM PREDICTIONS TO TRUSTWORTHY DECISIONS



- Quantifies model confidence in each segmentation prediction
- Out-of-distribution detection and robust deployment of vision models
- Industrial computer vision and real-time visual inspection systems

# Selected recent publications

CAPE: Connectivity-aware path enforcement loss for curvilinear structure delineation

*E. Esmailzadeh, E. Garaaghaji, F. Hallaji Azad, D. Oner • MICCAI, 2025*

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Harnessing deep learning to detect bronchiolitis obliterans syndrome from chest CT

*M. Koziński, D. Oner, J. Gwizdała, et al. • Communications Medicine, 2025*

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Vision-based power line cables and pylons detection for low flying aircraft

*J. Gwizdała, D. Oner, S. K. Roy, et al. • Machine Vision and Applications, 2025*

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PartsdF: Part-based implicit neural representation for composite 3d shape parametrization and optimization

*Nicolas Talabot, Olivier Clerc, Arda Cinar Demirtas, Alexis Goujon, Hieu Le, Doruk Oner, Pascal Fua • TMLR, 2025*

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IT3 : Idempotent Test-Time Training

*Nikita Durasov, Assaf Shocher, Doruk Oner, Gal Chechik, Alexei A Efros, Pascal Fua • ICML, 2025*

---

Enabling uncertainty estimation in iterative neural networks

*Nikita Durasov, Doruk Oner, Jonathan Donier, Hieu Le, Pascal Fua • ICML, 2024*

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Persistent homology with improved locality information for more effective delineation

*D. Oner, A. Garin, M. Koziński, K. Hess, P. Fua • IEEE TPAMI, 2023*

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Enforcing connectivity of 3D linear structures using their 2D projections

*D. Oner, H. Osman, M. Koziński, P. Fua • MICCAI, 2022*

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# Sinem Sav

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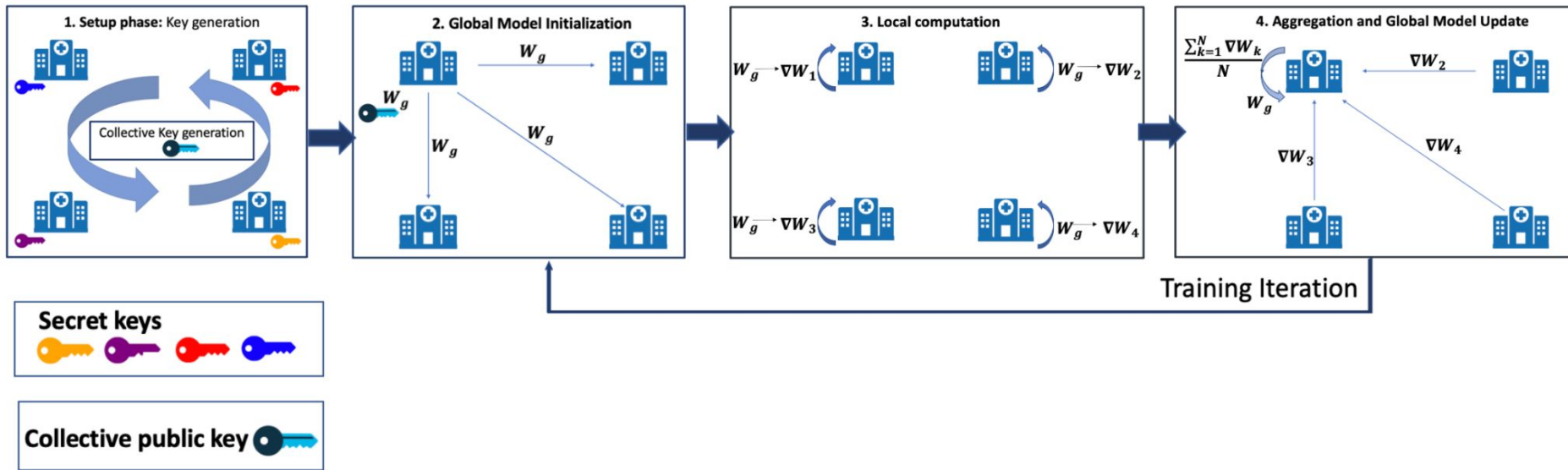


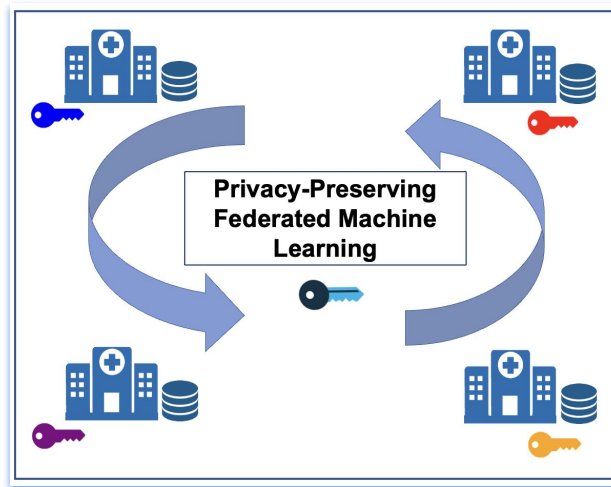
Applied Security and Privacy Lab

At ASAP lab, we mainly work on the following:

- Secure and private federated learning pipelines
- Applied security for machine learning
- Privacy-preserving healthcare systems such as drug discovery and single-cell analysis
- Privacy attacks and defense mechanisms for machine learning

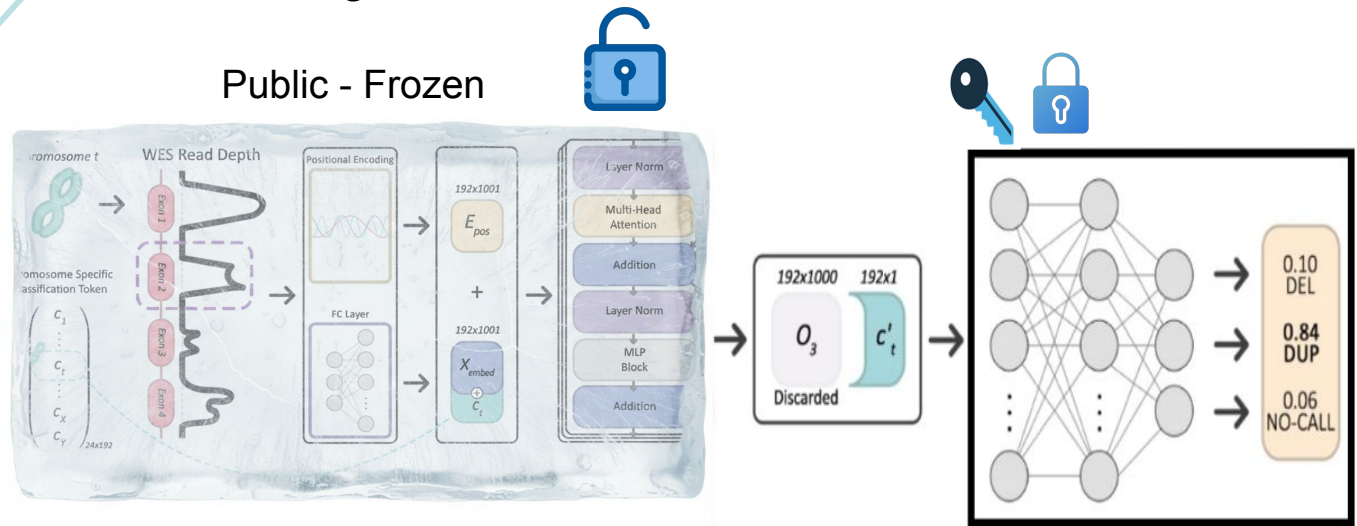
# Privacy-Preserving Federated Learning using Homomorphic Encryption



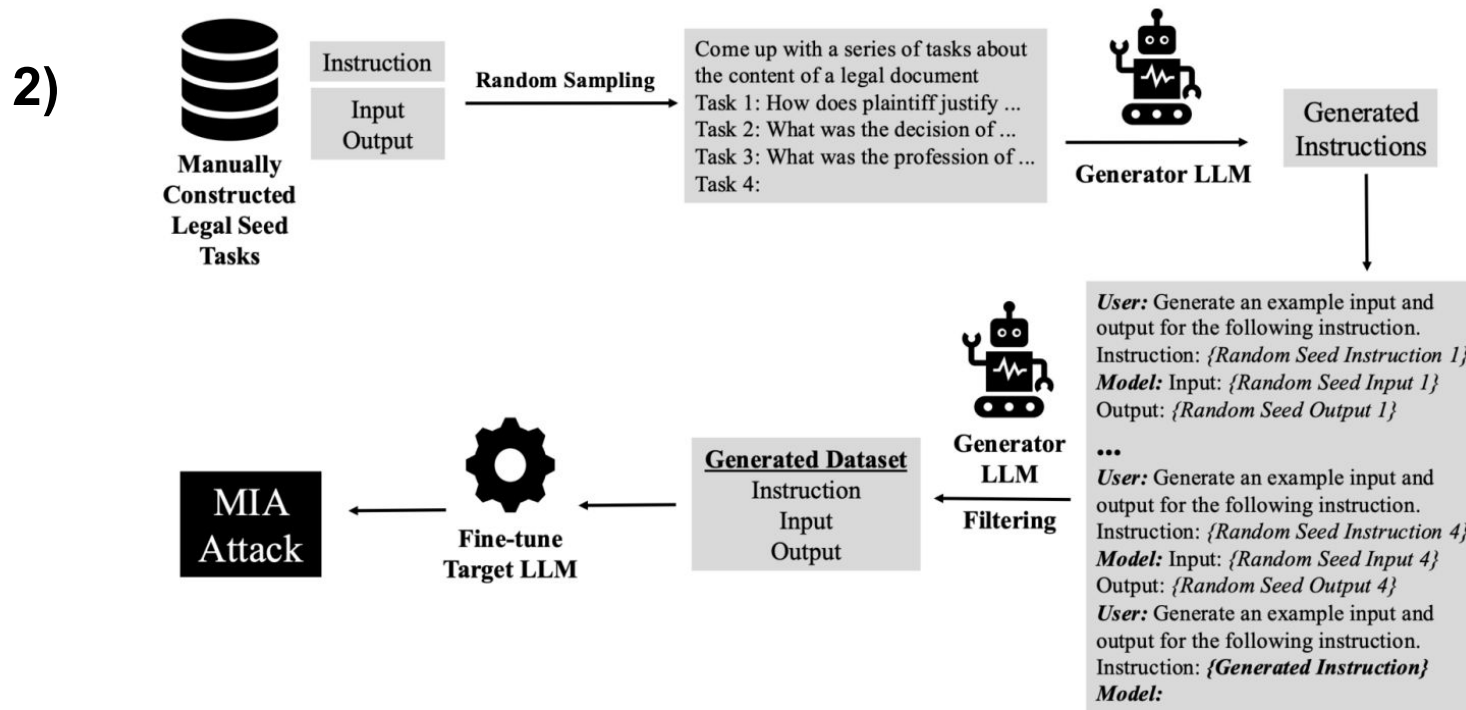


Transformer weights are publicly available. Private fine-tuning on MLP:

**Genomics**



# Does fine-tuning with LLM-generated data enhance privacy, or does it pose additional privacy risks?



# Selected Publications

- Akkus, A., Aghdam, M. P., Li, M., Chu, J., Backes, M., Zhang, Y., & Sav, S. (2025). Generated data with fake privacy: Hidden dangers of fine-tuning large language models on generated data. In *34th USENIX Security Symposium (USENIX Security 25)* (pp. 8075-8093).
- Coşğun, M., Gençtürk, M., & Sav, S. (2026). Bridging Local and Federated Data Normalization in Federated Learning: A Privacy-Preserving Approach. *IEEE Transactions on Big Data*.
- Kanpak, H. I., Shabbir, A., Genç, E., Küpçü, A., & Sav, S. (2024). Cure: Privacy-preserving split learning done right. Accepted at PoPETS, 2026.
- Poorghaffar Aghdam, M., Shukueian Tabrizi, S., Ayöz, K., Ayday, E., Sav, S., & Çiçek, A. E. (2025). A reinforcement learning-based approach for dynamic privacy protection in genomic data sharing beacons. *Genome Biology*, 26(1), 400.
- Saleem, K., Cicek, A. E., & Sav, S. (2025). Beacon Reconstruction Attack: Reconstruction of genomes in genomic data-sharing beacons using summary statistics. *Bioinformatics*, 41(6), btaf273.
- Sav, S., Bossuat, J. P., Troncoso-Pastoriza, J. R., Claassen, M., & Hubaux, J. P. *Privacy-preserving federated neural network learning for disease-associated cell classification. Patterns*. 2022 May; 3 (5): 100487.
- Sav, S., Pyrgelis, A., Troncoso-Pastoriza, J. R., Froelicher, D., Bossuat, J. P., Sousa, J. S., & Hubaux, J. P. (2020). POSEIDON: Privacy-preserving federated neural network learning. *NDSS*, 2021.

# Abdullah Talayhan

KAFES

Bilkent Cryptography & Security Lab

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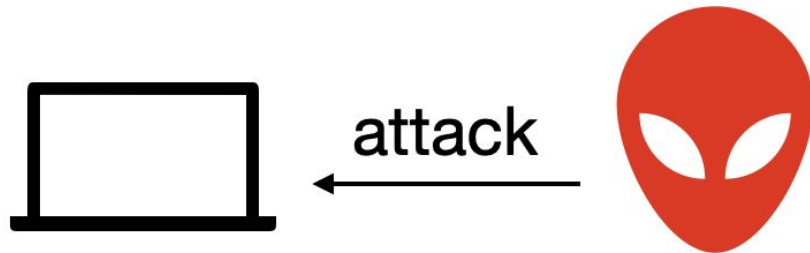


## Research Areas:

- Post-quantum cryptography
- Zero-knowledge proofs
- Digital Signatures
- More: <https://kafes.cs.bilkent.edu.tr/research/>

Join us: <https://kafes.cs.bilkent.edu.tr/join/>

## Classical Cryptography



we defend using hard problems  
against classical computers

## Post-quantum Cryptography



we defend using hard problems  
against quantum computers



Our goal is to develop efficient  
protocols suitable for real-world  
deployments and prove their **security**  
against **quantum computers**.

# Eray Tüzün

Bilkent University Software Engineering and Data Analytics Research Group

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## Research Areas

- Software Analytics / Intelligence
- Machine Learning & Data Science for Software Engineering
- AI for Software Engineering
- Software Productivity

Interested in being part of our research group?  
Please contact us at  
[eraytuzun@cs.bilkent.edu.tr](mailto:eraytuzun@cs.bilkent.edu.tr)



# Recent Publications

- Utku Boran Torun, Mehmet Taha Demircan, Mahmut Furkan Gön, and Eray Tüzün. 2026. Past, Present, and Future of Bug Tracking in the Generative AI Era. ACM Trans. Softw. Eng. Methodol. Just Accepted (April 2026). <https://doi.org/10.1145/3806655>
- Uğur Can Altun, Ismail Sergen Göçmen, Emre Sülün, Erdem Tuna, and Eray Tüzün. 2025. Process smells in practice: an evaluative case study. Empirical Softw. Engg. 30, 5 (May 2025). <https://doi.org/10.1007/s10664-025-10664-8>
- Elnouby, Y., Uysal, S., Cihan, U., Erdogmus, H., Tüzün, E. (2026). DevScholar: A Reuse-Based Approach for Evaluating Developer Contribution. In: Taibi, D., Smite, D. (eds) Software Engineering and Advanced Applications. SEAA 2025. Lecture Notes in Computer Science, vol 16083. Springer, Cham. [https://doi.org/10.1007/978-3-032-04207-1\\_14](https://doi.org/10.1007/978-3-032-04207-1_14)
- Göçmen, I.S., Cezayir, A.S. & Tüzün, E. Enhanced code reviews using pull request based change impact analysis. Empir Software Eng 30, 64 (2025). <https://doi.org/10.1007/s10664-024-10600-2>
- Fereshteh Vedadi, Ali Emir Güzey, Giray Akyol, and Eray Tüzün. 2025. Predicting the Next Generation of Key Developers: A Dual-Methodology Approach. ACM Trans. Softw. Eng. Methodol. Just Accepted (December 2025). <https://doi.org/10.1145/3779119>
- A. T. Işık, H. Kübra Çağlar and E. Tüzün, "Enhancing Pull Request Reviews: Leveraging Large Language Models to Detect Inconsistencies Between Issues and Pull Requests," 2025 IEEE/ACM Second International Conference on AI Foundation Models and Software Engineering (Forge), Ottawa, ON, Canada, 2025, pp. 168-178, doi: 10.1109/Forge66646.2025.00027.



HOME RESEARCH

**BILSEN**

Bilkent University Software Engineering and Data Analytics Research Group



**BILSEN (Bilkent University Software Engineering and Data Analytics Research Group)** of [Computer Engineering Department](#) at [Bilkent University](#) has been performing research studies on software engineering domain over the last decade.

Bilkent University Software Engineering and Data Analytics Research Group (BILSEN)

<https://bilsengroup.github.io>

Interested in being part of our research group?  
Please contact us at [eraytuzun@cs.bilkent.edu.tr](mailto:eraytuzun@cs.bilkent.edu.tr)



@eraytuzun

<http://twitter.com/eraytuzun>

# Özgür Ulusoy

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URL: <http://www.cs.bilkent.edu.tr/~oulusoy/>

## Current Research Areas

- **Text-to-SQL Systems**
- **Web Search Engines**
- **Multimedia Database Systems**
- **Social Network Analysis**
- **Resource Optimization in Wireless Sensor Networks**

# Text-to-SQL Systems

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## Recent Publications

- H. A. Caferoğlu, M. S. Çelik, Ö. Ulusoy, '*SING-SQL: A Synthetic Data Generation Framework for In-Domain Text-to-SQL Translation*', **arXiv:2509.25672**, 2025.
- H. A. Caferoğlu, Ö. Ulusoy, '*E-SQL: Direct Schema Linking via Question Enrichment in Text-to-SQL*', **arXiv:2409.16751**, 2024.
- A. Usta, A. Karakayalı, Ö. Ulusoy, '*xDBTagger: explainable natural language interface to databases using keyword mappings and schema graph*', **VLDB Journal**, 2024.
- A. Usta, A. Karakayalı, Ö. Ulusoy, '*DBTagger: Multi-Task Learning for Keyword Mapping in NLIDBs Using Bi-Directional Recurrent Neural Networks*', **Very Large Databases (VLDB) Conference**, 2021.

## Recently Funded Projects

- '*Translating Natural Language Queries into Structured Query Language (SQL) Using Large Language Models (LLM)*', **TÜBİTAK** 1001 (Grant No: 125E386), 2025-2027
- '*Applying Information Retrieval Paradigms in Natural Language to SQL Translation*', **TÜBİTAK** 1001 (Grant No: 118E724), 2019-2021

<https://bilkent-text-to-sql-research-group.github.io/>

# Web Search Engines

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## Recent Publications

- S. Yigit-Sert, I.S. Altingovde, Ö. Ulusoy, '*Diversity-aware strategies for static index pruning*', **Information Processing & Management**, 2024.
- S. Yigit-Sert, I.S. Altingovde, C. Macdonald, I. Ounis, Ö. Ulusoy, '*Explicit diversification of search results across multiple dimensions for educational search*', **Journal of the Association for Information Science and Technology (JASIST)**, 2021.
- A. Usta, R. Ozcan, I. S. Altingovde, Ö. Ulusoy, '*Learning to Rank for Educational Search Engines*', **IEEE Transactions on Learning Technologies**, 2021.
- S. Yigit-Sert, I.S. Altingovde, C. Macdonald, I. Ounis, Ö. Ulusoy, '*Supervised approaches for explicit search result diversification*', **Information Processing & Management**, 2020.
- T. Yilmaz, R. Ozcan, I. S. Altingovde, O. Ulusoy, '*Improving Educational Web Search for Question-like Queries through Subject Classification*', **Information Processing and Management**, 2019.
- E. Sarigil, I. S. Altingovde, R. Blanco, B. Cambazoglu, R. Ozcan, Ö. Ulusoy, '*Characterizing, predicting, and handling web search queries that match very few or no results*', **Journal of the Association for Information Science and Technology (JASIST)**, 2018.
- E. Sarigil, O. Yilmaz, I. S. Altingovde, R. Ozcan, Ö. Ulusoy, '*A "Suggested" Picture of Web Search in Turkish*', **ACM Transactions on on Asian and Low-Resource Language Information Processing**, 2016.
- R. Ozcan, I. S. Altingovde, B. B. Cambazoglu, Ö. Ulusoy, '*Second Chance: A Hybrid Approach for Dynamic Result Caching and Prefetching in Search Engines*', **ACM Transactions on the Web**, 2014.

# Multimedia Databases

(joint work with Prof. Uğur Güdükbay)

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## Recent Publications

- D. Durmus, U. Güdükbay, Ö. Ulusoy, '*Learning visual similarity for image retrieval with global descriptors and capsule networks*', **Multimedia Tools and Applications**, 2024.
- F. Calısır, M. Bastan, Ö. Ulusoy, U. Güdükbay, '*Mobile Multi-View Object Image Search*', **Multimedia Tools and Applications**, 2017.

<http://www.cs.bilkent.edu.tr/~bilmdg>

# Social Network Analysis

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## Recent Publications

- A.N.N. Rende, T. Yilmaz, Ö. Ulusoy, '*Negotiating Comfort: Simulating Personality-Driven LLM Agents in Shared Residential Social Networks*', **arXiv:2507.09657**, 2025.
- A.N.N. Rende, T. Yilmaz, Ö. Ulusoy, '*Crowd: A Social Network Simulation Framework*', **IEEE Transactions on Computational Social Systems**, 2025.
- T. Yilmaz, Ö. Ulusoy, '*Misinformation Propagation in Online Social Networks: Game Theoretic and Reinforcement Learning Approaches*', **IEEE Transactions on Computational Social Systems**, 2023.
- H. Aksu, I. Körpeoğlu, Ö. Ulusoy, '*An Analysis of Social Networks based on Tera-scale Telecommunication Datasets*', **IEEE Transactions on Emerging Topics in Computing**, 2019.
- H. Aksu, M. Canim, Y. C. Chang, I. Körpeoğlu, Ö. Ulusoy, '*Distributed k-Core View Materialization and Maintenance for Large Dynamic Graphs*', **IEEE Transactions on Knowledge and Data Engineering**, 2014.

<https://github.com/bilkent-sna>

# Resource Optimization in Wireless Sensor Networks

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(joint work with Prof. İbrahim Körpeoğlu)

## Recent Publications

- M. C. Cavdar, I. Körpeoğlu, Ö. Ulusoy, '*Application Scheduling with Multiplexed Sensing of Monitoring Points in Multi-purpose IoT Wireless Sensor Networks*', **IEEE Transactions on Network and Service Management**, 2024.
- M. C. Cavdar, I. Körpeoğlu, Ö. Ulusoy, '*Application placement with shared monitoring points in multi-purpose IoT wireless sensor networks*', **Computer Networks**, 2022.