100+ Full-time Faculty

2271 Undergrad Students

455 Grad Students

300 Publications/yr

75 Laboratories

88 Ongoing Projects; 58.5 MTL budget

43 Staff

6800 Alumni

4714 UG

1393 MS

256 PhD

12 Laboratory Staff
Student Numbers

**Undergraduate Student Enrollment**

- Industrial Engineering: 786
- Mechatronics Engineering: 190
- Materials Science and Engineering: 59
- Computer Science and Engineering: 321
- Electronics Engineering: 128

**Total**: 2271

*Undeclared students: 728

**Undergraduate Student Alumni**

- Mechatronics Engineering: 51
- Computer Science and Engineering: 66
- Electronics Engineering: 26
- Materials Science and Engineering: 19
- Molecular Biology, Genetics and Bioengineering: 20

**Total**: 398

4714 UG
Student Numbers

Graduate Student Enrollment

<table>
<thead>
<tr>
<th>Discipline</th>
<th>MS</th>
<th>PhD</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMPUTER SCIENCE &amp; ENGINEERING</td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>ELECTRONICS ENGINEERING</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>INDUSTRIAL ENGINEERING</td>
<td></td>
<td>35</td>
</tr>
<tr>
<td>MANUFACTURING ENGINEERING</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>MATERIALS SCIENCE &amp; ENGINEERING</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>MATHEMATICS</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>MECHATRONICS ENGINEERING</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>MOL. BIO., GENETICS &amp; BIOENGINEERING</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>PHYSICS</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>DATA ANALYTICS</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>ENERGY TECHNOLOGIES &amp; MANAGEMENT</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>INFORMATION TECHNOLOGY</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>
Student Numbers

Graduate Student Alumni

- COMPUTER SCIENCE & ENGINEERING
- ELECTRONICS ENGINEERING
- INDUSTRIAL ENGINEERING
- MANUFACTURING ENGINEERING
- MATERIALS SCIENCE & ENGINEERING
- MATHEMATICS
- MECHATRONICS ENGINEERING
- MOL. BIO., GENETICS & BIOENGINEERING
- PHYSICS
- DATA ANALYTICS
- ENERGY TECHNOLOGIES & MANAGEMENT
- INFORMATION TECHNOLOGY

Non-Thesis Master's Programs

- MS
- PhD

1393 MS
256 PhD
Publications

Web of Science Categories

SNIP Factor Distribution
Publications

285 PAPERS PUBLISHED WITH COLLABORATIONS FROM ALL AROUND THE WORLD
Publications
89 PAPERS PUBLISHED
WITH COLLABORATIONS FROM EUROPE
Projects

88

FACULTY OF ENGINEERING AND NATURAL SCIENCES

7 Projects
₺ 3.8 M

39 Projects
₺ 23.2 M

5 Projects
₺ 3.2 M

33 Projects
₺ 5.3 M

The budget of the Center of Excellence in Data Analytics (CEDA) is included.

FACULTY OF ENGINEERING AND NATURAL SCIENCES & SABANCI UNIVERSITY NANOTECHNOLOGY RESEARCH AND APPLICATION CENTER (SUNUM)

1 Project
₺ 2.0 M

1 Project
₺ 1.0 M

Budget Source as of June 2018

EU
Non-Governmental Organizations/University/Other
TUBITAK
TUBITAK
Business Enterprises
<table>
<thead>
<tr>
<th>Patent Title</th>
<th>Inventors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multifunctional Tools For Endoscopic Surgery</td>
<td>Meltem Elitaş</td>
</tr>
<tr>
<td>Additive For Suspensions</td>
<td>Özge Akbulut, Yusuf Menceloğlu</td>
</tr>
<tr>
<td>A Micromixer Based Hydrodynamic Cavitation</td>
<td>Ali Koşar</td>
</tr>
<tr>
<td>Nanoplasmic Device With Nanoscale Cooling</td>
<td>Ali Koşar, Kürşat Şendur</td>
</tr>
<tr>
<td>Pharmaceutical Drug Delivery System</td>
<td>Ali Koşar</td>
</tr>
<tr>
<td>Artificial Hollow Biological Tissue Network And Method For Preparation Thereof</td>
<td>Bahattin Koç</td>
</tr>
<tr>
<td>Stable Electrospinning Composition For Stable Nano/Submicrostructure Production And Preparation Method Thereof</td>
<td>Melih Papila, Yusuf Menceloğlu</td>
</tr>
<tr>
<td>Method For Production Of Three-Dimensional Closed Graphene-Based Nano/Micro Structures</td>
<td>Yusuf Menceloğlu, Mehmet Yildiz, Burcu Saner Okan</td>
</tr>
<tr>
<td>Self-Healing System Comprising Logitudinal Nano/Microstructures And Method Of Production Thereof</td>
<td>Yusuf Menceloğlu, Mehmet Yildiz, Melih Papila, Volkan Özugü, Burcu Saner Okan</td>
</tr>
<tr>
<td>Food Packaging Material with Antibacterial, Ethylene Scavenging and Barrier Properties</td>
<td>Yusuf Menceloğlu, Fevzi Çakmak Cebeci, Hayriye Ünal, Serkan Ünal</td>
</tr>
<tr>
<td>Variable Negative Stiffness Actuation</td>
<td>Volkan Patoğlu</td>
</tr>
<tr>
<td>A Series Elastic Holonomic Mobile Platform For Upper Extremity Rehabilitation</td>
<td>Volkan Patoğlu</td>
</tr>
<tr>
<td>Exoskeleton</td>
<td>Volkan Patoğlu</td>
</tr>
<tr>
<td>Large Format Short Wave Infrared (SWIR) Focal Plane Array (FPA) With Low Noise And High Dynamic Range</td>
<td>Yaşar Gürbüz</td>
</tr>
</tbody>
</table>
Alumni in Academy – 2019

Dr. Zeynep Temel (ME PhD, 2013) is an Assistant Professor in the Robotics Institute at the Carnegie Mellon University.

Canan Dagdeviren (MAT MSc., 2009) started at a Faculty position in the EECS Department at MIT and in the MIT Media Lab in January 2018.

Serap Aksu (MAT BSc, 2008) is an Assistant Professor at Koç University.

Dr. Elif Özden Yenigun (MAT PhD, 2013) is Senior Tutor in textiles at the Royal College of Art.

Ahu Gümrah Dumanlı (MAT PhD, 2008) is a Faculty Member in Imperial College London.

Kübra Kalkan Çakmakçı (CS MSc, 2011) is an Assistant Professor at Özyeğin University.

Aycan Adrian Corum (EE MSc, 2012) is a Faculty Member at Cornell University.

Rabia Tügce Yazıcılı (EE BS, 2009) is an Assistant Professor (ECE) at Boston College of Engineering.

Ece Gelal (Telecommunications BS, 2004) is an Assistant Professor at Bahçeşehir University, Faculty of Engineering and Natural Sciences, Computer Engineering Department.

Aydın Aysu (EE MSc, 2010) is an Assistant Professors at Electrical and Computer Engineering department of North Carolina State University.
Centers and Forums

SU Nanotechnology Research and Application Center (SUNUM)
SU Integrated Manufacturing Research and Application Center (SU IMC)
Center of Excellence for Functional Surfaces and Interfaces (EFSUN)
Center of Excellence in Data Analytics (CEDA)
Our Placement in University Rankings

Engineering - General

2019
251–300

Electrical & Electronic Eng.

2019
251–300

Mechanical & Aeronautical Eng.

2019
251–300

Computer Science

2019
301–400
Faculty of Engineering and Natural Sciences

fens.sabanciuniv.edu/en
Cofounders

Selim Balcısoy
balcisoy@sabanciuniv.edu
SPEED: The speed at which an analytic outcome must be produced (e.g., near real-time, hourly, daily) or the time it takes to develop and implement the analytic solution.

ANALYTIC COMPLEXITY: Algorithmic complexity (e.g., complexity class and execution resources).

ACCURACY & PRECISION: The ability to produce exact versus approximate solutions as well as the ability to provide a measure of confidence.

DATA SIZE: The size of the dataset (e.g., number of rows).

DATA COMPLEXITY: The data type, formal complexity measures including measures of overlap and linear separability, number of dimensions/columns, and linkages between datasets.

Balancing the Five Analytic Dimensions

Source: Booz Allen Hamilton
Behavioral attributes and financial churn prediction

Erdem Kaya1, Xiaowen Dong2, Yoshihiko Suhara3, Selim Balcişoy1, Bürçin Bozkaya1 and Alex "Sandy" Pentland1

Figure 3 Feature Importance Analysis. Illustrated is the importance of the features which were calculated based on the mean decreasing values of area under ROC curve after randomly permuting the relevant feature. Higher decreasing value of a feature indicates more contribution.
Segmentation-based labels are highly correlated with each other.
InitialInsights
Low-fidelity prototyping with simple collaborative tabletop computer-aided design systems (Computer & Graphics Journal, 2017)

Tangy: Tabletop Visual Analytic System

Spatio-temporal Data Visualization
Building a Visual Analytics Tool for Location-based Services (Book Chapter, 2015, Geo-intelligence and Visualization through Big Data Trends, IGI Global)

DimXplorer: Progressive Visual Analytics
Research Topics
Identify trends and anomalies
Behaviour Analytics platforms for Experts
Human Data & AI Interaction

Agent Mind
- Gesture Recognition
- Visualization
- Conversation Mining

Visual Analytics

Message
- **Sender**: VA Visualization
- **Receiver**: Agent Mind
- **Intent**: Registration

Message
- **Sender**: VA Gesture Recog.
- **Receiver**: Agent Mind
- **Intent**: Touched Data
- **Message**: {Touched Location}

Message
- **Sender**: User Tracking
- **Receiver**: Speech Recog.
- **Intent**: Speaker
- **Message**: {Speaker Id}

Fig. 4
The multi-display wall. The top display visualizes an agent's version of data. The bottom display shows extra information about the data, including charts. It also visualizes the meeting environment, with the current speaker highlighted in red.

It takes input from all senses (i.e. hearing, sight, touch) and then decides where to route it. In our scenario, the hearing is accomplished through microphones, seeing through Kinect's visual input, and touch through tabletop. After taking the raw input from its "senses", the agent routes this input to the designated sub-modules for processing (e.g. audio stream to speech recognition).

Afterwards, it decides whether the processed output should be further routed to other sub-modules (e.g. processed data to visualization), or whether it should be logged in the meeting notes. In the end of the meeting, the agent generates the notes which include users' speech transcriptions with time-stamps, users positions and emotions during the meeting, users actions such as table touching, and the problems discussed and solutions generated.

Essentially, the agent's mind enables inter sub-module communication as it contains an intrinsic socket server. When each of the sub-modules starts, they send their identification to the mind. The top message in figure 5.b. depicts a sample message for registration. After each of the sub-modules is registered to the agent, they can communicate with each other through the agent's mind.

Each sub-module has a message handler. Whenever a message is received by a sub-module, its handle is triggered. In other words, the socket server uses push notification rather than the pull notification [40]. An example of such message is the second message in figure 5.b. If a sub-module needs to send a message to another sub-module, the message should contain the receiver sub-module's name, sender sub-module's name, and the message itself. The agent then routes the message to the designated destination (see figure 5.b).

5.2 Visual Analytics System
The tabletop serves as a medium for visual analytics, which takes input through gestures. Its software includes two sub-modules responsible for data visualization and gesture recognition respectively.

5.2.1 Data Visualization
As described in section 4, we visualize the branches of a given segment of our insurance company data on a map by using their longitude and latitude information. In our data, a segment can be either performance, governance or response. When a segment is chosen, its sub-segments are displayed as red, yellow or green based on the selected segment. Figure 6 depicts data visualization on the tabletop.
Insurance Fraud Detection:

A Network Modeling and Behavioral Analytics Approach
Overview

Number of Insurance Policy Holders: 6,700,000

Reported Complex Fraud Cases (2014-15): 27,000

Two-stage analytical approach to identify or predict fraud cases:

1) develop a network-based model that links various parties involved in insurance contracts and claim processing, and use it to identify (behavioral) predictor variables

2) use a gradient boosting algorithm to classify accident loss claims as fraudulent or non-fraudulent.

Model Results (2014-15): 172,000
Model Accuracy 97.4%
Network Modeling

– Commercial vehicles, periodic collusions

– Persona: Small & Medium Enterprise
  – Accidents with near-by SME vehicles
  – Periodic accidents
  – Trades vehicles occasionally

– Luxury cars/Company cars, Irregularities

– Persona: Shady Car Dealership
  – does expertise reports
  – owns repair shop
  – owns insurance agency
  – owns rent-a-car/leasing
  – trades used cars/parts

• Personal #1:
  
  PERSONA #1:
  4.5 YILDA
  29 FARKLI ARAÇ
  32 KAZA

• Personal #2:
  
  PERSONA #2:
  4.5 YILDA
  OTO TİC
  OTO KIRALAMA
  SIGORTA
  EKSPER
  120 FARKLI ARAÇ
  120 KAZA

Ornek durum: Hamar için yapılan ödemeler ile ara son dúvida piyasada değerin birbirine yakın olması durumu
Behavioral Predictors
Testing

5 fold X-validation

- Train: AUC-mean: 0.9977,
- Test: AUC-mean: 0.9976

Using class probabilities as scores

- 0.85 threshold => 0.97 accuracy

The frequency distribution of customers’ calculated scores (fraud probabilities)

The Confusion Matrix