Research Areas at EPS-UAM

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Escuela Politécnica Superior

UAM UNIVERSIDAD AUTONOMA DE MADRID

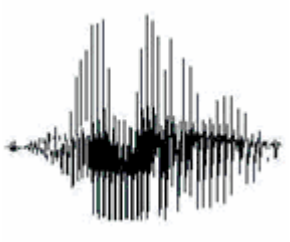
Research Groups

- Biometric Recognition Group (ATVS)
- Digital System Lab (DSLab)
- Machine Learning Group (GAA)
- Group for Advanced Interactive Tools (GHIA)
- Biological Neurocomputation Group (GNB)
- Radiocommunication Systems Group (GSRCO)
- High Performance Computing and Networking (HPCN)
- Human Computer Technology Lab (HCTLab)
- Information Retrieval Group (IRG)
- Video Processing & Understanding Lab (VPU-Lab)
- Biomedical Signal Processing Group (GTSB)
- Control, Computación, Cognición y Comunicaciones para mejorar la calidad de vida (C4LIFE)

Biometric Recognition Group - ATVS

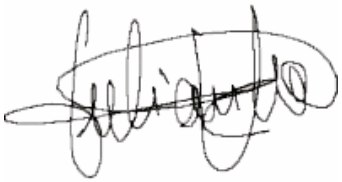
- The Biometric Recognition Group is devoted to research in the areas of biometrics, pattern recognition, image analysis, and speech and signal processing.
- The group maintains European public projects and is also working in national projects and diverse contracts with companies, which are leaders in this sector.
- http://atvs.ii.uam.es/

Biometric Recognition Group - ATVS

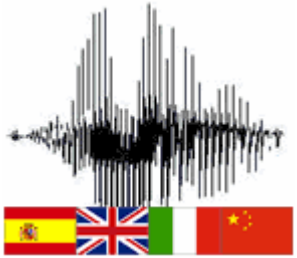


Speech

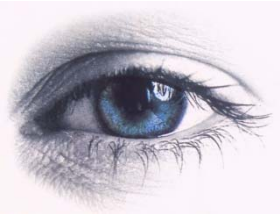
Fingerprint



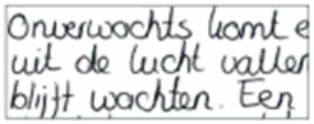
Signature



Language



Iris



Handwritting

Multibiometrics

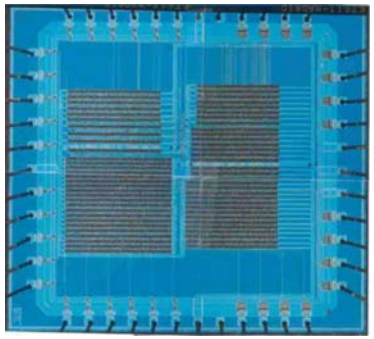
Forensic Biometrics

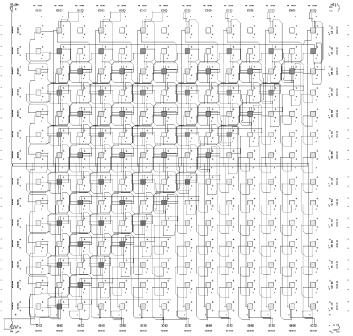
Security

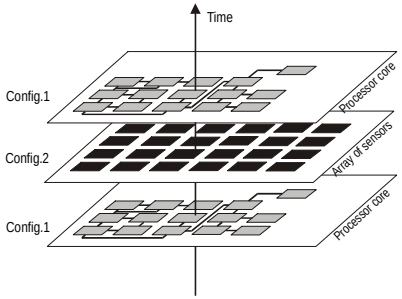
Databases

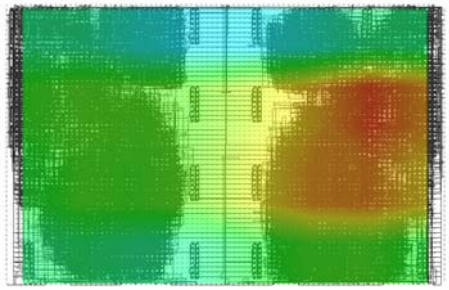
Digital System Lab - DSlab

- http://arantxa.ii.uam.es/~euroform_dslab/
- Field Programmable Gate Arrays (FPGA)
- Integrated Circuits Design Methodology
- Digital Design Methodology
  - Self-Timed Synchronization
  - High speed – minimum latency
  - Low Consumption Design
  - Thermal Analysis and Verification









Digital System Lab - DSlab

- Contracts with companies
  - FEDETEC
    - HW Architecture for Emergency Centers
    - 112 phone number in Madrid
    - Deployed in 200+ cities
  - KERAJET
    - Development of the head controller in a printer for glazed tiles.
    - Embedded processor Microblaze / FPGA Spartan 3
  - CECOFERSA
    - Web portal B2B for 100 hardware stores

Machine Learning Group - GAA

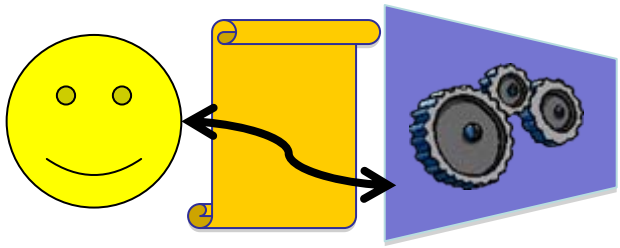
- http://arantxa.ii.uam.es/~gaa/
- Wind power prediction systems
  - Wind power: more than 11% of the total energy consumed in Spain.
  - Difficult to control: how much is wind going to blow today?
  - By using mathematical models, systems can be constructed to predict how much energy is going to be generated in the following hours.
- Fraud detection systems in methods of payment
  - Problem: when someone uses my credit card: is it me or someone is passing himself off as me?
  - Mathematical models “learn” the user and defrauder behaviour.

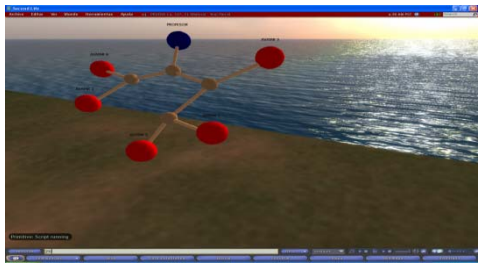
Machine Learning Group - GAA

- Selection of variables in highly dimensional classification problems
  - Algorithms to identify a subset of relevant variables in classification problems.
  - Development of new techniques to improve the efficiency of existing algorithms in highly dimensional problems.
  - Application to real problems
    - **Bioinformatics:** protein identification in the genomic sequence for illness diagnosis and prognosis.
    - **Image Recognition**: Hand-writing recognition, functional magnetic resonance images.
    - **Behaviour pattern recognition**: Fraud detection in methods of payment.

Group for Advanced Interactive Tools - GHIA

- Educational computer systems
  - Web-based adaptive systems
    - They adapt automatically to users
  - VLeaF Project
    - Educational Plataform based on Virtual Worlds
  - KNOWCAT Project
    - Knowldege collaborative management
  - Proyecto eMadrid:
    - Promotion and Innovation in the use of new technologies in education.
    - Coordinated project with other Universities
- http://astreo.ii.uam.es/~ghia/

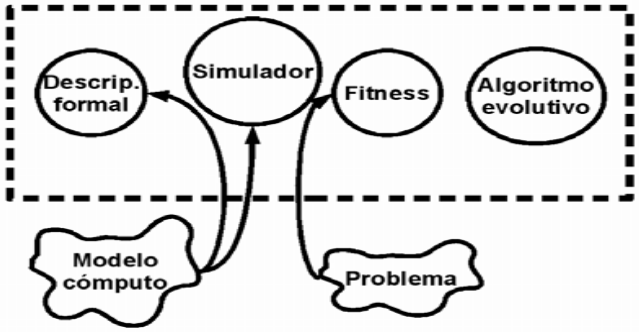




eMadrid
www.emadridnet.org

Group for Advanced Interactive Tools - GHIA

- Other research lines
  - Model-based Programming
  - Complex Systems Programming
  - Domotics
  - Human-Computer Interaction



amilab | ambient intelligence laboratory
http://amilab.uam.es

AIPO

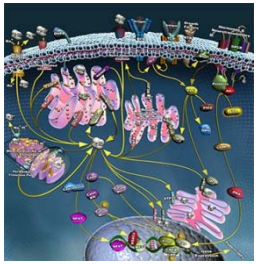
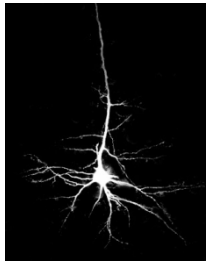
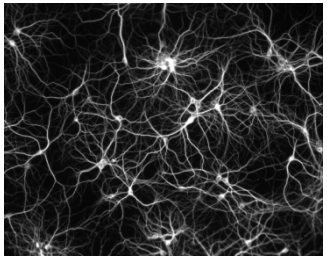
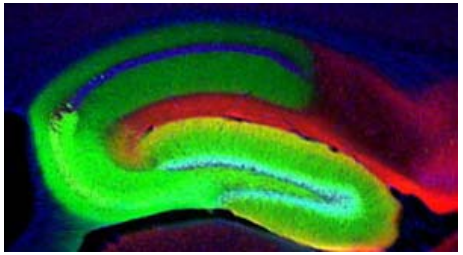
Biological Neurocomputation Group - GNB

Research in: **http://www.eps.uam.es/~gnb**

- Computational Neuroscience

  (we study the nervous system from the perspective of its functionality: information processing)

- Bio-inspired Artificial Intelligence
- Bio-inspired Autonomous Robotics
- Artificial Noses
- Brain-Body- Machine interfaces

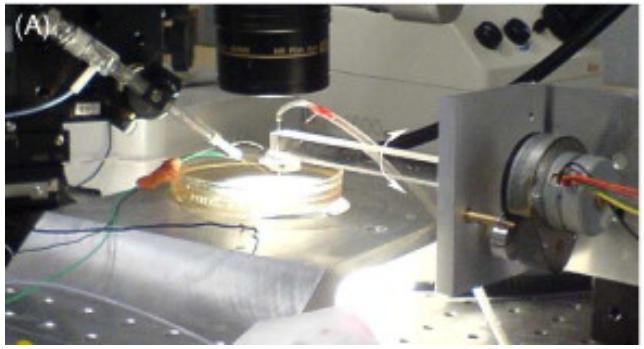





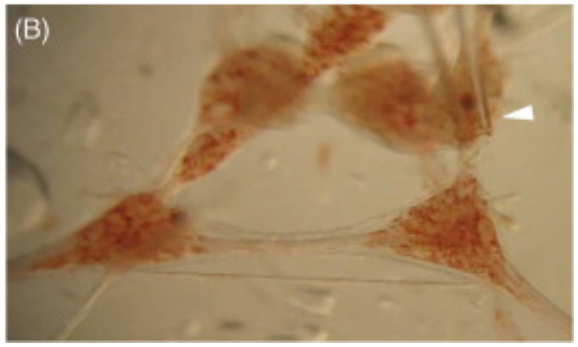

Biological Neurocomputation Group - GNB

http://www.eps.uam.es/~gnb

Tools for our study:

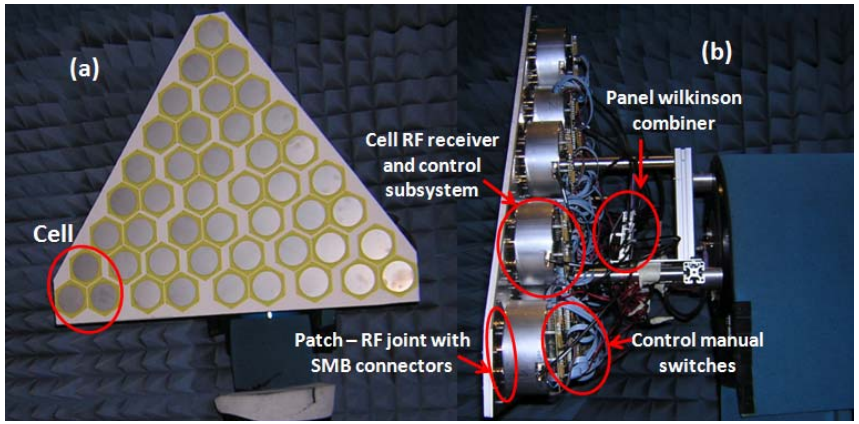
- Theoretical formalisms and models of neural dynamics.
- Hybrid circuits: living and artificial neurons and devices connected bidirectionally.
- Real time software technology to implement closed-loop interactions with the nervous system.

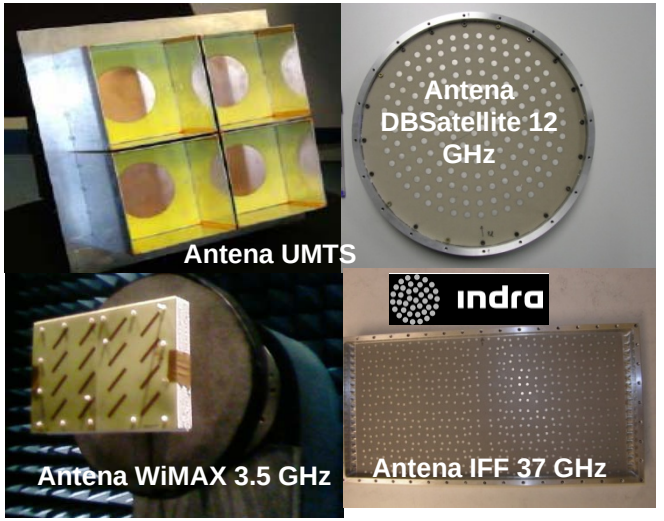




Radiocommunication Systems Group - GSRCO

- Radio Communication
- Optical Communication
- Antennas and Supply Circuits



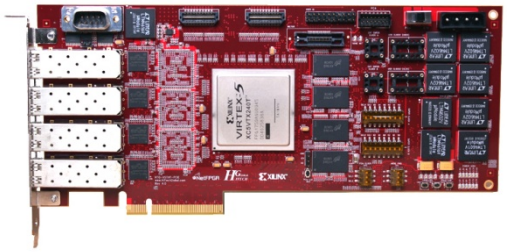


Radiocommunication Systems Group - GSRCO

- **Radio Communication**
  - Analysis, design and planification by communication system simulation
  - Propagation and channel characterisation in mobile communication systems
  - Propagation in microwave links and millimetric waves via satellite
  - Coexistence between different radio systems
  - Study of radio system provision
  - Antijamming radio systems
- **Optical Communication**
  - Studies about very high speed DWDM system provision (40 Gb/s and 100 Gb/s) and its application to real sceneries
  - Optical networkds: architectures and planning criteria
  - Network solutions (telecommunication operators, electrical sector, etc.)
- **Antennas and Supply Circuits**
  - Analysis, design, construction and measurement of antennas and supply circuits asociated to mobile systems, radar, satellite communications.
  - Collaborator companies: INDRA, THALES, RYMSA, INSA, ALTAIX, TTI NORTE.

High Performance Computing and Networking - HPCN

- Communication network management and monitorization
  - Quality Measurements
    - High accuracy level
    - High speed: 40 Gbps
  - Traffic analysis

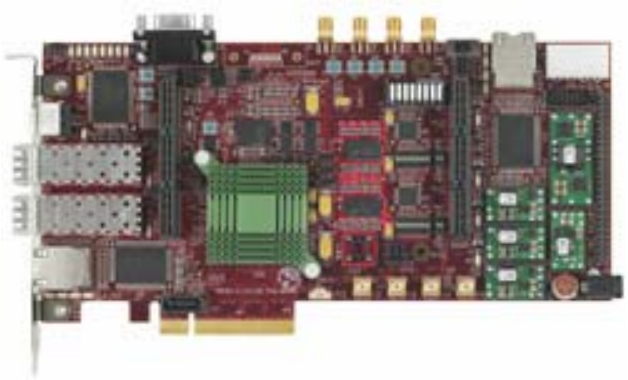


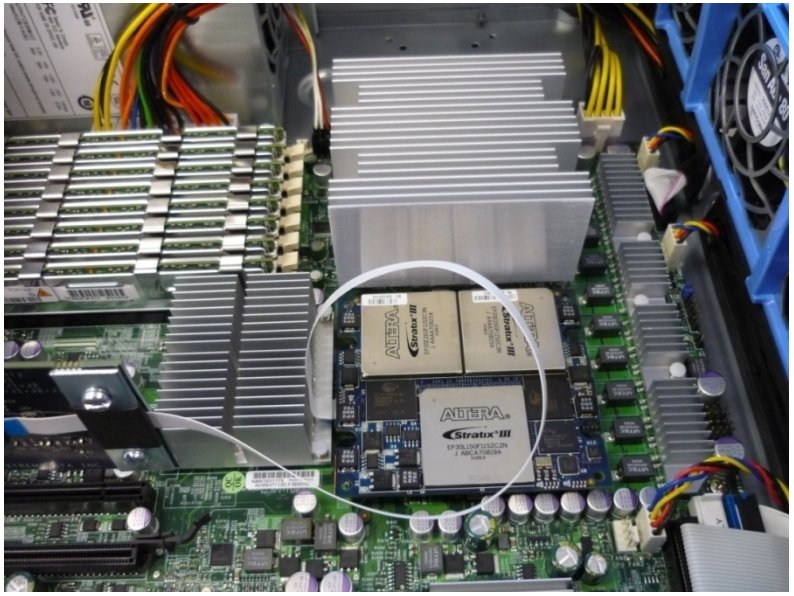
- High performance computing
  - Hybrid computation
    - CPUs + FPGAs (made-to-measure hardware)
    - CPUs + GPUs (high degree of paralelism)
  - Made-to-measure solutions for problems that cannot be solved by using conventional systems
    - Acceleration by specific hardware

- http://www.hpcn.es/

High Performance Computing and Networking - HPCN

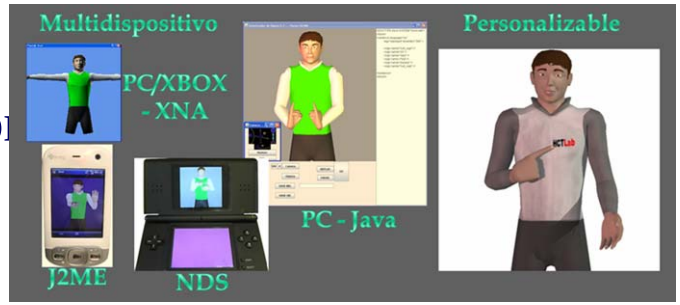
- Development of hardware co-processors for specific computations
  - FPGA modules in socket
  - PCI-e Cards





Human Computer Technology Lab - HCTLab

- Technologies for disabled people
  - Avatar that speaks Spanish sign language
  - Online tutor for people with Down's Syndro
  - Text telephone for people with a hearing disability
- Embedded systems
  - Access control intelligent systems
  - Fingerprint capture without contact
  - Telemeasure systems in automotion
- http://www.hctlab.com/



Information Retrieval Group - IRG

- Research in techniques and algorithms related to:
  - Search engines (Google, Yahoo!, etc.)

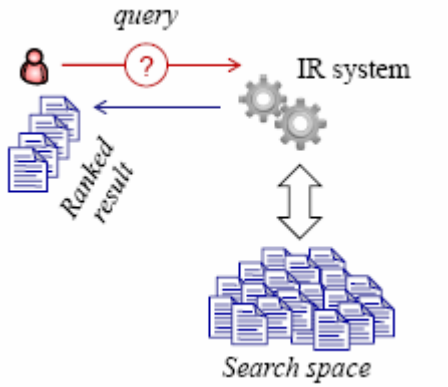
  - Recommendation techniques (Amazon, Last.fm, etc.)

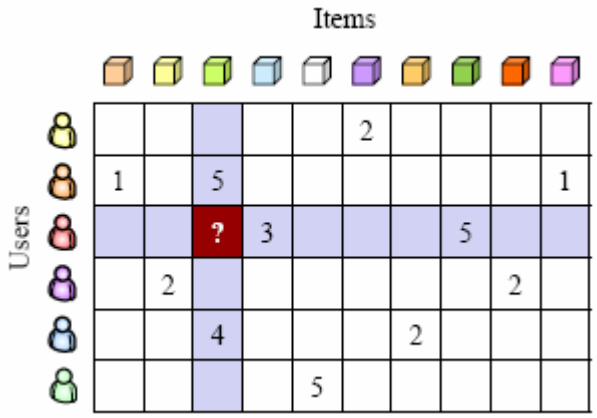
  - Social networks (Facebook, Tuenti, etc.)

- http://ir.ii.uam.es/

Information Retrieval Group - IRG

- Information Retrieval
  - Text (mainly) and multimedia search
  - Personalised and interactive search (history and session logs)
  - Theory and models for information retrieval
- Recommendation sistems
  - Improvement and innovation of algorithms
  - Ensembles and heterogeneous sources
  - Community detection
  - Evaluation methodologies
- Research problems
  - Problems in real applications
  - Introduction of new dimensions
  - Quality and efficiency improvement
  - Methodology, formalisation



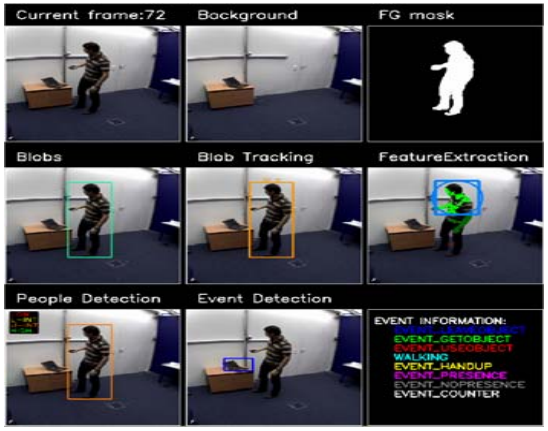


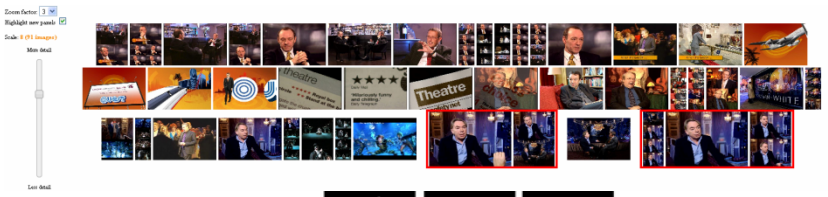
Video Processing & Understanding Lab - VPU-Lab

- Research group about theory, methods and applications in digital image processing, fundamentally oriented to the analysis of video sequences and visual contents adaptation.
- The main application areas are ***video-security*** systems and ***video repositories*** (e.g., ***YouTube***). Its activity is mainly oriented to the in-vivo manipulation of video sequences. This feature imposes restrictions that are applied to all their research areas.
- http://www-vpu.eps.uam.es

Video Processing & Understanding Lab - VPU-Lab

- Video sequence analysis
  - Segmentation of close-up objects
  - Segmentation of objects in motion
  - People detection
  - Object tracking
  - Abandoned/stolen objects detection
  - Event detection
- Adaptation of visual contents
  - Instant video summaries
  - Scalable video summaries
  - Automatic adaptation of multimedia contents
- Gestural Interfaces
- http://www-vpu.eps.uam.es/





Biomedical Signal Processing Group - GTSB

- Research Lines
  - Algorithm Development in signal processing for biomedicine
  - Digital Image Processing
  - Inverse problems
  - Tomography

Control, Computation, Cognition & Communications to improve the quality of life - C4Life

- Development and application of new technical methods, as well as advanced strategies in the conjunction of **advanced computational methods, Artificial Intelligence-based control strategies, Artificial Cognitive Systems,** supported on free distribution and proprietary software and emergent **communication technologies**.

- Optimization of **complex** systems behavior that will conduct to short, medium and long-term improvements in the quality of life.

http://www.eps.uam.es/

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