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LETTER FROM THE PRESIDENT

"THE EURO'S DECLINE HAS LEFT ITS MARK"



Olivier Dumas, President of the Foundation Council of Idiap

Activities, numerous projects, successes, brief disappointments, publications, people on the move... These are the elements that give rhythm and meaning year after year to the hectic and rewarding life of Idiap!

This year we need not look far for the most significant event; the fall of the euro has left its mark. With just over 25% of the institute's income coming from European projects, the net impact on 2010 amounts to approximately half a million euros. Despite various measures taken during the year, the financial year closed with a deficit. It is worth noting that the mechanism for financing European projects does not allow foreign exchange hedging. The result, however lamentable, does not call into question Idiap's financial soundness.

At the start of 2010, a new professor from EPFL joined Idiap's team. This new recruit bears witness not only to the solid partnership between our institute and the prestigious Lausanne University, but also the willingness of EPFL to fulfil its federally appointed role as academic partner of Idiap. We are delighted that 2011 has begun in the same vein: EPFL has just appointed three Idiap researchers – Messrs Gatica-Perez, Odobez and Fleuret – as senior lecturers (MER).

Although EPFL is a partner from the very first days, our ties have been considerably strengthened during the period of 2008-2011. To continue this fruitful partnership and consolidate the strategic alliance with EPFL, in June 2010, Idiap submitted a scientific and financial plan for 2012 to 2016 to the federal authorities. Discussions are underway, and we remain extremely confident about the outcome.

When Idiap moved out of Martigny's center to its current premises at Centre du Parc, we predicted a revival for this section of town and an extension of the redevelopment of the area northwest of the station. This joint project of Idiap and the municipality took shape in 2010 with the completion of plans for the technology park.

Thanks to the instigation of a private partner and generous subsidies from Martigny and the Canton of Valais, a 14,000 m² center will be built in close proximity to Centre du Parc. It will accommodate, under the aegis of IdeArk SA, current and future start-ups that develop and prosper in the wake of Idiap successes.

We would like to thank the authorities of the Canton of Valais, the town of Martigny and The Ark Foundation for their invaluable contribution not only to this specific project, but also for the abiding support they provide to Idiap.

Thus I close on a note of optimism. I wager that this place, dedicated to the technologies of tomorrow, will foster countless new companies, modelled on the many start-ups in Martigny that have already emerged under Idiap's wing.

A handwritten signature in blue ink, appearing to be 'O. Dumas', written in a cursive style.

MESSAGE FROM THE DIRECTOR

"OUR STRENGTH IS OUR UNITY"



Hervé Bourlard, Director of Idiap

Each year when I sit down to write this message, I enjoy recalling highlights of the past twelve months. While some years are remarkably packed with action, others are noteworthy as strong periods of transition. This was the case for 2010.

Two words come to mind when I think about 2010 at Idiap: "stabilization" and "consolidation."

After a phase of rapid growth, we turned our attention to the institute's structure, with the goal of maintaining progress without sacrificing quality. To accomplish this we first expanded our management circle. Into the decision-making process we've integrated a Scientific Board and Research Committee. This restructuring was necessary not only to ensure better in-house communication, but also to further support the collaborative work of different teams.

Within a few short years Idiap has expanded our team from twenty people to one hundred. To adapt to this growth, in 2010 we altered our in-house operations by setting up a new management system.

While taking these steps forward, one objective has maintained its importance above all others: the unity of the team. This is our strength. Typically when large research laboratories expand, they lose this dynamic, although it is integral to the creative process. At Idiap we value and nourish the unity of our team.

Office doors at Idiap are always open. Researchers work in synergy with the developers. Students exude enthusiasm on research teams. The results of our research, thanks to the IdeArk incubator, regularly give rise to start-ups, and other innovations. This small, contained world is bursting with creativity—and all within an atmosphere that is calm and studious. The increasing potential of Idiap and its dynamism are a genuine pleasure to behold.

Among the highlights of 2010, I would also include the return to the fold of Ronan Collobert, an excellent French researcher who did his PhD here at Idiap. He came back to us in November 2010 after spending a number of years at NEC Princeton. This Idiap alum has become an outstanding scientist, who is still as generous and modest as ever. Given that he received offers from the largest American universities, from Yahoo! and even Microsoft, it is a real coup that Idiap can count him among us in 2011 and beyond.

In 2010 Idiap was honored to be awarded, in addition to its many other research projects, three prestigious Sinergia projects. Sinergia is a new, highly selective incentive sponsored by the Swiss National Fund.

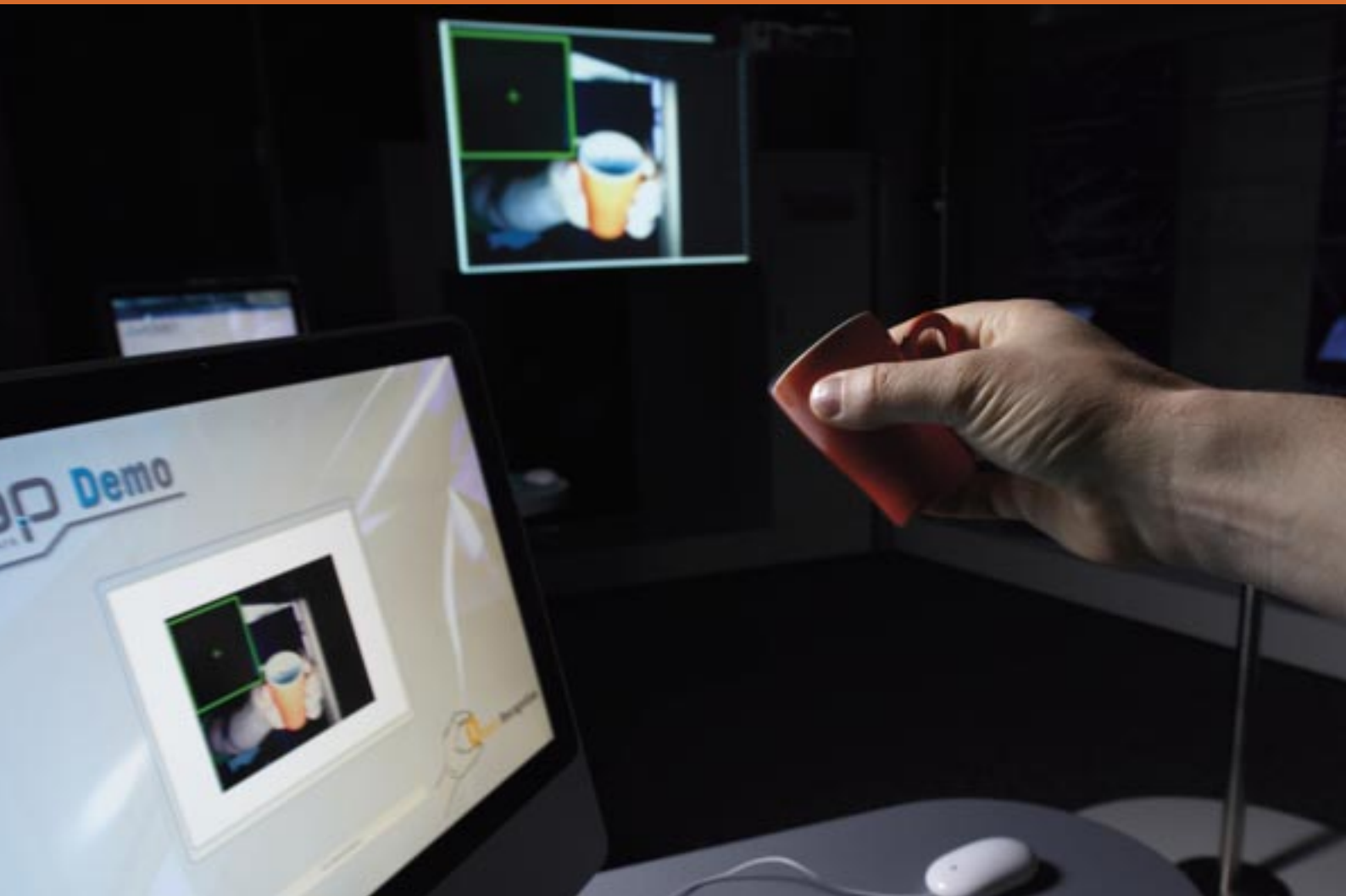
Last but not least, our team has been strengthened in 2010 by the arrival of twenty-one new people: one professor, one researcher, seven postdoctoral students, eleven PhD students and one financial assistant. And only eight people left.

I would like to wish all Idiap employees a calm and creative 2011 and take this opportunity to thank them not only for their accomplishments here, but also for creating a work environment that continues to be both pleasant and stimulating.

A handwritten signature in blue ink, which reads "H. Bourlard". The signature is stylized and cursive.



R E S E A R C H



IDIAP'S IDENTIFICATION CARD



Profile

From its base in Martigny (Valais/Switzerland) the non-profit Idiap Research Institutes is specialised in the management of multimedia information and man-machine multimodal interactions. The Idiap Research Institute was founded in 1991 by a collaborative effort among the Town of Martigny, the State of Valais, the Ecole polytechnique fédérale de Lausanne (EPFL), the University of Geneva and Swisscom. It is autonomous but connected, via a joint development plan, to EPFL.

Sixty percent of Idiap's annual budget of more than nine million francs is financed by research projects competitively awarded, and forty percent by public funds (cf. Distribution of sources of financing, page 32).

From having employed only about thirty people in 2001, Idiap has grown by 2010 to more than one hundred employees, including eighty researchers (professors, senior researchers, researchers, postdoctoral students and PhD students). All institute personnel work in the west wing at Centre du Parc in Martigny, after moving there in August 2007. Idiap now occupies 2,600 m² on four floors.

Research areas

Idiap's main research areas are the following:

- **Perceptual and Cognitive Systems**
speech processing / natural language understanding and translation / document and text processing / vision and scene analysis / multimodal processing / cognitive sciences
- **Social and Human Behavior**
web-based social media / mobile social media / social interaction sensing / social signal processing / verbal and nonverbal communication analysis
- **Information Interfaces and Presentation**
multimedia information systems / user interfaces / system evaluation
- **Biometric User Authentication**
speaker identification and verification / face detection, identification and verification / multimodal biometric user authentication
- **Machine Learning (ML)**
statistical and neural network based ML / computational efficiency, targeting real-time applications / very large datasets



Objectives

Activities at Idiap pursue three main objectives:

- Conduct fundamental research projects at the highest level, thus taking its place among the best on a national, European and global scale. Idiap benefits from a wide network of international partners and work collaboratively with, for example, large universities, and public and private research centres.
- Help interns discover the world of research and thereby foster their recruitment. Idiap welcomes talented young researchers working on their PhD by providing a number of courses at EPFL and in-house.
- Ensure technology transfer not only through the widest possible dissemination of its research results into the scientific community, but also by forging close ties with the world of industry.



Geographical Situation

The Idiap Research Institute is in Martigny, one of the main towns of the canton of Valais, in southern Switzerland, the French-speaking part of the country. In the heart of the Alps, Valais has an exceptional landscape and a pleasant microclimate, which makes it both a popular tourist destination and a desirable place to live. Martigny is a town of approximately 15,000 inhabitants, situated close to Montreux, Lausanne and Lake Geneva. Geneva airport is 90 minutes away by train. Martigny enjoys an ideal position right in the center of Europe.

Idiap: 2010 Statistics

Human Resources (averages over the past few years)

- 2 professors
- 13 permanent and senior researchers
- 15 postdoctoral students
- 38 PhD students
- 8 development engineers
- 6 system engineers
- 16 interns and visiting staff per year
- 10 administrative employees
- 3 doctorates awarded
- 39 'start-up' positions on the IdeArk site
- 29 nationalities represented

Scientific Activities

- IM2 National Centre of Competence in Research (interactive and multimodal management of information systems), since 2001
- Participation in 39 research programs
- Project management in 9 consortiums
- Participation in the economic development strategy of the Canton of Valais through The Ark programme and in particular the IdeArk company
- 188 scientific publications
- Participation in numerous international conferences

www.idiap.ch

"THE SOCIAL COMPUTER COULD SOLVE SOCIETY'S PROBLEMS."

In 2010 the European Union launched a contest for projects in the field of Future and Emerging Technologies (FET). Idiap is taking part with a project entitled "The Social Computer." For Idiap director, Hervé Bourlard, it brings the opportunity to feature more than ten years of research in a field that could revolutionize not only computer science but the whole society. Interview with Hervé Bourlard.

What makes this European contest, this "flagship," so important?

When the European Union launched this contest, it was looking for ambitious projects that would revolutionize society, in the vein of sending the first man to the moon or decoding the human genome. Therefore, in cooperation with many other European institutions, we worked for twelve months creating and writing up our proposal. The selected projects will each receive one billion euros to work on the subject for ten years. Needless to say, this is a worthwhile challenge.

Is it difficult to participate in such a contest?

Well, it's a long process, which uses a vast network of partnerships, but it's also a good scientific practice. We've been regularly presenting our ideas to Brussels for more than a year. At each meeting the representatives of the European Union guide us, discouraging certain directions and encouraging us to unite with other institutes, and so on. At the beginning, approximately 200 teams from across Europe showed an interest. Eventually about thirty projects were submitted by multidisciplinary teams. To get to this stage is already a success, one on which we can build many initiatives in the future.

Idiap is presenting a project on "the social computer."

In what way is it innovative?

Today most social processes are evolving in a way that involves either the human brain (social networks, etc.), or the machine (processing multimedia data, biometrics, etc.). (See diagram on page 9). Our project opens up a new research field by bringing these two worlds together to create "social computing." The idea is to integrate humans into computer networks better, and vice-versa, and thereby open up a new means to handle society's very complex problems that will never be solved by either machines or humans alone.



An example?

Amazon offers a service called, "Mechanical Turk." It is a sort of large server of social networks – you give it a very complicated problem to solve, and it does it in a few days, by asking people worldwide. Here the computer only serves to network human intelligence. We used this service recently. In one week, we obtained the opinion of 5,000 people who assessed the speech synthesis systems on which we're working – and for only a few thousand Swiss francs.



Then could we say that the machine also needs man?

In the past ten years, we've believed that the computer would replace man, but we were wrong. A human brain still has a lot of value and an enormous amount of potential – even more when it is networked with other human brains. Here's a clear example: in December 2009 the United States sent a challenge to all scientists in the world, telling them that on 12 January 2010, ten weather balloons would be released into the sky in ten different places in the United States. We had to find them, and obviously as quickly as possible! Many universities began by processing satellite images and implementing their best image recognition technologies. However, when they were still putting the finishing touches on their software the balloons had already been located. In nine hours! This feat was achieved by MIT (Massachusetts Institute of Technology). Their secret? They offered 2,000 dollars to any Internet user who could detect a balloon, and 1,000 dollars to anyone who could recommend another person likely to locate a balloon, and so on. In just a few hours, they created a social network of several million people, and the Internet users rose to the challenge.

"Yes, our project may change human behavior, but this is nothing new. When Gutenberg invented the printing press, he changed human behavior. Television changed it, advertising and the Internet change it everyday – video games too."



In concrete terms, what problems will we be able to resolve with the social computer?

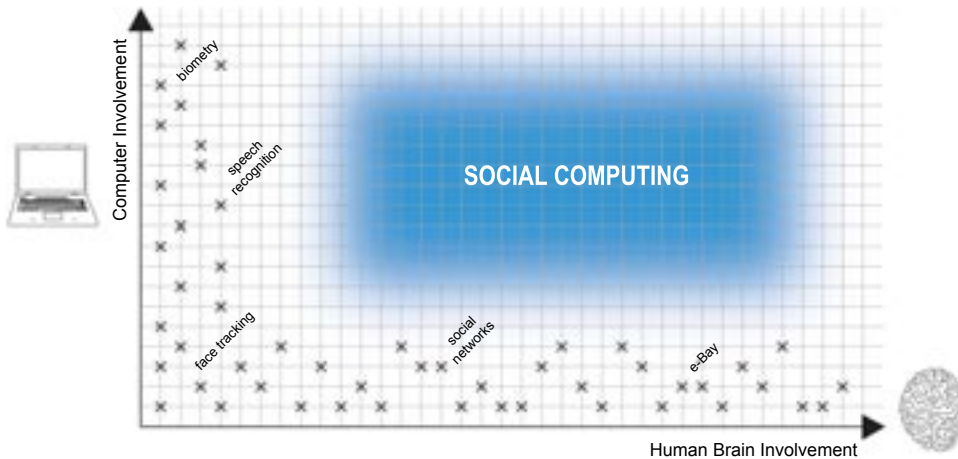
We seek to improve social cooperation by involving computers. Nowadays for example, people often work within multidisciplinary teams spread over several countries, but the language barrier compromises their cooperation.

I dream of children from here being able to play remotely with children in Russia, Hungary or Pakistan – each speaking his own language and, despite social and cultural differences, understanding each other perfectly. Also in the area of transport, the computer is a precious

ally, that can interpret traffic data and network people for car sharing, etc.

How does the human contribute to this collaboration?

He contributes his experience, intelligence and values; he is irreplaceable. Take health costs: they increase every year, and we don't know what to do about it. To improve the quality of care, engineers create increasingly expensive new machines and software, but people aren't included in these processes. In my opinion this is a mistake. In the banking system too, we relied on computers to make financial predictions, forgetting that there were real humans behind the machine. Result: the system collapsed. We don't sufficiently educate users to understand tools and their limits. I believe that it's possible to create a real community of computers and people, where information circulates effectively in both directions.



Idiap is exploring a new research domain called “Social Computing.” A name given by Director Hervé Bourlard, this new field of research will explore the space between human intelligence and the quasi-infinite resources of machines.

Is there a risk that your project will change human behavior?

That’s a question people often ask me. The answer is yes, but that’s nothing new. When Gutenberg invented the printing press, he changed human behavior. Television changed it, advertising and the Internet change it everyday –video games too. Today the Internet changes humans, but humans don’t change the Internet. They can only add information to it, that’s all. In the area that interests us, there will be considerable interaction between the two.

If Idiap wins this contest, what will be the consequences for the institute?

For us, even if it’s the logical continuation of what we’ve been doing for several years, it’s still a new field of research. Whatever happens, we’ll be working on it over the next few years with our partners in Switzerland and Europe. However, if we’re one of those selected, we’ll receive support for our work in this field for ten years and we will be able to dedicate ourselves to it more intensively, and in cooperation with many European partners.

Will other Swiss institutes be working alongside you?

Yes, of course. Our partners in this project are particularly the University of Geneva, the University of Zurich, and EPFL – but also smaller organisations, such as the Observatoire Valaisan de la Santé (Valais Health Research Institute). It’s important to us to include in this venture universities with faculties in political, social and human sciences.

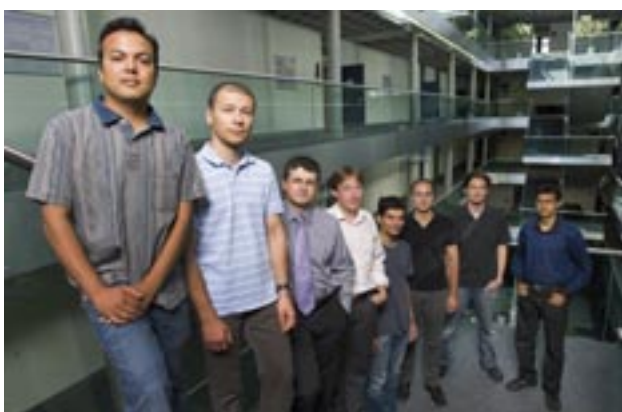


THWARTING IDENTITY FRAUD

With his new European project, "Tabula Rasa," Sébastien Marcel has forty-two months to make biometric security systems more robust. To meet this challenge he has the support of eleven partners, including a few Swiss companies.

Project Tabula Rasa Trusted Biometrics Under Spoofing Attacks

| | |
|------------------|--|
| Idiap | Head: Sébastien Marcel, Senior Researcher Idiap team: 3 Postdoctoral Students and 4 PhD Students |
| Partners | University of Oulu, UOULU (FI) Universidad Autonoma de Madrid, UAM (ESP) University of Southampton, USOU (GB) University of Cagliari, UNICA (IT) EURECOM, Sophia-Antipolis (F) Chinese Academy of Sciences, CASIA, Beijing (CN) Starlab Barcelona, S.L. (ESP) Morpho, Issy-les-Moulineaux (F) KeyLemon, Martigny (CH) BIOMETRY.com AG, Alpnach (CH) Centre for Science, Society and Citizenship, CSSC, Rome (IT) |
| Financing | European Union (75%) |
| Schedule | November 2010 - May 2014 (forty-two months) |
| Website | http://www.tabularasa-euproject.org |



Sébastien Marcel (3rd from the left), Senior Researcher at Idiap, and his research team.

Today an increasing number of companies are using biometrics – measuring the biological characteristics of the human being – to ensure their security. Sensitive areas are equipped with facial recognition cameras, fingerprint readers, voice recognition systems, etc. Given that no scheme is infallible, how can attacks against these systems be prevented? To answer this important question, Sébastien Marcel, a senior researcher at Idiap, recently won the support of the European Union for his project, "Tabula Rasa."

A Fraud Submits Someone Else's Biometric Data

Biometric systems work on the principle of recognition. For example, portraits of authorised persons are saved in the security system database for facial recognition. When someone comes to the entrance, the machine compares the face with those it has in its memory and decides whether or not to authorize access. Two types of attacks can be envisaged: an indirect attack, in which the computer is penetrated from the inside; and the direct attack – of interest to Idiap, in which the sensors themselves are tricked.

"A few years ago," explains Sébastien Marcel, "a scientist developed a way to duplicate a fingerprint by using a mould and glue." The idea is to dupe the sensors by submitting biometric data that aren't one's own, such as someone else's photo or fingerprint. "In this new project we will begin by looking at the limits of current systems by imagining all the processes that ill-intentioned people could invent, then we will quantify the success of each process: how many times has the machine been duped by a color photo, a silicone finger, etc."



Voice, Face, But Also Gait or Vein Pattern

This project accounts for a total of seven biometric data: face, voice, iris, fingerprint, vein pattern, gait and electrophysical signals – i.e. the heartbeat or the electrical activity of the brain, two characteristics that differ from one person to another. Sébastien Marcel's team is in charge of "the face." "Some data are known to be relatively easy to duplicate, while other data present more difficulties, as is the case with vein pattern, gait and electrophysiological signals."

Subsequently, the project aims to ensure that systems can detect and respond to fraudulent attacks. It will answer, for example, how a photo might be differentiated from a real face, or a real finger from an artificial one – and all this while accounting for the constraints imposed by the partner companies. "Three companies that form part of the research group all work in the area of security, and they've given us study scenarios," says Sébastien Marcel. "For example, it would be easy to differentiate a real face from a photo with a 3D camera, but not all companies have the means for this type of equipment. Therefore, other answers must be found."



Considering Ethics

As the project instigator and coordinator, Idiap has joined forces with eleven partners for this venture. The coalition is comprised of several universities in Europe and one in China, along with various companies interested in the research results, such as two Swiss companies, BIOMETRY.com and Key-Lemon, as well as the French company Morpho, which holds the European market for airport metal detectors. An independent institute in Italy ensures that ethical guidelines are followed.

What is the difference between a real finger and a fake one? That's one of the questions the scientists of the Tabula Rasa project attempt to answer.



SINERGIA NATIONAL PROGRAM

INCENTIVE FOR INTERDISCIPLINARY RESEARCH

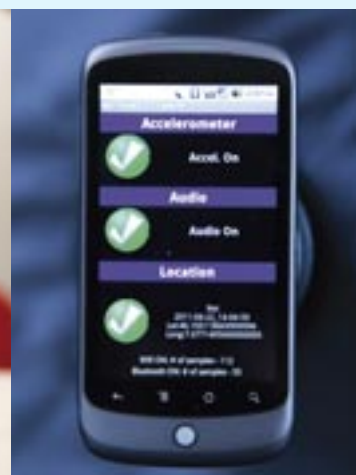
In 2008, the Swiss National Science Foundation (SNSF) launched a new incentive program with an evocative name, Sinergia. In 2010 Idiap managed two *Sinergia* projects and participated in a third.

"The Sinergia networks," explains the SNSF, "are perfectly balanced to execute research in an effective network, with minor administrative costs. With its network structure, this incentive also offers an ideal platform for interdisciplinary research. Participating groups will jointly tackle a proposed topic which taps into a promising new area of research and/or is at the cutting-edge of international research."

Synergy, networking, interdisciplinary, efficiency. The objectives are clear. Thus, to be approved, a Sinergia project must not only meet the usual criteria for scientific quality, but it must also include at least three teams from Swiss institutions (universities, university of applied sciences, research institutes, laboratories, etc.). Their complementary nature is evaluated, alongside the added value of the synergy. If certain required skills cannot be found in Switzerland, the project can include a team from abroad. The duration of a subsidy is a maximum of thirty six months.

SONVB Project Sensing and Analyzing Organizational Nonverbal Behavior

| | |
|------------------|--|
| Idiap | Daniel Gatica-Perez, Coordinator, and Jean-Marc Odobez |
| Partners | Dartmouth College, Hanover (USA) University of Neuchâtel, Institute of Work and Organizational Psychology (IPTO) |
| Research | Nonverbal communication plays a crucial role in human behavior, particularly in the context of work: tone of voice, gestures, position, gaze, facial expression, etc. This project studies the non-verbal behavior of individuals and groups in certain organizational settings in relation to three variables: hierarchy, personality, and performance. Using automatic analysis methods the project taps into the fields of psychology and computer technology to better analyze social interaction. |
| Financing | 800,000 francs |
| Schedule | June 2010 - May 2013 |



COMTIS Project

Improving the Coherence of Machine Translation Output by Modeling Intersentential Relations

| | |
|------------------|--|
| Idiap | Andrei Popescu-Belis, Project Manager |
| Partners | University of Geneva, Computer Science Center University of Geneva, Linguistics Department |
| Research | Although machine translation has made significant progress over the past decade, current systems are still compromised, since they merely consider sentences individually. For an accurate translation, the connection between the sentences must be considered. COMTIS aims to find methods that automatically determine these connections and to integrate them into an innovative translation system. |
| Financing | 883,000 francs |
| Schedule | March 2010 - February 2013 |
| Site web | http://www.idiap.ch/comtis |

| COMTIS analyzers | | | | | | |
|-------------------|-------------------------|---------------------|-------------------|-------------|--------------|-----------------------|
| | Connective | Pronoun | Verb tense | | | |
| <i>The matrix</i> | <i>has been reduced</i> | <i>four times,</i> | <i>since</i> | <i>it</i> | <i>was</i> | <i>too large.</i> |
| <i>La matrice</i> | <i>a été réduite</i> | <i>quatre fois,</i> | <i>depuis qu'</i> | <i>il</i> | <i>a été</i> | <i>trop grand. ✗</i> |
| | | | <i>car</i> | <i>elle</i> | <i>était</i> | <i>trop grande. ✓</i> |

The COMTIS project aims at correcting some of the translation errors of current statistical systems (first translation above, in red) by considering the dependencies between propositions (second translation, in green).

UBM Project

Understanding Brain Morphogenesis: Computer Vision Morphological Feature Extraction

| | |
|-----------------------|---|
| Project leader | Olivier Pertz, University of Basel, Department of Biomedicine, Institute of Biochemistry and Genetics |
| Idiap | François Fleuret |
| Other partners | University of Geneva, Faculty of Medicine EPFL, Computer Vision Laboratory |
| Research | Morphogenesis of the brain is an extremely complex process. In certain areas of the brain, neurons continue to evolve well into adulthood, producing sorts of tentacles that enable the extension of the neural network. Understanding what allows this phenomenon to take place would give medical science new hope for the treatment of certain neurodegenerative diseases. In this project biologists capture images of these neurons, EPFL measures these images, and Idiap processes all the data. Computer science -- in particular, image recognition -- can process a large quantity of data and in so doing, extract significant statistics. |
| Financing | 1,198,000 francs |
| Schedule | October 2009 - September 2012 |



THE MANY FACES OF THE RESEARCHER

TEACHER, RESEARCHER, LECTURER AND OTHER STAFF

The researcher... Who is the person hiding behind this mysterious job? What occupies the time of the thirty or so researchers (researchers, senior researchers and postdoctoral students) who work at Idiap? What follows is an inventory.

“Being a researcher means being extremely polyvalent, but this is also what makes it an interesting career choice. One could consider it a craft, in opposition to industrial production, because we have to make sure that the ‘product’ is well-made from the beginning of the process to the very end—starting with the initial funding all the way to industrial application, while working with students and writing texts along the way.”

François Fleuret, Idiap Senior Researcher

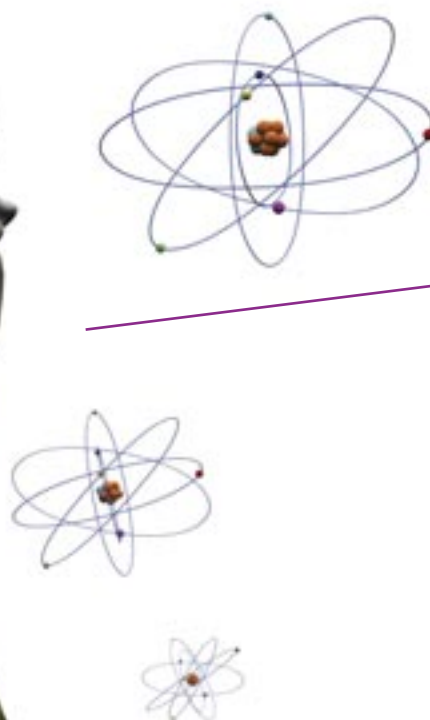
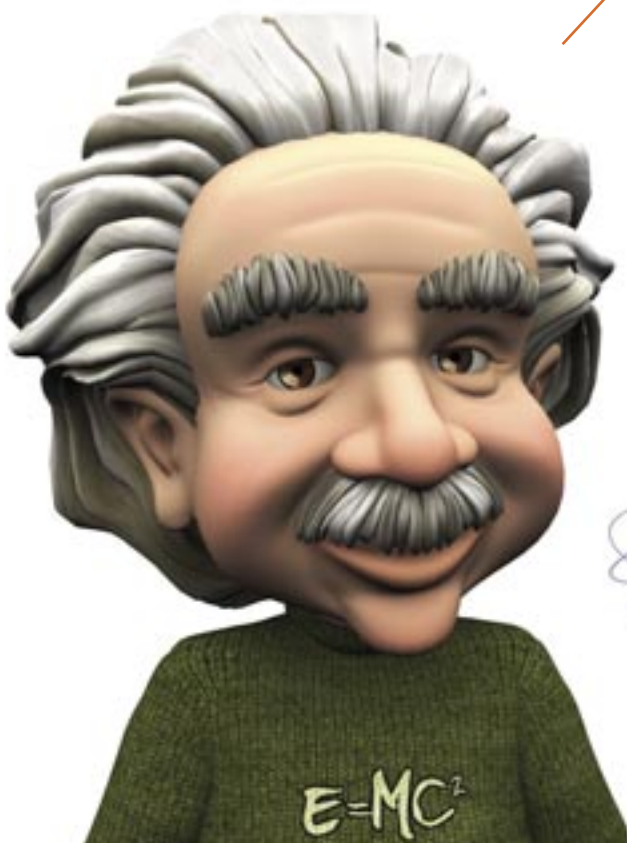
Supervising Students

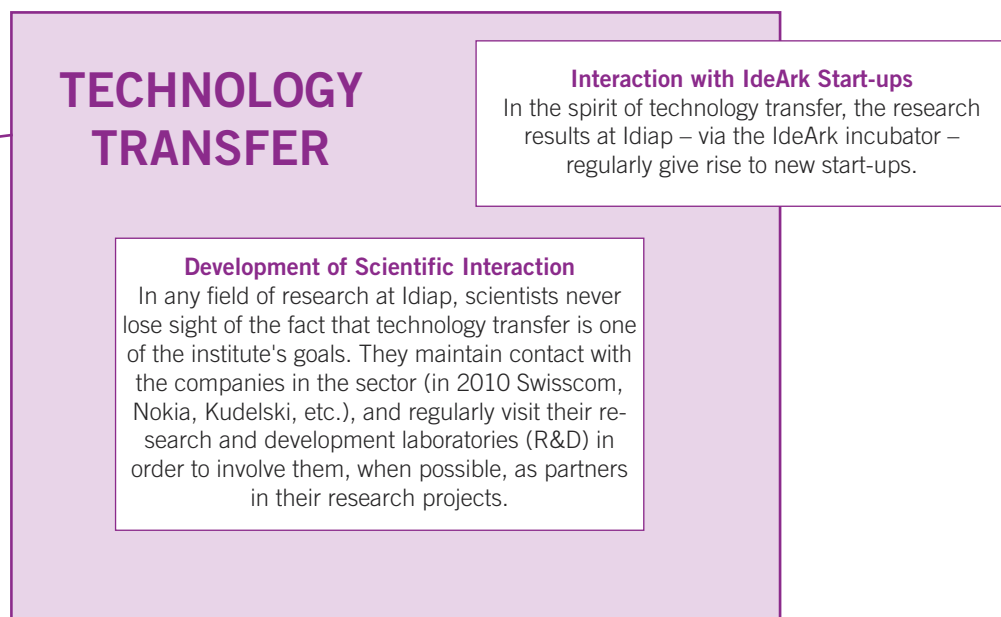
EPFL students who are writing their thesis at Idiap, in the form of joint research between student and supervisor

TRAINING

Teaching at EPFL

Preparing course notes, lectures, practical examinations, marking exams, etc.





NETWORK



SYNERGY LEADS TO PERFORMANCE

With the 2013-2016 period in sight, Idiap turns its attention to the future. Its vision: an autonomous institute in a strong, strategic alliance with EPFL that continues its exceptional work in emerging research fields.



Two thirds of Idiap's total annual budget of roughly 9 million Swiss francs is financed by Swiss or European projects awarded to the institute (see pages 31-32). The Swiss Confederation currently contributes 20% of the institute's financing. To obtain this support from Bern, Idiap must take a number of measures. In 2010 the institute filed two financing applications with the State Department for Education and Research (SER) – one for 2012 and one for the 2013-2016 period – along with plans for both development and financing. This file comprised a total of 282 pages.

Development of New Research Areas

In scientific terms, Idiap develops by extending the research activities undertaken in recent years, with more emphasis on emerging fields at the institute, such as cognitive systems (man/machine interfaces), social networks, innovation processes and multilinguism.

In strategic terms, Idiap seeks to maintain its status as an autonomous institution, while cultivating its alliance with both Swiss Federal Institutes of Technology and its partnership with EPFL in particular. For the most recent financing period, the institute obtained a federal subsidy of 6.5 million Swiss francs over four years, on the condition of forming a strategic alliance with EPFL. Evolving alongside this powerful academic partner presents a great opportunity for the institute.

Federal Financing Renewed in 2012

The executive of the Swiss federal government requested a transition year to align the four-year plans with the legislative periods; therefore 2012 will be transitional, likely modeled on 2011. The financial framework has already been renewed without incident, in line with the annual increase of 6% calculated by the executive branch to account for inflation and the natural progression of the institution. Idiap's 2013-2016 financing application also relies on this principle. Bern will make its decision for that period in 2011. Whereas 2010 was the year for planning and drafting the vision for 2013-2016, 2011 and 2012 are emerging as years of negotiation with the federal scientific authorities about the future of Idiap.

Work in the Public Interest

Idiap is a non-profit foundation, recognized at the federal level, and subject to the new law on incentives for research and innovation (LERI). In the interest of encouraging research and innovation, this law provides financial support for autonomous institutions producing work in the public interest.





KOEMEI OUT TO CONQUER THE GLOBAL MARKET

Koemei, Idiap's newest start-up, is starting to market a speech recognition platform that has been developed at the institute for almost eight years. With this innovative technology, the manager of Koemei, Temitope Ola, prepares to conquer the world from the IdeArk incubator in Martigny.

From 2002 to 2010, Idiap ran two European projects dedicated to speech recognition:

AMI and AMIDA. This work resulted in a cutting edge technology, developed in partnership with the universities of Edinburgh and Sheffield. Dedicated to its priority of technology transfer, Idiap hunted down an entrepreneur capable of bringing this technology to the market, an economist working on the development of microcredit and new technologies: Temitope Ola.

How did you react to Idiap's proposal?

Well aware of Idiap's work and reputation, I was immediately enamored with the idea. For eight months I collected every piece of useful information on the subject. I understood that the technology being offered to me was a global "first," in particular due to its reliability and its unequalled capacity to transcribe the speech of several speakers.

So its success is guaranteed?!

Let us say that the conditions for success are in place. First, "speech" is an expanding market. Next, there's always a research interest, since there are still so many challenges to be met. Finally, Koemei has both a broad network of potential clients and outstanding partners at Idiap and at the University of Sheffield. Nowhere else have I found such support in terms of resources. In Valais alone, I'm able to rely on the Centre of Financial Expertise (CCF SA), The Ark Foundation and Idiap.

When are you going to be able to start commercial production?

Several hundred users will be invited to test the public Beta version as of April 2011, and the first commercial version will be on sale in June 2011.

Koemei, Free Speech Recognition

Koemei – pronounced *koméi* – is a platform that recognises free speech originating from several speakers, used in the context of conversations, meetings, chatlines, videoconferences, and so on. From an audio recording the Koemei system retranscribes the conversations (English version only for the moment). It indexes the content for keyword searches.



Who will Koemei's customers be?

Companies have already shown interest in integrating this technology into their products, in particular: Adobe Connect, Klewel and Dev-Audio. This market is enormous – approximately 16 billion dollars worldwide. At the moment a transcription costs approximately 2 dollars per minute; with Koemei, this price is reduced by between 50% and 90%, depending on the level of perfection required. The technology also makes it possible to locate and listen again to a passage from a meeting – a service that interests a great number of companies and executives.

Are you still looking for financing?

The project requires 1.2 million Swiss francs, which we will seek in two phases. For the first block of 500,000 Swiss francs, we are looking for strategic investors, who are interested in being associated with our venture. For the second block of 700,000 Swiss francs, which should be completed in autumn 2011, we will turn to financial investors.

Will jobs be created?

Two full-time staff and four part-time staff are already working on the project in the offices of Koemei in Idiap's IdeArk incubator, and we're looking for more.



IDIAP FOR KIDS

As part of IM2 National Center of Competence in Research*, Idiap promoted science with young people by viewing it through a child's eyes, for example via an initiation into the magic of electricity or a private discussion with the most popular robot in the world. Here are some highlights.

"Hérissou Sous Gazon", Charrat

Launched in 2009, this children's event was an instant success and received 2,000 visitors the first year. On June 19, 2010, no less than 2,500 people – including around 1,300 children – attended the "Hérissou Sous Gazon" festival in Charrat, a few kilometres from Idiap. It was too good an opportunity for the institute to miss.

Throughout the day, in cooperation with the "KIDSinfo, Girls and Technology" project, Idiap offered children – girls in particular – an insight into the world of science. With the assistance of cardboard, a battery, a few wires and pieces of copper, the engineers managed to grab their attention!

Workshops for Gifted Children

In December 2010, Idiap organized two workshops for children around the theme of science and discovery. These workshops attracted twenty-three children, brought together by the Valais Association for Parents of Gifted Children.

While the older children, aged between 9 and 13, assembled a robot, the younger children built a small electric circuit. Then they all attended a demonstration of Tai Chi led by the NAO humanoid robot, which was programmed at Idiap – an experience that they will undoubtedly remember! The visit ended with a tour of the showroom, where the children were introduced to Idiap's fields of research.

At the end of the adventure, they all seemed delighted by this insight into the world of technological research. Who knows – perhaps some will return in a few years as researchers?!

KIDSinfo, Girls and Technology

"KIDSinfo, Girls and Technology" is a project of the Swiss Association of Women Engineers (ASFI) supported by "Woman and Sia" (Swiss Association of Engineers and Architects), of French-speaking Switzerland. This committee aims to transfer a fascination with technology to children, to present examples of successful women in technical and scientific fields, and to make young people – girls and boys – aware that they have freedom of choice in their professional future. <http://www.kidsinfo.ch>



See the NAO Project, a.k.a. "the most popular robot in the world," in which around thirty countries participated (<http://www.aldebaran-robotics.com/en>).



* IM2 National Centre of Competence in Research, Interactive and Multimodal Information Management - www.im2.ch



MYPARK PROJECT

FROM THE INCUBATOR TO THE TECHNOLOGY PARK

Idiap and the Town of Martigny, through their joint venture IdeArk, are constructing a genuine technology park called, MyPark. It is a way for Idiap to deal with the influx of SMEs and start-ups in its wake. The incubator will be developed on a site of 14,000 m² in which it will have more than 2,800 m² of office space. The opening is set for autumn 2012.

"When we moved here in 2007," explains Jean-Albert Ferrez, deputy director of Idiap, "we also wanted to provide a space for the development of start-ups. We were already aware that in the near future, we would need to consider an extension if we wanted to continue to grow." This intuition has now become a reality. Although Idiap's research work can still be carried out under good conditions in the west wing of Centre du Parc, the work of technology transfer needs to be moved to new premises.

An Investor: Implenia

According to Jean-Albert Ferrez, "At the start of the year, with the success of our start-ups and the growing list of those who wanted to join us, things accelerated." Implenia wanted to invest in Martigny's technology sector, and so with the town's support, the project started to take shape. In the Nouvelliste of September 10, 2010, the Town's president confirmed this: "This technology park will provide a platform for exchanges and synergies among researchers who work at Idiap with start-ups and companies who transform ideas into industrial realities. In partnership with The Ark, IdeArk, and Idiap, the



municipality heartily encourages this local enterprise. With the development of this park, the municipality can count on the creation of 500 new valuable jobs."

Regular Appearance of New Start-ups

IdeArk, one of the six cantonal sites of "The Ark" foundation, currently shares Idiap's building. IdeArk develops the results of the institute's research by facilitating its transfer to industry. Specializing in multimodal interaction and multimedia information management, each year the IdeArk incubator generates new companies that create jobs. By the end of 2010, the center housed around ten start-ups (such as Key-Lemon, Klewel, Moka Studio, Quantesys, Geroco, Tastemap, Koemei) and was looking forward to the takeoff of three SMEs (Cinetis, Cnoté and Snowpulse).

9.45 Million in Financing from the Municipality and the Canton

IdeArk will occupy 20% of the new five-story, 14,000 m² building, and the rest will be available to companies who wish to set up there. "Ideally," articulates Jean-Albert Ferrez, "Idiap wants to provide space for companies that have a connection with Idiap and the existing start-ups." Thus the space is reserved for compatible businesses – companies working in areas such as technology, IT, industry, communication, but also insurance, property and similar fields.

The first stone was laid in April 2011, and the work should be complete by the end of 2012. The entire project represents an investment of 44 million Swiss francs. The IdeArk share of this amount totals 9.45 million, part of which is financed by the Canton of Valais and the Municipality of Martigny. The rest has been borrowed without interest from the Canton and the Confederation and will be amortized by the Municipality of Martigny over a period of fifteen years.



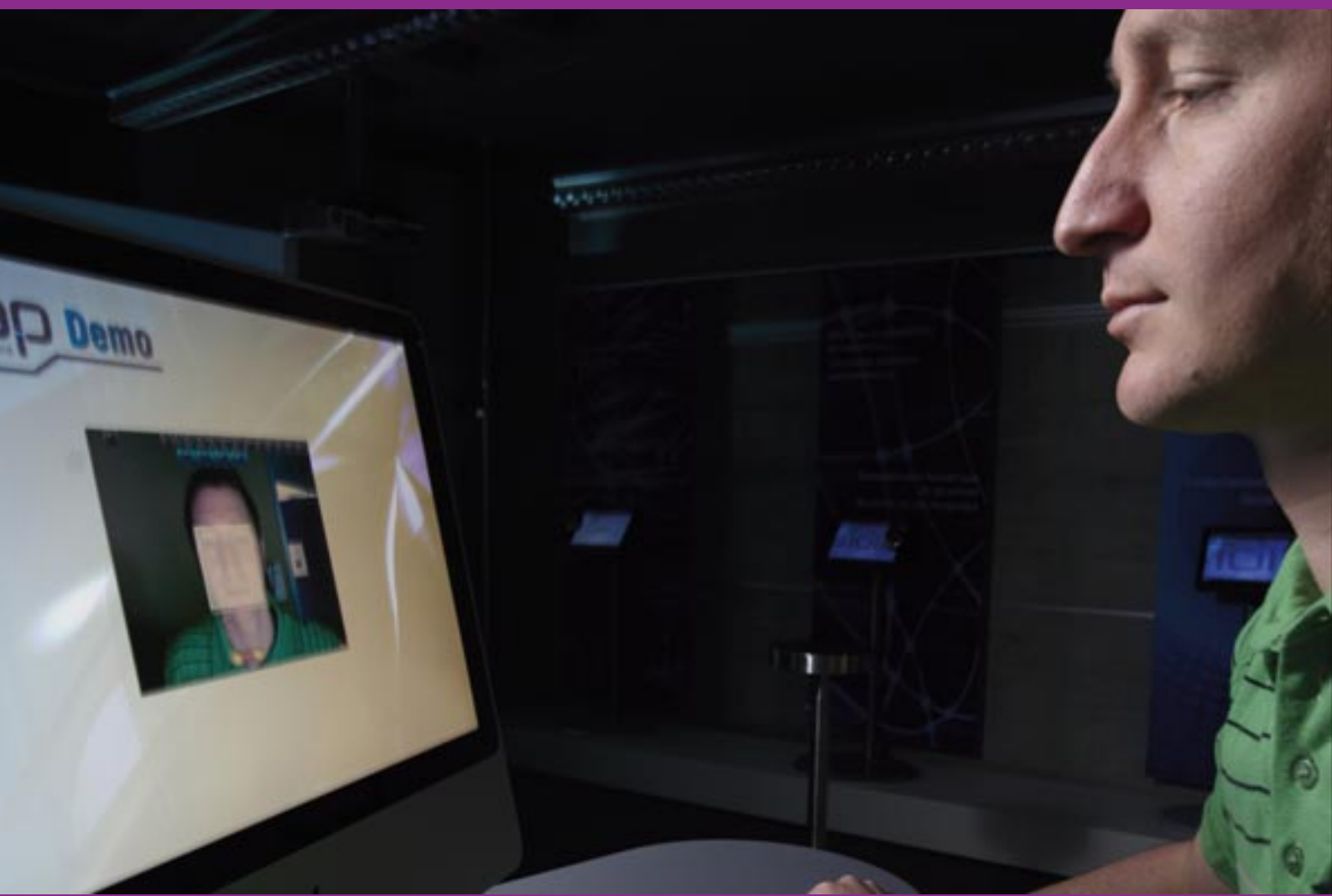
Space for Rent from the End of 2012

Are you seeking space for your company working in the field of technology, IT, industry, communication, insurance, property, or a similar area?

Contact us at:
IdeArk SA
Centre du Parc
Rue Marconi 19
1920 Martigny
Tel. +41(0)27 721 77 17



F A C E S



RONAN COLLOBERT RETURNS

"I HESITATED FOR A LONG TIME BETWEEN MICROSOFT AND IDIAP."

Six years after completing his PhD at Idiap, and after a substantial detour via Princeton University in the United States, Ronan Collobert has returned to Martigny. The highly skilled researcher from Brittany was headhunted by both Microsoft and Yahoo!, but preferred to continue his career in Europe. Lucky for Idiap.

A scientific spirit is second nature in Collobert's family – his father trained as an astrophysicist and is a researcher in the field of machine learning, and his mother, a physicist, programmed computers in the era of punch cards. Naturally, as a child, Ronan started early, typing away on the large computers that his father brought back from the laboratory.

Rennes, Martigny, Princeton...

Later this young man wanted to become an astrophysicist as well. He studied mathematics at the University of Rennes 1. Upon graduating in 2000, he accepted an invitation from a friend of his father, Samy Bengio, who was then a senior researcher at... Idiap. While on that internship in Martigny, Collobert discovered a small, dynamic research institute and a friendly team, and decided to undertake a PhD in machine learning here.

Four years later, having completed his PhD, the young researcher was offered a one-year postdoctoral fellowship one hour away from New York City at NEC, in Princeton, a famous laboratory where the machine learning luminary Vladimir Vapnik works. It was an offer that could not be refused. Furthermore, Idiap supports the exodus of its PhD students. "After my postdoc year," explains Ronan Collobert, "I was asked to stay. First I worked for three years in the field of theory of learning algorithms, then I started to look at what my colleagues were doing on the language side."

"If another human being can do it, so can you."

Ronan Collobert definitely owes this curiosity to his father, who often repeated to him, "If another human being can do it, so can you." It is a phrase that has stayed with him. Thus this young man who dreamed as a child of a machine that could talk to him, started exploring language. "I built a system capable of recognising the nature of words and the dynamics of phrases."



In 2010 when several of his colleagues left NEC, Ronan Collobert, saw this as a sign that he should leave as well. A few months earlier, the director of Idiap, Hervé Bourlard, had contacted him to ask him to return to the institute, but the young researcher initially declined. "First, I set about looking for something in the United States. I was offered several jobs, in particular at Yahoo! and at Microsoft, and I have to admit that working on the West coast, on a large campus like Microsoft, with two thousand people, was very appealing to me! But... it's in the United States!" At Idiap, Hervé Bourlard realised that his call had come just at the right time. He insisted, called back and pitched Idiap's employment conditions to Ronan Collobert. At last he convinced this stellar researcher to return to Idiap.

Exceptional Conditions at Idiap

"I really liked the idea of returning to Europe, and Idiap gives me the freedom to create my research group with students with whom I can work for several years, which is exceptional. In most laboratories, they are there for six months, and as soon as they are trained, they leave. And Switzerland is a magnificent country..."

Professional career

| | |
|-----------------|--|
| 1995-2000 | Bachelor's degree and Master's degree in mathematics, University of Rennes 1 (FR) |
| 2000-2004 | PhD in Machine Learning, Idiap Research Institute, Martigny, and University of Montreal (Canada) |
| 2005 | Postdoctoral fellowship, NEC Laboratories of America, Machine Learning Department, Princeton, New Jersey (USA) |
| 2005-2010 | Researcher, NEC Laboratories of America, Machine Learning Department, Princeton, New Jersey (USA) |
| Since Nov. 2010 | Researcher at Idiap |



A MEXICAN STUDYING THE MAYAN GLYPHS

"THE HUMAN BEING REMAINS AT THE HEART OF MY RESEARCH."

For ten years Daniel Gatica-Perez, senior researcher at Idiap, has been exploring new solutions for tapping into and understanding social behavior. In Switzerland, this native of Mexico has learned about nature and tranquillity. What follows is an interview with a researcher who is passionate about communication and freedom.

You were born in Mexico forty-one years ago.

How was your arrival in Switzerland?

When you've grown up in the industrial zone of Mexico City, with the smells of an oil refinery, there's nothing much left in life to shock you! (Laughs) No, it's true that there is a huge contrast. In 2002 when Hervé Bourlard asked me to come to Martigny, he warned me, "If you like cities like San Francisco or Los Angeles, forget it!" He was right. I knew nothing about Idiap, but I already knew that the place would be very quiet.

Too quiet?

What surprised me in the beginning were the opening times of the shops. If you want to have something in your fridge, you better not forget what time the shops close. I also found the well-known cow fights very strange. We have bullfights in Mexico, but they are no longer very popular. Here I was unable to find a single ticket left!

What inspires you?

Other people's ideas, because as the saying goes, we are only "dwarfs standing on the shoulders of giants"... I'm also fascinated by the work of certain artists. Writers such as Georges Perec and Robert Walser imposed great constraints on their writing, but they found great freedom in this. The same is true

in the field of science. Our world is very competitive, but if you identify your own problems and develop your own solutions, there's less competition, because you possess all the originality that comes with following your own path.

But you still need the freedom to work in an original way...

This is the case at Idiap! We have this freedom. We have to get results, but we decide which results, and we initiate all the steps of the projects. It's a great opportunity!

What is your greatest dream for the future?

I would like to see some of the applications we are developing actually implemented. For example, to find out the social perception of a video I post on the web, to identify the principal person in a meeting, or to make traffic on the roads more fluid using smartphone technologies.

Are you not afraid that technology is taking up too much space in our lives?

All technologies can be misused. The risks are there, alongside a capacity to make choices. The human being is at the heart of our research. There is great potential to apply technology at all levels of daily communication, whether in "face to face" relations, on the telephone, or in social networks. I'm delighted that our experiments are in line with reality outside the laboratory.

Decoding the Writing of the Ancient Mayans

Since August 2008, Daniel Gatica-Perez has led a research project financed by the Swiss National Science Foundation (SNSF) called "CODICES: Automatic Analysis of Mexican Codex Collections."

Mayan writing is comprised of around 800 glyphs, 20% of which are still indecipherable. When a new sign is discovered, in order to find similar elements, researchers must examine, one by one, those that have already been decoded — a painstaking task. Daniel Gatica-Perez and his team are developing a system based on image recognition technology that, once all the existing glyphs are digitalized, will facilitate recognition and classification of the new ones.



ADMINISTRATIVE TEAM

YOU CANNOT IMAGINE ALL THE THINGS OUR ADMINISTRATIVE STAFF CAN DO FOR YOU...

Welcome to the heart of Idiap, where all come with their problems and where all problems are solved. An accommodation problem? A residence permit needs to be renewed, or a business trip to be organized? Sylvie Millius and Nadine Rousseau deal with dozens of requests per day. No face is unknown to them, no administrative machinery escapes their survey. By their sides Ed Gregg and Christophe Ecoeur manage finances. What follows is a profile of an administrative team that is as versatile as it is indispensable.

Finance Department: Ed Gregg, manager, and his assistant, Christophe Ecoeur



"Above all, do not make a mistake!"

Idiap's accounts are not straightforward. With staff who travel to conferences worldwide, income that changes for PhD students during the year, budgets and sources of financing that differ according to the project... countless particularities complicate calculations. This is why salaries, expense claim forms, and

invoices are so closely monitored. Christophe Ecoeur admits that he spends several hours checking payments for Idiap's approximately one hundred employees, since each case is different. "For foreigners, we have to deduct tax at source, check the place of residence because the rates change for each town, check marital status, if their spouse is paid by an employer or not, and whether they have children."

Another sizeable challenge are payments to the institute's scientists. PhD students, postdoctoral students, developers and senior researchers are paid partly by Idiap and partly by the projects, according to the percentage of work carried out for these projects – and this rate differs each month. "It's a question of not making mistakes," emphasizes Christophe Ecoeur. "But if it happens, in general, we realize very quickly!"

The finance manager, Ed Gregg, supervises all account operations and is responsible for their final closing. This former basketball player, retrained in finance, ensures compliance with the budgets of around thirty research projects.

Secretarial Staff: The Dynamic Duo of Sylvie Millius and Nadine Rousseau

Sylvie Millius



"Every day people from all over the world come to us!"

Sylvie worked in finance (international companies, trust companies, law and notary firms, import-export contracts) in Lausanne, Zurich and Crans-Montana before joining Idiap. She also spent a year in the United

States where she perfected her English. "Here, it's our first language. Some employees who understand French very well ask us to speak English just for the pleasure of hearing our accent!" Sylvie is employed on a 70% contract and mainly deals with the administration of Idiap's staff. "We are everyone's private secretaries, and we have the privilege of having contact with people from all over the world!"

Nadine Rousseau



"I never grow tired of doing this job."

Nadine arrived from Belgium in 1996 with her husband Hervé Bourlard – who at the time was just appointed director of Idiap – and their six-year-old son. Formerly working at Mons Faculty of Engineering, this

administration pro very quickly got her bearings. "I don't regret this change in our lives. We're very happy in Martigny." She is employed on a 90% contract and deals in particular with managing accommodation, organizing travel, and purchasing equipment. "Each day is different, we never get bored."



A DAY WITH... THE ADMINISTRATIVE TEAM

Their office door on the fourth floor is always open. Employees go there to sign an important document, ask a question, chat or nab a sweet. There is no such thing as routine! As discreet as they are indispensable, they have been working together in perfect harmony for fifteen years. Spotlight on: the daily lives of Sylvie and Nadine, two pillars of the institution.



8:30 The Post Arrives

Nadine empties the post-office box and sorts the mail. She slides the letters into their recipients' pigeonholes. Idiap receives around fifty letters every day. During this time, Sylvie has arrived at her desk. "My first task? To refill the candy dish. Some people come to see us just for the pleasure of picking up a sweet on their way through. It's a fun custom."



9:00 Replying to Applicants

A glance at the "Jobs" page of the website, where Idiap senior researchers recruit their lifeblood. Sylvie follows up with the applicants – a negative reply for some, a request for reference letters for others. Once an applicant has been selected, she closes the position and starts the hiring procedure. "The telephone rarely rings here. Most problems are resolved by e-mail."



9:30 Looking to Rent...

Nadine immerses herself in the daily paper. She's looking for two furnished studio apartments for PhD students who she had to accommodate in a hotel. Idiap rents around thirty apartments for its employees. "They are all full. I have to find new ones regularly. This property service is greatly valued. Newcomers from abroad are reassured that they will have a roof over their heads on arrival."



10:00 A Trip to the Library

Three new books have arrived, ordered by one of the institute's researchers. Sylvie registers them, numbers them, and re-covers them before they're placed on the shelves. "People have free access to the library and can consult the catalogue on the website. They let us know they've borrowed a book by leaving us the index card, and we enter it in the bibliadiap (website of Idiap's library). It's simple and it works well."



11:00 Request for supplies

"Files and paper clips please!" Behind the counter, Nadine and Sylvie run the bursar's office and manage the stock of office supplies. On the shelves of the secretarial office, stacks of plates, coffee cups and cookies are a reminder that meeting receptions are also organized here.



12:00 We Try to Stop...

They leave their desks to have their photo taken, but usually Sylvie and Nadine shut themselves away in their office to eat a sandwich, drink a coffee, and chat. The secretarial office is officially closed between 12:00 and 13:30. "Actually we never stay quiet for long. People don't hesitate to open the door to ask us for something. Fair enough – we don't mind working non-stop."



14:00 Flow of Forms

Sylvie is responsible for all the paperwork that goes with hiring staff at Idiap. She juggles dozens of files at the same time. Contracts, residence permits, social security registrations, forms for tax at source, visas, extending permits, etc. "Between the PhD students, interns and postdoctoral students, there is a lot of movement. In 2010 18 people left and 35 arrived. Since 80% of them come from abroad, the administrative procedures are complex."



15:00 SOS Radiator

The neighbour of an Idiap tenant is worried. She can hear strange water noises coming from the apartment next door. Nadine speaks to the owner and contacts the student involved. She discovers that the radiator hasn't been 'bled.' "These little problems aren't serious, but they take time." A forgotten key, a faulty light bulb, a washing machine breakdown... everyone looks to Nadine for the solution.



16:00 Sign Here...

Stefan Duffner, postdoctoral student, comes to the window to complete and sign an expenses claim form. He has just returned from a stay in Austria for the TA2 Project. Each trip is subject to a formal application and receipts must be produced before it is passed on to the accounting department.



17:00 Last Check

Nadine stamps the letters to be dispatched and sets off for the post office. Sylvie checks the progress of various projects. In a couple of minutes, Sylvie turns the computers off, turn on the voicemail – clear signs that the secretary desk is now closed for the evening.



EMPLOYEES JOINING AND LEAVING

2010 was a remarkable year, with no less than twenty-one new recruits joining the Idiap team: eleven PhD students, seven postdoctoral students, one researcher, one professor and one financial assistant.

JOINING US IN 2010

First Name, Last Name, Position, Country of Origin, Residence

Eray Abdurrahman Baran, Research Assistant, Turkey
Volkan Cevher, Professor, Turkey
Cheng Chen, Postdoc, China
Ronan Collobert, Research Scientist, France
Cong-Thanh Do, Postdoc, Vietnam
Christophe Ecoeur, Financial Assistant, Switzerland, Collombey
Laurent El Shafey, Research Assistant, France
Rémi Emonet, Postdoc, France
Marco Fornoni, Research Assistant, Italy
Alexandre Heili, Research Assistant, France
Vasil Khalidov, Postdoc, Russia

Leonidas Lefakis, Research Assistant, Greece
Thomas Meyer, Research Assistant, Switzerland, Martigny
André Rabello Dos Anjos, Postdoc, Brazil
Ramy Rasipuram, Research Assistant, India
Carl Scheffler, Postdoc, Germany
Samira Sheikhi, Research Assistant, Iran
Gokul Thattaguppa Chittaranjan, Research Assistant, India
Zoltan Tüske, Research Assistant, Hungary
Roy Geoffrey Wallace, Postdoc, Australia
Sree Harsha Yella, Research Assistant, India

MOVING ON IN 2010

First Name, Last Name, Position, Country of Origin, Year of Arrival at Idiap, New Employer

Alfred Dielmann, Postdoc, Italy, 2008
Sarah Favre, Research Assistant, Switzerland, Nendaz, 2006
Giulia Garau, Postdoc, Italy, 2008
Maël Guillemot, Dev. Engineer, France, 2002, Klewel, Martigny
Hayley Shi-Wen Hung, Postdoc, England, 2007, Institut Voor Informatica, Amsterdam, Netherlands
Sandra Micheloud, Financial Director, Switzerland, Monthey, 2007, Cortex IT SA, Monthey
Joel Praveen Pinto, Research Assistant, India, 2005, Nuance Communications Aachen GmbH, Germany
Deepu Vijayasanan, Research Assistant, India, 2006, Universität des Saarlandes, Saarbrücken, Germany

HONORS, COMPLETED THESES

HONORS

Each year Idiap grants two awards to its PhD students. One rewards research, and one rewards a publication. For the Idiap PhD Student Paper Award, an in-house committee assesses the candidate on five criteria: publications, participation in the team, involvement in the project, communication skills, and autonomy. For the PhD student Research Award, senior members of the institute make an initial selection among the work written primarily by an Idiap PhD student. Members of the International Strategic Committee then grade the chosen publications, separately and anonymously.

In 2010, the Research Award was given to **Katayoun Farrahi** and the Paper Award to **Edgar Francisco Roman-Rangel**.



Katayoun Farrahi
2010 Research Award



Edgar Francisco Roman-Rangel
Recipient of the 2010 Idiap PhD Student Paper Award

"Analyzing Ancient Maya Glyph Collections with Contextual Shape Descriptors"
Edgar Francisco Roman-Rangel, Carlos Pallan, Jean-Marc Odobez, Daniel Gatica-Perez
International Journal of Computer Vision, October 2010

COMPLETED THESES

Three students completed a thesis in 2010: Joel Praveen Pinto, Deepu Vijayaseenan and Sarah Favre.

- **Multilayer Perceptron based Hierarchical Acoustic Modeling for Automatic Speech Recognition**
Joel Praveen Pinto, March 3, 2010
Thesis director: Prof. Hervé Bourlard
Members of the Thesis Committee: Prof. Martin Hasler, Prof. Simon King, Dr. Ralf Schlueter
- **An information theoretic approach to speaker diarization of meeting recordings**
Deepu Vijayaseenan, October 27, 2010
Thesis directors: Prof. Hervé Bourlard, Dr. Fabio Valente
Members of the Thesis Committee: Prof. Pierre Vanderghenst, Prof. Steve Renals, Prof. Mari Ostendorf, Dr. Jean-Marc Vesin
- **Social Network Analysis for Automatic Role Recognition**
Sarah Favre, December 8, 2010
Thesis directors: Prof. Hervé Bourlard, Dr. Alessandro Vinciarelli
Members of the Thesis Committee: Prof. Pierre Vanderghenst, Dr. Fabio Pianesi, Prof. Steve Renals, Prof. Jean-Philippe Thiran



F I N A N C E S



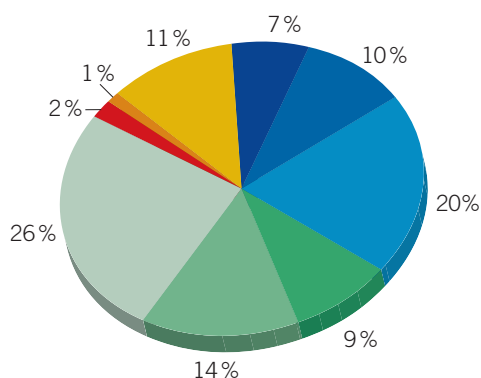
OPERATING ACCOUNT

| (Swiss Francs) | 2009 | 2010 | % |
|--|------------------|------------------|----------------|
| INCOME | | | |
| Town of Martigny | 600,000 | 600,000 | 6.76% |
| Canton of Valais | 1,000,000 | 900,000 | 10.14% |
| Swiss Confederation | 1,510,000 | 1,795,000 | 20.22% |
| TOTAL SUBSIDIES | 3,110,000 | 3,295,000 | 37.12% |
| Loterie Romande | 150,000 | 0 | 0.00% |
| EPFL Contribution | 72,000 | 72,000 | 0.81% |
| TOTAL DONATIONS - ALLOWANCES | 222,000 | 72,000 | 0.81% |
| NCCR IM2 projects | 1,331,107 | 776,520 | 8.75% |
| Swiss National Science Foundation projects | 965,768 | 1,271,946 | 14.33% |
| European projects | 2,452,661 | 2,342,794 | 26.40% |
| CTI projects | 323,097 | 151,426 | 1.71% |
| TOTAL PROJECTS | 5,072,633 | 4,542,686 | 51.19% |
| Industrial Financing and other income | 815,324 | 965,933 | 10.88% |
| TOTAL INCOME | 9,219,957 | 8,875,619 | 100.00% |
| EXPENSES | | | |
| Personnel expenses | 6,334,515 | 6,592,844 | 74.28% |
| Training and travel | 502,869 | 498,747 | 5.62% |
| Third party expenses | 415,130 | 45,896 | 0.52% |
| Computer equipment and maintenance | 199,486 | 208,950 | 2.35% |
| Administrative costs | 178,333 | 187,167 | 2.11% |
| Promotion and communication | 75,639 | 57,814 | 0.65% |
| Rent | 823,187 | 871,114 | 9.81% |
| Depreciation | 266,278 | 551,250 | 6.21% |
| Other provisions | 397,000 | - | 0.00% |
| TOTAL EXPENSES | 9,192,437 | 9,013,782 | 101.56% |
| OPERATING PROFIT / LOSS | 27,520 | -138,163 | -1.56% |



SOURCES OF FUNDS / COSTS / COMMENTS

Distribution of Sources of Financing



- City of Martigny
- Canton of Valais
- Swiss Confederation
- NCCR IM2 Projects
- Swiss National Science Foundation Projects
- European Projects
- CTI Projects
- EPFL Contribution
- Industrial Financing and Other Income

Note on the Accounts

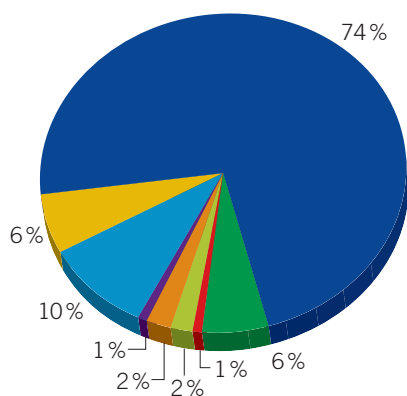
Since more than a quarter of the institute's activity comes from European projects naturally paid in euros, the bottom line in 2010 was severely affected by the fall in this currency's exchange rate. Although the volume of European projects is slightly up, actual income is down by almost half a million Swiss francs. This unforeseeable phenomenon occurred at the same time as the planned reduction in the volume of activity of NCCR IM2, resulting from reduced financing during its third and final phase of 2010. In the end, Idiap overcame this financially difficult year through cost management and the financial soundness of the institute itself, however not without an operating loss.

Swiss Confederation, Canton, Municipality Subsidies

(In thousands of Swiss francs)

| YEAR | 2008 | 2009 | 2010 | 2011 | Total |
|---------------|-------|-------|-------|-------|--------------|
| Confederation | 900 | 1,510 | 1,795 | 2,357 | 6,562 |
| Canton | 1,200 | 1,000 | 900 | 900 | 4,000 |
| Municipality | 550 | 600 | 600 | 650 | 2,400 |

Distribution of Costs



- Personnel Expenses
- Training and Travel
- Third Party Expenses
- Computer Equipment and Maintenance
- Administrative Costs
- Promotion and Communication
- Rent
- Depreciation

Following the agreement signed with the State Secretariat for Education and Research (SER), which provides for a gradual increase in the federal subsidy, the Canton of Valais and the Town of Martigny have agreed to provide together an almost equivalent amount, in accordance with the distribution given in the table above.

BALANCE SHEET

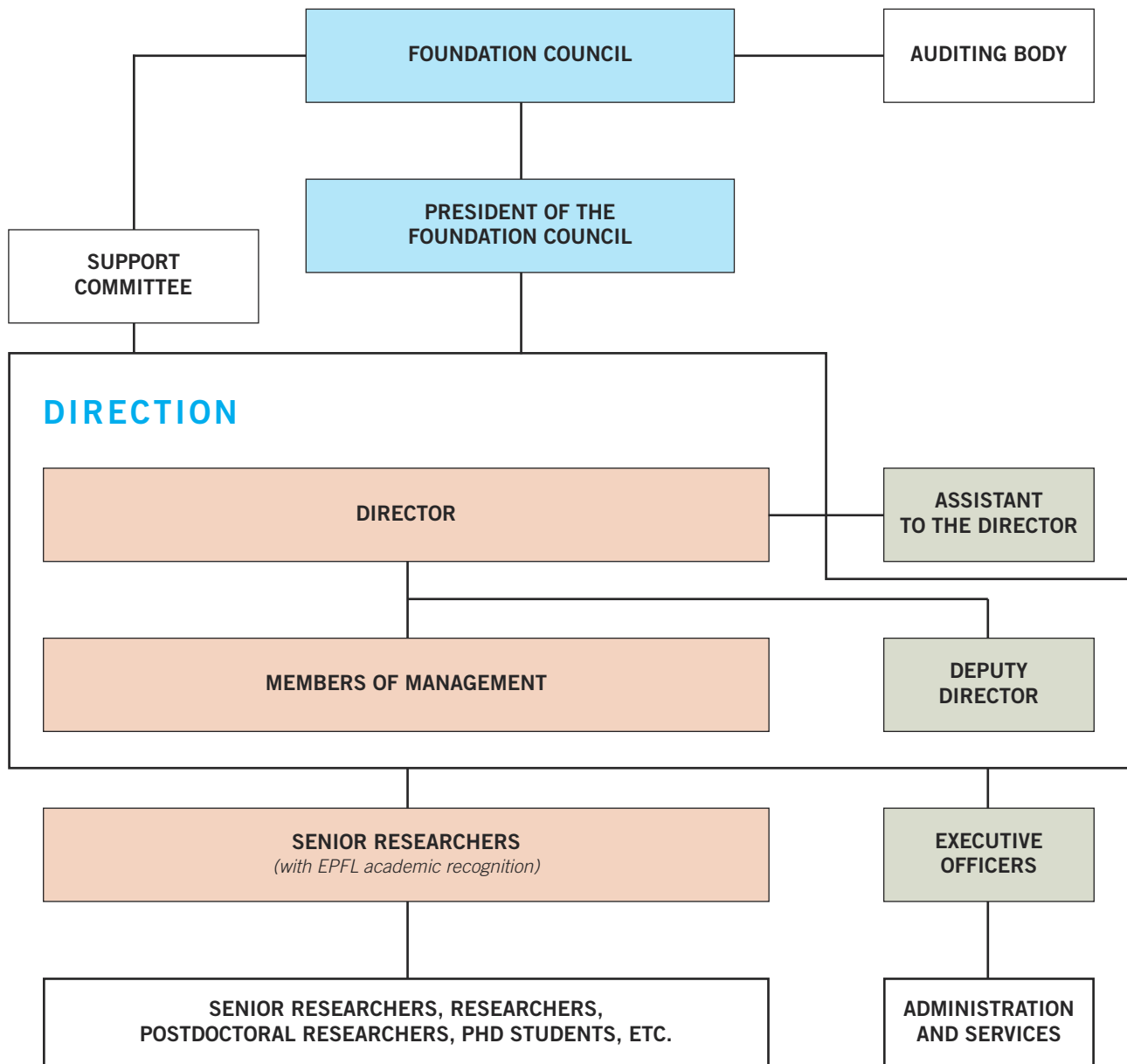
| (Swiss Francs) | 31.12.2009 | 31.12.2010 |
|---------------------------------|---------------------|---------------------|
| ASSETS | | |
| Cash | 2,762,410.81 | 2,812,924.45 |
| Accounts receivable | 240,450.85 | 231,089.80 |
| Accrued income and other | 520,640.79 | 862,331.54 |
| TOTAL CURRENT ASSETS | 3,523,502.45 | 3,906,345.79 |
| Equipment | 528,219.05 | 446,073.15 |
| Financial assets | 50,000.00 | 50,000.00 |
| TOTAL NON-CURRENT ASSETS | 578,219.05 | 496,073.15 |
| TOTAL ASSETS | 4,101,721.50 | 4,402,418.94 |
| LIABILITIES | | |
| Accounts payable | 277,233.39 | 279,750.32 |
| Accrued expense | 1,733,703.29 | 2,477,046.45 |
| Provisions | 578,000.00 | 471,000.00 |
| TOTAL FOREIGN FUNDS | 2,588,936.68 | 3,227,796.77 |
| Share capital | 40,000.00 | 40,000.00 |
| Special reserve | 1,200,000.00 | 1,000,000.00 |
| Retained earnings | 245,265.34 | 272,784.82 |
| Net income | 27,519.48 | -138,162.65 |
| TOTAL OWN FUNDS | 1,512,784.82 | 1,174,622.17 |
| TOTAL LIABILITIES | 4,101,721.50 | 4,402,418.94 |



ORGANIZATION



ORGANIZATIONAL CHART



- The Scientific Board, comprised of all the professors and senior lecturers (MER), ensures the scientific management of Idiap, particularly regarding recruitment, positioning, and partnerships.
- The Administrative Board is comprised of finance, human resources, industrial relations and public relations managers, as well as project, infrastructure and IT managers.





EMPLOYEES

Scientists

First Name, Last Name, Position, Country of Origin, Residence, Year of Arrival

Oya Aran Karakus, Postdoc, Turkey, 2009
Afsaneh Asaei, Research Assistant, Iran, 2008
Constantin-Cosmin Atanasoaei, Research Assistant, Romania, 2008
Venkatesh Bala Subburaman, Research Assistant, India, 2007
Eray Abdurrahman Baran, Research Assistant, Turkey, 2010
Joan Isaac Biel, Research Assistant, Spain, 2008
Hervé Bourlard, Director, Belgium, 1996
Barbara Caputo, Senior Research Scientist, Italy, 2005
Volkan Cevher, Professor, Turkey, 2010
Cheng Chen, Postdoc, China, 2010
Ronan Collobert, Research Scientist, France, 2010
John Dines, Research Scientist, Australia, 2003
Cong-Thanh Do, Postdoc, Vietnam, 2010
Trinh-Minh-Tri Do, Postdoc, Vietnam, 2009
Charles Dubout, Research Assistant, Switzerland, Renens, 2009
Stefan Duffner, Postdoc, Germany, 2008
Laurent El Shafey, Research Assistant, France, 2010
Rémi Emonet, Postdoc, France, 2010
Katayoun Farrahi, Research Assistant, Canada, 2007
François Fleuret, Senior Research Scientist, France, 2007
Marco Fornoni, Research Assistant, Italy, 2010
Philip Garner, Senior Research Scientist, England, 2007
Daniel Gatica-Perez, Senior Research Scientist, Mexico, 2002
Alexandre Heili, Research Assistant, France, 2010
David Imseng, Research Assistant, Switzerland, Rarogne, 2009
Dinesh Babu Jayagopi, Research Assistant, India, 2007
Niklas Johansson, Research Assistant, Sweden, 2008
Vasil Khalidov, Postdoc, Russia, 2010
Danil Korzhagin, Postdoc, Russia, 2008
Leonidas Lefakis, Research Assistant, Greece, 2010
Hui Liang, Research Assistant, China, 2008
Jie Luo, Research Assistant, China, 2007
Mathew Magimai-Doss, Research Scientist, India, 2007
Sébastien Marcel, Senior Research Scientist, France, 2000
Christopher McCool, Postdoc, Australia, 2008
Thomas Meyer, Research Assistant, Switzerland, Martigny, 2010

Gelareh Mohammadi, Research Assistant, Iran, 2009
Petr Motlicek, Research Scientist, Czech Republic, 2005
Radu-Andrei Negoescu, Research Assistant, Romania, 2007
Jean-Marc Odobez, Senior Research Scientist, France / Switzerland, Clarens, 2001
Sree Hari Krishnan Parthasarathi, Research Assistant, India, 2007
Hugo Augusto Penedones Fernandes, Research Assistant, Portugal, 2008
Andrei Popescu-Belis, Senior Research Scientist, France / Romania, 2007
André Rabello Dos Anjos, Postdoc, Brazil, 2010
Ramya Rasipuram, Research Assistant, India, 2010
Edgar Francisco Roman-Rangel, Research Assistant, Mexico, 2008
Anindya Roy, Research Assistant, India, 2007
Lakshmi Saheer, Research Assistant, India, 2008
Dairazalia Sanchez-Cortes, Research Assistant, Mexico, 2009
Carl Scheffler, Postdoc, Germany, 2010
Samira Sheikhi, Research Assistant, Iran, 2010
Serena Soldo, Research Assistant, Italy, 2009
Nicolae Suditu, Research Assistant, Romania, 2008
Gokul Thattaguppa Chittaranjan, Research Assistant, India, 2010
Tatiana Tommasi, Research Assistant, Italy, 2008
Zoltan Tüske, Research Assistant, Hungary, 2010
Fabio Valente, Research Scientist, Italy, 2005
Jagannadan Varadarajan, Research Assistant, India, 2008
Alessandro Vinciarelli, Senior Research Scientist, Italy, 1999
Roy Geoffrey Wallace, Postdoc, Australia, 2010
Majid Yazdani, Research Assistant, Iran, 2008
Sree Harsha Yella, Research Assistant, India, 2010

Development Engineers

Philip Abbet, Senior Dev. Engineer, Switzerland, Conthey, 2006
Olivier Bornet, Senior Dev. Engineer, Switzerland, Nendaz, 2004
Christine Marcel, Dev. Engineer, France, 2007
Olivier Masson, Dev. Engineer, Switzerland, Vevey, 2002
Florent Monay, Dev. Engineer, Switzerland, Monthey, 2008
François Moulin, Dev. Engineer, Switzerland, Vollèges, 2009
Alexandre Nanchen, Dev. Engineer, Switzerland, Martigny, 2008
Flavio Tarsetti, Dev. Engineer, Switzerland, Martigny, 2008

Administrative staff

Céline Aymon Fournier, Public Relations, Switzerland, Fully, 2004
Valérie Devanthéry, Program Manager, Switzerland, Sion, 2008
Christophe Ecoeur, Financial Assistant, Switzerland, Collombey, 2010
Jean-Albert Ferrez, Deputy Director, Switzerland, Verbier, 2001
Pierre Ferrez, Program Manager, Switzerland, Verbier, 2004
François Foglia, Director Adjunct, Switzerland, Saxon, 2006
Edward-Lee Gregg, Financial Manager, United States, 2004
Sylvie Millius, Administrative Assistant, Switzerland, Vétroz, 1996
Yann Rodriguez, Industrial Relations, Switzerland, Martigny, 2006
Nadine Rousseau, Administrative Assistant, Belgium, 1998

System Engineers

Tristan Carron, System Administrator, Switzerland, Martigny, 2003
Bastien Crettol, System Administrator, Switzerland, Sion, 2005
Norbert Crettol, System Administrator, Switzerland, Martigny, 2002
Cédric Dufour, System Administrator, Switzerland, Verbier, 2007
Frank Formaz, System Manager, Switzerland, Fully, 1998
Vincent Spano, Webmaster, Switzerland, Martigny-Combe, 2004

Interns

First Name, Last Name, Country of Origin, Home Institution

Idiap interns generally spend between six and ten months at the research institute. Some are students at EPFL (Ecole polytechnique fédérale de Lausanne) and do this work placement as part of their degree. Others come on student exchange programs set up with European projects in which Idiap participates.

Emrah Bostan, Turkey, Istanbul Technical University, Turkey
Murali Mohan Chakka, India, Indian Institute of Technology, Madras, India
Teodora Kostic, Serbia, Belgrade University, Serbia
Chongyang Liu, China, University of Hong-Kong, China
Jesus Martinez Gomez, Spain, Escuela Politécnica Superior de Albacete, Universidad de Castilla-La Mancha, Spain
Raul Montoliu Colas, Spain, Dept. Ingeniería y Ciencias de los computadores, Jaume I University, Castellon, Spain
Kazuhiro Otsuka, Japan, NTT Communication Science Laboratories, Kyoto, Japan
Mert Ozcan, Turquie, Département du Génie Electrique et Electronique (D-ITET), ETHZ, Zürich, Switzerland
Sriram Prasath Elango, India, National Institute of Technology (NIT), Bhopal, India
Alexandre Sokolov, Belgium, Université Polytechnique de Mons, Belgium
Elham Taghizadeh, Iran, Sharif University of Technology, Teheran, Iran
Mohammad J. Taghizadeh, Iran, Amirkabir University of Technology, Department of Electrical Engineering, Teheran, Iran

Visitors

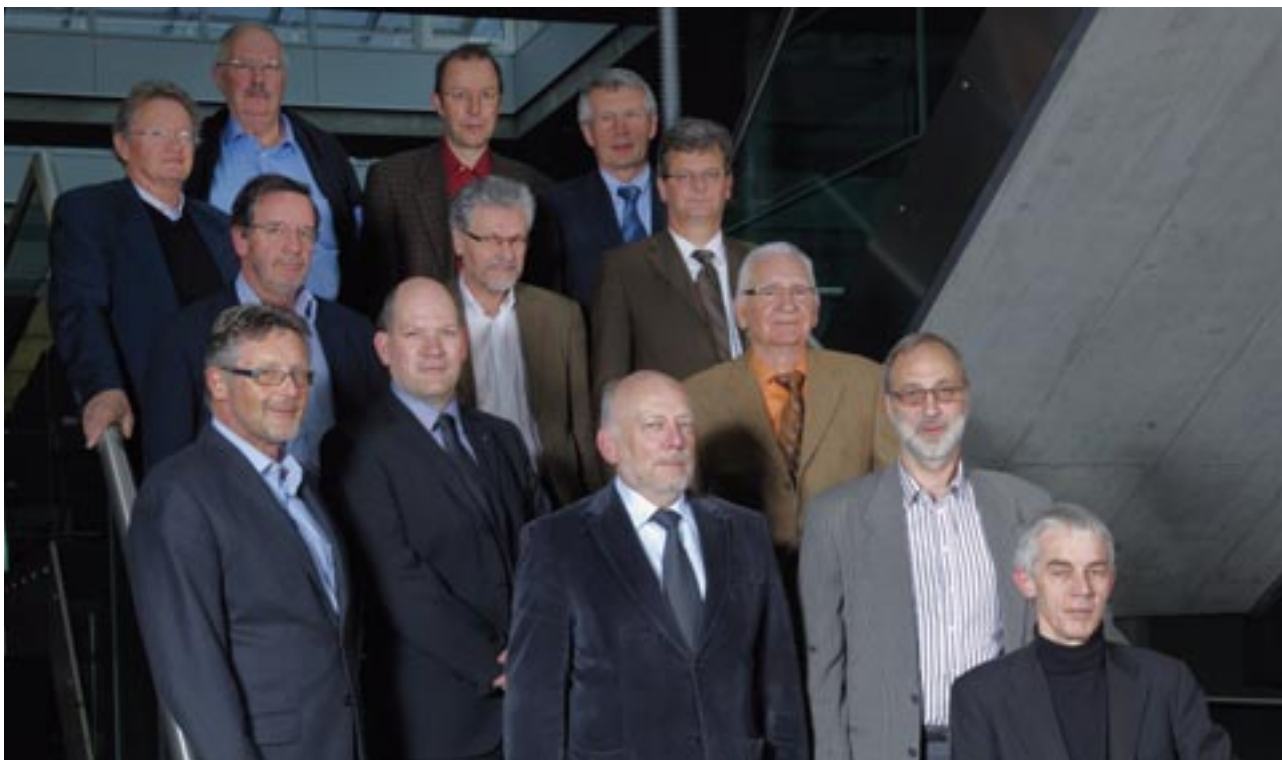
First Name, Last Name, Home Institution

Visitors are researchers or manufacturers who only spend a few days or weeks at the institute, some to strengthen inter-institutional relationships and others to get an insight into the work carried out by the institute.

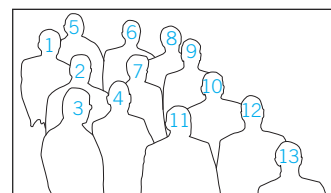
Hamid R. Abutalebi, Yazd University, Iran
Perttu Laurinen, University of Oulu, Finland
Filiberto Pla Banon, Dept. Lenguajes y Sistemas Informáticos, Universidad Jaume I, Castellon, Spain
Marius Silaghi, Florida Institute of Technology, United States



FOUNDATION COUNCIL



The Foundation Council is responsible for the economic and financial management of Idiap. The Council defines the structure of the research institute, appoints its director, and generally defends its interests, ensuring the successful development of Idiap.



- | | |
|--|---|
| <p>11 Olivier Dumas, President Director of Electricité Emosson SA</p> <p>3 Jean-Daniel Antille, Vice-President Manager of the Regional Office for the Economic Development of French-speaking Valais</p> <p>13 Prof. Martin Vetterli, Vice-President Dean of the School of Information and Communications (IC), EPFL (Ecole polytechnique fédérale de Lausanne)</p> <p>7 Jean-Pierre Rausis, Secretary Managing Director of BERSY Consulting</p> <p>12 Hervé Boulard Director of Idiap</p> <p>4 Jean-Albert Ferrez Deputy Director of Idiap</p> <p>10 Josy Cusani President of CimArk SA</p> <p>1 Prof. Jean-Jacques Paltenghi Adviser to the President, EPFL (Ecole polytechnique fédérale de Lausanne)</p> | <p>5 Pierre Crittin Notary</p> <p>8 Walter Steinlin Director of Swisscom Outlook President of the Commission for Technology and Innovation (CTI)</p> <p>9 Stefan Bumann Ad interim Director of HES-SO Valais Wallis</p> <p>2 Prof. Christian Pellegrini Senior Member of the Foundation Council of Idiap Honorary Professor in the Faculty of Sciences at the University of Geneva</p> <p>6 Daniel Forchelet Adjunct General Secretary CIIP (Conférence intercantonale de l'instruction publique de la Suisse romande et du Tessin)</p> <p>Dr. Bertrand Ducrey (not pictured) Director of Debio Pharmaceutical Research SA</p> <p>Jean-René Germanier (not pictured) National Councilor, President of the National Council</p> <p>Marc-Henri Favre (not pictured) President of the Town of Martigny</p> |
|--|---|



"IDIAP'S PROGRESS IS REMARKABLE"

Christian Pellegrini,
Senior Member of the Foundation Council of Idiap
Honorary Professor in the Faculty of Sciences
at the University of Geneva

In what context did you join Idiap's Foundation Council?

When the Dalle Molle Foundation created Idiap in 1991, EPFL and the University of Geneva were asked to be "coach" of this new institution. My colleague, Professor Bernard Levrat, was the first university representative on the Foundation Council, and a few years later in 1993, I succeeded him.

What do you think about Idiap's progress?

In the beginning Idiap was a small research unit that occupied a few offices on the first floor of Villa Tissières in Martigny. Now the institute has more than 100 employees and occupies 2,600 square metres in an ultra-modern building. The progress made in such a short time is remarkable. This is largely owed, I think, to the current director, Professor Hervé Bourlard, and to the entire Foundation Council, which has supported these developments.

You praise its structural growth, but what about its research work?

The two elements are inseparable. If there are around one hundred people at Idiap today, it is because the projects presented at the federal, European and international levels have been successful, and therefore it has been necessary to hire researchers to carry out this research. Idiap has been able to expand its areas of interest while maintaining thematic unity in the research it undertakes. It has also been able to offer its researchers the freedom to specialize in their preferred subjects, while ensuring that their work is compatible. All this has led to the success that it now has.

What is the Foundation Council's role within Idiap?

Since Idiap is governed by a foundation, the presence of a Foundation Council is required by law. It has legal responsibility for the financial aspects of the institute's operations. In our case, our role goes well beyond this. The members of the Council bring not only their expertise but also their contacts from academic, scientific, political and economic circles.

What are the most significant decisions you have taken?

Idiap has had two directors. Between the two, there were two years during which my colleague from EPFL, Professor Giovanni Coray, and I were in charge of operational management. We travelled to Valais every month – and he did the trip almost every week. Our last major decision was therefore the appointment of Hervé Bourlard, the current director. We were also occupied for some time setting up the strategic alliance with EPFL in 2008, following the Confederation's request to that effect. I think now that this partnership can be strengthened further in light of the initial experiment.

What benefits does being a Foundation Council member have for you?

On a professional level, it has introduced me to areas outside of my normal scope, and it's always very enriching to expand one's scientific horizons. With regard to my department at the University of Geneva, it's enabled us to make contacts and organize ambitious and fruitful projects with the Idiap researchers. On a more personal level, serving on the Foundation Council I've made many new contacts and even formed a number of friendships.



ADVISORY BOARD

The Advisory Board is comprised of members of the scientific community selected by Idiap's management for their exceptional skills and avant-garde vision. Although their role is strictly advisory, their advice is frequently sought and proves to be invaluable when making decisions regarding research, training, and technology transfer.

Dr. Jordan Cohen

Independent Consultant, Spelamode
Half Moon Bay, CA, USA

Prof. Dr. Donald Geman

Professor of Mathematics, Johns Hopkins University
Baltimore, USA

Dr. John Makhoul

Chief Scientist, Speech and Signal Processing, BBN Technologies
Cambridge, MA, USA

Prof. Nelson Morgan

Director of the International Computer Science Institute (ICSI)
Berkeley, CA, USA

Dr. David Nahamoo

Senior Manager, Human Language Technologies, IBM Research
Yorktown Heights, New York, USA

Prof. Dr. Bayya Yegnanarayana

Professor and Microsoft Chair International Institute of Information
Technology (IIIT)
Hyderabad, India

Dr. Hong-Jiang Zhang

Managing Director, Microsoft Research Asia Advanced Technology
Center
Beijing, China



MAIN PARTNERS

TOWN OF MARTIGNY

CANTON OF VALAIS

SWISS CONFEDERATION

State Secretariat for Education and Research (SER)



www.loterie.ch



www.swisscom.com



Swiss Power Group.

www.groupemutuel.ch



www.epfl.ch



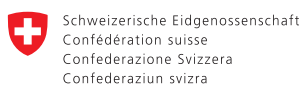
www.theark.ch



www.ideark.ch



www.snf.ch



Innovation Promotion Agency CTI

www.bbt.admin.ch/kti



cordis.europa.eu/fp7





Centre du Parc, rue Marconi 19, PO Box 592, CH-1920 Martigny
T +41 27 721 77 11 F +41 27 721 77 12 info@idiap.ch www.idiap.ch



IDIAP RESEARCH AREAS: HUMAN AND MEDIA COMPUTING

As announced in last year's report, to face its continuous growth, while still fostering internal multi-disciplinary collaborations, Idiap reorganized its internal structuring of its research themes. Idiap has thus adapted the way it presents itself and describes its current activities, to take into account the new areas of development not only towards human-computer interaction but also toward human-to-human interaction, collaboration, behavior, and innovation. Thus, after several (13) years of positioning itself under the general theme of "Multimodal human-computer interaction", Idiap decided to officially cover a larger research domain, now referred to as "**Human and Media Computing**".

Articulated around our current activities, "Human and Media Computing" now covers the following research themes:

- **Perceptual and cognitive systems:** Speech processing; Natural language understanding and translation; Document and text processing; Vision and scene analysis; Multimodal processing; Cognitive sciences.

Idiap combines its multi-disciplinary expertise to advance the understanding of human perceptual and cognitive systems, engaging in research on multiple aspects of human-computer interaction with computational artefacts such as natural language understanding and translation, document and text processing, vision and scene analysis, multimodal interaction, computational cognitive systems, and methods for automatically training such systems (see our research efforts in machine learning).

- **Social/human behavior:** Web social media; Mobile social media; Social interaction sensing; Social signal processing; Verbal and nonverbal communication analysis.

Social Signal Processing is the domain aimed at automatic understanding of social interactions through analysis of non-verbal behavior.

- **Information interfaces and presentation:** Multimedia information systems; User interfaces; System evaluation.

Information processing by computers must be accompanied by human-computer interfaces that present information and receive input in an efficient and usable way, possibly acquiring information from users in a non-disruptive way. Current research directions at Idiap focus on multimedia information systems, user interfaces, and the evaluation of interactive systems.

- **Biometric person recognition:** Face recognition (detection-localization-identification-verification); Speaker identification/verification; Multimodal biometric person recognition; Countermeasures to spoofing attacks.

Biometric person recognition refers to the process of automatically recognizing a person using distinguishing behavioral patterns (gait, signature, keyboard typing, lip movement, hand-grip) or physiological traits (face, voice, iris, fingerprint, hand geometry, EEG, ECG, ear shape, body odour, body salinity, vascular). Over the last decades, several of these biometric modalities have been investigated (fingerprint, iris, voice, face) and are still under consideration. More recently, novel biometric modalities have emerged (gait, EEG, vascular) mainly due to the development of sensor technologies.

Biometric person recognition offers a wide range of challenging fundamental and concrete problems in image processing, computer vision, pattern recognition and machine learning. It is thus a truly inter-disciplinary research field.

- **Machine learning:** Statistical and neural network based machine learning; Computational efficiency, targeting real-time applications; Very large datasets; Online learning.

Research in machine learning aims at developing computer programs able to learn from examples. Instead of relying on a careful tuning of parameters by human experts, machine-learning techniques use statistical methods to directly estimate the optimal setting, which can hence have a complexity beyond what is achievable by human experts.



1. Machine learning and signal processing

Leading researchers: *François Fleuret, Barbara Caputo, Ronan Collobert, Volkan Cevher*

Machine learning still plays a central place in all Idiap's activities, both as a common tool to solve very large, real-life, real-scale problems, and as a research topic.

Machine learning is applied with great success to research areas such as the automatic analysis of social behavior, large-scale human behavior modelling, or autonomous cognitive agents, where we pioneer the use of sophisticated multi kernel online learning algorithms for building semantic representations of space. Generic tools developed at Idiap are publicly available through <http://torch5.sourceforge.net>, and keep being regularly enhanced and updated.

The MASH project (initiated and coordinated by Idiap) funded by the EU (<http://mash-project.eu>), and the VELASH project funded by the SNF, are investigating the collaborative development of machine learning with very large families of feature extractors. They both aim at developing novel tools to allow large groups of individuals to design jointly very complex intelligent systems for computer vision and robotics. With a total workforce of more than 400 person-months, this research initiative will provide key results on the potential of such approaches for the next-generation artificial intelligence.

Innovative work on machine learning applied to the control of non-invasive prosthetics devices has been initiated in 2010. The projects NinaPro, funded by the SNF, and the ToAdapt project, funded by the Hasler foundation, aim at paving the way to the next generation of dexterous and easy to control prosthetic hands. Central to this progress will be the use of state of the art transfer learning algorithms, able to ease the burden of controlling the prosthesis by the patient.

Leveraging Unlabeled Data

Hand-labeling data remains an expensive task in many cases. It motivates research for leveraging the cheap and basically infinite source of unlabeled speech, text or images available in the digital world. Classical semi-supervised learning and transduction are machine learning classification techniques able to handle labeled and unlabeled data, which assume each unlabeled example belongs to one of the labeled classes that are considered. Finding ways to adapt and scale these methods to real large-scale problems is a challenge we are interested in, here at Idiap. We are also investigating other ways to leverage

unlabeled data, like for example transfer learning (a fully unsupervised task can learn interesting representations for a supervised task).

Deep Learning

Real complex tasks require complex learning models. A wide range of approaches can be considered between two extremes: (i) use complex features and a simple learning algorithm, or (ii) use simple features and a complex learning algorithm. Deep architectures are an implementation of approach (ii), which stacks several layers of data representations with an increasing level of abstraction. Training these representations is extremely challenging as it implies training highly non-linear and non-convex models. At Idiap, we are currently interested in applications in Natural Language, Image and Speech processing.

Information Organization and Retrieval

With fast growing internet resources, automatic information extraction and information organization from documents is of crucial concern. Our research aims at marrying natural language processing and information retrieval in this context. It requires not only finding new fast natural language processing algorithms able to scale to billions of documents but also new techniques to implement semantic knowledge in computing document-query distances.

Methods for low-level signal models

We study the theoretical and algorithmic foundations for provable learning (both in generalization and complexity) of structured low-dimensional models. We investigate how to exploit geometric topologies and the diminishing returns (i.e., sub-modularity) within our learning objectives to significantly move from compressive sensing of signals towards compressive processing of information for scalable parameter estimation.

As an example, we have developed the first rigorous and scalable learning framework to construct signal dictionaries for sparse representation. This was achieved by casting the dictionary-learning problem in a new, discrete setting, and proposing new scalable algorithms by exploiting a geometric connection between sub-modularity and sparsity.



2. Audio and speech processing

Leading researchers: *Hervé Bourlard, Phil Garner, John Dines, Mathew Magimai-Doss, Petr Motlicek, Fabio Valente*

Idiap keeps being recognized as one of the key leading institutions in audio and speech processing and retains an expertise in areas such as improved robustness, better modelling of the time/frequency structure of the speech signal, portability across new applications, automatic adaptation, confidence measures, keyword spotting, out-of-vocabulary words, acoustic modelling of temporal dynamics and speaker turn detection (using acoustic features and/or source localization features). Besides further development, and adaptation to multiple applications, the resulting leading edge software (acoustic feature extraction and continuous speech recognition) are currently being released through open source libraries:

- “Tracter” Audio processing (incl. beamforming, acoustic feature extraction): see <http://juicer.amiproject.org/tracter/> for more information.
- “Juicer” Continuous Speech Recognition: <http://juicer.amiproject.org/juicer/> for more information.

Our research interest in speech processing also involves automatic detection of keywords, i.e. to identify words (or phrases) of interest in unconstrained speech recordings. This is defined in general as Spoken Term Detection (STD), where terms do not have to necessarily be defined a-priori. The STD system developed at Idiap for detecting English spoken terms employs the Large Vocabulary Continuous Speech Recognition (LVCSR) system developed within the AMI and AMIDA projects (<http://www.amiproject.org>). In 2010, the STD system was further improved by applying a language identification module to avoid processing speech segments pronounced in a non-English language.

Microphone arrays continue to be an important research topic. Idiap is well known for work in the past involving microphone arrays in meetings. Future requirements are likely to focus on social signal processing (in SSPnet and IM2), and on family scenarios (as in TA2). 2010 saw the array work re-started along two complementary threads. In the first thread, sparse techniques are being investigated. Such techniques capitalize on the unique spectral structure of speech to allow source separation and localisation using very few microphones. Initial and very promising results were presented at Interspeech; further work has been accepted to appear in 2011.

In the second complementary thread, we are looking again at conventional microphone arrays. Instead of considering them as simply speech enhancement devices, distinct from the application, we are considering the whole chain from audio acquisition through to speech recognition or localisation. This allows us to optimise data flow and functionality through the

chain, customising the processing for speech recognition (as in meetings) or for event detection (in TA2 style family scenarios).

Idiap has been active in detection/identification tasks performed over input speech, such as speaker/language identification and keyword spotting (including spoken term detection where terms do not have to necessarily be defined a-priori).

In case of keyword spotting (KWS), attention was paid to develop various (complementary) systems (differing in detecting speed-complexity/accuracy) using unconstrained dictionaries, which could eventually be fused to increase final detection performance. For the purpose of the IM2 project, an English real-time KWS system has been implemented (together with EPFL) to enable robust indexing of children's speech recorded in hospital. Current research trends address adaptation of a monolingual system for multi-lingual purposes, demanded in several of Idiap's R&D activities.

3. Image and video processing and analysis

Leading researchers: *Daniel Gatica-Perez, Jean-Marc Odohez, François Fleuret, Barbara Caputo*

Idiap keeps also being very active, and a recognized leader, in multiple areas of image and video processing and analysis, including: object modelling, algorithm robustness, data fusion (colour, shape, motion) and feature selection, online learning and model adaptation, multi-object tracking (dynamics and data-likelihood modelling), behavioral models, joint tracking and event recognition, and computational complexity, as exemplified below.

The PASCAL II funded SS2-Rob project develops categorization algorithms for life-long learning of semantic place representation, with a special emphasis on indoor places. A specific goal that we have investigated is the design of semi-supervised algorithms for enabling autonomous agents to evaluate their own level of competence for given tasks autonomously, and in case of lack of confidence, or detection of ignorance regarding a concept, to be able to develop learning strategies to fill this gap.

In another research line, we have proposed novel semi-local quantized descriptors for the analysis of complex and noisy shapes such as those encountered in Maya glyphs. The work was done in the context of the CODICES project funded by the SNSF, which aims at designing algorithms for the robust representation and retrieval of complex visual patterns in complex images of cultural and historical collections.



Many of the resulting algorithms are made publicly available through the TorchVision library (as part of Torch, <http://torch3vision.idiap.ch>) also thus allowing researchers to incrementally build on each other's work, while optimizing for collaborations.

4. Multimodal information management and indexing

Leading researcher: Andrei Popescu-Belis

Idiap keeps being active in the areas of content-based information management using multiple data streams (audio and video), and optimization of user interaction. In 2010, research on multimodal information indexing and retrieval mainly focused on augmenting the access to meeting archives through the Automatic Content Linking Device (ACL D), described in Section 3.9 of the key achievements. The ACL D is a voice-based just-in-time retrieval system that suggests relevant multimedia items from its database, based on the contents of an ongoing meeting. The system was completed in 2010, and keeps being improved; it has been demonstrated at many events during the year.

5. Biometric person recognition

Leading researcher: Sébastien Marcel

Idiap keeps working on increasing robustness of person recognition techniques, mostly in face recognition. In 2010, these efforts were taking place mainly in the context of two SNSF projects, as well as the FP7 projects MOBIO and TABULA RASA (both with Idiap as coordinator). The resulting research efforts are currently at the basis of several developments and technology transfer successes, including one of Idiap's spin-offs, KeyLemon (<http://www.keylemon.com>), enabling users to automatically lock/unlock their laptop based on their face.

The project TABULA RASA will study the vulnerability of biometric systems to attacks at the sensor level, so-called spoofing attacks, and will develop counter-measures, paving the way for a new research direction within the biometric person recognition research theme: Trusted Biometrics under Spoofing Attacks.

In 2010, Idiap established again strong relationships during the preparation of a joint collaborative European project in security with research institutions such as the TUBITAK Informatics and Information Security and Advanced Technologies Research Center in Turkey, the Commissariat à l'Energie Atomique (CEA) in France, and the famous Federal Office for Information Security (BSI) in Germany as well as with several companies such as TUV Informationstechnik (TUViT) in Germany. Idiap also strengthened existing collaborations with MOR-

PHO (ex-SAGEM Sécurité) and the Ecole polytechnique fédérale de Lausanne (EPFL).

6. Social and human behavior

Leading researchers: Daniel Gatica-Perez, Jean-Marc Odobez

This area is concerned with the automatic analysis of a variety of real-life human behaviors. This activity exploits expertise and synergies between key areas at Idiap including multi-sensor human behavior capture, machine learning, and perceptual processing. In 2010, the specific work in this domain included three main areas.

In the first place, we have continued our work on large-scale reality mining from mobile phone sensor data through the LS-CONTEXT (funded by Nokia Research) and the SNSF HAI projects. Our methods aim at inferring human patterns (related to mobility and social context) using statistical methods that operate on low-level observations. Our research is conducted on large-scale phone data of two hundred users over more than one year of life.

In the second place, Idiap's long-standing work on human interaction modelling has been continued in the context of the European HUMAVIPS and NOVICOM projects, the SNSF SONVB and MULTI projects, and the NCCR IM2. HUMAVIPS seeks to endow humanoid robots with basic social skills necessary to deal with small groups of people. NOVICOM is developing methods to extract nonverbal communicative cues from video. SONVB is exploring new sensing and analysis approaches for automatic social inference in organizational scenarios. MULTI is investigating methods to extract and analyze privacy-preserving audio in mobile sensing scenarios. Finally, IM2 is investigating new links between nonverbal behavior and social media.

In the third place, in the context of the European Vanaheim project, we have started our investigation towards enhanced behavior recognition in the surveillance context. To move one step beyond location-based activity analysis, we are currently designing algorithms to infer behavioral cues like head and body orientation. Despite the use of low-resolution images (the situation should improve with the advent of high-definition cameras or the more frequent use of Pan-Tilt-Zoom cameras), good results have been achieved. The next step will be to exploit these cues to infer meaningful behavioral patterns like recognizing whether people are part of the same group or interacting with each other, or other situations of interest (e.g. arguing, fights).



7. Social signal processing (SSP)

Leading researchers: Alessandro Vinciarelli, Hervé Bourlard, Fabio Valente

In 2010, Social Signal Processing (SSP) scientific activities have addressed two main topics, namely role recognition and personality computing.

Two main results have been achieved in role recognition: the first is the combination of turn-organization and prosody towards the recognition of roles associated to norms, i.e. to expectations expressed in terms of prescriptions about the way people playing a certain role are supposed to behave. The second is the integration of role-related a priori knowledge in a speaker diarization system, an approach that has led to significant improvements. Ongoing work aims at extending the approaches above to the more challenging case of roles associated to beliefs, i.e. to subjective choices about the behavior to be displayed, for instance social roles.

The main result in personality computing is the development of an approach capable not only of predicting how human listeners tend to perceive the personality of unacquainted speakers, but also to identify the vocal behavioral cues actually influencing personality perception. Ongoing work aims at assessing cross-cultural effects associated to the phenomenon.

In parallel, several SSP oriented initiatives have been organized, including the International Workshop on Social Signal Processing, the Workshop on Mobile Social Signal Processing, the International Workshop on Socially Intelligent Surveillance and Monitoring.

Furthermore, Alessandro Vinciarelli has been invited as a lecturer or keynote speaker in a large number of events, including the Summer School on SSP, the International Workshop on Human Behavior Dynamics, the Interdisciplinary Workshop on Culture, Language and Society, and the COST2102 Winter School.

8. Multilingual processing of spoken and written information

Leading researchers: Andrei Popescu-Belis, John Dines, Phil Garner, Hervé Bourlard

Multilingual processing is becoming a key research theme in Europe, while being vastly underrepresented in a multilingual country like Switzerland. Building upon our expertise and activities in spoken language processing (and our know-how in multilingual spoken and written information processing), we

still believe that Idiap is in a unique position to move large activities towards multilingual speech-based document retrieval and machine translation technologies.

The EU-FP7 EMIME project Effective Multilingual Interaction in Mobile Environments, <http://www.emime.org>, on-going in 2010, will help to overcome the language barrier by developing a mobile device that performs personalized speech-to-speech translation, such that a user's spoken input in one language is used to produce spoken output in another language, while continuing to sound like the user's voice.

2010 was an important year for the EMIME project, being the final full year, and coinciding with the 7th ISCA speech synthesis workshop. Idiap's EMIME contributions took a high profile at the workshop, where we were able to demonstrate fast adaptation of HMM based speech synthesis using vocal tract length based techniques.

During 2010, several other project proposals were submitted capitalising on the contributions of EMIME.

The COMTIS SNSF Sinergia project (www.idiap.ch/comtis) in Machine Translation (MT) has started in 2010, focusing on a problem that is less targeted in the current statistical MT paradigm: the translation of relationships between sentences. In collaboration with two teams in Geneva, from linguistics and computational learning, we have started analyzing collections of examples of various types of dependencies between sentences, such as rhetorical relations signaled by discourse connectives, which are problematic for current MT engines. Work towards their modeling and automatic disambiguation, in preparation for MT, is now under way.

9. Probabilistic modeling of natural images

Leading researcher: Volkan Cevher

Acquisition, compression, denoising, and analysis of natural images (similarly medical, seismic, hyper-spectral, etc.) draw high scientific and commercial interest. Research to date in natural image modeling has had two distinct approaches, with one focusing on deterministic explanations and the other pursuing probabilistic models. We therefore bring together the deterministic and probabilistic models of compressibility in a simple and general manner under a new class of probabilistic models, the so called compressible priors. We dovetail the concept of order statistics from probability theory with the deterministic models of compressibility from approximation theory. We expect this work to cast new light on the compressibility of natural images and provide new low-level models for vision problems.



SELECTION OF IDIAP'S KEY ACHIEVEMENTS IN 2010

1. Realtime large vocabulary speech recognition (Juicer)

Leading researchers: *Phil Garner, John Dines*

Previous work on speech recognition from the AMI and AMIDA projects resulted in a large software and knowledge base with clear commercial possibilities. 2010 saw these possibilities solidify in the form of a licensing agreement and a spin-off company. Idiap entered into an agreement with the universities of Edinburgh and Sheffield to jointly license AMIDA technology. The agreement represents the continuation of the AMIDA partnership. Based on the agreement, a company called Koemei has been created via the IdeArk incubator. Koemei will provide a speech recognition service, allowing users to take advantage of the AMIDA recognition system without the difficulties associated with running such a large system themselves. Koemei already has working relationships with other AMIDA spin-offs such as Dev-Audio (<http://www.dev-audio.com/>) in Brisbane and Quorate Technology in Edinburgh.

The resulting AMI/AMIDA speech recognition system has also been recently exploited within Klewel. Similar to Koemei, Klewel is a spin-off company of Idiap. It provides leading edge solutions for capturing, indexing and distributing online the full content of conferences and its main objective is to develop and maintain solutions, which can ensure the continued existence and visibility of various types of events (congress, conferences, symposiums, workshops, meetings). The AMIDA speech recognition system has been incorporated into a Klewel search engine to develop a real system performing automatic speech-to-text indexing intended for automatic retrieving of lecture recordings.

2. Speech processing & MLP-based feature extraction

Leading researchers: *Fabio Valente, Mathew Magimai-Doss, Hervé Bourlard*

Idiap continued its research on MLP features for Mandarin automatic speech recognition (ASR). The research focussed along the following lines. First on small scale experimental setup, studying MRASTA features along with other long term features such as DCT TRAPS, wLP TRAPS in the standard three layer MLP framework and five layer bottle-neck MLP framework. It was found that wLP TRAPS consistently yields the best system, and five layer bottle-neck MLP features yield better systems than three layer MLP features. Second, studying ICSI multi-stream features and hierarchical MRASTA features on large

scale experimental setup using the RWTH GALE system. On three different evaluation sets, the MLP features were found to yield between 18-23% relative improvement. Finally comparing genre-independent acoustic modeling against genre-dependent acoustic modeling. Genre-dependent acoustic modeling using MLP features that are obtained by training MLP with long term features could help in improving ASR performance on both genres, i.e. broadcast news and broadcast conversation.

We initiated the research on the use of MLPs trained to classify "universal" phonemes/phones for mixed language speech recognition and recognition of non-native speech. In both cases, the use of universal phone posterior probabilities has been found to help in improving the performance of the ASR system.

Building on a recent Idiap-EPFL PhD thesis (from Joel Pinto), the hierarchical MLP-based approach to model information present in long temporal context of sound class posterior probabilities was applied to:

1. *Language identification (LID)*: Preliminary studies on the SpeechDat(II) corpus demonstrated that the hierarchical MLP-based approach can yield a better system than both phonotactic constraints-based LID system and speech recognition based LID system.
2. *Articulatory feature-based recognition*: The hierarchical MLP-based approach was found to significantly improve both articulatory feature classification accuracy and articulatory feature-based phoneme recognition accuracy.

We investigated the use of phone posterior probabilities, referred to as posterior features, estimated by MLP for:

1. *Template-based recognition*: Using different local distance measures, and irrespective of the type of data (matched condition or auxiliary) used to train MLP, the posterior features were found to outperform standard cepstral features.
2. *Grapheme-based recognition*: Preliminary studies on English exploiting Kullback-Leibler divergence based acoustic models have shown that, with the modeling of longer sub-word unit context, a grapheme-based system could yield performance similar to phoneme-based system.

3. Speaker diarization

Leading researcher: *Fabio Valente*

Speaker diarization refers to the problem of automatically detecting "who spoke when". Speaker diarization thus involves



determining the number of speakers in a given audio stream and clustering together segments belonging to the same speakers. Idiap has proposed a non-parametric system based on the information bottleneck principle that allows the use of an arbitrarily large number of features, which can reduce the error rate by 30% with minimal increase in the computational complexity. This work has been finalized in Deepu Vijayaseenan's PhD thesis, successfully defended in December 2010. Furthermore the convergence between speaker diarization methods and conversation analysis methods has been investigated on several datasets (political debates, AMI corpus and Rich Transcription data); results show that conversation properties like turn-taking, influence, and role information can be used to further reduce the speaker error.

4. MASH collaborative platform for image feature development

Leading researcher: François Fleuret

Over the course of 2010, the European MASH project, headed by Idiap, deployed a first operational version of its open platform for the collaborative development of image feature extractors (<http://mash-project.eu>). The long-term goal of the project is to facilitate the joint work of very large teams around the development of complex machine learning systems.

The platform incorporates standard features for the communication between contributors, and novel development tools oriented towards machine learning. They allow participants to access feature extractors contributed by others, maintain their own collection, and make a part or the totality of it available publicly.

The resulting system thus integrates machine-learning techniques developed at Idiap, together with algorithms (or heuristics) developed by other members of the project, and allows collaborators to run experiments using their own contributions, or those of others, on both image classification and goal-planning tasks. Large-scale experiments defined by the consortium members are ran on a regular basis to assess the overall progress of the project.

The underlying architecture has been designed from the ground up as distributed across multiple computers, allowing the platform to run experiments with a robotic arm located in Prague, Czech Republic, and to scale up the computation capabilities if necessary.

5. Temporal activity discovery from large sensor logs

Leading researcher: Jean-Marc Odobez

In 2010, Idiap has developed a novel model for the unsupervised discovery of recurrent patterns in multivariate time series, where observed values are caused by the superposition of multiple phenomena that can occur concurrently and with no synchronization. This is a typical situation when multiple sensors are recording the activities of multiple objects/people, like for instance multimodal sensors (proximity, water, light sensors, etc.) in domestic applications. Our model relies on a probabilistic representation where activities not only encode the co-occurrence information (as in all previous topic models) but also the order in which this information appears, and when the activities occur in the data.

The method was successfully applied to multi-camera data in both indoor and outdoor complex surveillance scenarios and microphone-array audio data of traffic scenes. Discovered activities correspond to recurrent trajectories and sequential patterns of different object classes (e.g. cars stopping at red light followed by pedestrian crossing the zebras). In addition, the method also allows the identification of abnormal situations, an important point that will be exploited in the European project Vanaheim to select the streams to be displayed in control rooms of large public spaces and direct the attention of operators towards relevant information.

6. Large-scale human behavior modelling from mobile phones

Leading researcher: Daniel Gatica-Perez

We have developed methods to mine daily patterns at large-scale from mobile phone users, which operate on low-level observations obtained from phone sensor data, such as the locations of an individual and who they are in proximity with, as well as the time of the day when this occurs. Our recent work designed automatic methods for (1) discovery of human places of interest; (2) discovery of social context and groups; and (3) discovery of patterns of phone application usage. In the first research line, our work integrated multiple sources of location information (GPS, Wifi, etc.) and additional sensor data to infer the most relevant physical places in a person's life. This work received the Best Paper Award at the Int. Conf. on Mobile and Ubiquitous Multimedia in 2010.



In the second research line, we developed a new probabilistic graphical model that can recover interaction types from blue-tooth data, i.e., groups of people and the most likely times when they meet. In the third line of work, we proposed a framework to mine phone application logs, and discover common patterns of daily usage of specific applications over individuals and the whole population. We have shown the performance of these methods on data generated by a large data collection campaign involving about 200 users over more than a year of life. This work was done in collaboration with Nokia Research.

7. Automatic content linking device

Leading researcher: Andrei Popescu-Belis

In 2010, within the AMIDA and IM2 projects, Idiap extended the Automatic Content Linking Device (ACL D) into a more flexible version, which has been installed and demonstrated in several settings, with real-time processing. The ACL D provides the participants to an ongoing discussion (or users listening to a recording discussion or lecture) with documents and fragments of past-recorded meetings that are related to the content of this discussion, as well as with websites and potentially any file from the user's computer. The ACL D makes use of Idiap's Large Vocabulary Continuous Speech Recognition system (see above) and its multimedia archive contains recordings of past meetings that were processed using automatic speech recognition, speech segmentation, and speaker diarization. The system could be installed, together with the Idiap ASR system, on a single Macintosh laptop, making the demonstrator portable. A typical scenario for demonstration has the speaker use the ACL D while describing the functioning of the system. A version installed in the Idiap Show Room is connected to the database of Idiap publications, and is intended as an assistant for a presenter talking about research at Idiap.

8. Biometric person recognition

Leading researcher: Sébastien Marcel

In 2010 was the conclusion of the FP7 project MOBIO (Mobile Biometry). The experts of the European Union evaluated the project during its final review, reporting full success of this project. MOBIO was acknowledged for its leading edge position in biometric technology for mobile devices using face and speaker recognition.

One of the first key achievements was the development of a MOBIO prototype of face recognition embedded on an iPhone 4, probably one of the first face recognition systems on an iPhone 4.

A second achievement is the public release of the MOBIO database, a large corpus of audio/video samples recorded from mobile phones across multiple sites in Europe, to allow the development and the evaluation of mobile biometric face and speaker recognition technologies.

9. Improving family conferencing systems

Leading researchers: Phil Garner, Petr Motlicek, Jean-Marc Odohez

Within the TA2 FP7 EU project, Idiap participates in developing a real-time multimodal analysis system with "just-in-time" multimodal association and fusion for an unconstrained living room environment. The system comprises the detection and tracking of up to 4 persons in both the audio and video modalities, and the analysis of their behaviors and interactions from the detection, localization and fusion of verbal (keyword spotting), paralinguistic (e.g. laughter), and nonverbal (e.g. attention focus) events. The system is designed to be possibly used in open, unconstrained environments like in next generation video conferencing systems that automatically "orchestrate" the transmitted video streams to improve the overall experience of interaction between spatially separated families and friends.

10. Model-based compressed sensing

Leading researcher: Volkan Cevher

Prof. Volkan Cevher and co-workers established the first theoretical framework to incorporate generic prior information on sparse signal coefficients into compressive sensing (CS) recovery with provable guarantees. CS is an emerging alternative to Shannon/Nyquist sampling paradigm for simultaneous sensing and compression of signals. While the original CS theory has applications to digital signal processing, machine learning, data streaming, combinatorial group testing, and communications, it failed to exploit application dependent sparsity priors with rigorous guarantees. Prof. Cevher's contribution is therefore substantial for increasing the impact of CS



on all of its application areas by improving its recovery speed and performance, while simultaneously reducing the sampling requirements.

In addition, Prof. Volkan Cevher introduced the compressible priors framework, providing solid mathematical grounds for statistical low-dimensional models. Compressible priors unify the deterministic and probabilistic models of compressibility in a simple and general manner with applications to underdetermined linear regression and modeling of natural images. Identifying and exploiting compressible priors alleviate high-dimensional statistical analysis, inference, and decision-making.



MAIN PROJECTS IN PROGRESS

ACRONYM NAME, NAME

PARTNERS

EUROPEAN PROJECTS

DIRAC

Detection and Identification
of Rare Audio-visual Cues

Eidgenössische Technische Hochschule Zürich (ETHZ)
The Hebrew University of Jerusalem
Czech Technical University
Carl Von Ossietzky Universität Oldenburg
Leibniz Institute for Neurobiology
Katholieke Universiteit Leuven
Oregon Health and Science University Ogi School of Science and Engineering
University of Maryland, Neural Systems Laboratory

BBFOR2

Bayesian Biometrics for Forensics

Radboud University Nijmegen
Universidad Autonoma de Madrid
Politecnico di Torino
Universiteit Twente
University of York
Katholieke Universiteit Leuven
Högskolan i Halmstad
Netherlands Forensic Institute
Agnitio Voice Biometrics
Netherlands organisation for applied scientific research (TNO)
Defense, Security and Safety
Forensic Science Service

EMIME

Effective Multilingual Interaction
in Mobile Environments

University of Edinburgh
Helsinki University of Technology
Nagoya Institute of Technology
Nokia Corporation
University of Cambridge

HUMAVIPS

Humanoids with Auditory and Visual
Abilities in Populated Spaces

Institut National de Recherche en Informatique et Automatique
The Czech Technical University
Aldebaran Robotics
Bielefeld University

MASH

Massive Sets of Heuristics
for Machine Learning

Centre National de la Recherche Scientifique
Technische Universität Berlin
Institut National de Recherche en Informatique et en Automatique
The Czech Technical University

MOBIO

Mobile Biometry

University of Manchester
University of Surrey
Laboratoire d'Informatique d'Avignon
Brno University of Technology
University of Oulu
EyePmedia
IdeArk
Visidon

NOVICOM

Automatic Analysis of Group Conversations
via Visual Cues in Non-Verbal Communication



| DURATION (MONTH/YEAR) | WEB | COORDINATOR | CONTACT |
|------------------------------|--|---|-------------------------|
| 01.06 – 12.10 | www.diracproject.org | The Hebrew University of Jerusalem | Dr. Barbara Caputo |
| 01.10 – 12.13 | http://lands.let.ru.nl/bbfor2 | Stichting Katholieke Universiteit | Dr. Sébastien Marcel |
| 03.08 – 02.11 | www.emime.org | University of Edinburgh | Dr. John Dines |
| 02.10 – 12.12 | http://humavips.inrialpes.fr/ | Institut de Recherche en Informatique et en Automatique | Dr. Daniel Gatica-Perez |
| 01.10 – 12.12 | http://mash-project.eu | Idiap Research Institute | Dr. François Fleuret |
| 02.08 – 01.11 | www.mobiproject.org | Idiap Research Institute | Dr. Sébastien Marcel |
| 06.09 – 12.11 | www.idiap.ch/project/novicom | Idiap Research Institute | Dr. Daniel Gatica Perez |



ACRONYM NAME, NAME**PARTNERS****PASCAL2**

Pattern Analysis, Statistical Modelling
and Computational Learning

56 sites in the network

SCALE

Speech Communication
with Adaptive Learning

Universität des Saarlandes
University of Edinburgh
University of Sheffield
Radboud University Nijmegen
RWTH Aachen
Motorola Limited UK
Philips
Eurice

SSPnet

Social Signal Processing Network

Imperial College of Science, Technology and Medicine
University of Edinburgh
University of Twente
Università Di Roma Tre
Queen's University Belfast
DFKI
CNRS
Université de Genève
Technische Universiteit Delft

TA2

Together Anywhere, Together Anytime

EURESCOM - European Institute for Research and Strategic Studies in Telecommunications
GmbH, British Telecommunications plc
Alcatel-Lucent Bell NV
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.
Goldsmiths' College
Netherlands Organisation For Applied Scientific Research – TNO
The Interactive Institute II Aktiebolag
Stichting Centrum voor Wiskunde en Informatica, Ravensburger Spielverlag GmbH
Philips Consumer Electronics BV
Limbic Entertainment GmbH
Joanneum Research Forschungsgesellschaft GmbH

VANAHEIM

Video/Audio Networked Surveillance
System Enhancement through
Human-Centered Adaptive Monitoring

Multitel ASLB
Institut National de Recherche en Informatique et Automatique
Thales Communications France
Thales Italia
Gruppo Torinese Trasporti
Régie Autonome des Transports Parisiens
University of Vienna



| DURATION (MONTH/YEAR) | WEB | COORDINATOR | CONTACT |
|------------------------------|--|----------------------------|----------------------------|
| 03.08 – 02.13 | www.pascal-network.org | University of Southampton | Dr. François Fleuret |
| 10.08 – 09.12 | www.scale.uni-saarland.de | Universität des Saarlandes | Prof. Hervé Bourlard |
| 02.09 – 01.14 | www.sspnet.eu | Idiap Research Institute | Dr. Alessandro Vinciarelli |
| 02.08 – 01.12 | www.ta2-project.eu | Eurescom | Phil Garner |
| 02.10 – 07.13 | www.vanaheim-project.eu | Multitel ASBL | Dr. Jean-Marc Odobez |



ACRONYM NAME, NAME**PARTNERS****SNSF PROJECTS****NCCR IM2**

Interactive Multimodal Information Management

Ecole polytechnique fédérale de Lausanne (EPFL)
University of Geneva
University of Fribourg
University of Bern
Swiss Federal Institute of Technology in Zurich (ETHZ)

CODICES

Automatic Analysis of Mexican Codex Collections

COMTIS

Improving the Coherence of Machine Translation Output by Modeling Intersentential Relations

University of Geneva/Department of Linguistics
University of Geneva/Department of Computer Science

DM3

Distributed MultiModal Media server, a Low Cost Large Capacity High Throughput Data Storage System

FlexASR

Flexible Grapheme-Based Automatic Speech Recognition

HAI-2010

Human Activity and Interactivity Modeling

ICS-2010

Interactive Cognitive Systems

MULTIO8

Multimodal Interaction and Multimedia Data Mining

SONVB

Sensing and Analysing Organizational Nonverbal Behavior

University of Neuchâtel
Dartmouth College

TRACOME

Robust Face Tracking, Feature Extraction and Multimodal Fusion for Audio-Visual Speech Recognition

UBM

Understanding Brain Morphogenesis

Ecole polytechnique fédérale de Lausanne (EPFL)
University of Basel

VELASH

Very Large Sets of Heuristics for Scene Interpretation

SNSF PROJECTS (INDO-SUISSE)**CCPP**

Cross Cultural Personality Perception

University of Geneva
International Institute of Information Technology, India

HASLER FOUNDATION**EMMA**

Enhanced Medical Multimedia Data Access

In addition to the above projects a number of industrials projects (CTI, The Ark) and grants are ongoing at Idiap.



| DURATION (MONTH/YEAR) | WEB | COORDINATOR | CONTACT |
|------------------------------|--|---|---|
| 01.02 – 12.13 | www.im2.ch | Idiap Research Institute | Prof. Hervé Bourlard |
| 09.08 – 08.11 | www.idiap.ch/~eroman/codices.html | Idiap Research Institute | Dr. Daniel Gatica-Perez Dr. Jean-Marc Odobez |
| 03.10 – 02.13 | http://www.idiap.ch/comtis | Idiap Research Institute | Dr. Andrei Popescu-Belis |
| 03.10 – 02-11 | | Idiap Research Institute | Prof. Hervé Bourlard |
| 06.09 – 05.12 | | Idiap Research Institute | Dr. Mathew Magimai-Doss |
| 10.10 – 09.12 | | Idiap Research Institute | Dr. Jean-Marc Odobez |
| 10.10 – 09.12 | | Idiap Research Institute | Prof. Hervé Bourlard |
| 10.08 – 09.10 | | Idiap Research Institute | Prof. Hervé Bourlard |
| 06.10 – 05.13 | www.idiap.ch/project/sonvb | Idiap Research Institute | Dr. Daniel Gatica-Perez |
| 04.10 – 03.13 | | Ecole polytechnique fédérale de Lausanne (EPFL) | Dr. Jean-Marc Odobez |
| 10.09 – 09.12 | | University of Basel | Dr. François Fleuret |
| 06.09 – 05.12 | | Idiap Research Institute | Dr. François Fleuret |
| 01.09 – 12.11 | http://www.idiap.ch/project/ccpp | Idiap Research Institute | Dr. Alessandro Vinciarelli |
| 01.10 – 12.11 | | Idiap Research Institute | Dr. Barbara Caputo |



MAJOR PUBLICATIONS / CONFERENCES

This selection, from among the many publications of Idiap, illustrates the diversity of our research.

BOOKS, BOOK CHAPTERS AND JOURNAL PAPERS

Human Behavior Understanding

Alessandro Vinciarelli
Springer Verlag, 2010

More than Words: Inference of Socially Relevant Information from Nonverbal Vocal Cues in Speech

Hugues Salamin, Gelareh Mohammadi, Khiat Truong and Alessandro Vinciarelli

in: Toward Autonomous, Adaptive, and Context-Aware Multimodal Interfaces: Theoretical and Practical Issues, A. Esposito (ed.), LNCS, Springer, 2010

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Alessandro Vinciarelli and Gelareh Mohammadi

in: Affective Computing and Interaction: Psychological, Cognitive and Neuroscientific Perspectives, D. Gokcay & G. Yildirim (eds.), igi-global, 2010

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Daniel Gatica-Perez and Jean-Marc Odobez

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Oya Aran and Lale Akarun

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Analysis of MLP Based Hierarchical Phoneme Posterior Probability Estimator

Joel Praveen Pinto, G. S. V. S. Sivaram, Mathew Magimai-Doss, Hynek Hermansky and Hervé Bourlard

in: IEEE Transactions on Audio, Speech, and Language Processing, 2010

Analyzing Ancient Maya Glyph Collections with Contextual Shape Descriptors

Edgar Roman-Rangel, Carlos Pallan, Jean-Marc Odobez and Daniel Gatica-Perez

in: International Journal of Computer Vision, 2010

Autoregressive Models of Amplitude Modulations in Audio Compression

Sriram Ganapathy, Petr Motlicek and Hynek Hermansky

in: IEEE Transactions on Audio, Speech, and Language Processing, 2010

Estimating Dominance in Multi-Party Meetings Using Speaker Diarization

Hayley Hung, Yan Huang, Gerald Friedland and Daniel Gatica-Perez
in: IEEE Transactions on Audio, Speech, and Language Processing, 2010

Feature distribution modelling techniques for 3D face recognition

Chris McCool, Jordi Sanchez-Riera and Sébastien Marcel

in: Pattern Recognition Letters, 31, 2010

Hierarchical and Parallel Processing of Auditory and Modulation Frequencies for Automatic Speech Recognition

Fabio Valente

in: Speech Communication, 52(10), 2010

Inferring competitive role patterns in reality TV show through nonverbal analysis

Bogdan Raducanu and Daniel Gatica-Perez

in: Multimedia Tools and Applications, Special issue on Social Media, 2010

Measuring the gap between HMM-based ASR and TTS

John Dines, Junichi Yamagishi and Simon King

in: IEEE Journal of Selected Topics in Signal Processing, 2010

Mining group nonverbal conversational patterns using probabilistic topic models

Dinesh Babu Jayagopi and Daniel Gatica-Perez

in: IEEE Transactions on Multimedia, 2010

Modeling and Understanding Flickr Communities through Topic-based Analysis

Radu-Andrei Negoescu and Daniel Gatica-Perez

in: IEEE Transactions on Multimedia, 12(5), 2010

Multi-Stream Speech Recognition based on Dempster-Shafer Combination Rule

Fabio Valente

in: Speech Communication, 52(3), 2010

Probabilistic Mining of Socio-Geographic Routines from Mobile Phone Data

Katayoun Farrahi and Daniel Gatica-Perez

in: IEEE Journal of Selected Topics in Signal Processing, 4(4), 2010

The More you Learn, the Less you Store: Memory-controlled Incremental SVM for Visual Place Recognition

Andrzej Pronobis, Jie Luo and Barbara Caputo

in: Image and Vision Computing, 2010



Tuning-Robust Initialization Methods for Speaker Diarization

David Imseng and Gerald Friedland
in: IEEE Transactions on Audio, Speech, and Language Processing, 18(8):2028-2037, 2010

Wide-Band Audio Coding based on Frequency Domain Linear Prediction

Petr Motlicek, Sriram Ganapathy, Hynek Hermansky and Harinath Garudadri,
in: EURASIP Journal on Audio Speech and Music Processing, 2010.(856280), 2010

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A Comparative Study of MLP Front-ends for Mandarin ASR

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A Comparison of Supervised and Unsupervised Cross-Lingual Speaker Adaptation Approaches for HMM-Based Speech Synthesis

Hui Liang, John Dines and Lakshmi Saheer
Proceedings of IEEE International Conference on Acoustics, Speech, and Signal Processing, Dallas, U.S.A., 2010

A Multi Cue Discriminative Approach to Semantic Place Classification

Marco Fornoni, Jesus Martinez-Gomez and Barbara Caputo
CLEF 2010 Notebook Papers/LABs/Workshops, 2010

A Multimodal Corpus for Studying Dominance in Small Group Conversations

Oya Aran, Hayley Hung and Daniel Gatica-Perez
LREC workshop on Multimodal Corpora: Advances in Capturing, Coding and Analyzing Multimodality, Malta, May 2010

A Random Walk Framework to Compute Textual Semantic Similarity: a Unified Model for Three Benchmark Tasks

Majid Yazdani and Andrei Popescu-Belis
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