

Opening Speech

Control, PDEs and Machine Learning

University of Deusto

<https://dcn.nat.fau.eu/events/ez65-control-pdes-and-ml/>

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Dear colleagues, dear friends,

It is a great joy and a deep emotion to welcome you to this conference here in Bilbao, in the heart of the Basque Country, at the University of Deusto.

Seeing so many of you gathered here is both an honor and a moving reminder of how fortunate I have been throughout my scientific and academic life. For me, this meeting is above all a celebration of people, ideas, collaborations, and opportunities.

I was fortunate from the very beginning, when I became a mathematics student at *Euskal Herriko Unibertsitatea* (EHU), the University of the Basque Country, only a few kilometers from here. The university's motto, *Eman ta zabal zazu*—"give and spread"—has accompanied me throughout my life and career. Mathematics has carried me across continents and disciplines, but it has always brought me back to the people, the places, and the values that shaped who I am.

Since then, mathematics has taken me far, but it has also brought me back, again and again, to the people, places, and values that shaped me. We all begin life connected by an umbilical cord.

Today, the panorama has changed radically. Mathematics has become one of the degrees offering the strongest opportunities in the job market. The fact that the University of Deusto has successfully opened a Bachelor's degree in Mathematical Engineering is a beautiful sign of this new era.

Mathematics is often presented as a solitary activity. My own experience has been exactly the opposite. The most meaningful ideas, the most lasting projects, and the most beautiful moments have come from dialogue, collaboration, friendship, and shared curiosity.

This is something I learned in Paris, as a master's and PhD student, in the legendary school of Jacques-Louis Lions: that mathematics is not only a discipline of rigor, but also a human adventure built through generosity, trust, and shared imagination.

I am especially grateful to the organizers of this meeting, and very particularly to Sebastián and Miren, for their dedication, generosity, and friendship. I am also deeply grateful to all of you for coming from so many places to take part in this event. I also remember with gratitude those who wished to be here but could not join us because of visas, family reasons, or other difficulties.

My thanks go to the University of Deusto, which has hosted my team and me for almost ten years now, and where we have had the opportunity to develop two ERC Advanced Grants. I would also like to remember Professor José María Guibert, rector of Deusto during an important part of this period, who passed away recently, too soon. Eskerrikasko, Josemari.

I am equally grateful to the Universidad Autónoma de Madrid, where I obtained my first position back in 1988, and to which I remain closely affiliated. I also wish to thank Friedrich-Alexander-Universität Erlangen-Nürnberg, which offered me a generous Humboldt Professorship in 2019, while allowing me to preserve and strengthen my Basque and Spanish connections.

I have also been extremely fortunate to receive the generous support of the Spanish Ministry of Science, the Alexander von Humboldt Foundation, the European Research Council, and other research agencies. Their trust made it possible to pursue many academic projects and dreams which, in the end, shaped not only my career, but also the course of my life.

None of this would have been possible without the unconditional support of my family. Some of them are here today. To them I owe more than I can properly express. They have supported me through many projects, many moves, and, at times, an almost nomadic life.

They always understood that part of my effort was not only mine. In some sense, I was also carrying with me the name, hopes, and presence of my younger brother Xabier.

I was born into a Basque-speaking family. Basque, one of Europe's oldest languages, remains a minority language even today. In a world where every Basque speaker is outnumbered by thousands of speakers of larger languages, one learns early that nothing can be taken for granted. Perhaps this is one of the reasons why I always felt that I had to make an extra effort, both personally and professionally.

Beyond the personal occasion, I hope these days will be an opportunity to look forward: to discuss new challenges in applied mathematics, control, computation, artificial intelligence, and their role in addressing the complex problems of our societies.

At a university such as Deusto, inspired by the Ignatian tradition and by the idea of Magis — the search for what is deeper, better, and more meaningful — it is natural to remember that mathematics is not only the language of science, but also a tool for understanding, connecting, and transforming reality. For us, Magis does not mean simply doing more or producing more; it means striving for mathematics of greater depth, clarity, beauty, and service to society, guided by a sense of responsibility toward peace, justice, and the common good.

This is particularly important in the age of artificial intelligence. As Pope Leo XIV — himself a mathematician and currently visiting Spain — reminds us in his recent encyclical *Magnifica Humanitas*, AI must remain at the service of humanity, truth, dignity, work, justice, and peace.

This message speaks directly to mathematicians. To make artificial intelligence trustworthy and genuinely human-centered, we need mathematics capable of illuminating its mechanisms: helping us understand, explain, control, certify, and guide these systems.

Without such foundations, technology may become powerful yet opaque; with them, it can become a force for freedom, creativity, equality, and the common good. The goal is clear: science and technology should make human beings freer, more equal, and more capable of shaping their own future. Mathematics has a decisive responsibility in this endeavour.

This aspiration is not new. Almost 2,500 years ago,³ Aristotle, in his *Politics*, observed that human freedom would be enlarged if many tasks that condemned people to servile labor could be performed automatically. Today, in a very different world, this ancient intuition remains strikingly relevant.

Mathematics has contributed enormously to the technological and social progress that allows us to live in organized societies, to enjoy safety and comfort, and to devote ourselves to activities we truly love — science among them — instead of spending our days merely securing water, fire, shelter, or survival. This is one of the quiet miracles of civilization.

And mathematics is one of the most marvellous and fascinating fields in which to deploy this life program: to understand more deeply, to act more responsibly, and to contribute

more generously to the common good. It must continue doing so, again and again, with rigor, creativity, responsibility, and a deep sense of service.

The Basque expression “ekin eta erein” — to act and to sow — beautifully captures the mission of science: to work in the present while creating opportunities and knowledge for future generations.

Let us make these days a celebration of mathematics, friendship, and human creativity. Enjoy the conference, enjoy Bilbao and the Basque Country, and let us continue building together the future of our discipline.

Thank you very much for your friendship, collaboration, and trust. Ekin eta erein!