EMbeDS

DEPARTMENT OF EXCELLENCE FOR ECONOMICS AND MANAGEMENT IN THE ERA OF DATA SCIENCE

ANNUAL REPORT 2018
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1. A BRIEF INTRODUCTION TO EMbeDS: A DEPARTMENT OF EXCELLENCE FOR ECONOMICS AND MANAGEMENT IN THE ERA OF DATA SCIENCE

EMbeDS is an acronym that, referring to a notion of embedding/inclusion, represents our overarching goal of exploiting opportunities fostered by Data Science (DS) in the disciplines of Economics (E) and Management (M) – leveraging data and tools to bridge the gaps that still exist between complex models, their empirical validation, and their use in policy. Within the path delineated by research funding and engagement initiatives at the Italian, European and United Nations levels, our scientific aim is to better understand the relationships between innovation, employment, growth, environmental and social sustainability. Our policy aim is to identify public- and private-sector strategies to manage socio-economic and environmental change, and the corresponding evolution of our welfare systems. These aims build upon four broad areas in which the Institutes of Economics and Management of the Sant'Anna School of Advanced Studies have a strong record of research, education and engagement with private and public institutions: (1) Innovation and the 4th Industrial Revolution; (2) Industrial Dynamics, Competitiveness and Financial Markets; (3) Economies as Evolving Complex Systems; (4) Environmental and Social Sustainability (with a particular focus on healthcare systems for the latter).

For each of these areas, opportunities and challenges afforded by contemporary big data are key. Data availability, as well as the possibility of integrating information from multiple sources, are rapidly growing. Exploiting these opportunities to spur major research progress requires sophisticated modeling approaches and state-of-the-art statistical and computational tools to gather, integrate and analyze big data. Our groups pioneer many such approaches and tools. We work with young researchers in CoMoS (the Complexity Modellers’ Society of the Institute of Economics) and in HealthPros (a Marie Sklodowska-Curie Innovative Training Network for Healthcare Performance Intelligence Professionals, designed to train international analysts to systematically link health data and strategic planning decisions. We also have ties to the Quantitative Finance Group (Scuola Normale Superiore, Pisa) and the KDD Laboratory (CNR and University of Pisa). In addition, utilizing Big Data in many of EMbeDS areas requires care towards issues of intellectual property, as well as privacy, data protection and data safety; legal and ethical aspects related to these endeavors are part of the competences represented in the DIRPOLIS Institute of the Sant’Anna School.

We have an established track record of translating research into measurable socio-economic impact through policies in support of innovation, growth and social mobility, environmentally sustainable production and consumption protocols, and effective and efficient healthcare systems. Finally, and importantly, we interact closely with the private sector on issues related to innovation, organizational change and new business models – with projects in the biomedical and healthcare sectors, the manufacturing sector, the banking and insurance sectors, and the manufacturing sector at large. We work with small and large companies, as well as institutional partners.

More information and details can be found at EMbeDS website: http://embeds.santannapisa.it/

2. HIGHER EDUCATION: PhD PROGRAMS ASSOCIATED WITH EMbeDS

We offer a PhD in Economics and a PhD in Management which enrolled, respectively, 7 and 8 students in 2018. Both doctoral programs have been classified as “innovative” by ANVUR. Doctoral theses produce high-
profile international publications and the placement of our graduates is outstanding. Notably, in May 2017 we granted a PhD in Economics Honoris Causa to Joseph E. Stiglitz, Nobel prize in Economics in 2001, and in November 2018 we granted a PhD in Economics Honoris Causa to Mario Draghi, president of the European Central Bank.

From 2017-18, we also offer a new PhD in Data Science, which enrolls 9 students every year. This doctoral program is a consortium with the Scuola Normale Superiore, the University of Pisa, CNR and the IMT of Lucca. It has been classified as both "innovative" and "interdisciplinary" by ANVUR, and it is part of an effort to increase interdisciplinary research through a focus on statistical and computational methods, and projects based on big data.

Starting with the 34th cycle (2018-19), EMbeDS supports three scholarships, one in each of the three PhD programs. This year’s awardees are Roberta Iovino, PhD in Sustainability – Management, Marco Martinez, PhD in Economics, and German Rodikov, PhD in Data Science (http://embeds.santannapisa.it/news/three-phd-students-marco-martinez-roberta-iovino-and-german-rodikov-join-embeds).

The three PhD programs hold yearly meetings showcasing the research of their students. These meetings allow young researcher to receive input and feedback on their progress and promote collaboration and cross-fertilization among students and faculty of the programs. The Data Science PhD meeting was held on June 22 and 26, 2018. The students delineated very interesting research directions – tackling a variety of scientific and methodological questions. Their work spans areas as diverse as urban mobility; international migration and trade; scientific and technical innovation; subjective well-being; autism spectrum disorder; fake news; statistical techniques for model selection, robustness and imputation in high dimension; and approaches to decipher feature contributions and causation from “black box” learning algorithms. The Management PhD meeting was held June 27-29, 2018. Students presented progress in their research at the frontier of management sciences. Their work concerns topics such as innovation accelerators and start-ups, healthcare performance, “circular economy” companies, the role of Big Data in open innovation, etc. Awards for best presentations and most innovative research were also assigned during the meeting. The Economics PhD meeting was held on October 1 and 2, 2018. Student presentations were all held as plenary talks, with time allowed for interactions and feedback from other students and internal faculty. A broad range of topics was addressed, from firm growth and industry dynamics, to employment, trade and financial bubbles. External experts were invited to the meeting and acted as discussants.

The three PhD programs also regularly provide opportunities for students to participate to a variety Summer Schools. For instance, one such school customarily attended by students in the Economics program is the Summer School of Mathematics for Economic and Social Sciences at Centro De Giorgi of San Miniato (the 2018 edition was on “Mathematical Methods for Time Series Analysis”; http://www.crm.sns.it/event/438/), one attended by students in the Data Science program is the Lipari School for Computational Complex and Social Systems (the 2018 edition was on “From swarm intelligence to digital democracy, new tools for a complex society”; https://complex17.liparischool.it/). Students in the Management program often attend the Summer Schools in Research Methods for the Social Sciences organized by the University of Calabria (http://www.egiunical.org/summer-school/summer-school-english/2019-summer-schools.html).

While students from the Data Science program will start graduating only in 2020, and those supported by EMbeDS only in 2021, the placement of students graduating from the Economics and Management programs
in 2018 continued its tradition of excellence. Three students graduated from the Economics program: Giovanna Capponi, who moved to the Utrecht University (NL) on a research fellow position; Caterina Santi, who moved to University College Cork (UK) as a lecturer; and Jacopo Staccioli, who graduated in early 2019 and moved to the Catholic University of Milan on a postdoctoral position. Twelve students graduated from the Management program in 2018: Nora Annesi, Gianluca Cafagna, Jacopo Cerri, Michele Contini, Giorgio Giacomelli, Margherita Macellari, Stefania Manetti, Chiara Pellegrini, Salvatore Pirri, Silvia Sarti, Niccolò Maria Todaro and Shanshan Zhou.

3. EDUCATION AND RESEARCH-RELATED ACTIVITIES: VISITORS

During 2018, the Sant’Anna School hosted several visitors with research interests closely related to EMbeDS. In May 2018 (http://embeds.santannapisa.it/news/visitors-may-2018) we hosted (i) Martin Kenney, Distinguished Professor of Community and Regional Development at the University of California Davis, who worked on a special issue of the Journal of Technology Transfer with Andrea Piccaluga and Alberto Di Minin of the Institute of Management and Rosa Grimaldi (UniBo), and held lectures on University engagement with industry; (ii) Marcelo C. Pereira, Associate Professor of Microeconomics and Quantitative Methods at the University of Campinas, Brazil, who worked on projects concerning micro-macro dynamics modeling and model validation with Giovanni Dosi, Andrea Roventini and other researchers of the Institute of Economics, and held lectures on the effective use of agent-based models in macroeconomic applications; (iii) James Rising, Assistant Professor and Research Fellow at the Grantham Institute of the London School of Economics, who worked on projects concerning the impacts of climate change with Francesco Lamperti and other members of CoMoS (the Complexity Modellers’ Society) in the Institute of Economics, and gave a seminar on the effects of climate change on US agricultural yields and the modeling and data analysis challenges posed by climate impact research.

In June 2018 (http://embeds.santannapisa.it/news/visitors-june-2018) we hosted László Györfi, Professor of Mathematics in the Department of Computer Science and Information Theory at the Budapest University of Technology and Economics, who worked with Giulio Bottazzi, Daniele Giachini and other researchers of the Institute of Economics, and held a series of lectures titled Information Theory and Growth Optimal Portfolio Selection. In September 2018 (http://embeds.santannapisa.it/news/visitors-september-2018) we hosted Koichi Maekawa, Emeritus Professor of Econometrics and advisor of the Statistical Science Research Core at Hiroshima University, Japan, who visited Alessio Moneta and other researchers in the Institute of Economics and gave a seminar titled Non-Gaussian Structural Var Models with Applications to the Japanese Quantitative Easing Monetary Policy. In Fall 2018 we hosted Ahn JoonMo, Assistant Professor at the Graduate School of Management of Technology of Sogang University (Republic of Korea) and Head of the STI (Science, Technology and Innovation) Policy Research Center, who worked with Andrea Piccaluga and other researchers of the Institute of Management and held a seminar titled The Impacts of Government Funding on Openness.

For 2019, we are planning return visits by Martin Kenney and Marcelo Pereira, as well as visits by Gwyn Bevan (Emeritus Professor of Policy Analysis at the London School of Economics and Director of the Office for Healthcare Performance of the Commission for Health Improvement in the UK); Ofer Harel (Professor of Statistics and Director of Graduate Admissions for the Statistics Department, University of Connecticut); Matthew Harding (Associate Professor of Economics and Statistics at the University of California Irvine); Andrea Vandin (Assistant Professor in the Formal Methods for Safe and Secure Systems Section of DTU...
4. EDUCATION AND RESEARCH-RELATED ACTIVITIES: WORKSHOPS AND MEETINGS RELATED TO EMbeDS

During 2018 and early 2019 there were several initiatives and workshops associated with EMbeDS. Some of the activities were organized in collaboration with the young researchers of CoMoS (Complexity Modellers’ Society) - a group that shares ideas, resources and experiences on issues related to agent-based and computational modeling, and whose activities are coordinated by the Institute of Economics, but also extend to researchers from the Institute of Management and to PhD students in Economics, Management and Data Science. In particular, we held:

- In May 2018, a meeting on the use of GITHUB repositories (http://embeds.santannapisa.it/event/comos-meeting-may).
- In May 2018, a 3-day workshop on the use of R in Data Science applications (http://embeds.santannapisa.it/event/workshop-r-data-science-applications).
- In December 2018, a meeting on agent-based modeling and analysis of complex data (http://embeds.santannapisa.it/event/comos-meeting-december-2018).

In May 2018 EMbeDS also organized an important meeting with Diego Piacentini, the then Special Commissioner for the implementation of the Italian Digital Agenda, and Raffaele Lillo, the then Chief Data Officer of the Italian Digital Transformation Team (http://embeds.santannapisa.it/news/digital-transformation-italian-public-administration-meeting-diego-piacentini-and-raffaele).

Finally, in November 2018, in collaboration with the IT Services of the Scuola Superiore Sant’Anna, EMbeDS hosted a meeting with Nvidia - a leader in the IT market. Researchers, faculty and students from different scientific areas and institutions of the Pisan academic community discussed a potential partnership aimed at creating a permanent learning platform for the use of GPU technologies (graphical processing units) in various scientific applications (http://embeds.santannapisa.it/news/meeting-high-performance-computing).

EMbeDS members also attended and participated to the organization of further initiatives described below:

- In April 2018, researchers and faculty from the Institute of Management held a workshop titled “Reti di cura per le patologie croniche” (https://www.santannapisa.it/sites/default/files/programma_stukel_17042018_0.pdf).
- In July 2018, researchers and faculty of the Institute of Economics and the Institute of Life Sciences presented projects and studies highlighting complementarities between the two disciplines in a workshop titled “Economics and Life Sciences” (http://embeds.santannapisa.it/event/economics-life-sciences-workshop).
- In October 2018, as part of the ROBOTICS FESTIVAL PISA, researchers and faculty from the Institute of Management held a workshop titled “Intelligenza Artificiale e Robotica verso una nuova frontiera per ricerca e sviluppo in ambito farmaceutico”.
- In October 2018, a conference was held on “PRAGMATIC CONSTRUCTIVISM AND ACTOR-REALITY CONSTRUCTION: Possibilities, digitalization, numbers and actors” (http://www.arcpisa2018.santannapisa.it)
- In December 2018, the Institute of Management held the final day event of the Master Program organized for the ENEL Group, “School Of Global Generation”.
- In December 2018, researchers and faculty of the DIRPOLIS Institute held a workshop titled "Privacy and the Control of Knowledge in the Era of Big Data", tackling issues of accountability in the use of data and privacy protection in the field of Artificial Intelligence (http://embeds.santannapisa.it/news/workshop-privacy-and-control-knowledge-era-big-data).
- In February 2019, PhD students in Data Science, researchers and faculty involved in the PhD Consortium (Sant’Anna School, Scuola Normale Superiore, University of Pisa, IMT and CNR) gathered to present their research and exchange ideas in a "Colloquium Workshop" (http://embeds.santannapisa.it/event/data-science-colloquium-workshop-2019).
- In February 2019, researchers and faculty from the Institute of Management participated to a seminar on Artificial Intelligence in China, held at the Confucio Institute of Pisa.
- In February 2019, Sir John Armstrong Muir Gray (Founding Director of Oxford Centre for Triple Value Healthcare) held a lecture as part of the Master Program organized for managers operating in the Italian Healthcare System https://www.santannapisa.it/sites/default/files/cs_gray.pdf.

5. EDUCATION AND RESEARCH-RELATED ACTIVITIES: SELECTED ARTICLES, MANUSCRIPT AND CONFERENCES

ARTICLES and MANUSCRIPTS

Faculty, researchers and students belonging to the EMbeDS community published a number of articles in important, peer-reviewed venues in 2018. Neglecting bibliometrics (which is hardly indicative within a 1-year span), we report below a selection of those which we consider of high potential impact for the research areas covered by EMbeDS:


In addition to published articles, several manuscripts reporting promising ongoing research have been made available through *working paper series* and *public repositories* in 2018. Among those are:


TALKS AT CONFERENCES AND WORKSHOPS
Faculty, researchers and students belonging to the EMbeDS community preented their work at a number of important International Conferences and Workshops in 2018. Among those are1:

- Conference of the Society for Computational Economics and Finance (CEF 2018), Cattolica University, Milan IT; XXIII Annual Workshop on the Economic Science with Heterogeneous Interacting Agents (WEHIA 2018), International Christian University, Tokyo, Japan; EAEPE Conference 2018, University of Sophia Antipolis, Nice FR. E. Russo, G. Dosi, A. Roventini "The effect of trade and technological regimes upon international differentiation and catching up: results from an agent-based model".

1 Presenters in bold.


• International Family Enterprise Research Academy Annual Conference 2018, Zwolle, the Netherlands. **R. Barontini** “Investment Opportunities and R&D Investments in Family and Nonfamily Firms”.


IRSPM 2018 Annual Conference, Edinburgh, UK. S. Barsanti “Impacts of the Chronic Care Model: perspectives from General Practitioners in Italy”.


VarEvolution Meeting, Florence, Italy. L. Cinquini, “Big Data, Artificial Intelligence, Industry 4.0 & Management”.


6. EDUCATION- AND RESEARCH-RELATED ACTIVITIES: EXTERNALLY FUNDED PROJECTS

Faculty, researchers and students belonging to the EMbeDS community also continued their work on a variety of externally funded projects. We report below a selection of those which we consider of high potential impact for the research areas covered by EMbeDS.

Among the projects concluded in 2018:

- DOLFINS H2020 (European Commission) 2015-2018. Unit leaders at SSSA: G. Dosi, A. Roventini. The project addressed the global challenge of making financial systems better serve society, by placing scientific evidence and citizen participation at the centre of the policy process in finance. It focused on two crucial and interconnected policy areas that are currently shaping the public debate: How to achieve
financial stability and how to facilitate the long-term investments required by the transition to a more sustainable, more innovative, less unequal and greener EU economy. [https://simpolproject.eu/funding-and-project-details-dolphins-project/](https://simpolproject.eu/funding-and-project-details-dolphins-project/)

- **ISIGROWTH** H2020 (European Commission) 2015-2018. PI: G. Dosi, Unit leader at SSSA: A. Roventini. The main goal of ISIGrowth was twofold (1) to provide novel and comprehensive diagnostics of the relationships between innovation, employment dynamics and growth in an increasingly globalized and financialised world economy; and (2) based on such diagnostics, to elaborate policy scenarios and deliver a coherent policy toolkit to achieve the Europe 2020 objectives of smart, sustainable and inclusive growth. [http://www.isigrowth.eu/](http://www.isigrowth.eu/).

- **IMPRESSIONS** FP7 (European Commission) 2013-2018. Unit leaders at SSSA: G. Dosi, A. Roventini. The project aimed at advancing our understanding of the bio-physical and socio-economic implications of high-end climate change, involving temperature increases above 2°C, and to help decision-makers apply such knowledge within integrated adaptation and mitigation strategies encompassing a variety of sectors including – but not limited to - water, energy, forestry, industry and finance. [http://impressions-project.eu](http://impressions-project.eu).

Among the ongoing projects:

- **HARMONicSS** (HARMONIzation and integrative analysis of regional, national and international Cohorts on primary Sjögren’s Syndrome (pSS) towards improved stratification, treatment and health policy making disease) H2020 (European Commission) 2017–2020. Unit Leader at SSSA: C. Seghieri. The project aims to create an International Network and Alliance of partners and patients cohorts, for addressing unmet needs in primary Sjogren Syndrome; working together to create and maintain a platform with open standards and tools, designed to enable secure storage, governance, analytics, and controlled sharing of information at multiple levels along with methods to make results of analyses and outcomes comparable across EU centres. Services for big data mining, governance and visual analytics will be integrated onto these harmonized data, to address clinical and health policy needs.

- **EFFIGE** (ENVIRONMENTAL FOOTPRINT FOR IMPROVING AND GROWING ECO-EFFICIENCY). European Commission, 2019-2021. Principal Institution: SSSA. The project aims to improve the environmental performance of products in a number of focus sectors, by means of the EU Product Environmental Footprint (PEF) method described in the EU Rec. 179/2013. Using PEF as a tool for supporting decision processes within companies and removing information asymmetries on the final good market, EFFIGE supports pilot companies (especially small and medium-sized enterprises) in improving their environmental “hot spots” and introducing more sustainable products and services to their markets. [https://www.lifeeffige.eu/](https://www.lifeeffige.eu/).

- **ENHANCE** (EMAS AS A NEST TO HELP AND NURTURE THE CIRCULAR ECONOMY) European Commission, 2017-2020. Principal Institution: Ministry of Territory and Sustainability. Government of Catalonia - Generalitat de Catalunya. The project aims to improve the implementation of regional policy instruments for increasing resource efficiency through the exchange of experiences and practices supporting EMAS registration. ENHANCE implements best practice exchange and dissemination initiatives to encourage the adoption of EMAS in Europe. [https://www.interregeurope.eu/enhance/](https://www.interregeurope.eu/enhance/).

- **RECYPACK** European Commission, 2017-2020. Principal Institution: AIMPLAS - Asociación de investigación de materiales plásticos y conexas, Spain. The project aims to foster green public procurement (GPP) of commercial plastic packaging waste (CPPW) in urban areas, and demonstrate that this waste stream is a valuable resource from which new recycled added-value materials and products
can be obtained. RECYPACK will implement an innovative management model to assist local authorities in decision-making, and to provide companies with incentives to participate. The project will evaluate the generation of CPPW by business/shopping centres, urban commercial centres, distribution companies and professional small and medium-sized enterprises. http://www.liferecypackproject.eu/

- **BRAVER (BOOSTING REGULATORY ADVANTAGES VIS À VIS EMAS REGISTRATION)** European Commission, 2016-2019. Principal Institution: IEFE. The project aims to increase the adoption of regulatory relief measures to support EMAS in participating countries and regions. In particular, building upon the 2011-2014 Life+ BRAVE project, BRAVER will involve other EU countries seeking to increase the number of EMAS registered organisations. The project will demonstrate that “better regulation” in environmental policies is possible if voluntary schemes, such as EMAS and the EU Ecolabel, are effectively and proactively used in the development of new legislation and in the revision of the existing one. These measures are feasible for all EU Member States and at the EU regulatory level – with appropriate efforts in policy making (drafting new or revised directives and legislative acts) and implementation (changing permitting procedures, communication flows, control modalities, etc.) http://www.lifebraver.eu/.

- **TACKLE (TEAMING-UP FOR A CONSCIOUS KICK FOR THE LEGACY OF ENVIRONMENT)** European Commission, 2018-2021. PI: Tiberio Daddi. The project aims to increase awareness and improve football event practices, to foster better environmental management. Analyzing shortcomings of the current governance of sport events, in order to prevent and reduce football matches' environmental impacts, TACKLE will: (i) Focus on the whole sport event life cycle (conception, organisation, staging, closure); (ii) Collect, assess and test best environmental management practices during sport events, creating guidelines for awareness actions; (iii) Develop adequate competences and organizational structures within national football associations (NFAs) to guide the diffusion of best practices in football leagues and stadiums; (iv) Identify information flows that are critical for NFAs to ensure an adequate implementation of the EU environmental policies in stadiums; (v) Increase competences and awareness within NFAs for developing a set of strategies and tools (e.g., guidelines, procedures, contract formats, etc.) to both prevent and manage waste according to circular economy criteria and to improve the environmental management of stadiums; (vi) Engage all relevant contractors (e.g. food and beverages providers, stadium cleaning operators, tickets sellers etc.) in enduring efforts to prevent and reduce waste during sport events. https://lifetackle.eu/.

- **S-PARCS (ENVISIONING AND TESTING NEW MODELS OF SUSTAINABLE ENERGY COOPERATION AND SERVICES IN INDUSTRIAL PARKS)** H2020 (European Commission), 2018-2021. Principal Institution: Energieinstitut ander Johannes Kepler Universität Linz. The project proposes a framework for reducing energy costs and energy consumption in industrial parks, and increasing renewable on-site energy production. A pre-assessment of seven “Lighthouse Parks” (in Spain, Portugal, Italy and Austria) participating to the study has shown a high potential for joint energy actions, many of which are transferrable to the community of S-PARCS followers in the UK, Sweden, Turkey, Russia, Italy, Portugal, Austria and Norway. Five research organisations, an engineering company and an industrial association will make their knowledge on suitable technologies, novel business models and cooperative action among companies available to the parks – aiding them in the development of an “energy cooperation plan” and the necessary skills to achieve long-lasting sustainability. https://www.sparcs-h2020.eu/

Among the projects awarded in 2018 or early 2019:

• EURA -- pronounced “jura”, the Latin word for rights (European Commission) 2018-2021. PI: A. Bertolini. This is the first hub for research on law and technology created in Europe. It addresses topics concerning the regulation of robotics and artificial intelligence (R&A) – in light of European and member states’ law – taking into account social implications in domains as diverse as ethics, economics, innovation and business management, also known as ELSE (Ethical, Legal, Social, and Economic implications of R&A). [http://embeds.santannapisa.it/news/eura-jean-jean-monet-centre-excellence](http://embeds.santannapisa.it/news/eura-jean-jean-monet-centre-excellence)

• GROWINPRO H2020 (European Commission) 2019-2022. PI: A. Roventini, Unit leader at SSSA: G. Dosi. This builds upon ISIGrowth, deepening the ‘diagnostic exercise’ and extending the scope of investigation – fully addressing the interactions among innovation, productivity and growth in a world possibly undergoing a IV Industrial Revolution, wherein globalization exacerbated the diverging patterns of value distribution among countries and social groups. The project will thoroughly study the effects of monetary, fiscal and mission-oriented policies in stimulating productivity and output growth. The team comprises leading international scholars and links to a group of National Statistical Offices developing new data and measurements. Policy recommendations will be grounded in solid micro-, meso- and macro analyses, always accounting for the feedbacks between Schumpeterian (supply side) and Keynesian (demand side) dynamics. Relevance and adequacy of the proposed policies will be continuously challenged by the interaction with a whole set of stakeholders belonging to European Institutions, civil society and business. [http://embeds.santannapisa.it/news/growinpro-h2020-project-starts-its-work](http://embeds.santannapisa.it/news/growinpro-h2020-project-starts-its-work).

• LOST HIGWAY: SKILLS, TECHNOLOGY AND TRADE IN ITALIAN ECONOMIC GROWTH, 1815-2018 PRIN (Progetti di Ricerca di Interesse Nazionale, Italian Ministry of Universities and Research). 2019-2021 PI: Alessandro Nuvolari. This project will test a general hypothesis about Italian economic growth that lingering in debates among economic historians and economists; namely, that the roots of the current economic malaise can be traced back to some specific shortcomings of the early Italian industrialization process. We hypothesize that factor endowments shaped the patterns of innovation and choice of technologies and thus determined the feasible rate of technical progress. Specifically, Italian factor endowments made it difficult to imitate technological leaders while, at the same time, a lack of investment in human capital formation prevented the development of domestic innovations. This resulted in a peculiar development path that prevented Italy from joining permanently the small group of leading advanced industrialized countries.

• HOW GOOD IS YOUR MODEL? EMPIRICAL EVALUATION AND VALIDATION OF QUANTITATIVE MODELS IN ECONOMICS. PRIN (Italian Ministry of Universities and Research). 2019-2021 PI: Alessio Moneta. An important task of econometrics is to assess and evaluate economic models, discriminating those that offer valid instruments for intervention and explanation of the phenomena at hand, from those that do not. In many circumstances this task has not been very successful. Models with different assumptions and irreconcilable predictions are equally accepted in the scientific economic community, reinforcing the pessimistic view that empirical evidence cannot discriminate between conflicting theories. This project takes on the challenge, developing new methods for the empirical validation of quantitative models in economics. We go beyond standard approaches to model evaluation, linking empirical validation with
causal inference: for the purpose of explaining and intervening, a model is valid if it adequately represents existing causal relationships.

- TECHNOLOGICAL CHANGE, INDUSTRY EVOLUTION AND EMPLOYMENT DYNAMICS. PRIN (Italian Ministry of Universities and Research). 2019-2021 PI: Daniele Moschella. The project develops an integrated analysis of the anatomy and dynamics of innovation processes and the ensuing patterns of industrial change and employment dynamics, starting from the ways in which new knowledge is incorporated into business, down to the market processes of “Schumpeterian” competition. We follow three main lines of research. First, because an increasing gap between the “productivity” frontier and laggard firms was one of the causes of the productivity slowdown preceding the Global Crisis, we will further investigate the determinants of productivity dispersion among firms. Second, we will study the effects of firm-specific patterns of innovation in the revealed performances of firms, also exploring new facets of the innovation process through recently developed data. Third, we will analyse the patterns of resource reallocation in the face of secular stagnation.

7. INTERACTIONS WITH INSTITUTIONAL AND PRIVATE SECTOR PARTNERS

EMbeDS mission includes the transfer and dissemination of knowledge produced by research to policy makers and private sector actors, to support their decision processes and achieve a significant impact on society. To this end, EMbeDS engages institutional and professional networks through a variety of initiatives of the Institute of Economics and the Institute of Management. Examples of such initiatives are listed below:

- European growth prospects are still below their potential and the European Union is losing competitiveness. Innovation is sluggish, financialization is increasing and inequality is rising within and between member states. The EU-funded ISIGrowth project (http://www.isigrowth.eu/2018/06/29/the-new-european-deal-a-policy-plan-for-innovation-fuelled-sustainable-and-inclusive-growth/) provided a detailed diagnostic of such problems and delivered a policy plan to jumpstart growth in Europe. Main results were described in the project’s policy briefs and debated during a Final Conference held at the European Parliament in Brussels on June 19, 2018. The event, hosted by MEPs Massimiliano Salini, Patrizia Toia and Marco Valli, involved EU policy makers, members of the European Commission and representatives of the civil society. Key-note speakers included Giovanni Dosi (ISIGrowth’s coordinator) and Mariana Mazzucato, who spoke on “The current European policies and the ISIGrowth policy roadmap” and “The macro and micro dimensions of mission-oriented programs”, respectively.

- IRPES is an inter-regional healthcare performance evaluation network comprising ten regions and two autonomous provinces in Italy (http://www.performance.sssup.it/netval). Its mission includes: (i) documenting and comparing healthcare units performance within and between regions; (ii) strengthening managerial competencies and performance analysis skills of the regional healthcare units’ staff; (iii) promoting benchmarking on non-administrative data such as employees’ and patients’ surveys; (iv) detecting and disseminating best practices between and across regions. During the last 10 years, IRPES has spread knowledge about healthcare evaluation systems at the national and international level, promoting innovative methods to share data, algorithms and techniques to analyze performance. Moreover, IRPES has supported capacity building throughout the inter-regional network with regular seminars and workshops held in Pisa as well as in other locations, where national and international
keynote speakers research centers or institutional entities discuss results and future challenges of performance measurement in healthcare.

- The **HSE Lab** is the first research laboratory in Italy tackling Health, Safety & Environment (HSE) issues in coordination with large companies operating in the energy, transportation, ICT and manufacturing sectors. The HSE Lab “co-creates” with, and disseminates to, these companies new knowledge on the management of health, safety and environmental aspects in the workplace, while supporting them in handling current and future sustainability challenges. The HSE Lab brings together academic and business partners to develop and experiment innovative managerial approaches, grounded on a solid toolkit of wide-ranging research methodologies. Companies have the opportunity to co-design and participate in empirical research activities aimed at improving HSE management, focusing on topics ranging from risk assessment methodologies, to organizational networks, to managers’ leadership and employees’ behavioural styles for a more proactive and effective HSE management. By combining advanced academic research and managerial practices, the HSE Lab promotes a more careful, systemic and strategy-oriented approach to HSE management among participating companies.

- The **Observatory on the Green Economy** creates a platform where institutional and business actors can debate critical issues related to the Green Economy. In particular, the Observatory has established two “working tables”: (i) the **Policy Table**, which concerns institutional approaches and policies for the Green Economy, as well as tools to support planning, evaluation and decision making; (ii) the **Management Table**, which produces analyses and critical inputs for business strategies, focusing on managerial and product-related aspects. EMbeDS, through the Institute of Management, is a partner of the Management Table, with specific research objectives related to the circular economy, environmental certification, life cycle assessment and environmental footprinting. Membership to the Observatory is open to companies of the industry and service sectors, category associations, consortia, consulting firms, banks and credit/financial/insurance institutions, regions, provinces, municipalities and other administrative entities, environmental agencies, certification and voluntary standardization entities. Several large companies and organizations have already joined the Management Table (e.g., Ferrero, Barilla, Carlsberg, Mapei, Eni, Enel, Brembo, Whirlpool, etc.)

**8. INFRASTRUCTURE: HIGH-PERFORMANCE COMPUTING CLUSTER**

EMbeDS scientific and educational mission requires significant investments in new hardware. Consistent with our proposal, in 2018 we moved ahead with plans and technical specifications for the acquisition of a high-performance cluster which will serve the scientific computing needs of a broad community of researchers and students who perform in silico experiments, large simulations and advanced statistical analyses of big data. Based on these needs, we articulated a purchasing plan and a detailed “technical specifications”. Our cluster will include a pair of multi-core node in server rack attached to a Storage Area Network for high performance and/or "reliability", interconnected in star topology with a ToR switch. The cluster will be managed using industry standard virtualization middleware to maximize its use. Overall, our target is a computational architecture comprising two elements: (1) a general-purpose cluster with performance specificity + capacitive/scratch storage, which will offer both classical computational power and computational power supplied by GPUs mounted on servers (sharing GPUs core among VMs); (2) an additional computational node as a standalone machine equipped with GPUs. In a first purchasing phase,
which should be completed in the summer of 2019, we will acquire the general-purpose cluster. In a second purchasing phase, which we expect to complete in the summer of 2020, we will expand on the first purchase adaptively – based on users’ needs; we may expand the cluster acquired in the first phase with machines with the same configuration features or acquire a separate dedicated machine for optimal support of “killer” applications (a standalone system capable of supporting massive computational loads).

9. INFRASTRUCTURE: MULTI-FUNCTION LABORATORY

Also consistent with EMbeDS proposal, in 2019 we made significant progress towards the realization of a new multi-functional laboratory. The Sant’Anna School has allocated an appropriate room, and plans and specifications for adapting such room and acquiring all required furniture and technical infrastructure have been finalized. We expect the laboratory to be completed in the summer of 2019. The laboratory, which will be supported by the high-performance cluster, will host a lecturing platform with a large screen and board, a direction post and 24 modular work posts, each composed by movable desk+chair and dividers, and equipped with a wireless laptop. It will allow on site coordinated hands-on learning activities, as well as remote teaching and collaborations. In addition, the room will be equipped with recording technology for the development of online courses and audio/video materials, and with hardware and software infrastructure for computer-aided behavioral experiments and remote connectivity. The laboratory will be instrumental to research, collaborations and training activities involving EMbeDS researchers, PhD students in Economics, Management and Data Science, as well as other researchers and students of the School. It will also facilitate connectivity with various public and private stakeholders, and training activities aimed at policy makers and practitioners (for example through specific "policy laboratories").

10. INFRASTRUCTURE: DATA BASE AND SOFTWARE ACQUISITION

In 2019 EMbeDS acquired several databases critical to its scientific and educational mission. In particular:

- 04/2018. **ORBIS and ZEPHYR** provided by Bureau van Dijk. ORBIS contains rich, comprehensive and standardized data on over 280 million companies across the globe. ZEPHYR contains up-to-date information on M&A, IPO, private equity and venture capital deals and rumours. Some training sessions were also provided by BvD to our community ([http://embeds.santannapisa.it/news/orbis-and-zephyr-now-available](http://embeds.santannapisa.it/news/orbis-and-zephyr-now-available)).

- 06/2018. **Crunchbase** provided by Crunchbase Inc. Crunchbase is a database of innovative companies, providing comprehensive information on start-up activity and financing within and across countries. It comprises data on technology companies, key people, investors, types of investors, funding rounds, types of funding, acquisitions and events ([http://embeds.santannapisa.it/news/crunchbase-now-available](http://embeds.santannapisa.it/news/crunchbase-now-available)).

- 12/2018. **CRSP US Stock Databases** provided by the University of Chicago Booth School of Business. The CRSP databases comprise daily and monthly market and corporate action data for over 32,000 active and inactive securities with primary listings on the NYSE, NYSE MKT, NASDAQ, Arca and Bats exchanges. They include CRSP broad market indexes, as well as comprehensive corporate action information and highly accurate total return calculations ([http://embeds.santannapisa.it/news/crsp-databases-now-available](http://embeds.santannapisa.it/news/crsp-databases-now-available)).

The databases are available to our community, as well as researchers and students in other institutions, through the Library of the Sant’Anna School. We plan to continue securing access to critical data sources in 2019 and beyond.
11. RECRUITMENT: ASSOCIATE AND ASSISTANT PROFESSORS

In 2018 EMbeDS recruited a number of new faculty members. In particular:

- **10/2018. Caterina Sganga** joined the DIRPOLIS Institute and EMbeDS as Associate Professor of Private Comparative Law. Sganga’s research concerns international and comparative intellectual property law, with a focus on European copyright law, IP and new technologies (AI, IoT, cloud computing, cyberpace, digitization), IP and innovation policies, the interplay between IP and human rights, and data ownership and management in the era of big data (http://embeds.santannapisa.it/news/caterina-sganga-associate-professor-private-comparative-law-joins-embeds).

- **12/2018. Daniele Giachini** joined the Institute of Economics and EMbeDS as Assistant Professors of Economics (RTD-A). Giachini’s research concerns the selection dynamics operated by markets among an ecology of heterogeneous agents who make investment decisions based on behavioral rules. His work seeks to understand the long-term outcomes of selection in terms of survival, dominance, and disappearance of different rules, and to analyze the information content of emerging prices and its relationship with the “rationality” of individual behavior. He also investigates the connections between machine learning methods and economic models (http://embeds.santannapisa.it/news/daniele-giachini-assistant-professor-economics-rtd-joins-embeds).

- **12/2018. Francesco Lamperti** joined the Institute of Economics and EMbeDS as Assistant Professors of Economics (RTD-A). Lamperti’s research concerns macroeconomics, agent-based and integrated assessment modelling, climate change economics and the dynamics of natural disasters. His work seeks to foster our understanding of climate impacts on economic activities through bottom-up approaches and to design suitable policy solutions -- overcoming the focus on carbon taxation (http://embeds.santannapisa.it/news/francesco-lamperti-assistant-professor-economics-rtd-joins-embeds).

- **12/2018. Chiara Seghieri** joined the Institute of Management and EMbeDS as Associate Professor of Social Statistics. Seghieri develops and applies statistical methods for analyzing health services and outcomes using large databases (e.g. healthcare administrative databases) and healthcare surveys (e.g. patient satisfaction surveys, organizational climate surveys of healthcare professionals) with a special focus on the analysis of patterns of treatment and quality of care for patients with chronic conditions such as cardiovascular diseases and diabetes (http://embeds.santannapisa.it/news/chiara-seghieri-associate-professor-social-statistics-joins-embeds).

In January of 2019 we also recruited **Anna Maria Murante**, who joined the Institute of Management and EMbeDS as an Assistant Professor of Management (RTD-A). Murante’s research concerns service management and marketing in the healthcare sector. Her work focuses on user experience with healthcare services; healthcare service delivery processes for chronic disease management; and health promotion interventions through social marketing approaches (http://embeds.santannapisa.it/news/anna-maria-murante-assistant-professor-management-rtd-joins-embeds). Our efforts will continue in 2019 with the recruitment of an Associate Professor in Econometrics 13A5 (SECS / P05) specializing in big data econometric analysis, and an Assistant Professor (RTD-B) in Computer Science 01B1 (INF/01) who will bringing critical computational competences and interdisciplinary value to the EMbeDS community. Three more Assistant Professors (RTD-A) will also be recruited in 2019, two in Business Economics 13B, and one in Statistics and Mathematical Methods for Decisions 13D.
12. RECRUITMENT: POSTDOCTORAL FELLOWS

In October 2018, Irene Martelli joined the Institute of Management of the Sant’Anna School and EMbeDS as a Research Fellow in Management (SECS/P08), with a research proposal titled “Statistical Analysis for Data Science Applications in Open Innovation Strategy”. Martelli’s interests include the use of latent variable models to assess unobservable constructs, and data and text mining techniques applied to data on innovation management. She will work on the integration of different data sources to analyse both determinants and outcomes of innovation processes occurring in small and medium-size companies, and develop statistical models to characterize and evaluate European innovation policies – with a special focus on Open Innovation practices (http://embeds.santannapisa.it/news/irene-martelli-research-fellow-management-joins-embeds).

In January 2019, Elisa Foresi joined the Institute of Management of the Sant’Anna School and EMbeDS as a Research Fellow in Management (SECS/P08), with a research proposal titled “Big data per la misurazione della performance delle reti in sanità”. Foresi’s interests include methods for linkage of large administrative databases in the healthcare sector. (http://embeds.santannapisa.it/news/elisa-foresi-research-fellow-management-joins-embeds)

Research groups within both the Institute of Economics and the Institute of Management are planning the recruitment of several additional postdoctoral fellows associated with EMbeDS in 2019.

13. RECRUITMENT: TECHNICAL PERSONNEL

In June 2018 Cristiana Bettelli joined EMbeDS as Administrative Officer (PTA). She holds a degree in Economics and Business Management & Health Services from the Catholic University of the Sacred Heart in Rome. From June 2013 to June 2018, Cristiana worked as a research fellow at the MeS Laboratory of the Sant’Anna School – acquiring critical experience with the School’s community, units and procedures – as well as with some aspects of the research characterizing EMbeDS (performance measurement systems in the healthcare sector, with particular focus on economic and financial dimensions). As the Administrative Officer of EMbeD, she now supports communication, administrative activities and budget management.

In 2019, concomitant with the completion of the first phase of hardware acquisition, we plan to recruit an IT and data processing technician (category D). The profile and specifications for this post have been finalized and the internal mobility stage of the procedure completed. A public call and subsequent evaluation and recruitment proceedings will be initiated as soon as possible.

14. MANAGEMENT, MONITORING AND PLANNING ACTIVITIES

The MANAGING BOARD of EMbeDS was formed in January 2018, comprising Francesca Chiaromonte, Alessandro Nuvolari, Andrea Piccaluga, Fabio Iraldo, Luca Bardi and Pierdomenico Perata.

Francesca Chiaromonte is the Scientific Coordinator of EMbeDS. At Sant’Anna, she is a Full Professor of Statistics in the Institute of Economics, and the internal referent for the consortium PhD in Data Science. She also teaches Statistics and directs the Institute for Genome Sciences (one of the Huck Institutes) at the
Pennsylvania State University. Her principal research area is developing methods for the analysis of large, high-dimensional and complex data, and applying such methods in several scientific fields – including contemporary “Omics” sciences, Meteorology and Economics. She holds a PhD in Statistics from the University of Minnesota (USA) and a Laurea in Statistics and Economic Sciences from the University of Rome La Sapienza. Andrea Piccaluga is a Full Professor of Innovation Management and the Director of the Institute of Management. In addition, he is the President of Netval (www.netval.it), the Italian network of University Technology Transfer Offices, and has launched the DBA programs at Sant'Anna (www.dba.idm.sssup.it). He holds a PhD from Sant’Anna and a Master in Technology and Innovation Management from SPRU (University of Sussex, Brighton UK). Alessandro Nuvolari is a Full Professor of Economic History and Director of the Institute of Economics. Prior to becoming director, he was the coordinator of the PhD program in Economics at Sant’Anna. A graduate of Bocconi University with a PhD in Economics from the Eindhoven University of Technology (Netherlands), his research is focused on the role played by science and technology in the emergence and consolidation of economic growth both in historical and contemporary contexts. Fabio Iraldo, is a Full Professor of Environmental Management and he is in charge of relationships with stakeholders for EMbeDS. He is the coordinator of the PhD program in Management at Sant’Anna. His principal research areas include Corporate Environmental Management, Life-Cycle Management, Economics and Management of Voluntary Certification Schemes, Environmental Innovation and Competitiveness, Sustainable Marketing, Environmental Reporting, and Stakeholder Engagement. He holds a Laurea from the Bocconi University (Milan) and a PhD in Economics from the University of Venice. Luca Bardi is the Managing Director of Sant’Anna. He holds a Laurea from the University of Pisa and a Master in Information Studies from the University of Northumbria (UK). Pierdomenico Perata is a Full Professor if Plant Physiology and the Rector of Sant’Anna since May 2013 (he will remain in office until May 2019). Prior to becoming the rector, he was also deputy Vice-Rector, Dean of the Faculty of Experimental Sciences, and coordinator of the PhD in Agrobiodiversity. His research the physiology of stress, the interaction between primary metabolism and hormonal physiology, and the synthesis of natural colorants in plants. He holds a Laurea and a PhD in Agricultural Biology from the University of Pisa and was an allievo of Sant’Anna during his undergraduate and graduate studies.

The Managing Board held regular monthly meetings since February 2018 and formed task forces (comprising also other faculty and personnel of the School) to plan and advance various initiatives.

| EMbeDS Managing Board Meetings (2018 and early 2019) |
| --- | --- |
| 13.02.18 | 22.01.19 |
| 07.03.18 | 20.02.19 |
| 14.05.18 | 25.03.19 |
| 26.06.18 | 06.05.19 |
| 06.07.18 | 14.06.19 |
| 17.07.18 |  |
| 06.09.18 |  |
| 26.10.18 |  |
| 13.11.18 |  |
| 17.12.18 |  |
In July 2018, Andrea Mina and Nicola Belle’ became ASSOCIATE SCIENTIFIC COORDINATORS of EMbeDS (http://embeds.santannapisa.it/news/embeds-appoints-two-associate-scientific-coordinators). They work closely with Francesca Chiaromonte, the Scientific Coordinator, and participate to meetings and task forces of the Managing Board. Andrea Mina is an Associate Professor in the Institute of Economics of the Sant’Anna School of Advanced Studies, a Fellow of the Cambridge Judge Business School and a Senior Researcher of the Centre for Business Research at the University of Cambridge. His research focuses on the analysis of technical change, innovation networks and industrial dynamics, science and technology policy and the financing of innovation. Nicola Belle’ is an Assistant Professor in the Institute of Management of the Sant’Anna School of Advanced Studies. His research focuses on behavioral human resource management. Specifically, he studies how we can use behavioral science to understand work motivation and improve decision-making in the context of mission-driven organizations.

Finally, EMbeDS operates in close COORDINATION WITH OTHER UNITS of the Sant’Anna School, in particular the ICT Services directed by Italo Lisi, who is actively involved in infrastructure acquisition and related coordination and training initiatives; the Library, where Maria Teresa Nevigato and Carla Papa are involved in the acquisition and management of databases access; the Purchasing Office; the Human Resources Office; the Technical Area Office.; and the Communication specialists. We also work closely with the faculty and the coordinator of the PhD in Data Science Dino Pedreschi (UniPi). Finally, we are establishing collaborative ties with the Department of Excellence of Area 9 at the Sant’Anna School and with the Scuola Normale Superiore concerning the acquisition and use of computational infrastructure and databases, as well as other initiatives.

15. ONLINE PRESENCE, SOCIAL MEDIA AND MEDIA COVERAGE

WEBSITE DESIGN AND DEVELOPMENT

We designed and implemented a website to collect general information on EMbeDS and its people, and specific news and events relevant to our scientific and educational aims (http://embeds.santannapisa.it/). Relatedly, we developed a logo and graphic design for the Department of Excellence – which is used on the website, as well as in printed and online materials. The website is a key communication tool that allows us to reach a broad community and advertise our initiatives, activities and progress. It is in constant evolution, and at this time it includes the following sections:
- WHO ARE WE? (profiles of some of the people in leadership and administration roles)
- OPENINGS (active calls and calls for expressions of interest)
- RESEARCH (description of the main research areas of EMbeDS, and of the challenges and opportunities of Big Data)
- EDUCATION (description of the PhD programs related to EMbeDS)
- IMPACT (description of the socio-economic impact of our research)
- PRIVATE SECTOR (summary of connections with the private sector and relations with stakeholders)
- NEWS (news concerning salient activities, workshops, papers, visitors, recruitment, databases, etc.)
- EVENTS (description, scheduling and locations of events relevant to the EMbeDS community).
- ANNUAL REPORTS (where this document is now posted for 2018).

MEDIA COVERAGE
In May, 2018: the Sant’Anna School of Advanced Studies hosted a meeting with Diego Piacentini, the then Government Commissioner for the Digital Agenda, and Raffaele Lillo, the then Chief Data Officer of the Italian Digital Transformation team. In addition to publicity provided on the EMbeDS website (see above), the event was live-streamed (https://www.santannapisa.it/en/news/digital-transformation-italian-public-sector-diego-piacentini-and-raffaele-lillo-give-live) and it received media coverage, e.g.:

ANSA news agency
http://www.ansa.it/sito/notizie/economia/2018/05/14/revoluzione-digitale-nella-p.a-ecco-i-risultati_720fab95-6d70-415e-8feb-57fe05b82e86.html
Libero (newspaper)
https://tecnologia.libero.it/piacentini

In December 2018, the Sant’Anna School inaugurated its 2018-19 academic year conferring a PhD Honoris Causa to Mario Draghi, President of the EBC (European Central Bank). This event was also live streamed (https://www.santannapisa.it/en/event/celebrating-new-academic-year-2018-2019) and received large media coverage by national TV and radio newscasts, as well as newspapers, e.g.:

TV news:
From the broadcasts of the Italian Public TV
https://www.santannapisa.it/it/multimedia/rai-1-al-santanna-inaugurazione-anno-academico-con-conferimento-phd-honoris-causa
https://www.santannapisa.it/it/multimedia/rai-3-mario-draghi-riceve-il-phd-honoris-causa-economics-durante-inaugurazione-anno
https://www.santannapisa.it/it/multimedia/rainews24-mario-draghi-phd-honoris-causa-economics-alla-scuola-santanna
From the broadcasts of major private networks (LA7, Sky)
https://www.santannapisa.it/it/multimedia/la7-apertura-anno-academico-con-conferimento-phd-honoris-causa-economics-mario-draghi
https://www.santannapisa.it/it/multimedia/la7-inaugurazione-anno-academico-al-santanna-e-conferimento-phd-honoris-causa-economics

RADIO news:
From the radio broadcast of Confindustria (Radio 24)
https://www.santannapisa.it/it/multimedia/radio24-dal-santanna-phd-economics-honoris-causa-mario-draghi-durante-inaugurazione-anno
From the broadcasts of the Italian Public Radio
https://www.santannapisa.it/it/multimedia/radio1-al-santanna-inaugurazione-anno-academico-con-conferimento-phd-honoris-causa
In January 2019, the Sant’Anna School hosted a meeting with Ignazio Visco (President of the Italian Central Bank), who introduced his recent book “Anni Difficili: dalla crisi finanziaria alle nuove sfide per l’economia” – followed by a discussion with Giuliano Amato (Justice of the Constitutional Court) and Giovanni Dosi (Professor, Institute of Economics, Sant’Anna School). This too received large media coverage, e.g.:

**TV news:**
From the broadcasts of the Italian Public TV (RAI 3)

**Print news**
ANSA news agency

Sole 24 ore

La Repubblica

L’Espresso

La Stampa

Il Messaggero

Il Fatto Quotidiano
PRESENCE ON SOCIAL PLATFORMS

In 2018 we also developed a social media communication strategy for the Department of Excellence in collaboration with the Communication specialists of the Sant'Anna School. In particular, we expect to establish a regular presence on Twitter in 2019.