Development Plan

From
Center for Mind/Brain Sciences – CiMeC
to
CiMeC Department

Masterplan 2019-2025
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CIMeC OBJECTIVES 2019 – 2025

The Center for Mind/Brain Sciences (CIMeC) is a cutting-edge research center in the area of cognitive neurosciences, dedicated not only to the description and understanding of cerebral functioning under normal conditions, but also to discovering innovative strategies for preventing and treating neurological pathologies which could compromise it. The combination of basic research, research inspired by use and translational research puts the Centre in a privileged position, both for what concerns the training of future researchers of neuroscience as well as the rapid transfer of highly innovative scientific results into daily practice.

In line with the University’s strategic plan, in the next 6 years we aim to retain our position on the frontiers of knowledge, innovation and experimentation. In order to reach this goal, we intend to pursue various areas of development to strengthen our activities of research and education in the neuroscience sector. Our efforts will be focused on a strategic proposal which brings together the finest scientific expertise, a multidisciplinary environment, attractiveness, academic integrity, reliability and increased sustainability.

The end objective is not just to make new discoveries of high scientific value about cognitive and brain processes, but also to be able to translate them into diagnostic and rehabilitative care, thereby making an important contribution to the challenges being faced today in the health sector.

This will be achieved by bolstering CIMeC’s strengths along with increased attention to the integration of a wide variety of expertise when facing research and educational problems, along with increased operational efficiency aimed at optimizing the use of instruments and data, while respecting the rights of animals and people.

The expected results of CIMeC’s development plan are:

❖ The consolidation of a small/medium sized international research infrastructure which would ensure continuity of the University of Trento’s role as an international leader in the field of neuroscience.

❖ The establishment of a unique and innovative educational program in the field of neuroscience, in English, with programs at the three degree levels (three-year Bachelor’s degree, two-year Master’s degree, PhD);

❖ Strengthening (in partnership with various provincial, national and international actors) of outreach and educational activities regarding health and science;

❖ Support, through innovation, of the development of the “health and wellness” industry at the regional and national level.

OBJECTIVE 1 CAMPUS UniTN @ MANIFATTURA - INFRASTRUCTURE

Creation of a campus for all of the structures of CIMeC

Currently the research and teaching activities of CIMeC take place in 5 different locations in Mattarello and Rovereto (Figure 1). The fragmentation of CIMeC in different geographic locations is an important, and critical, element which impedes our ability to best face the global challenges of our times.
The objective is to bring all five locations together in a single University Campus located in the buildings of the “Progetto Manifattura” complex in Piazza Manifattura, 1 Rovereto (TN) (Figure 2).

The centers that will be relocated are:

- The Neuroimaging LNIF laboratories (Magnetic Resonance Imaging - MRI, Magnetoencephalography, transcranial brain stimulation, Behavioral and Eye Tracking Lab, EEG co-registration), all currently located in Mattarello;
- The Experimental Psychology (EPL) laboratories and the Language, Interaction & Computation Laboratory (CLIC) currently in Palazzo Fedrigotti (main building and annex) in Corso Bettini, Rovereto;
- The Center for Neurocognitive Rehabilitation (CeRiN), currently located in the Trade Center in Rovereto;
- Classrooms located in Palazzo Istruzione in Rovereto.

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**Figure 1 Facilities and Centers**

**Figure 2: Aerial view of the Progetto Manifattura complex - Rovereto**
The relocation of the various CIMeC sites to the Manifattura will bring with it many advantages in terms of optimizing staff scheduling for technical and administrative staff, as well as for professorial staff, but also for the optimization of the resources necessary for the management of the Center. The following list presents some of the main advantages:

❖ All of the technical and administrative staff will be in a single site which will allow for a more efficient organization in terms of costs and work times;
❖ The MRI and CeRiN laboratories will be in the same site which will allow for shared medical coverage, necessary for the operation of both facilities;
❖ All seminars, meetings, and conferences will be organized at the same site, reducing the time necessary to reach events, which will result in increased participation;
❖ Students, PI, and post-docs will be at the same site along with offices, classrooms, experimental laboratories and meeting places leading to more constructive interactions which can take place daily (for example the PI will have more opportunities to talk with their colleagues about projects, grants, collaborations, etc.);
❖ Special-needs groups (ex. participants with cognitive or sensory disabilities) will be able to be included in data recording without the inconvenience of travelling between sites (ex. from CeRiN to the MRI laboratories).
❖ Increased visibility of CIMeC as a single entity for visiting researchers, speakers invited for conferences, lending bodies and the public.

Figure 3 aerial view with “numeric map” of the Progetto Manifattura complex –Rovereto.

The implementation times for this objective depend on the design process and the open competitive bidding managed by the Real Estate Office of the University of Trento (or delegated to the competent provincial offices APAC).

14 a) The section a of Building 14, shown in green in the map in figure 3 has already been built.

14 b) The section of Building 14b (shown in red in the map in figure 3) will host the Italian Institute for Technology – IIT (animal enclosures and laboratories in the basement, ground floor and first floor IIT offices). Construction is in process on the basement and ground floor of 14b and the estimated completion time is the end of 2019. CIMeC offices will be located on the upper level floors (second and third); the renovation of the first, second and third floors is still in the design phase and at the moment completion times are unknown.
10) The estimated completion of Building 10 (shown in blue in the map in figure 3) is the end of 2022. The neuroimaging laboratories will be relocated here from Mattarello.

11) and 13) A feasibility study has not been carried out for buildings 11 and 13 (shown in grey in the map in figure 3) which would host CeRiN, all of the CI MeC facilities currently in Palazzo Fedrigotti, and the classrooms. It is our hope that this renovation phase will begin as soon as possible.

In this context, a development plan to improve the quality of CI MeC’s activities, but also that of the entire Rovereto university campus, would be greatly facilitated by the creation of a **clear and well-defined program** aimed at facilitating and consolidating a move of this magnitude. The continued advancement of CI MeC can only be guaranteed through programmed deadlines for this project. In short, we would like to highlight that the final decision to place CI MeC in the Manifattura in Rovereto depends on a clear development plan of the University of Trento at the Manifattura which we hope to see better defined by end of September 2019.

*Figure 4 rendering of the Progetto Manifattura complex –Rovereto.*
Objective 2 Neuroimaging strengthening - INFRASTRUCTURE

Updating of current equipment, development and strengthening of methodologies and research groups which use it

Since its founding, what has set CIMeC apart is the unique possibility, unique both on the national and international panorama, to be able to combine different instruments for advanced neuroimaging. At the same time, the technological and methodological progresses in the field of neuroimaging and in the cognitive neurosciences have evolved at an extremely fast pace. With this objective we intend to ensure that CIMeC will be able to maintain the possibility of integrating, within the same research center, various complementary measures for anatomy and brain functioning also in the coming years. Essential to achieving this goal are various technological upgrades of our instrumentation as well as an increase in the number of research staff, with particular attention towards methodological expertise and developments on the frontiers of research: research activities which go beyond both discipline and geographical confines with the aim of progress and excellence.

We have already started to develop this goal through the purchase in 2018 of a new MRI scanner with a 3 Tesla field intensity, considered the gold standard in experimental and diagnostic areas, which offers a considerable quality increase for the spatial and temporal definition of acquired data. In 2019, thanks to funds received from the Departments of Excellence, we are currently upgrading the instrumentation which can be used alongside the new MRI scanner through the purchase of peripheral instrumentation compatible with the magnetic fields, allowing for a multimodal approach (Multimodal Imaging), such as electroencephalography (EEG), neuronavigation, neurostimulation, and the use of decoding instruments online for approaches which require closed-loop transfers. On this point, we consider it important to highlight that the purchasing contract with Siemens includes the relocation of the scanner by 2022 to the new facility at Manifattura Tabacchi once Building 10 is completed (in line with Objective 1).

Upon moving the neuroimaging lab to Building 10 at the Manifattura we have planned for a technical update of the magnetoencephalography (MEG) scanner to bring it up to date, as it is ten years old. The update will guarantee continuous technical support in the future and will also incorporate an advanced recycling system of the used liquid helium which will dramatically lower the operating costs of the MEG, while also improving the quality of data acquisition properties from the system.

For what concerns research staff, we intend to strengthen the neuroimaging area through the recruitment of new researchers with strong international profiles and proven experience in the areas of methodological development and the application of these methodologies to the study of cognitive neuroscience.

Along with these more general actions, we will be putting into place more specific measures for the implementation of procedures which will allow for a wider range of experimental queries (per type of data acquired and per population of study) than what is possible today at CIMeC.

Among them are the following:

❖ **Optimization of MRI data acquisition methodologies** compatible with the new 3 Tesla scanner as well as the implementation of protocols for the acquisition of high spatial-temporal resolution and strong contrast images, and standardized parameters for data sharing on “open Science” platforms (linked with Objective 4);

❖ **The development of a “big data” perspective** which can guarantee compatibility of neuroimaging studies with the latest IT and computational advances;

❖ **The implementation of sequences** as well as hardware and software platforms for the acquisition and analysis of fMRI and EEG data in real time (for example, real time fMRI), necessary for neuro-feedback studies and closed loop for the development of integrated brain-machine interfaces;

❖ Cutting edge computational/neural model processing with the use of deep learning techniques to explain how anatomy and brain functioning can lead to the formation of concepts and their
transmission through language (thanks to the linking of representations acquired through MRI and MEG with vectoral representations extracted, for example, from texts and images);

❖ Bringing together researchers with interdisciplinary expertise, open to the exchange of ideas and skills, will contribute to the study of computational models which can learn continuously without forgetting. The development of such models would allow us to overcome one of the most important weaknesses of current research on the development of Artificial Intelligence;

❖ The promotion and coordination of the instrumental, scientific, ethical and logistical aspects of support necessary for carrying out neuroimaging studies on people of different age groups which cover the entire human life span, in order to better investigate the development and aging processes of the brain and cognitive faculties;

❖ The realization of clinical research studies with a translational perspective (of interest also for the local area) on neurodegenerative pathologies, such as Alzheimer’s or Parkinson’s, or on brain damage caused by stroke or brain damage, with an emphasis on the neurobiological mechanisms and on cognitive deterioration and its rehabilitation (linked with Objective 9).

**Objective 3 Optimization - SUSTAINABILITY**

**Development of a system for equipment and laboratory management and resource usage cost control**

With this objective we intend to provide continuity and increased efficiency of the resources necessary for carrying out the scientific and cultural projects of CIMeC through **close and detailed monitoring of the costs of administration costs of all research equipment**, starting from the neuroimaging equipment.

The use of the MRI and MEG machinery, considering the high maintenance costs, has been optimized to prevent resource waste through the creation of an automatic system for reservations and operation of the laboratories and peripheral equipment. This system has allowed us to optimize access of researchers to technical and methodological resources (definite facilities), through an attentive monitoring of the use of equipment, thereby ensuring access to research groups through shared criteria. The same system is in use for access to the experimental psychology labs in Palazzo Fedrigotti and the animal cognition and neuroscience labs in the Manifattura.

This system was at the base of the project which allowed us to obtain precise calculations of the operating costs of the technical and methodological resources, and therefore the “hourly” and “per subject” costs of experimental activities. The Center has developed a software which operates with the reservation system for technical and methodological resources and allows us to precisely calculate the cost of the single experimentation activities carried out by different research groups. This second part of the application is already operational and functioning at the MRI and MEG Labs in Mattarello, and will be expanded in the coming years to include all of the Center’s labs and instrumentation.

With the support of researchers, CIMeC technical and administrative staff, and the accounting offices of the Rovereto Campus (in collaboration with CIBIO and the concerned administrative offices), and based on previous work, the University has certified a **cost recharge** system for different types of facilities, a methodology to calculate equipment costs. This will allow us, starting in 2019, to charge facility use costs as direct costs for projects which are funded by third-party national and international organizations.

Completion time for the objective: The “tool” is already operational for the labs in Mattarello. As previously mentioned, a third-party cost certification was carried out in February 2019 and we are currently waiting for instructions from the central administration for the different unit costs for the different user types (internal UniTN, contract staff / special agreement, External).
The extension of the protocol to the Experimental Psychology Labs in Rovereto is expected at the end of 2019. After an initial phase of “mapping” costs and usage, we expect to develop the same protocol for the Animal Cognition and Neuroscience labs at the Manifattura Tabacchi by 2020.

This will permit not only a more precise administration and quantification of research activity costs, but also greater efficiency in operating the laboratories. Researchers who lack their own funding will still be able to access research equipment thanks to the support of the Center which will implement merit-based procedures for the awarding of “virtual funds”.

It is important to highlight that this measure will allow for open access to all CIMeC facilities to all researchers by preventing the personalization of space and equipment administration. In particular, this would mean young researchers would not be obligated to “share” findings with senior researchers who normally manage the equipment. At the same time, this will also allow us to recover some financial resources that can be used towards improving facilities, renewing obsolete tools and upgrading equipment.

Parallel to this, a self-registration system is currently being designed for researchers, based on the projects which they are part of, available funding and laboratories which are used. Lastly, with the help of the board of directors, we intend to also develop computer-based procedures for the submission of projects to the University Ethics Committee. Together, these systems will provide researchers with a tool which guides them through the laboratory access procedures.

OBJECTIVE 4 THINK OPEN - SUSTAINABILITY

Think Open - Construction of a platform dedicated to the organization and sharing of Open Science “neuroimage” data

It is our intention to develop a new IT platform for the organization and sharing of data related to images of the brain or general data regarding the Center. The objective is to create, in full compliance with privacy and intellectual property laws, a database of data from healthy participants as well as those suffering from brain diseases. This database will allow us to share data from different laboratories, which will also be available to contract staff, and will facilitate participation in multicenter studies. The creation of such a database promotes the full usage and the free circulation of acquired data in an Open Science prospective. The principles are simple: allow data and research materials to move freely between research groups and between disciplines, thereby accelerating research times, increasing the quality of results, and reducing costs while guaranteeing integrity at the same time.

The entire scientific community is engaged in a great effort to increase our knowledge of how the brain works and how diseases can alter its functioning. Nevertheless, for an optimal use of acquired data, sometimes it is necessary to compare images obtained by different researchers, combine different data and at times analyze them with methods of analysis that weren’t available at the time they were acquired. A natural consequence of the decision to follow an Open Data path will be that the Center’s reputation will improve and it will enter into a global network of centers which use a Big Data approach, therefore also allowing us to join consortiums, and participate in calls for grants both from the EU as well as from Industry or Foundations.

This project includes the results that will be the direct result of the measures to be taken:

❖ guarantee research integrity (reliability, rigor, replicability) which is crucial for the international reputation of the University of Trento;

❖ facilitate pre-print and open publications in order to improve the digital identity of the University of Trento and its impact on research, in line with the intentions of many funding agencies in Europe (Nature 559, 311-312, 2018).
Through this project, we will **reduce data acquisition costs** by sharing it with laboratories around the world and **improve our international reputation**.

To reach this objective we have planned to purchase a new computer cluster and computing machines that will make use of high-performance graphic cards. The required funds for this project are already available thanks to two grants (Departments of Excellence; European fund for regional development). The first phase has already been completed through the hiring of a specialized technician dedicated to this project. After purchasing the cluster base, it is scheduled to be implemented in 2020 and 2022.

Objective completion time: Completion of the comprehensive plan is expected by 2022.

The following “tools” are planned to reach this objective:

- **Scientific**: share data acquired by the Center through the creation of databases which are open and available to the scientific community; contribute to the research and development of effective and informative ways of describing data and metadata;
- **Educational**: spread and consolidate “open” approaches for new generations of students and researchers;
- **“positioning”**: positioning of the Center as a stable reference point for Open Science in the national and international community.

In order to reach these objectives, the **following actions have been planned**:

- In 2018 a work group was created to work on the project.

**Scientific Tools**: to facilitate the creation and increase the availability of open databases, (at least) three activities will be pursued:

- “ethics and integrity”, which regards reviewing and checking aspects of privacy and intellectual property in order to ensure a correct and honest exposition of a selection of data which is as relevant as possible for the scientific community;
- “metadata and data fusion”, in which the various laboratories of the Center will share their most effective approach descriptions for the composition of metadata to create datasets which combine information from different sources;
- “sharing”, in which the methods which are most suitable for sharing data and metadata within the Center and with the scientific community will be discussed, analyzed and implemented.

**Educational Tools**: Two new activities will be started to help spread and consolidate “open” approaches for future generations of students and researchers:

- “Open Software”, in which information on updating the data analysis software best suited to sharing and transferring results will be spread through training programs (ex. tutorial, infographics, cheat sheets);
- “Data analysis challenges”, initiatives connected to open science such as data analysis competitions, article editing such as “data – descriptor” will be publicized and promoted;

**Positioning tools**: To establish the Center as a reference point for open science, beyond the projects described in the previous points, three specific activities will be carried out:

- “Open Science Hubs” for the analysis of databases of European and international initiatives (ex. openAIRE, EOSC, etc.) and discuss the Center’s possible participation;
- “Open science seminars” in which members of the Center will be asked to discuss topics and progress related to open science. Members of the international and national scientific community will be invited to the Center to present their contributions and to potentially establish collaborations;
- “Open science hands-on sessions” in which members of the center will hold hands on sessions about using specific software for open science, both for reviewing information and for creating of informative and shareable databases. These sessions will be held for both the national and/or...
international scientific/academic community, on topics concerning both specific and non-specific fields (ex. conferences on related themes, special open science days).

We have planned the following in order to check the efficacy of these actions:

- **Scientific tools**: Make available to CIMeC researchers an informed consent form which authorizes the supervised sharing of data within the research center community by 2019; this form will also allow the possibility to correctly share data outside the Center;

- **Educational tools**: Create at least three tutorials (open data and distributed computing; from raw data to a well-constructed dataset; open data fusion) and offer them periodically to the PhD community and Early Career Scientists (ECS) at the Center, first in a prototype phase (2020) and then systematically (2021 and on);

- **Positioning tools**: Organize the open science seminars so that there are always five each year. Ensure continuity in the Center’s participation (at least one initiative per year from 2019 on) at events related to open science.

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**Objective 5 Research strengthening - SUSTAINABILITY**

**Consolidate quality and quantity standards of scientific production and the ability to attract funding.**

We intend to promote further development of the quality and quantity of the scientific research carried out at the Center, strengthening some areas which are already present and completing recruitment in some research areas deemed crucial for the center. In order to further increase outside funding, CIMeC has recently carried out strategies to promote participation by its researchers in European and international grant announcements. With the help of the University of Trento Research Support offices, the center regularly publishes an updated list of the national, European, and international funding announcements in the field of cognitive neuroscience and related fields, divided into interest areas, as a service to its researchers. Thanks to this monthly listing, researchers are well-informed of the possibilities available for obtaining funding.

The administrative offices at CIMeC, along with the Research Support offices guarantee support for preparing funding applications as well as in the handling of funded projects. Furthermore, once again in collaboration with the Research Support offices and in line with the University’s research policies since 2017, CIMeC has started a project which aims to facilitate young researchers (through courses and direct support) who intend to present proposals for the Marie Skłodowska Curie Individual Fellowship grants for which CIMeC – University of Trento is a host institution. This project has recently received increased support from the University of Trento.

Finally, we are implementing a series of strategies aimed at guaranteeing greater access to research funds for all researchers at the Center:

- use overhead to benefit the administrative management of projects;
- promote participation in projects in partnership with other institutions in the form of competitions for “visiting scientists @ CIMeC” with the objective of facilitating scientific cooperation which lead to proposals for project funding;
- maintain internal financing of the research activities of researchers, annually assigning 24-month post-doc grants assigned through merit-based procedures with third-party evaluation;
- Encourage using the Center’s available resources on researchers who apply for funding, even if they are not funded, rather than for those who don’t apply for any funding;
- Draw up procedures for giving financial support from the Center to projects which, despite being judged excellent by important grant agencies, did not receive funding (ex. reroute funding recovered from facilities to projects in the same area);
- Provide co-financing, even if limited, from the Center to projects which require it in order to improve the likelihood of obtaining external grants.
**Objective 6 Attraction - People**

**Maintain international appeal**

The objective is to adopt the highest quality standards allowed by the Italian university system to attract the best talent. With this in mind, we consider it equally important that young PI who are already working at the Center must be able to show their own scientific independence in order to have career progression. In addition, our merit-based recruitment policy has the goal of maintaining the international character of the Center. In recent years research positions have attracted many applications from abroad, demonstrating the reputation of the Center as being attractive at an international level. In particular, 36% of PhD applications, 33% of research fellows/assistants and 28% of professor/researcher have come from abroad. As a result, out of the total personnel recruited by the Center, 30% of doctoral candidates, 44% of research fellows/assistants and 33% of professors/researchers are non-Italian.

In order to further improve the recruitment process and the prospects of career development, the Center has decided to establish a Commission with the goal of implementing the instructions it receives from the University of Trento Committee on Recruitment and Career Development. This will put into action the Center’s philosophy that considers each researcher, even at the beginning of their career, to be an independent PI in every respect.

However, in order to raise our already high standards, the Center needs strong support from the University through flexible staffing policies, in particular so we can balance out the high turnover rate for foreign researchers. In this context it is essential that the Center is able to recover resources when permanent staff decide to move abroad, within an appropriate timeframe from their arrival at the University of Trento.

Furthermore, it would be desirable for the University to have incentive policies in order to offer temporary benefits to researchers who decide to come from abroad to the University of Trento, including when they are directly appointed.

**Objective 7 – Education - Teaching**

**Keep teaching quality levels high and increase course offerings**

The courses at CIMeC are oriented towards neuroscience and in particular to the study of the mind-brain system with an interdisciplinary perspective, integrating the cognitive approach with biological, neurological, technological, statistical and computational approaches.

Consistent with the University Strategic Plan 2017-2021, CIMeC puts great importance on teaching quality and promotes innovative teaching practices which encourage interdisciplinary skills, in a learning environment which stimulates individual curiosity, dialogue and a sense of belonging to the scientific community. Our educational program features internship experiences and significative moments of research in our labs which allow students to quickly put into practice the skills they learn. Students are encouraged to take courses in other countries through study abroad programs and through the numerous existing projects between the Center and various universities abroad. The international character of our programs is guaranteed by the fact that English is the language used at all levels. This allows CIMeC to host and teach both Italian and foreign students and give them the possibility to be competitive at the international level.

Recent surveys on career development of CIMeC alumni are very encouraging and confirm that CIMeC is playing an important role in educating a new generation of researchers that are able to influence future research in the field of cognitive neuroscience.

CIMeC currently offers two degree programs, a two-year course (Master degree) in Cognitive Science and a PhD program in Cognitive and Brain Sciences. CIMeC also contributes to the 2-year Interdepartmental Master degree in Data Science offered through the Mathematics Department.
In the coming years, we intend to **increase our course offerings** through a full degree program in Neuroscience, entirely in English. In order to reach this objective, we have proposed the following two actions:

- **New three-year Bachelor’s degree program in Cognitive Neuroscience** (Class: L-24 – Psychological sciences and techniques), for students who are interested in learning the foundations and research methods of the neurosciences. Students who finish the program will then be able to decide if they want to do a specialization course in Cognitive Science (and go on to the Master degree in Cognitive Science offered by CIMeC), Neuroscience (new Master degree offered by CIMeC, see following point), or in Psychology (Master degree in Psychology offered by the Cognitive Sciences Department – DiPSCo). This degree program will be promoted in collaboration with the DiPSCo.

- **New two-year Master degree in Neuroscience** (Class: currently under ministerial review). This course of study would respond to an educational demand also perceived by CUN and turn out students with advanced knowledge and an excellent command of the most innovative research methods in the field of neuroscience.

Additionally, CIMeC is drafting a proposal for a program aimed at neuroscience within the new Master degree in Artificial Intelligence of DISI.

Lastly, CIMeC has undertaken a series of measures to widen its recruitment base of potential students both at the national and international levels. More specifically, we would like to see an increase in the number of applications in 2020 for the various courses (in 2019 the applications for MA program were 119 for 50 places; and for the PhD program 120 applications for 12 places) and consequently an increase in the number of enrolments in the Master degree in Cognitive Science.

The following actions are planned: live streaming of all of the orientation events; increased use of social media; creation of videos about the courses and activities at CIMeC as well videos with current students interviewed about courses and student life. These videos will be posted on social media as they offer a more effective and rapid communication method as compared to traditional methods (posters, brochures, seminars, events, etc.).

Planned realization time for the above objectives: The actions are already in progress and completion is foreseen by the beginning of 2025.

**Objective 8 Cognitive computational neuroscience - SUSTAINABILITY**

Development and consolidation of the research group in the area of Computational cognitive neurosciences

Our intention is to consolidate the computational approach to the study of brain functioning through increased collaboration with the Center of Neuroscience and Cognitive System (CNCS) of the Italian Institute of Technology (IIT). This approach consists in the elaboration of mathematic models constructed and validated on the basis of the integration of different types of real data (fMRI, MEG, EEG, and behavioral) in animals and in human subjects, both healthy and with pathological conditions. This has the goal of simulating how the brain works and has the potential for two important applications: increase the diagnostic usefulness of neuroimages and develop effective forms of man-computer connections such as the use of machine learning techniques to evaluate computational/neural models to decode brain signals.

In this context we recognize that there is an opportunity to further develop our combined research activities by reciprocally using resources and developing the exchange of expertise and professional skills. This project has been designed together with IIT and aims at developing activities in the field of neuroscience which are in the mutual areas of expertise of CNCS-IIT and CIMeC. With this goal, development of the Center’s activities will occur through the consolidation of our partnership with an institution outside of the University of Trento, thereby promoting sustainable growth through the sharing of approaches based on sustainable research.
The objective includes the creation of new shared laboratories with researchers affiliated with both IIT-CIMEC, co-financed by both institutions in equal measure or in different proportions. These laboratories will be set up specifically for the scientific programs designed within the agreement between the institutions.

We will be pursuing the establishment of a laboratory with facilities of interest to both structures in the three-year period 2019-2021. This laboratory will not duplicate facilities or expertise already found within UniTN, but rather will be an innovative development. The members of this laboratory will be affiliated with both institutions (IIT-CIMEC).

This collaboration will also contribute in the new 2-year Master degree in neuroscience through computationally oriented coursework.

The results expecting from this plan are:

❖ creation of strategic synergies in cutting-edge research;
❖ promotion of scientific knowledge (journals and scientific events) and post-graduate training in the area of neuroscience (didactic/educational);
❖ Fostering of regional and national industrial development, in particular contributing to scientific excellence and its effects (third mission).

A strategic committee made up of 6 members (2 internal members from the Centers, 2 representatives from the reference institutions and 2 people chosen from the interested parties/stakeholders). The committee will be responsible for evaluating and further promoting the collaboration strategies, current and future, between CNCS-IIT and CIMEC-UniTn.

**Objective 9 Translational research - Public Understanding of Science**

*Increase the translational effects of neuroimaging research in order to promote scientific knowledge outside of the academic community.*

The objective is designed to be a meeting point between local institutional actors and industry in order to create a network of expertise and competencies and promote the activities carried out within the University of Trento.

The center’s contribution to the development of clinical research, starting from precise scientific enquiries will be increased thanks to greater collaboration with other research and clinical institutions in the Autonomous Province of Trento, such as the Provincial Health Service of Trentino, The Bruno Kessler Foundation, industries located in the province and other Italian facilities. The primary objective is to collaborate on the development of new diagnostic and rehabilitative instruments for neurological and psychiatric patients by contributing to the creation and development of neurotechnologies which can be used to understand neural processes and facilitate recovery in the event of a neurological condition. This strategy also has the aim of producing and strengthening partnerships aimed at increasing the Center’s ability to carry out research projects with a strong socio-economic impact, but also support provincial industries and services through innovation and education.

Clinical research studies with neuroimaging: this action, which is of great scientific importance with potential spill-over effects of public interest, consists in the possibility of carrying out clinical and translational research with the MRI, MEG, EEG and TMS instruments available at the center. This is of the utmost strategic importance in order for CIMEC to attract funding. To achieve this objective, we will start the process for accreditation of the MRI instruments with the Autonomous Province of Trento so that we can obtain authorization for studies on people and populations suffering from pathologies.

An example is the Center’s investment in the creation of the Network of Reversing Age and Resilience in the Elderly (RARE). The goal is to create a network of highly qualified researchers in Trentino who are tackling the topic of active aging. These researchers use an interdisciplinary approach with a view towards implementing ideas and innovative research programs in the cognitive and neurobiological fields in order to
increase the autonomy of the elderly. Healthy aging is an area of growing importance at the cultural, social and economic levels.

Another example is the creation of a network of laboratories for research on autism – TRAIN – Trentino Autism Initiative. The project involves the establishment of a network of laboratories for research on autism with the aim of promoting research on disorders related to the autism spectrum at the territorial level. The scientific competencies of this network are of a multidisciplinary nature and range from in vitro and in vivo biological studies to behavioral and clinical studies on patients.

We have recently established more partnerships (authorized by formal agreements) with various other research centers and territorial health institutions. This strategy will be further developed through the direct support of the Center for partnerships with external institutions, or through events designed to have a translational impact.

**Objective 10 Neuroscience Valley - Sustainability**

*Increase links with the territory through the “Neuroscience Campus” project*

Integration and collaboration can become driving forces for research development. The demands of society require us to overcome the boundaries between scientific disciplines as attention moves from the discovery in itself to its application, and towards multidisciplinary skills. This approach allows us to resolve concrete technical problems while creating solutions with an immediate impact for society, as well as giving us the possibility to train people able to translate their knowledge into innovation. Research in the field of neuroscience is frontier research, which tries to answer open questions, from trying to determine the mechanisms that regulate our ability to learn to those which are responsible for physiological and pathological aging, from visualizing brain functioning to understanding how a disorder can make the brain incapable of carrying out those functions, to the development of specific treatments.

A boom in neuroscience research will revolutionize diagnostics and treatment of neurological and psychiatric disorders, therefore an increase in the translational impact of neuroscience research is an important element. Nevertheless, there isn’t currently a strong coordination between the wealth of general neuroscience and the efforts translating this into clinical usage.

For these reasons, we would like to see investment in the development of CIMeC’s areas of expertise and encourage the establish of a neuroscience network, a Center for Excellence in Neuroscience, which brings together all of the important institutions in the area which work in this research area. An active partnership between the University of Trento and the Provincial Health Service (APSS), with the support of the Province, is key to guarantee the sustainability of scientific and technological progress within this area of excellence. Therefore, the goal is to create a network of people and knowledge which promotes best practices in the field of neuroscience. The implementation of this project would allow for a better use of the expertise of researchers and the cutting-edge instruments available locally. This strategy has the aim of producing and strengthening partnerships which can improve our capacity for carrying out highly competitive projects at the European level with a clear impact on society.

Listed below are some of the areas in which we propose to carry out activities in partnership with the Provincial Health Service. For each one of these areas there are already projects currently under way or which have been designed and are ready to be carried out.
Clinical Project

Objective: Create a network of services for the management of neurological patients with varying levels of specialization, CeRiN is ranked second/third level: assessment and specialized rehabilitation

Scientific Project

Objective a: Guarantee innovation in assessment and in rehabilitation through development of new tests, functional assessment scales, new rehabilitation protocols and computerized cognitive rehabilitation programs and neurostimulation/neuromodulation.

Objective b: contribute and guarantee innovation in diagnostic assessment and rehabilitation through the study of neural correlates in the recovery of cognitive or motor deficits with the fMRI, EEG, MEG or with TMS (transcranial magnetic stimulation) or tES (transcranial electric stimulation).

Training Project

Objective: Support and increase excellence in staff training by transferring expertise acquired to the rest of Trentino through the organization of professional training courses structured according to CIMeC’s skill areas and in agreement with the APSS training service.

Educational Project

Objective: start a round table to assess possible educational opportunities in the Health field (ex. interuniversity courses), organized for each of the three types of university degree levels.

To realize this project, we propose the creation of a round table in order to discuss how to reach the following strategic objectives with our partners (APSS). This would be a permanent Scientific Committee as already provided for in the agreement between the University of Trento – CeRiN and the Provincial Health Service. The Scientific Committee will have responsibility for advancing and assessing the various collaboration strategies.

To further improve the Committee’s workings, the creation of an Operative Committee with the job of developing and defining the focus of the strategies related to four specific areas with one delegate for each area: i) clinical project, ii) scientific project, iii) training project and iii) educational project.

The Scientific Committee will meet every six months to assess the efficacy and usefulness of the foreseen actions as well as to ensure that the collaborative objectives in the agreement are met. The Scientific Committee will suggest development strategies or alternative strategies in the event of a failure to meet tangible results. The Committee will verify that the foreseen actions have been implemented as well as consider if they have had impact on the strategies of the two institutions, in terms of clinical activity, training, research and funding obtainment.

REQUIREMENTS FOR AN EFFECTIVE DEVELOPMENT PLAN

Moving all of CI MeC to the Manifattura is an important structural investment which would resolve the current problem of geographical fragmentation, thereby making CI MeC’s activities more efficient both from a scientific point of view as well as for what concerns the administrative and technical management of the Center. It is therefore essential that the board of directors ensure that the Manifattura project is completed as quickly as possible.

The Center needs strong support from the University, in particular through flexible policies for personnel management, specifically concerning staff who decide to transfer to institutions abroad after a period at CI MeC, with the objective of balancing the predictable turnover of researchers.
FUTURE PROSPECTS

This report provides a precise development plan for CIMeC, describing its activities and the expected results. A path towards a University in which research, in particular translational research, and education work together as a driving force for cultural, economic and social development must begin with a push from the academic departments. The need for constant change is still strongly felt by our University which finds itself faced by the challenge of maintaining its status as a University of Excellence within a territory which needs, now more than ever, quality educational programs and scientific innovation. The results which have been obtained show that there are all the conditions necessary to recognize CIMeC’s distinct identity and independence thereby giving its members a clear objective and to sustain a strong group effort in the next six years. We hope that CIMeC, as also suggested by international auditors, is given the conditions for the growth it needs, as it has proven itself to be an important element for guaranteeing excellence, innovation and internationalization to the entire University. Consistent with an approach of continuous innovation in the university departments, dynamic and innovative departments like CIMeC represent an important tool. On this basis, our ambition is to establish by 2025 a CIMeC department with an international appeal which can give – consistent with a best practice approach – an important contribution to the field of cognitive neuroscience, both general and clinical.