Funded by the
European Union

www.gain-twinning.eu

Project Acronym: **GAIN**

Project Full Title: **Georgian Artificial Intelligence Networking and Twinning Initiative**

Grant Agreement Number: 101078950

HORIZON EUROPE - WIDERA-2021-ACCESS-03 (Twinning)

WEBSITE: www.gain-twinning.eu

Project Start Date: 1st October 2022

Deliverable D.5.7. Dissemination, impact and sustainability Plan, Version 2

Dissemination level:	Sensitive
Due Date:	March 31, 2024
Deliverable leader:	MICM
Author:	George Giorgobiani
Contributors:	All
Reviewers:	B.E. Wirth, P. Müller, F. Bremond
Type:	Report
WP / Task responsible:	MICM

Contents

1. Executive Summary

This document describes the **Dissemination, Impact and Sustainability Plan, Version 2** (D.5.7) of the project GAIN.

Document History			
Version	**Date**	**Contributors**	**Description**
1	27/02/2024	J. Alexandersson, P. Müller, B. E. Wirth – DFKI; F. Bremond – INRIA; G. Giorgobiani – MICM	Dissemination, Impact and Sustainability Plan, Version 2
2	20/03/2024	J. Alexandersson, P. Müller, B. E. Wirth – DFKI; F. Bremond – INRIA; G. Giorgobiani – MICM	Dissemination, Impact and Sustainability Plan, Version 2
Final	28/03/2024	J. Alexandersson, P. Müller, B. E. Wirth – DFKI; F. Bremond – INRIA; G. Giorgobiani, T. Tsmindashvili – MICM.	Dissemination, Impact and Sustainability Plan, Version 2

2. Versions and Updates

The previous version of the report, Dissemination, Impact and Sustainability Plan, Version 1 (D.5.5) was submitted in March 2023.
According to the DoA of the project, the integrated dissemination and sustainability report will be submitted at the end of the project (Deliverable 5.6).

3. Introduction

One of the main objectives of the project is to significantly improve the visibility and image of MICM in local, regional and European communities by positioning it as a cross-disciplinary R&I Excellence Center with a complete portfolio of competences related to the area of AI and Computational Methods, as well as in various application domains.
Below, the dissemination and promotional campaign conducted by the project during the reporting period, is described.

4. Dissemination and communication

During the reporting period the following tasks have been performed:

Task 5.1 Project website

D5.1. Project website, version 1 (submitted)

- The project website is ready and is constantly updated https://www.gain-twinning.eu/ . Facebook and LinkedIn accounts are linked to the GAIN website. Activities targeting civil society and the

interested public are published on the GAIN project website and are liked and shared via Facebook and LinkedIn
https://www.facebook.com/people/GAIN-twinning/100087895163991/
https://www.linkedin.com/company/gain-twinning/

- Open data repository (Zenodo Platform) for the scientific publications and data sets is integrated in the project website.

Task 5.2 Dissemination activities towards Research

The following activities have been conducted:

1. October 18 – 19, 2022, MICM, Kick-Off Meeting of the GAIN project. Audience – researchers, Georgian policy-makers and authorities (about 70 guests).
2. November 2022. MICM was invited to the EDU AI consortium. Project proposal (no: 101120027, Call: HORIZON-CL4-2022-HUMAN-02) was submitted (not funded).
3. From December 2022. Collaboration with EU-funded projects - Sister Twinning Projects Focus Group, initiated by the project EPIBOOST - BOOSting excellence in environmental EPIgenetics (GA no. 101078991); funded by the European Union within the call HORIZON-WIDERA-2021-ACCESS-03 – Twinning. Sister Twinning Projects Focus Group Survey 1 was submitted.
4. May 22, 2023. Survey on "Reflecting the experiences in Horizon Europe projects" was submitted. Survey contains overall functioning, efficiency, relevance for beneficiaries and expected outputs and impacts of the GAIN project. The survey is part of the ongoing evaluation of the European Framework Programmes for Research and Innovation.
5. June 4-11, 2023, the members of MICM – GAIN research team, Vakhtang Kvaratskhelia, Kartlos Kachiashvili and Marine Menteshashvili were in France, at the National Institute of Applied Sciences (INSA), Rennes. V. Kvaratskhelia and K. Kachiashvili were seconded within the framework of the ERASMUS+ exchange program. M. Menteshashvili was supported by the GAIN project. Meetings and mutually interesting discussions were held at the departments of Computer Sciences, Computer Engineering and of Applied Mathematics. MICM GAIN research team presented the GAIN project main goals and objectives. The French colleagues expressed their interest in the prospect of future collaboration with the grantees.
6. GAIN has been disseminated at 3 project events held in Europe, which were attended by the researchers outside the GAIN consortium as well:
   - ✓ January 19 – 20, 2023, MEPHESTO & GAIN meeting, INRIA, Sophia Antipolis, France.
   - ✓ August 21 – 25, 2023, On-the-job training for Research Administrators and Managers (collocated with the Summer School), organized by EXOLAUNCH, Technical University of Berlin, Germany.
   - ✓ September 4 – 8, 2023, The First GAIN Summer School (collocated with the 3rd INRIA-DFKI EUROPEAN SUMMER SCHOOL ON ARTIFICIAL INTELLIGENCE, IDESSAI 23), INRIA, Sophia Antipolis, France.
7. GAIN has been disseminated at 2 project training events, which were attended by the Georgian researchers outside the GAIN consortium as well:
   - ✓ December 21, 2023, Web-based training on European innovation tools 1: IPR in HEP projects.

- ✓ January 16, 2024, MICM, Tbilisi, Georgia. Innovation training workshop for researchers and managers.

8. March 12, 2024. Georgian National Academy of Sciences. EU funded research in AI in Georgia. Speaker: G. Giorgobiani. Objective: Raise awareness about the GAIN project towards researchers. http://science.org.ge/?p=15963 https://www.gain-twinning.eu/?p=890
9. 28 March 2024, venue: MICM. Presentation of the GAIN-MICM Computing Server. Audience – guest researchers and students from, GTU, University of Georgia, Javakhishvili Tbilisi State University, Georgian National Astrophysical Observatory. https://www.gain-twinning.eu/?p=895
10. 17 conference talks were delivered[1]. Presentations contain the logos of the EU and the GAIN project and all relevant acknowledgements. See the presentations at https://www.gain-twinning.eu/?page_id=300
11. 12 research papers were prepared[2] (6 – published, 2 – accepted, 1 – submitted, 3 – prepared).

GAIN workshop at ACII 2024

GAIN researcher will hold the full day workshop "EmoRec EEG: Generalizability of Emotion Recognition from EEG signals" at the 12th International Conference on AFFECTIVE COMPUTING & INTELLIGENT INTERACTION in Glasgow, UK, September 15-18, 2024. The organizers are young Georgian researchers (N. Kukhilava, T. Tsmindashvili) and researchers from DFKI (P. Müller, B. E. Wirth) and INRIA (L. Ferrari, F. Bremond) https://acii-conf.net/

Task 5.3 Dissemination activities towards Society

D 5.3 Set of the project promotional materials, version 1 (submitted)

- Business cards and rollups were prepared.
- A promotional video was recorded and is available at the project website:
  https://www.gain-twinning.eu/?page_id=302
  https://www.youtube.com/watch?v=Bgi9Ju_VJeU&ab_channel=GainTwinning

Publications

1. *IPN* Interpressnews - https://www.interpressnews.ge/ka/article/734014-sakartvelos-teknikuri-universitetis-gamotvliti-matematikis-institutis-proekti-horizonti-evropas-sagranto-konkursis-gamarjvebulia
2. GTU website news - https://gtu.ge/News/20899/
3. MICM website - http://micm.edu.ge/en/project-gain-first-meeting/
4. D. Gurgenidze, V. Kvaratskhelia. Muskhelishvili Institute of Computational Mathematics at the Georgian Technical University. Georgian Electronic Scientific Journal: Computer Science and Telecommunications. No.1(61), 2022, p. 3-6. ISSN 1512-1232 https://gesj.internet-academy.org.ge/en/list_artic_en.php?b_sec=comp&issue=2022-08

Presentations

1. February 6, 2023. Horizon Europe Proposal Writing Camp for Georgia. Trainer: Mattias Wurch & Anneli Rose (Global Service Facility of the EC). Success Story from Georgia: MICM in EC

[1] See Appendix: Conference talks.
[2] See Appendix: Publications.

Projects. Speaker: G. Giorgobiani. Objective: Raise awareness about the GAIN project towards researchers, innovators, industry, business partners, EU institutions and the civil society. Venue: Tbilisi State University, Tbilisi, Georgia.

2. Jun 13, 2023. A short survey of the goals of the GAIN project (Story of a Successful Applicant) was published at the website of the Horizon Europe National Office of Georgia http://horizoneurope.org.ge/en/news/46
3. March 12, 2024. Georgian National Academy of Sciences. EU funded research in AI in Georgia. Speaker: G. Giorgobiani. Objective: Raise awareness about the GAIN project towards researchers. http://science.org.ge/?p=15963 https://www.gain-twinning.eu/?p=890

Task 5.4 Integration with European AI communities

The following working contacts (outside the GAIN consortium) have been established:

1. Since November 2022, MICM is a member of EDU AI consortium, Proposal number: 101120027,
   Call: HORIZON-CL4-2022-HUMAN-02. Proposal was submitted, but not funded.
2. From December 2022. Collaboration with EU-funded projects - Sister Twinning Projects Focus Group, initiated by the project EPIBOOST - BOOSting excellence in environmental EPIgenetics (GA no. 101078991); funded by the European Union within the call HORIZON-WIDERA-2021-ACCESS-03 – Twinning. Sister Twinning Projects Focus Group Survey 1 was submitted.
3. Saarland University, Germany.
4. National Institute of Applied Sciences (INSA), Rennes, France.
5. RWTH – Aachen University, Germany.
6. Idiap Research Institute, Switzerland.
7. RAIT 88, Defense engineering center, Italy – expressed interest in collaboration.
8. Helio.AI – recruiting software company (Georgia).
9. I. Javakhishvili Tbilisi State University.
10. International Black See University.
11. Tbilisi State Medical University.
12. Caucasus University.
13. Medical center „Mrcheveli“.
14. R. Agladze Institute of Inorganic Chemistry and Electrochemistry.
15. V. Chavchanidze Institute of Cybernetics.
16. International Center for Advancement of Research, Technology and Innovation (ICARTI).
17. Georgian AI Association (membership).
18. Tbilisi AI Lab.

All the partners of the GAIN consortium have been notified and given information about the dissemination results 15-20 days prior to making it publicly accessible.

5. Open Science and FAIR data principles

GAIN follows Open Science and FAIR data principles as given in the Grant Agreement and DoA of the project. Data management plan (DMP) to manage the digital research data generated in the project, (deliverable _D 6.3. Data Management Plan, version 1), is in line with these principles.
In the reporting period, 5 papers have been published in peer reviewed, open access journals and a repository. One paper was published in conference materials. Electronic copies of each published paper (see Appendix, Publications [1 – 6]), at the time of publication were available at the websites of the journals and repositories and immediate open access was provided. All publications were free of charge.

5.1. Datasets

During the reporting period, the GAIN researchers worked on generating the following datasets:

1. **EEG dataset**: Two types of experiments are conducted at MICM, which involve the recording of Event Related Potentials (ERP) with a commercial Unicorn Hybrid Black EEG device purchased by the GAIN project. The device has 8 active electrodes and a recording frequency of 250 Hz, covering 10-20 system positions FZ, C3, CZ, C4, PZ, PO7, OZ and PO8. Both experiments recorded auditory evoked potentials (AEP), which measure the electrical activity of the brain responding to sound stimuli, and both involve target/oddball tasks. In the second experiment subjects were required to make a certain response depending on the type of stimulus. As planned, the dataset and its analyses will be ready for publication after 20 recordings (each including 2 sessions per participant). Up to today, 5 records have been conducted and the experiment is still in progress. The research material and the dataset will be uploaded to the Zenodo platform as well as the website of the project and will be open access.
   Remark: The experiments will continue after the mentioned 20 records. Participants are mainly the volunteers from the GAIN-MICM team, but also other citizens, not related to the project. Up to now, we have consent of about 10 volunteer citizens, who are interested in the results of research. They are collecting data for the project, providing practical support, testing & experimenting with innovative R&I solutions. Note also that we plan to conduct other EEG experiments as well.
2. **Georgian language corpus**: it is planned to use the GTU library's electronic documents to create Georgian language corpus. The work is in progress. The dataset will be uploaded to the Zenodo platform as well as the GTU's and the project's websites and will be open access.
3. **Records of doctor – patient interviews**: in the reporting period, 5 interviews with 3 patients have been recorded at the Tbilisi Mental Health Centre. This data, containing medical and personal information, is subject to the Ethics Requirements and, consequently, is restricted. Data is encrypted and stored at the GAIN-MICM server. The work is in progress.

5.2. Open source software

5.2.1. Software framework EEGain

Within the project GAIN, a novel open source software framework EEGain is designed to improve the comparability and generalizability of EEG emotion recognition approaches. The framework will be

presented at the first workshop on Generalizability of Emotion Recognition from EEG Signals (EmoRec EEG) at ACII'24. It enables the participants to run 4 models - Tsception, EEGNet, DeepConvNet, ShallowConvNet, on 6 data – AMIGOS, DEAP, MAHNOB-HCI, SEED-IV, SEED, DREAMER.
Workshop link: https://emotionlab.github.io/EmoRec-EEG/
Framework link: https://github.com/EmotionLab/EEGain

5.2.2. Software VideoMAE

For the problem of emotion recognition from video, scale is the primary ingredient in attaining generalizable video representations. While scaling model capacity and data size for video masked autoencoders, VideoMAE has been explored for large generic datasets of short videos, adapting these models for longer video sequences remains a challenge which we aimed to address. Open source software VideoMAE was used as a feature extractor model, and with an added classifier layer on top, it was fine-tuned on specific emotion recognition datasets to enhance its performance in identifying and categorizing emotions from video data.
The code is available at https://github.com/EmotionLab/EmotionVMAE

5.3. Publishing in GESJ

MICM curates a journal by the name of "Georgian Electronic Scientific Journal, Computer Sciences and Telecommunications" (https://gesj.internet-academy.org.ge/, ISSN 1512-1232), which is Open Access, purely electronic, and has no publication fees.
In the reporting period, 1 paper, supported by the project, has been published in this journal (Appendix, Publications, [2]).

6. Strategic impact of GAIN

The project GAIN is designed in compliance with the following expected impacts given in the Work Programme's Destination:

6.1. Increased science and innovation capacities for all actors in the R&I system in widening countries.

The project GAIN is set to deliver a radical increase of capacities for a central R&I actor, MICM, in a key thematic domain (AI) in Georgia (a widening country). As Georgia is a small country, through GAIN, the entire science system is expected to receive a significant push.
To build a new quality of research capacities at MICM in the field of AI, 3 topics for joint research activities were defined with the help of the project partners, leading European RTD performers in the field INRIA and DFKI. After an initial series of research webinars, 6 thematic research groups (sub-tasks) were composed, where 18 Georgian researchers were assigned. The thematic research groups are supervised by researchers from DFKI and INRIA. Collaboration with European partners enabled Georgian researchers to raise their professional qualification in the field of AI, publish in prestigious journals and to present at leading conferences (planned in 2024, 2025), gaining in this way the scientific reputation.
One of the vehicles for the GAIN project is the joint INRIA-DFKI large-scale project MEPHESTO. The Pilot Research Project at MICM "Digital Phenotyping for Psychiatric Disorders from Social

Interaction", which is based on the ideas developed in the MEPHESTO project, is conducted in Georgia. The main responsible institutions of the task are the Tbilisi Mental Health Center, where the clinical data is collected, and MICM, were the data is stored and analysed by use of AI methods. This research, which is the first of its kind in Georgia, will support the increase of science and innovation capacities in the field of psychiatry and will attract the stakeholders from the broader field of medicine and beyond.

To foster the joint research capacity building of the partners, 3 project meetings have been conducted in France and Germany: The MEPHESTO & GAIN meeting at INRIA, On-the-job training for Research Administrators and Managers organized by EXO at Technical University of Berlin and the First GAIN Summer School at INRIA. The GAIN-MICM team members had an opportunity to meet with various research teams, attended workshops on different topics, and visited several research departments and labs.

The joint research in the reporting period resulted in 11 prepared research publications, out of which 5 are already published in peer-reviewed, open access journals, and 1 paper in conference materials. Georgian students delivered 17 conference talks at the international conferences and 5 presentations at the project's First Summer School.

To grow capacities in the field of AI, MICM has created 4 new research positions within the research departments of the institute. These positions are held by the students of GAIN-MICM team, whose research is focused on AI technologies.

Since November 2023, a new research unit „MICM AI Lab" has been operating at MICM. 26 Georgian researchers of the GAIN- MICM team are united in this lab, which will be part of the project's "Joint Virtual Laboratory" to be composed in 2024.

One of the goals of the project is to strengthen research management capacities and administrative skills of the staff working at MICM. The project activities involve the managerial and administrative staff of MICM, who will be offered various forms of training (events, on-the-job, placements) to facilitate and support the research excellence at MICM. Moreover, the respective practices at MICM will be modernized using the experiences of the European project partners. The goal is to make the managerial and administrative structures of MICM responsive to the evolving environment, capable of competitive fundraising, and supportive towards innovation. In this respect, during the reporting period, 3 training workshops were conducted: On-the-job training for Research Administrators and Managers in Berlin, Innovation training workshop for researchers and managers in Tbilisi, and a Web-based training on European innovation tools.

6.2. Reformed R&I systems and institutions leading also to increased attractiveness and retention of research talents.

Placing focus on young researchers, equipping them with cutting-edge skills and giving new career prospects, the project will tackle one of the major problems in science systems of Widening countries – brain drain. Mobility, opportunities for international research and fair compensation are the stimuli offered by the project to young talents.

Among the 26 Georgian researchers of GAIN, who are mostly from MICM and GTU but also from other universities, institutions and companies, 19 are young scientists, PhD, master and bachelor students. Five PhD students from DFKI and INRIA are involved in the joint research as well.
Four Georgian students (2 PhD and 2 master students) were selected for tenure track position. The above-mentioned 4 new employee positions are being held by these students. Currently, out of 28 researchers and 8 IT specialists at MICM, 9 are young, and 8 of them are researchers of GAIN.
Four students from MICM with tenure track position will be supported by the Staff Exchange (mobility) Scheme to visit DFKI and INRIA. The visits will start in Spring 2024 and last for about 3 months.
Three research groups for joint research activities will be leaded by the young Georgian scientists at MICM after acquiring relevant knowledge and skills through the Twinning Research and Innovation Programme (TRIP) activities.
The overall mobility plan of the project is focused on young researchers. To attend the above-mentioned 3 project meetings abroad, 27 person/trips were spent for young Georgian scientists.
Young Georgian researchers collaborate with scientists outside the GAIN consortium as well. These include collaborations within a neuropsychological fMRI experiment at the RWTH, Aachen, Germany and a collaboration on large language models with the Idiap Research Institute, Switzerland.
Young researchers are supposed to compose the core of the future project proposals. This was the case, when in November 2022, MICM was invited to the EDU AI consortium. A project proposal was submitted (but unfortunately not funded). In November 2023, impressed by the presentation on the GAIN research problems at the conference in Tbilisi (see Appendix, conferences [1]), the representative of "RAIT 88, Defense engineering center", Italy, has expressed an interest in collaboration. The possibility of research collaborations, involving our young researchers, is now negotiated in Large Language Models (LLMs) for text production, etc. It is also planned as well to write a project proposal for the local SRNSF[3] grant contest, where the participation of young researchers is highly stimulated.

6.3. Improved outreach to international scale for all actors.

Using GAIN as a vehicle powered by the capacities of the European partners, MICM will extend its capacity to do research internationally.
The project dissemination and communication activities are designed to maximally contribute to attaining the overall project goal – the integration of MICM into the community of leading European research organizations in the field of AI. Therefore, the project dissemination is focused on spreading the research results obtained through pursuing the TRIP addressing the research audience, while the communication activities address the wider audience of stakeholders, such as policy-makers, authorities, businesses, and the general public in Europe and in the South Caucasus region, in order to shape an image of MICM as a regional center of excellence.
Dissemination and communication activities, conducted in the reporting period are given in Section 4.

[3] Shota Rustaveli National Science Foundation of Georgia

6.4. Greater involvement of regional actors in R&I process. Exploitation of results.

GAIN will contribute to building applied research and innovation capacities in MICM and in Georgia as a whole. This is an important structural and cultural change to the science system, which still bears the consequences of isolation of science from economy.

MICM has been founded in 1956 as the "Computational Center" of the Academy of Sciences of Georgia. The first computer in the country was deployed here to tackle the optimization problems of economy, agriculture, energy, engineering, healthcare etc. posed by the government organizations. Related research has been performed by scientists of high esteem in the fields of probability and statistics, programming (software), analysis, computational methods, operations research, approximation theory and others. Currently, MICM maintains a high potential in the mentioned fields, but the research is still isolated from business and industry.

In this respect, the GAIN project brings new opportunities for the R&I process in Georgia. The importance of the project's specific focus on AI is justified by the common understanding that this area represents one of the greatest opportunities for global societal and economic progress. Artificial Intelligence represents a well-defined and dynamically developing area of research with various application domains. The TRIP includes 3 strategic interrelated and overlapping research Topics, each of them focused on building a particular excellence niche at MICM as well as integrating this niche into the relevant European research communities. Within the GAIN project the joint work is conducted on several applied research topics addressing domains of medical applications (exemplary eHealth application for early detection and monitoring of neuro-degenerative, mental and mood diseases) and other relevant application areas. All these application domains have socio-economic importance.

Though the research activities mainly play a facilitating and enabling role to integrate MICM into ERA, the project will also deliver research results with the potential to be exploited and transferred to economy and society. The project exploitation planning activities comprise:

- Identification of 2 topics with exploitation targets, namely potential application domains for all principal results, potential products/services which can be based on the results, degree of maturity, ownership, where appropriate IPR protection and sharing mechanism, time-to-market, other parameters important for exploitation planning.
- New knowledge (exploitable results) will be detected.
- During the 3rd project year MICM will implement the exploitation planning for all detected items of exploitable results. The resulting Exploitation Plan will be included in the final project report.

An important element of the project exploitation strategy will be the pilot innovation sub-project to be implemented during the 3rd project year. The project will select one of the most promising and high impact research results and implement a set of innovation activities to bring it closer to the market. This will include business case development and business modeling, market research, IP regime definition, initial marketing, etc. On top of using the exercise as a training tool for innovation capacity building, it will also ensure the exploitation of some of the project results.

Within the project it is planned to establish a Joint Virtual Laboratory and a spin-off company at MICM to extend the research results beyond the project framework. In addition, the spin-off company is supposed to reshape the research results to the needs of the market.

The attention of the regional as well as the global actors is being attracted based on the dissemination and communication activities, which have already yielded some results. These are several universities, institutions and an AI company in Georgia, universities, organizations, the Horizon Europe consortium and a company in Europe.

To measure the Impact of the GAIN project, the consortium applies the system of KPIs[4] as given by the DoA. Tables 2 and 3 in the Appendix show the target and current values of Institutional KPIs to monitor the evolution of MICM capacities and the KPIs for the GAIN project respectively. Diagram 1 shows the dynamics of growth of research performance indicators of MICM in 2023 with respect to 2022.

6.5. Citizen Engagement

One of the aspects of the joint work is the research co-creation methodology, which is widely accepted among the advanced research partners. In the GAIN project, this is realized by involving the citizens, relevant stakeholders, such as clinical and technical personnel of partners, potential patients, and the wider public in the planned research. This will result in better research outcomes and higher acceptance of research-based technologies.

Dissemination and communication activities of the project have elicited an interest of not only scientists, but also of the general public outside of academia.

The GAIN-MICM team conducts weekly seminars at the institute, which attract the attention of researchers and students as well as the non-scientific staff. They are involved in discussing and co-creating R&I visions, debating R&I findings of the project, provide practical help (e.g. constructing and arranging the space with cooling systems for the MICM computer server purchased with the support of the GAIN project).

Two types of experiments are conducted at MICM, which involve the recording of brain signals with use of an EEG device purchased by the GAIN project. Participants are mainly volunteers from the GAIN-MICM team, but also other citizens who are not related to the project. Up to now, we have consent of about 10 volunteer citizens, who are interested in the results of research. They are collecting data for the project, testing & experimenting with innovative R&I solutions.

During the preparation for the doctor-patient recordings, medical and support personnel of the End-user entity Tbilisi Mental Health Centre (in addition to the 2 psychiatrists from the GAIN team) was actively involved in providing the space/facilities and in patient data collection. Furthermore, the staff was involved in co-creating R&I visions, policies and frameworks, in testing and debating R&I findings, etc. Medical research staff will contribute to scientific publications as part of the GAIN project. MICM and the representatives of the Centre intend to submit a joint research proposal to the Shota Rustaveli National Science Foundation grant contest in 2024. Furthermore, other future opportunities for joint research will be discussed.

The project research and capacity building activities provide a supportive environment for the mobility. In this respect, during the reporting period, 4 person/trips were spent for clinical and technical personnel of the GAIN-MICM team.

[4] Key performance indicators.

7. Sustainability Plan

One of the objectives of the project is to continuously evaluate the impact of the project activities on the R&I capacities of MICM and design subsequent follow-up measure to ensure the sustainability and organic development of the project results.

Sustainability of the project's results will be ensured by the extended Twinning Research and Innovation Programme (TRIP), which is designed as a system of joint and mutually complementary mini-projects and is an organizational and directing framework unifying all capacity building activities in the project. The scientific results foreseen by TRIP will compose the basis for continuous collaborations beyond the GAIN project. The most striking result of this will be the Joint Virtual Laboratory integrating the complementary resources of the project partners, which will be established in 2024. The Joint Virtual Laboratory will integrate the most advanced and successful project collaborations. The partners will agree on mechanisms ensuring the sustainability of the laboratory operation beyond the project framework (e.g. on the basis of joint projects acquired during GAIN, internal financial resources, innovation activities), which will be included into the TRIP sustainability plan to be developed and agreed by the end of the project. A strong dissemination path based on open science and solid research data principles will facilitate the sustainable development of the project's results. GAIN will produce open access research publications and scientific data.

The project will also support the organizational changes in MICM aiming at building modern research administration and management capacity, introducing effective governing principles and processes typical for European research organizations (the project partners will serve as models). This will include the introduction of an internal achievement-rewarding system, an international Scientific Advisory Board, project-based research organization including roadmapping practices for internal projects, etc. The details will be presented in deliverable D 6.1 Strategic Development & Sustainability Plan, to be submitted in March 2024.

In order to practically apply acquired knowledge and skills, in 2025 the project will implement a Pilot Innovation Project based on the results of the TRIP and on the MEPHESTO project, which naturally integrates the TRIP research directions. This will enable MICM to submerge its research personnel into the running cutting-edge research endeavours of the European partners.

Appendix

Publications, conference talks and presentations contain references to the European Union and the GAIN project and all relevant acknowledgements[5].

Publications

1. **Philipp Müller, Michal Balazia** et. Al. MultiMediate'23: Engagement Estimation and Bodily Behaviour Recognition in Social Interactions. 10.1145/3581783.3613851, https://arxiv.org/pdf/2308.08256.pdf
2. **T. Saghinadze**. Constructing Convolutional Neural Networks with 90 Degree Rotational Equivariance and Invariance. Georgian Electronic Scientific Journal: Computer Science and Telecommunications 2023|No.1(63), p. 39 – 43. ISSN 1512-1232. https://gesj.internet-academy.org.ge/en/list_artic_en.php?b_sec=comp

[5] The authors with bold letters are the GAIN consortium members.

3. S. Chobanyan, L. Chobanyan, Z. Gorgadze and **G. Ghlonti**. An Algorithm for Finding a Near-Optimal Rearrangement in the Steinitz Functional. Bulletin of TICMI. Vol. 27, No. 1, 2023, 21–27. http://www.viam.science.tsu.ge/others/ticmi/blt/vol27_1/3.pdf
4. N. Abzianidze, N. Dogonadze, **G. Ghlonti**, Z. Kipshidze. About knowledge delivery strategies for intelligent tutoring systems in mathematics and computer science. Bulletin of TICMI. Vol. 27, No. 1, 2023, 29–37, ISSN 1512-0082 http://www.viam.science.tsu.ge/others/ticmi/blt/vol27_1/4.pdf
5. **V. Kvaratskhelia, G. Giorgobiani, M. Menteshashvili.** On one connection between the moments of random variables. Computer Science and Information Technologies CSIT 2023, September 25 - 30, 2023, Yerevan, Armenia. Book of abstracts https://csit.am/2023/proceedings/DMCA/DMCA_5.pdf
6. G. Baghaturia, **M. Menteshashvili**. Application of general integral of quasi-linear equation to solving of non-linear Cauchy problem. Bulletin of TICMI. Vol. 27, No. 2, 2023, 59–65. ISSN 1512-0082. https://www.emis.de/journals/TICMI/vol27_2/2%20Bagaturia_Menteshashvili_23_TICMI.pdf
7. G. Chelidze, S. Chobanyan, **G. Giorgobiani**, V. Tarieladze. Trigonometric series and the permutation sign convergence condition. *Accepted for publication in Analysis Mathematica, 2024*.
8. **Kachiashvili K.J., Kachiashvili J.K., Kalandadze R. M., Kvaratskhelia V.V**. Automatic diagnosis of lung diseases (pneumonia, cancer) with given reliabilities on the basis of an irradiation images of patients. *Submitted to the journal "Cancer Investigation".*
9. **T. Agrawal.** Robust and Efficient Multimodal Multi-dataset Multitask Learning. *Prepared to submit*.
10. **N. Kukhilava, T. Tsmindashvili, R. Kalandadze, L. Ferrari, V. Strizhkova**. Multimodal emotion recognition with physiological signals and video. *Prepared to submit*.
11. **T. Tsmindashvili, N. Kukhilava, S. Katamadze, R. Kalandadze, L. M. Ferrari, P. Müller, B. E. Wirth** Evaluation in EEG Emotion Recognition: State-of-the-Art Review and Unified Framework. *Prepared to submit*.
12. **G. Giorgobiani, V. Kvaratskheliaa, and M. Menteshashvili**. Unconditional Convergence of Sub-Gaussian Random Series. *To appear in Pattern Recognition and Image Analysis, 2024*.

Conference Talks

The conference talks are supported by the GAIN project. Presentations contain the logos of the EU and the project GAIN and all relevant acknowledgements (see https://www.gain-twinning.eu/?page_id=300).

1. **G. Giorgobiani, V. Kvaratskhelia, T. Saghinadze.** Mathematics of Artificial Intelligence. 2nd Int. Conf.: Science, Education, Innovations and Chemical Technologies – From Idea to Implementation. Tbilisi, Georgia, 23 – 24 November 2023. https://conference23iice.ge/
2. **N. Kukhilava, T. Tsmindashvili, R. Kalandadze, L. Ferrari, V. Strizhkova**. VideoMAE for Emotion Recognition. Second CERN-GTU collaboration meeting PMBC2023, 6 – 10 November 2023, GTU, Tbilisi, Georgia. https://indico.cern.ch/event/1334518/timetable/
3. **T. Tsmindashvili, N. Kukhilava, S. Katamadze, R. Kalandadze, L. M. Ferrari, P. Müller, B. E. Wirth**. Evaluation in EEG Emotion Recognition: State-of-the-Art Review and Unified Framework. Second CERN-GTU collaboration meeting PMBC2023, 6 – 10 November, 2023, GTU, Tbilisi, Georgia. https://indico.cern.ch/event/1334518/timetable/
4. **S. Katamadze , T. Tsmindashvili, N. Kukhilava, R. Kalandadze, L. M. Ferrari, P. Müller, B. E. Wirth**. Enhancing Emotion Recognition: EEG Evaluation and AI Models. DataFest Tbilisi 2023. 9 – 11 November, 2023, Tbilisi, Georgia. www.datafest.ge
5. M. Kublashvili, **Z. Sanikidze, T. Saghinadze**, M. Kublashvili. On the Mathematical Aspects of the Numerical Calculation of Engineering Constructions Weakened by Cracks. Second CERN-GTU collaboration meeting PMBC2023, 6 – 10 November, 2023, GTU, Tbilisi, Georgia. https://indico.cern.ch/event/1334518/timetable/

6. M. Zakradze, **Z. Tabagari**. Numerical analysis of some problems related to the calculation of electrostatic fields. Second CERN-GTU collaboration meeting PMBC2023, 6 – 10 November, 2023, GTU, Tbilisi, Georgia. https://indico.cern.ch/event/1334518/timetable/
7. **V. Kvaratskhelia, G. Giorgobiani, M. Menteshashvili.** On One Connection Between the Moments of Random Variables. Computer Science and Information Technologies CSIT 2023, September 25 - 30, 2023, Yerevan, Armenia. https://www.csit.am/2023/schedule.php
8. **Kachiashvili K., Kachiashvili J., Kalandadze R., Kvaratskhelia V**. Automatic Diagnosis of Lung Disease on the Basis of an X-Ray Images of a Patient with Given Reliability. XIII International Conference of the Georgian Mathematical Union, Batumi, September 4-9, 2023. p. 140. http://gmu.gtu.ge/conferences/wp-content/uploads/2023/09/Conference_GMU_2023_01.09.pdf
9. **Kachiashvili K., Kachiashvili J., Kalandadze R., Kvaratskhelia V**. Automatic Diagnosis of Diseases on the Basis of an Irradiation Images of a Patient with Restrictions Both Type of Errors. The 4th International Conference on Modern Management based on Big Data (MMBD2023), August 1-4, 2023, Seoul, South Korea. p. 19 http://www.mmbdconf.org/
10. **Kachiashvili K., Kachiashvili J., Kalandadze R., Kvaratskhelia V**. The automatization of the medical diagnosis on the basis of an X-ray image of a patient with the restrictions of both possible errors on the desired levels. The International Conference "Distributed Computing and Grid Technologies in Science and Education", 3-7 July, 2023, Dubna, Russia. JINR Meshcheryakov Laboratory of Information Technologies. https://indico.jinr.ru/event/3505/attachments/16120/27954/program_GRID2023.pdf
11. **G. Giorgobiani**, G. Chelidze, V. Tarieladze. Rearrangement universality of the Dirichlet type series in a complex field. 14th ISAAC Congress. Ribeirão Preto, University of Sao Paulo, Brazil, 17 – 21 July, 2023. https://dcm.ffclrp.usp.br/isaac/abstracts.pdf
12. **V. Kvaratskhelia, G. Giorgobiani, M. Menteshashvili.** On One Connection Between the Moments of Random Variables. Int. Conf. Applications of Stochastic Processes and Mathematical Statistics to Financial Economics and Social Sciences. November 15 –16, 2023, Tbilisi, Georgia
13. **V. Kvaratskhelia, G. Giorgobiani,** V. Tarieladze. Subgaussian Random Elements in Infinite Dimensional Spaces. XIII International Conference of the Georgian Mathematical Union. September 4 – 9, 2023, Batumi, Georgia. Book of Abstracts, p. 116. http://gmu.gtu.ge/conferences/wp-content/uploads/2023/10/Conference_GMU_2023_7.10_last.pdf
14. **V. Kvaratskhelia, G. Giorgobiani, M. Menteshashvili.** On One Connection Between the Moments of Random Variables. Ninth International Conference on Statistics for Twenty-first Century - 2023 (ICSTC-2023). 15-18 December 2023, Kerala University, India. https://sites.google.com/view/icstc2023/home
15. **V. Kvaratskhelia, G. Giorgobiani,** V. Tarieladze. Subgaussian Random Elements in Infinite Dimensional Spaces. The Fourth International Conference "Modern Problems in Applied Mathematics" dedicated to the 105th Anniversary of I. Javakhishvili Tbilisi State University (TSU) & 55th Anniversary of I. Vekua Institute of Applied Mathematics (VIAM). September 13-15, 2023, Tbilisi, Georgia.
16. **S. Katamadze, T. Tsmindashvili, N. Kukhilava, R. Kalandadze, L. M. Ferrari, P. Müller, B. E. Wirth**. Enhancing Emotion Recognition: EEG Evaluation and AI Models. Online I En, Data Zen Community. December 20, 2023, Tbilisi, Georgia. https://wearecommunity.io/events/enhancing-emotion-recognition-eeg-evaluation-and-ai-models
17. **S. Katamadze, T. Tsmindashvili, N. Kukhilava, R. Kalandadze, L. M. Ferrari, P. Müller, B. E. Wirth**. Enhancing Emotion Recognition: EEG Evaluation and AI Models. Online I Georgian language. March 22th, 2024, Tbilisi, Georgia. https://wearecommunity.io/events/enhancing-emotion-recognition-eeg-evaluation-and-ai-models-ge?utm_source=facebook&utm_medium=social&utm_campaign=ta?fbclid=IwAR0-mmpPbgQOhrvfV1T3y6awSz3Z9xFadOpKyYg0dS1k0M-rBYFcGai7cAM

Abstracts of Presentations at the First Summer School

1. Evaluation in EEG Emotion Recognition: State-of-the-Art Review and Unified Framework. *Sub-task 1: AI Technologies for Human Behaviour Understanding, Emotions (face crop video, biosignals). Group 1: R. Kalandadze, N. Kukhilava, T. Tsmindashvili, S. Katamadze. Supervised by: F. Bremond, L. Ferrari (INRIA), P. Muller, B. Wirth (DFKI). Presented by R. Kalandadze and S. Katamadze.*
2. The newest achievements of AI in Emotion Recognition from Human Body Movements. *Sub-task 2: AI Technologies for Human Behaviour Understanding, Emotions (full body video) Group 2: I. Katchiasvhili, L. Tabagari. Supervised by: P. Muller, B. Wirth (DFKI). Presented by I. Kachashvili.*
3. Exploring Image Captioning with Parameter-Efficient Transfer Learning for Vision Transformers. *Sub-task 3: Action detection/recognition (AI Technologies for Human Behaviour Understanding). Group 3: T. Saghinadze. Supervised by: F. Bremond, T. Agraval (INRIA). Presented by T. Saghinadze.*
4. Georgian Pretrained Language Understanding Model. *Sub-task 5: AI Methods for Deep Speech Analysis in Health, NLP. Group: B. Mikaberidze, B. Tepnadze. Supervised by: P. Muller, H. Lindsay (DFKI). Presented by B. Mikaberidze.*
5. Studying neural correlates of speech production using fMRI and NLP. *Sub-task 6: AI Methods for Deep Speech Analysis in Health - NLP-fMRI. Group 6: T. Giorgobiani, S. Tsagareishvili. Supervised by: P. Muller, H. Lindsay, B. Wirth (DFKI). Presented by T. Giorgobiani.*

Key Performance Indicators.

Table 1. Institutional KPIs of MICM

Number	Key Performance Indicators	Target for the end of project	Current
Scientific performance			
1	Number of peer reviewed publications	25	31[6]
2	Number of peer-viewed publications per researcher	1	1.1[7]
3	Number of presentations at scientific conferences	30	45
4	Number of publications/presentations co-authored by young researchers	40	12
5	Number of scientific conferences, workshops, symposia organized	10	7
6	Number of MSc and PhD dissertations defended	5/3	N/A yet
7	Number of researchers affiliated with the Joint Virtual Laboratory	25	N/A yet
8	Number of international project proposals submitted/accepted	10/3	1/0
9	Combined h-index of MICM researchers (sum)	40	h=80 Scopus, h=148 google sch.
10	Average "time-to-depreciation" of the MICM research equipment	30 months	36
Innovation performance			
1	Number of patents (by category: world-wide, European, national) granted	1/1/3	N/A yet
2	Number of other IPRs protected (copyright, industrial design, etc.)	3	N/A yet
3	Number of spin-off companies established	1	N/A yet

[6] In addition, 9 papers were accepted.

[7] There are 28 researchers and 8 IT specialists at MICM.

4	Number of knowledge transfer agreements and other types of licenses provided	3	N/A yet
5	Number of new products/services based on research results brought to the market	3	N/A yet
Economic performance			
1	Volume of the research budget (annual)	0,7 MEuro	0.242 MEuro
2	Share of competitive funding in the research budget	50%	N/A yet
3	Share of non-governmental funding in the research budget	10%	N/A yet
4	Share of international project funding in the research budget	30%	68%
5	Volume of funding accumulated in Joint Virtual Laboratory thanks to GAIN	150,000 euro	N/A yet
6	Return on Investments (through equity in spin-off companies, licensing, etc.)	10,000 euro	N/A yet
7	Research budget per researcher	15,000 Euro	3,200 Euro
Human Capital			
1	Percentage of staff members with doctoral degrees	60%	80%
2	Average age of research staff	45	60
3	Age balance (percentage of researchers in age groups)	40% under 40	24%
4	Percentage of women in research staff	30%	16%
5	Percentage of staff members acquired new skills	75%	37%

Table 2. KPIs for GAIN project

No.	Key Performance Indicator	Target value	Current
1	Number of consortium staff members participated in the research mobility	60	38
2	Number of established contacts (research leads) with potential collaborators outside of the GAIN consortium	100	18
3	Number of committed strategic supporters (local and international)	10	N/A yet
4	Number of European organizations expressed interest to cooperate (LoI)	20	7
5	Number of research proposals where MICM is invited to participate	10	1
6	Number of research events organized by the project	11	6
7	Number of research papers (non peer-reviewed/peer-reviewed) published on the basis of results received through the TRIP implementation	45/25	1/5[8]
8	Number of PhD candidates submitted their theses under double supervision	3	N/A yet
9	Number of young researchers participated in the project activities and trained through the project	15	19
10	Number of presentations at scientific conferences	30	17

[8] In addition, 2 papers will appear in 2024, 1 is submitted, 3 prepared for submission.

Diagram 1. Dynamics of growth of research performance indicators of MICM