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D2.1 Define and agree the framework parameters of the TRIP[1]

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[1] TRIP - Twinning Research and Innovation Programme

Contents

1. EXECUTIVE SUMMARY

This document describes the process of preparation of the **framework parameters of the Twinning Research and Innovation Programme (TRIP)** of the project GAIN.

Document History			
Version	**Date**	**Contributors**	**Description**
1	25/11/2022	George Giorgobiani - MICM	Define and agree the framework parameters of the TRIP
2	07/12/2022	George Giorgobiani - MICM	Define and agree the framework parameters of the TRIP
3	22/11/2022	George Giorgobiani – MICM; Alexandra Konig, Francois Bremond, Michal Balazia – INRIA; Andrey Girenko, Philipp Mueller - DFKI	Define and agree the framework parameters of the TRIP
4 (Final)	30/11/2022	George Giorgobiani – MICM; Alexandra Konig, Francois Bremond, Michal Balazia – INRIA; Jan Alexandersson, Andrey Girenko, Philipp Mueller - DFKI	Define and agree the framework parameters of the TRIP

2. INTRODUCTION

Deliverable 2.1 is a keystone planning document for the whole duration of the project and is in direct relation with the Task 2.1 (TRIP detailed planning) of the Workpackage 2 (Twinning Research and Innovation Programme). The overall objective of this work package is to enable stable and durable building of research and networking capacities among the project partners and, baised on that, creat conditions for the integration of MICM into the European AI[2] research community.
This goal will be achieved through the joint research activities structured in the form of joint projects involving key staff of the partner research organizations centred around 3 Topics with the following tentative titles:

- **Topic 1.** AI Methods for Deep Speech Analysis in Health (Leader: DFKI);
- **Topic 2**. AI Technologies for Human Behaviour Understanding (Leader: INRIA);
- **Topic 3**. Pilot Research Project at MICM, based on (but not limited to) the bilateral (INRIA-DFKI) large-scale project MePheSTO.

The project implementation will be supported with effective and efficient mobility scheme (Task 2.3).
The main objective of the Task 2.1:

1. Setting up the TRIP Steering Board;
2. Define and agree the framework parameters of the TRIP;
3. Organize (online) the Second TRIP detailed planning workshop (presentation of the document describing TRIP in detail developed by the Steering Board);

The framework parameters of the TRIP comprise:

1. To define the mapping between the Georgian researchers and the sub-projects around the abovementioned 3 Topics suggested by DFKI and INRIA
2. Selection and recruitment of researchers for the tenure-track position.

This task was implemented through the joint webinars with discussions and presentations. The mapping procedure was based on one hand on the „expression of interest“ from Georgian researchers to be involved in one of the sub-projects and advice and experience of the researchers from DFKI and INRIA on another.
As a result, 24 Georgian researchers were assigned to 3 Sub-Projects and the Technical Support and Research Management and Coordination groups at MICM (see Table 1 in the Annex). The Sub-Projects will be supervised by the researchers from DFKI and INRIA. PhD. students from DFKI and INRIA will be involved in the joint research as well. 4 Georgian researchers were selected with the conditions of a tenure-track.

[2] AI – Artificial Intelligence

3. SET UP OF THE TRIP STEERING BOARD

This section describes the process of election of TRIP Steering Board and its decisions about the TRIP parameters.
According to DoW of project GAIN, the first TRIP detailed planning workshop was collocated with the kick-off meeting of the project, 19 October, 2022. Composition of the Project and TRIP Steering Boards were agreed:
Composition of the TRIP steering boards

- DFKI – Jan Alexandersson, Philipp Müller
- INRIA - Alexandra Konig, Francois Bremond
- EXO – Svetlana Jasich
- MICM – George Giorgobiani.

To define the framework parameters of the TRIP the **Steering Board decided** to organize 2 webinars in November, 2022, one to be held by DFKI and the second by INRIA. The purpose of these meetings was to present ongoing research projects in these organizations relevant to the project GAIN. Then the Georgian counterparts will have opportunity to choose one (or several) projects to be involved in, according to their interests and expertize. Georgian counterparts will fill in the special mapping form in the excel sheet at the "Project online management platform" (Deliverable D.6.2, WP 6) expressing their interests. In this way the project will firstly obtain the **Mapping** between the **researchers and projects**
According to the project's DoW, MICM has to recruit three post-docs (doctoral, magister, bachelor students) for the project duration with the conditions of a **tenure-track** (post-contract evaluation and, in case of fulfilment of upfront declared KPIs, – a tenure position granting). The recruitment procedure will imply the international call for candidates and transparent selection process ensuring highest possible quality of the selected candidates. The duties of the new group leaders will comprise not only research work within the project, but also shaping the research teams in terms of personnel and thematic focus, leadership in corresponding capacity building activities and ensuring continuity in funding acquisition (the success in attaining these goals will be a condition for awarding tenure positions). Enabled by the Capacity Building programme, the newly appointed team leaders will be one of the major transformative forces in the project.
The final decision will be made by the TRIP Steering Board.

4. SELECTION PROCESS AND THE OUTCOMES.

This section describes the selection and recruitment procedures related to Deliverable 2.1 (Task 2.1).

4.2. Webinars

This section describes the webinars organized by DFKI and INRIA.

4.2.1. DFKI Webinar

On the 4th of November, two researchers from DFKI – Dr. Philipp Müller and Hali Lindsay, M.Sc., presented opportunities and project ideas for collaborations with young computer scientists from Georgia who are participating in GAIN. The idea behind this presentation meeting was to start further discussion and possible collaboration with them in smaller groups.
Introduced projects mainly focused on analysing social interactions. Some of the challenges presented involved eye contact detection, backchannel detection, next speaker detection and etc.
Each project's objective was described using visual diagrams for better understanding the structure, data collection methods were also explained in details.
After each presentation, participants further explored certain details about projects and asked questions regarding the terms of the collaboration.
At the end of the meeting, contact information and further steps for applying were discussed.

4.2.2. INRIA Webinars

On the 16th of November, researchers from INRIA presented opportunities and project ideas for collaboration with Georgian counterparts.
Laura M. Ferrari talked about multimodal emotion recognition with biosignals and video. The idea is to use different kind of sensors (EEG, ECG, EMG, EDA...) to detect emotions and use this information to prevent different diseases; adding video data to address the issue of the lack of generalization.
Second project was presented by Michal Balazia who talked about several project ideas like gaze estimation, personality recognition, extracting features from video and etc. the main idea is to use this kind of information in social Interaction.
The last project from INRIA was about behaviour analysis in group interaction, where Tanay Agrawal talking about the datasets and exact tasks to be done, about future plans and possible collaboration projects as well.
Each project's objective was described using visual diagrams for better understanding the structure, data collection methods and technical details were also explained in details.
After each presentation, participants further explored certain details about projects and asked questions regarding the terms of the collaboration.
At the end of the meeting, contact information and further steps for applying were discussed.
After the meetings it was decided:

1. To organize the webinars with the presentations of Georgian counterparts showing their experience and interests that helps to find the place where the collaboration can be made.
2. Georgian counterparts will fill in the special mapping form in the excel sheet at the “Project online management platform” (Deliverable D.6.2, WP 6) expressing their interests.

4.2.3. Webinars with presentations of Georgian counterparts

November 30, 2022.

The webinar was organized by INRIA and DFKI. The goal of this meeting was for students from Georgian universities to present their work experience, past and current research projects, and future interests in regard to the GAIN project. The presentations were followed by discussion concerning the possibilities of future joint research endeavours and collaboration with DFKI and INRIA.

The students had diverse research backgrounds. Three presentations have been made:

1. **Raphael Kalandadze**, a machine learning engineer and student at the Georgian Technical University's Information Technologies master's program, presented four projects. The first one focused on mouse behaviour analysis and the use of deep learning techniques to detect rats' body parts from video and use this information to make behaviour analysis. The second project involved an application that handled signal processing visualisation and used machine learning techniques to investigate these processes in more depth. Another project was about decoding EEG signals and trying to determine whether the applicant was thinking left or right movement. This was the similar project that Dr. Laura M. Ferrari (INRIA) works on. The last project was about teeth segmentation to detect teeth from 3d CBCT images and create exact structure from it.

   It was decided to arrange a meeting with Dr. Philipp Mueller, Dr. Michal Balazia and Tanay Agrawal to discuss more specific details and the joint research.
2. **Tamar Giorgobiani**, a clinical neuropsychologist, and a PhD student at I. Javakhishvili Tbilisi State University (TSU), Faculty of Psychology and Educational Sciences, presented her project regarding the effects of different demographic variables on expressive language abilities in Georgian-speaking adults (Master's thesis, 2018) and her current PhD study investigating the neural substrates of normal and agrammatic language production using functional Magnetic-Resonance Imaging (fMRI). She expressed interest in automatic speech analysis using Artificial Intelligence and its clinical applications in case of psychiatric disorders (MePheSTo) and dementias (DFKI, e.g., relevant publication: https://pubmed.ncbi.nlm.nih.gov/34093165/).

   Hali Lindsay from DFKI suggested a separate meeting to discuss the particulars of cooperation and a possibility to implement the current speech analysis methods and models in T. Giorgobiani's PhD project. Soon to be organized, an online meeting will also involve Dr. Phillip Müller and Dr. Benedikt Wirth from DFKI and Dr. Alexandra König from INRIA.
3. **Beso Mikaberidze,** a doctoral student of GTU works on his Ph.D. Thesis "Formalism and Applications of Georgian Language Processing by Machine Learning Methods". This research is a sub-project of the long-term project "Technological Alphabet of Georgian Language" of the Center for Cultural Protection and Technological Development of Georgian State Languages at GTU.Following modern natural language processing technologies and developing new

customized models is urgent for the Georgian language. Word embedding is a fundamental piece of NLP, as most of the problems require text documents represented as numbers so that machines can understand them. Accordingly, the main task is the modelling of the Georgian Vector Space.

B. Mikaberidze is interested in the projects related to Natural Language Processing (NLP), like "NLP/Audio", as well as the project of a different kind such as "High-Level Behaviour Analysis". Phillip Müller and Hali Lindsay from DFKI suggested an idea about evaluating semantic coherence in Alzheimer research, translating existing data for testing the language model elaborated by B. Mikaberidze. Next online meeting was scheduled in the following week.

December 7, 2022.

The second webinar with presentations of Georgian counterparts was organized by INRIA on 7 December, 2022. 6 presentations have been delivered:

1. **Luka Tabagari** presented the project Rating Controller, which is the software for political organizations, it has two main modules:
   The name of the first module is Monitoring, which operates in everyday regime. Its main goal is to increase and control political organizations' ratings. The name of another one is VoterBallot, which operates only during the election period and is focused on getting the votes according to political organization rating, not to lose them. Monitoring collects so-called all-day life problems, and with the help of AI identifies the responsible persons, who are responsible for fixing them.
   L. Tabagari expressed interests in the tasks: Emotion RGB and Behaviour disorders.
2. **Ioseb Kachiashvili**, a web developer with master's degree, presented a project "Indexes for classification of populations according to the intensity of cancer diseases"(Master's thesis 2020). Depending on the economic state of the country the regions of Georgia are grouped by intensity and necessity of help with cancer patients using the mathematical statistics methods.
   I.Kachiashvili expressed his interest in the projects related to analyzing patient's behaviours like "Emotion RGB or Multimodal", "Behaviour disorders: Schizophrenia / Bipolar disorder / Depression".
3. **Natia Kukhilava**, a machine learning engineer, student at Information Technologies master's program and guest lecturer at computer science bachelor's program at the Georgian Technical University, presented 3 projects. The first project was about automatic license plate detection for toll plazas. The system gets car images from the camera, detects license plates using deep learning, recognizes characters from it and the fee is deducted directly from the bank account of the car owner. The second project was focused on detecting some specific type of cancer in dogs. There are analysed pictures of cytological material, detected dog age and dog breed using convolutional neural networks and based on the result the doctors are able to make an initial decision as to the choice of further steps in the process of diagnosis and treatment. The last one

was a recommendation system for news webpages. The system used content-based filtering to get appropriate news recommendations.

N. Kukhilava expressed interest in computer vision field and two most interesting projects for her are "EEG/EDA/ECG" and "Pedestrian behavior prediction".

4. **Tatia Tsmindashvili**, a data scientist and student at Biomedical engineering and medical informatics master's program at the Georgian Technical University, presented 2 projects. The first project was about conversational AI chat-bot using transformers and generative models. The second project was Fruit sorter, a fruit detection, segmentation and then classification to determine if it is damaged or not (joint project with Natia and Raphael). She also mentioned projects Mouse behaviour tracking app, Cortical culture signal analysis app and Brain as a computer Mouse (EEG) (joint project with Raphael).

   T. Tsmindashvili expressed her interest in the projects "EEG/EDA/ECG".

5. **Davit Datuashvili, a**ffiliated associate professor at the faculty of computer science and architecture at International Black Sea University (IBSU). He is delivering lectures in machine learning and deep learning in IBSU as well as the University of Business and Technologies (BTU). Currently his interests are in the fields of digital signal processing and variety of fields of AI (machine learning, deep learning, reinforcement learning and natural language processing, as well as computer vision and image processing). He is an independent researcher and combines models and methods from different disciplines of computer science. He is interested in applications of signal processing and deep learning in medicine, seismology, audio engineering, etc.

   He has expressed his interest to participate in EEG/EDA/ECG signal analysis project.

6. **Teimuraz Saghinadze,** an assistant researcher at MICM and a 2nd year Ph.D. student at Georgian Technical University at the faculty of Civil Engineering, presented two ongoing research endeavours he's part of and the topic of his Ph.D. research. **Out of proposed projects he expressed interest in Pedestrian Behaviour Prediction, and general mechanics adapters**.

Dr. Michal Balazia (INRIA) suggested to meet and discuss more details about the project related to EEG. Corresponding group of researchers include Dr. Philipp Mueller, Tanay Agrawal, Natia Kukhilava, Raphael Kalandadze, Tatia Tsmindashvili and Davit Datuashvili.

4.2.4. Webinars in Selected Groups

After the presentations and discussions 6 Research Thematic Groups (sub-tasks) were composed:

1. G1. EEG/EDA/ECG (Unimodal EEG/Multimodal [RGB+EDA+EEG]/Implicit Intent Recognition)
2. G2. Face (Emotion RGB or Multimodal [RGB+audio+Text])

3. G3. High-Level Behaviour Analysis (Personality)
4. G4. High-Level Behaviour Analysis (Behaviour disorders: Alzheimer, Schizophrenia, Bipolar, Depression)
5. G5. NLP (Natural Language Processing)
6. G6. NLP-fMRI.

Researchers have been divided into groups based on their interests and specialities and the meetings were prolonged in groups.

G6 - December 12, 2022.

A meeting was held between **Tamar Giorgobiani**, a Georgian PhD student at Tbilisi State University, **Phillip Müller, Hali Lindsay, Benedikt Wirth** from DFKI and **Alexandra König** from INRIA to discuss the possibilities of collaboration on the T. Giorgobiani's PhD study. The PhD study is done in collaboration with the RWTH Aachen University, Division of Clinical Cognitive Sciences (the director: Univ.-Prof. Dr. med. Ferdinand C. Binkofski) and with the funding of AROP Scholarship. The goals of the study are to investigate neuronal correlates of morphosyntactic processing during normal speech production using fMRI and the functional reorganization patterns of the language production network in the brain after damage to the language regions during expressive agrammatism and after short-term disruption of Broca's area (using TMS) with fMRI. The study encompasses a set of three experiments, one regarding normal language production (the data of the German native speakers already acquired), the second with the patients with agrammatism and the third fMRI combined TMS virtual lesion study with the healthy subjects. Since all the above-mentioned experiments entail analysis of semi-spontaneous speech elicited using picture stories, in the meeting the possibilities of applying automatic language analysis and natural language processing techniques were discussed. For the existing data of the first experiment about the normal language production Automatic Speech Recognition (ASR) could be implemented for the transcription and extraction of some relevant syntactic and semantic features. For the upcoming TMS/fMRI experiment the relevant linguistic and paralinguistic features to be extracted were also examined. The precise nature of the analysis will depend on the acquired data and research questions, but the main idea is to extract the features that are clinically relevant and characteristic to the damage to Broca's region. The features will then be compared between the conditions (pre- and post-TMS virtual lesion) and will be related to the brain activity. The possible obstacles were also reviewed, including the data sharing and protection, speech output denoising, temporal resolution of the fMRI etc. **The data safety issue should be addressed before the next meeting which will be organized at the beginning of next year (2023). The goal of the future meeting is to try out different options and to come up with a more concrete plan for the speech analysis for the existing data.**

G5 - December 13, 2022.

Group 5 is centred around NLP (Natural Language Processing) and its application in different scenarios. From MICM the group includes **PhD. Student at GTU, Beso Mikaberidze and Barbare Tepnadze**, **B.Sc. at IBSU.** Following the formal introductions of each member, **Dr. Philipp Müller and Hali Lindsay, M.Sc.,** further explained details of ongoing studies, the motivation behind them and ways to incorporate NLP to achieve the study's objectives. DFKI Speed Dating Dataset was chosen as a current focus, and data specifications along with further steps were discussed. Participants asked questions regarding the current progress and vision, technical details and possible NLP techniques to implement.
The next meeting will be held in the middle of January. Before that, participants will do research and find already completed works that address similar scenarios as presented in the current study.

G 4 - December 14, 2022.

Group 4 is composed of the researchers with divert expertize. It includes:

1. Psychiatrists E. Chkonia and K. Sulaberidze - responsible for the clinical interviews with patients
2. Neuro-psychologists S. Tsagareishvili, T. Giorgobiani – responsible for clinical annotation
3. Physician E. Gaprindashvili - responsible for ECSI annotation
4. Technical support group L. Tabagari, B. Oikashvili, Z. Sanikidze, I. Katchiashvili, V. Berikashvili, Ts. Javakhishvili – responsible for maintaining the technical devices and data processing.

G 1 and G 2- December 13, 21, 2022.

Research topic, Sub-Task “Emotions” conducted at INRIA, comprise several directions. Two of them “full body video” and “face crop video, biosignals” occurred to be in the scope of interests of Georgian researchers. According to their interests and research potential, it was decided that I. Katchiasvhil and L. Tabagari will be engaged in research on “full body video”; R. Kalandadze, N. Kukhilava, T. Tsmindashvili, D. Datuashvili, K. Kachiashvili, Z. Tabagari in “face crop video, biosignals”.

G 3- December 16, 2022.

Research at INRIA on action detection/recognition contain sub-task on personality recognition and speed dating using advanced machine learning techniques. According to their interests and research potential, it was decided that two Georgian researchers will be engaged in this group: T. Saghinadze and D. Datuashvili.

5. TRIP PARAMETERS DEFINED AND AGREED.

5.1. Final Mapping document

Abovementioned 6 Sub-Tasks were united in 3 major Tasks, so called Sub-Projects, leaded by DFKI and INRIA:

1. AI Methods for Deep Speech Analysis in Health – Lead by DFKI
2. AI Technologies for Human Behaviour Understanding – Lead by INRIA
3. Pilot Research Project at MICM based on "MePhesto" project – Lead by DFKI and INRIA.

The benefits of creating the general **Technical Support group** was discussed as well. This group will support not only research in Group 4, but all Sub-Projects of GAIN at MICM as well. Besides, the group will take part in launching and upgrading of computer system at MICM, which will be designed in accordance with the needs of the project GAIN. Technical support group will include 7 IT specialists from MICM.

Research Management and Coordination of the Sub-Projects at MICM will be implemented by the group of scientists from MICM composed of 5 researchers.

As a result, 24 Georgian researchers were assigned to 3 Sub-Projects (in its turn containing different specific research topics, Sub-Tasks), the Technical Support group at MICM, and the Management and Coordination group at MICM (see Table 1 in the Annex). The Sub-Projects will be supervised by the researchers from DFKI and INRIA, Francois Bremond, Michal Balazia, Laura Ferrari, Alexandra Konig, Philipp Muller, Benedikt Wirth. PhD. students from DFKI and INRIA, Valeriya Strizhkova, Tanay Agrawal, Abid Ali, , Hali Lindsay, Mansi Sharma will be involved in the joint research as well.

The final mapping document between the Georgian researchers and the Sub-Projects (and Sub-Tasks) was agreed on the TRIP Steering Board meeting on December 27, 2022. More detailed description is available in the excel file "Tasks" at "Project online management system".

5.2. Selection for the tenure-track position.

After the discussions and procedures described in section 4, 4 Georgian researchers were selected to be assigned the Tenure-track Position:

1. PhD student Teimuraz Saghinadze (Sub-Task Action detection/recognition)
2. Master student Rapael Kalandadze (Sub-Task Emotions)
3. Master student Barbare Tepnadze (Sub-Task NLP)
4. PhD student Beso Mikaberidze (Sub-Task NLP).

Regarding this activity of the GAIN project, MICM has initiated the process of design of a new **Staff Schedule** aiming at recruiting young researchers. Namely 4 new positions are created within the research departments of the institute:

- Researcher – 1 position at the department of „Computational Methods“
- Assistant Researcher – 3 positions at the „Computational Center“.

New Staff Schedule is agreed with the Scientific Board of MICM and it has to pass the process of agreement with the Legal Bodies at GTU.

PhD student T. Saghinadze (currently holding the position of Assistant Researcher) will be encouraged to apply for the competitive position of a researcher. Three positions of Assistant Researcher will be suggested to the master students R. Kalandadze, PhD. student B. Mikaberidze and B. Tepnadze, BSc.

Note that by the support of the GAIN project "MICM AI Lab" has already started functioning since September 2022, which includes above sited 24 researchers, mostly young. The lab will be supported financially as well as scientifically by the project for 3 years. MICM administration plans to maintain created research capacities after the project ends by the budgetary help of the government and/or by seeking other funding opportunities, like research grants, commercialization etc.

A master student, active clinician of psychiatry Kh. Sulaberidze, plans to apply for a PhD. by the supervision of Professor E. Chkonia. Tentative title of her PhD Thesis is “A digital phenotype of social relationships in mental disorders”. As discussed earlier at the Kick Off Meeting, prospects for bilateral supervision (second supervisor from INRIA or DFKI) will be considered. GAIN will support this action in the frames of the DoW of the project.

6. CONCLUSIONS.

This document is developed by the TRIP Steering Board and describes the process of creation of the TRIP framework parameters.
As a final result agreed by the TRIP Steering Board, 24 Georgian researchers were assigned to 3 Sub-Projects and Technical Support and the Research Management and Coordination groups at MICM (see Table 1 in the Annex). The Sub-Projects will be supervised by the researchers from DFKI and INRIA. PhD. students from DFKI and INRIA will be involved in the joint research as well.
4 Georgian researchers were selected with the conditions of a tenure-track.

ANNEX

Sub-Project Leader	Sub-Projet Title	Sub-tasks	Researchers from MICM	Group
DFKI	AI Methods for Deep Speech Analysis in Health	NLP	B.Mikaberidze, B.Tepnadze	5
		NLP-fMRI	T.Giorgobiani, G.Giorgobiani	6
INRIA	AI Technologies for Human Behaviour Understanding	Action detection/recognition	T.Saghinadze, D.Datuashvili	3
		Emotions	I.Katchiasvhili, L.Tabagari (full body video)	2
			R.Kalandadze, N.Kukhilava, T.Tsmindashvili, D.Datuashvili, K.Kachiashvili, Z.Tabagari (face crop video, biosignals)	1
DFKI - INRIA	Pilot Research Project at MICM based on Mephesto Project	Clinical interviews with patients	K.Sulaberidze, E.Chkonia	4
		Clinical annotation	S.Tsagareishvili, T.Giorgobiani	
		ECSI annotation	E.Gaprindashvili	
Technical support at MICM	Technical support of all the Sub-Projects		L.Tabagari, B.Oikashvili, Z.Sanikidze, G. Ghlonti, I.Katchiashvili, V.Berikashvili, Ts.Javakhishvili	
Research Management and Coordination at MICM	Overall research management at MICM		G.Giorgobiani, V.Kvaratskhelia, M.Menteshashvili, Z.Sanikidze, V.Berikashvili	

Table 1.