

DESCRIPTION of a Novel Double-Degree Master's Study Program in Digital Health (MDH) at Russian-Armenian (Slavonic) University in Yerevan, Armenia

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Rationale and Need for the Master of Digital Health (MDH) Study Program

Information and Communication Technologies (ICT) are rapidly changing the way medicine and healthcare are practiced, researched, studied, and taught. The extraordinary developments and convergence in such fields as computing, communications and medical technologies requires development of advanced digital devices, best practices, analytics and educational programs. The Digital Health revolution is poised to massively transform health care for millions of people around the world, especially in developing countries and remote regions.

In 2019, the World Health Organization adopted a Global Strategy on Digital Health 2020-2024 and recommended all member states to foster development of Digital Health, in order to strengthen their health systems and move towards Universal Health Coverage. In many countries worldwide, digital transformation of healthcare is currently the hottest topic and the highest priority for all involved stakeholders: governments, ministries and public authorities, insurers, healthcare providers, physicians and nurses, and of course, patients and consumers. Millions of electronic health records will need analysis, diagnosis and cyber-triage under the direction of professionals trained in the use of powerful computing technology. The rapid rise of telemedicine, especially in view of the current coronavirus pandemic, will lead to thousands of well-paying professional jobs annually. Consequently, **Digital Health specialists will be among the most demanded professionals in the coming years and decades.**

The personnel trained to conduct such tasks is very scarce today. Professionals require training to learn this new field and to operate effectively in the new technology-centric healthcare environment. The MDH program addresses this need.

This uniquely innovative, uniquely interdisciplinary, and uniquely international study program will offer excellent and motivated graduates of biomedical and computer science disciplines from Armenia and abroad, an exclusive opportunity to obtain deep knowledge, professional skills and competencies in the fields of medical informatics, decision support systems, telemedicine, international healthcare management and ethics, global and public health informatics, translational research informatics, and home care. Students will learn how to design and implement innovative applications and promote new technologies to improve health care. The advancement of

technology in the medical field, accompanied by the requirements to keep sensitive data confidential, creates the need for a graduate program that offers medical informatics education and provides course work and study in remote medical diagnostics and data security. To provide students with an access to leading practitioners from around the world, and hands-on practical experience, an innovative digital hybrid approach to instruction will be required, utilizing both distance (online) education as well as local hands-on labs. This MDH program will be the first of its kind to fulfill these needs. In addition to providing new opportunities to Armenian students, this study program being multilingual and international, will bring many international students to study Digital Health in Armenia.

Current State of the Domain and Existing Issues

Armenia has attained accelerated economic and health achievements in recent years, however the healthcare system in the country still faces significant challenges in health inequality, and there has been relatively slow progress particularly in providing healthcare delivery services in remote and rural areas, and the lack of introducing innovative solutions to the healthcare sector that can benefit the wider and especially the poorer population. Furthermore, Armenia has relatively high prevalence of communicable diseases coupled with an increase in the prevalence of non-communicable diseases. At the same time, the country has seen major uptake and penetration of mobile phone and Internet usage in recent years. Yet, such technological developments have not yet been utilized effectively in Armenia's healthcare sector. One of the major reasons for that has been the lack of appropriately trained professionals who could become the drivers of digital transformation of the country's health system.

Armenia with its world-class workforce, dynamic ICT market, human resources, and the significant global networking opportunities greatly facilitated by the Armenian Diaspora, is uniquely positioned to become a global leader in Digital Health. With that in mind, a group of Digital Health enthusiasts and experts from Armenia and the Diaspora (including the RAU leadership and academics) have recently developed a concept of "**Global Center of Excellence in Digital Health in Armenia**". This proposal is both timely and important, especially with the new strategy of the Government of Armenia in attracting world class global IT businesses to the country. Digital Health will be eventually an attractive area and an incentive for these global companies to invest in such center and initiative. The establishment of the Center will also allow the country to be one of the leaders in this important area in a hugely attractive sphere for the educational, research and business

sectors. Digital Health can also be a major driver for the country's economy and modernization of the healthcare system, and can greatly assist to enable Armenia as one of the global IT leaders and the "Silicon Valley of Caucasus". Furthermore, this area will also allow the creation of thousands of local professional jobs within the IT, healthcare and the educational sectors and facilitate the improvement of health care throughout Armenia and Artsakh, and beyond. Such Center would create permissive and stimulating environment for fostering research and development of novel Digital Health applications and devices, boosting mutually beneficial international collaboration, attracting innovative technologies and forward-thinking students and eventually improving population health indicators and treatment outcomes.

All that explains why the initiative has already been endorsed by the Government of Armenia, and other relevant stakeholders. There is an ongoing support for the development of this area, therefore there is a strong need for a study program to train relevant specialists.

Similar programs that currently exist at the leading universities in Armenia (e.g. Biochemistry and Biotechnology in RAU, and Medical Cybernetics at the National Polytechnic University of Armenia) do not cover the scope and depth of knowledge and competences of the MDH curriculum, and thus are not able to fulfil the main goal of MDH: the creation of specialists at the intersection of medicine, healthcare and IT, who could assist in the digitalization of medicine and healthcare.

The Goal and Learning Objectives of the Master of Digital Health (MDH) Study Program

This study course will deliver solid theoretical knowledge, practical skills and methodological competences in Digital Health — with an emphasis on management and research components — preparing graduates for taking over **the leadership positions and driving the digital transformation of healthcare in Armenia and worldwide.**

The aim of the program goes beyond the basic objective of "employability" toward professional proficiency and career success. The focus is on hands-on, solution-oriented and implementation-oriented competencies in an international context, which are gained through concrete, practice-based projects and real-life case studies. Competencies in the areas of Foundations, Health Care, Medical and Health Informatics, Digital Health and eHealth, and Research and Methodology, as well as Soft Skills, will be developed through a module-based program structure. Within the modules, synthesis and synchronization will be achieved through translating knowledge into concrete case

studies (deduction and induction). As a rule, case studies, lab work, projects and “hot topics” will make up approximately 50% of each module.

Upon completion of the study program, the students will have achieved the following **Learning Objectives:**

Theoretical Knowledge:

- “Bridging knowledge” – the foundational knowledge in medicine and computer science, for students with technical and biomedical backgrounds, respectively, to prepare them for uptake of knowledge and skills in the interdisciplinary domain of Digital Health;
- In-depth knowledge in the domain of International and Global Healthcare Management – the approaches and methods of designing and delivering various healthcare services, knowledge of global health challenges and practices, of the structure, functions and financing of both national and international health systems;
- In-depth knowledge in the domain of Medical and Health Informatics – the approaches and methods of information representation and management in medicine and healthcare, with a focus on healthcare standards, interoperability, data integration and aggregation, artificial intelligence / machine learning in healthcare;
- In-depth, application-relevant knowledge and expertise in the domain of Digital Health – the approaches and methods of digitalization in the healthcare industry, with a focus on the areas of telematics, telemedicine and eHealth, as well as in the area of Digital Health application and service providers in national and international healthcare;
- In-depth knowledge in the domain of Evidence-Based Medicine and Healthcare Data Analytics – the approaches and methods of designing, conducting and interpreting healthcare research, including modern statistical and analytical methods.

Practical Skills:

- Conduct and present a comprehensive critical analysis and evaluation of a health system of a particular country while focusing on deficiencies and areas of suboptimal performance, identify possible Digital Health approaches and solutions to improving the outcomes;
- Conduct and present a comprehensive critical analysis of a particular healthcare issue or problem, identify possible Digital Health solutions to the problem;
- Implement relevant computer science and informatics methods to solve specific medical and healthcare-related tasks and assignments;

- Design and implement a prototype health information system, formulate technical and operational requirements, identify necessary resources, define architecture and other technical specifications, build or procure necessary capacity;
- Work with existing healthcare standards, classifications, terminologies, and various code sets in the field of medical and health informatics;
- Conduct and present a comprehensive critical analysis and evaluation of a Digital Health / eHealth system or landscape in a particular country while focusing on deficiencies and areas of suboptimal performance, identify possible approaches and solutions to improving functioning of the system;
- Conduct and present a comprehensive critical analysis and evaluation of a Digital Health / eHealth product (application, service, project or program) while focusing on deficiencies and areas of suboptimal performance, and identify improvement opportunities;
- Conduct and present benchmarking reports or market research in the domain of Digital Health;
- Design and implement a prototype Digital Health / eHealth product (application, service, project or program) for a particular healthcare institution, system, or company, define the needs and requirements;
- Analyze and assess business relationships and develop business-oriented and entrepreneurial approaches in the domain of Digital Health;
- Critically analyze the results of scientific research and present them in the form of scientific reports or scientific publications, maintaining high standards of protection of the Intellectual Property Rights;
- Design, conduct, publish and present a professional scientific research project in the domain of Digital Health, Medical and Health Informatics, International and Global Healthcare Management.

Methodological Competences:

- Apply professional terminology in the fields of Digital Health, Telemedicine, Medical and Health Informatics, International and Global Healthcare Management, in Armenian and foreign languages (English, Russian);
- Support, design and implement various educational activities (both degree- and certificate-based) in the fields of Digital Health, Telemedicine, Medical and Health Informatics,

International and Global Healthcare Management, in Armenian and foreign languages (English, Russian);

- Express himself or herself fluently in written and spoken and conduct negotiations;
- Solve problems in application-oriented manner using both basic and complex methods;
- Research and interpret scientific specialist texts and apply them to everyday situations in the institution or company;
- Independently formulate scientific tasks for theoretical and experimental research; in addition, particularly qualified students shall receive the theoretical foundations that enable them to conduct a doctorate or work in scientific areas;
- Know the various stakeholders in the field of digitalization in the healthcare industry and take their goals into account in the corporate strategy;
- Think and act entrepreneurially, formulate business strategies, develop business models and build companies;
- Organize teamwork and demonstrate leadership skills in interdisciplinary cooperation;
- Reflect and align actions to the ethical, ecological, social and economic requirements;
- Critically assess own strengths and weaknesses as well as own impact on others;
- Contribute to conflict resolution and deal constructively with criticism;
- Recognize the need for lifelong learning and acquire the skills to do so.

Expected Professional Activities and Career Prospects for MDH Graduates

Graduates of Master of Digital Health (MDH) study program will serve in various roles at hospitals and clinics undergoing digitalization and digital transformation, as well as at emerging Digital Health companies that provide various services such as telemedicine, remote patient monitoring, health data analytics. As a nascent industry, MDH graduates will also find themselves prepared for entrepreneurship and leadership opportunities to setup their own businesses.

MDH graduates can expect to have successful careers in the **following areas**:

- Digital Health project and program management – high-level managerial work for public or private entities, designing, developing, implementing, monitoring and reporting on various Digital Health projects and programs;
- Digital Health product and service development – high-level work for mostly private entities, designing, developing, producing, and marketing of various Digital Health products (ranging

from Mobile Health applications or AI in Genomics, to Hospital information Systems and Electronic Health Records);

- Digital Health education and research – work for public and private universities, institutes, laboratories, research and development groups, or companies, leading or supporting teaching and scientific research in Digital Health;
- Digital Health regulation and consultancies – work at public authorities (ministerial and other public bodies) and private institutions (e.g. insurance companies), consulting on their Digital Health policies, practices and approaches;
- Digital Health units and departments – high-level work at healthcare institutions and their IT departments, leading or supporting their everyday Digital Health processes and operations;
- Digital Health innovation and leadership – above all, the graduates of MDH are expected to become national and international thought leaders in Digital Health, campaigning for, popularizing and driving the digital transformation of healthcare in Armenia and worldwide.

Employment Opportunities & Internships for MDH Graduates

Graduates with MDH degree will excel in various institutions and organizations, such as hospital and healthcare systems, health informatics firms, research and development laboratories, medical technology or software companies, public health organizations, universities or institutes, insurance companies, non-governmental or governmental organizations. Employment in this field will be rapidly growing as more and more Digital Health services are being taken up.

During the development phase of the proposed study program, a potential labor market was evaluated, and discussions were held on the needs of various employers and the possible job positions for MDH graduates. The scope of the scientific institutions, state structures and production companies, which need the specialists to be trained within the framework of this educational program, has been clarified. Below are the main ones. It should be mentioned that MDH students will also be offered internship opportunity to gain practical experience at the mentioned institutions.

- The Ministry of Health of Republic of Armenia, and its relevant structures;
- “ARMED” – the National eHealth Operator of Armenia;
- At least 3 large multi-specialty hospitals in Armenia;
- At least 3 private healthcare clinics in Armenia;

- At least 3 major higher education institutions in Armenia;
- At least 2 R&D institutions with an interest in Digital Health in Armenia
- At least 12 Digital Health companies in Armenia and internationally;
- The NGO “Armenian Association of Digital Health”

Based on the discussions with the above-mentioned institutions, public authorities, NGOs and companies based in Armenia, it is estimated that only the local Digital Health market will need between 15-20 graduates per year, starting in 2022. The international market requirements have not been included in this document for obvious reasons; meanwhile it has to be stressed that the MDH program is expected to be enrolling not only local, but also a significant amount of international students.

Program Director  **Prof. Dr. Georgi Chaltikyan**