

DigitalRosh
Life Long Learning

TECHNION
Ariel Continuing Education and
External Studies Division

Digital Leadership Course DLC844:
The Future of Digital Medicine
Biology, Genetics, Technology, and Bioinformatics

Peer Learning, Theory, Practice

LLL-Ready

DLC844066

Q2 -2023
Mondays
17:00-20:00
Zoom

1- MAY
8- MAY
15- MAY
22- MAY
29- MAY
5- JUN
12- JUN
19- JUN
26- JUN
3- JUL

In the third decade of the 21st century, healthcare is extensively digital. The COVID-19 pandemic further accelerated the adoption of digital technologies by the medical sector. At the same time, state-of-the-art digital tools helped humanity overcome the pandemic and speed-up vaccine and drug development processes. This course is an introduction to the exciting field of digital medicine with a special focus on genetics and their applications.

DLC844066: The Future of Digital Medicine is designed for healthcare stakeholders who see the opportunities of the digital era together with facing its challenges. The course is a theoretical and practical introduction to digital medicine with an emphasis on genomics. It is specially built for healthcare specialists, researchers, healthcare managers, and policymakers willing to learn how they can harness digital technologies and data science to develop the future of medicine.

The course consists of 10 weekly sessions to be held on Mondays. Each session lasts 3 hours (17:00-20:00 IDT / 15:00-18:00 UTC / 10:00-13:00 EST) via Zoom. The sessions combine theory, practice, and peer learning.

All the course's material, including the recorded sessions, additional theory items, case studies, and more will be available for the course participants 24/7 on DigitalRosh online platform.

This is an introductory course, but it requires basic knowledge of digital technology and the healthcare domain. An interview with the course manager is a prerequisite to joining the course.

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Participants of DigitalRosh courses say:

“You never stop learning digital, certainly when you meet people from different disciplines. The biggest thing for me is the peer learning that opened my mind completely.”

Tony Cohen, CEO, of Maccabi Dent

“The course is organized excellently. The schedule is kept religiously and the time is fully exploited. Everything is digital and available any time - real LLL”

Yarden Yardeni, Project manager, ministry of justice

About Digital Medicine

From hybrid healthcare platforms and at-home diagnostic devices, through AI-driven diagnosis and robotic surgery, and all the way to microfluidic “organs-on-a-chip”, 3D-printed tissues, genomics, and individual therapeutics, digital technology revolutionizes medicine, improves diagnostic and therapeutic precision, enhances the ability to overcome once incurable diseases, and improves the overall quality of life.

Digital medicine can be defined as data-driven diagnosis and treatment of health conditions. While computers have been used in medicine for almost half a century, digital medicine does not aim to deal with hardware per se - it is increasingly a field dominated by sophisticated software gathering large amounts of evidence, structuring them into data, and analyzing the data to provide personalized insights and therapeutic intervention.

The amount of data received from living organisms grow exponentially, and its continuous second-to-second flow is enormous - making it readable only by sophisticated algorithms. These serve us in developing new medical technologies - however, unlike digital health or digital wellness applications, digital medicine should be ethical and supported by a sound body of scientific evidence.

About This Course

This course will provide a birds-eye overview of digital medicine before delving into one of its most promising fields - genomic and personalized medicine.

This is an evolving and exciting scientific domain, aimed at providing every individual with customized treatment based not only on his/her own genetic code but also on the epigenetic factors regulating the expression of particular genes. The course will include an introduction to genetics and the expression of genes in an organism, together with technologies for genome sequencing and analysis and furthermore, methods for meaningful analysis of the extracted data. Finally, we will discuss how genomic medicine is brought from the lab to the clinic today, as well as future treatment modalities stemming from it.

The topics discussed in the course will include:

- **Genetics** - DNA sequencing, how data is gathered and accumulated; as well as somatic and cancerous changes, mutations, and rare diseases. We will also learn about cell-free DNA, gene expression, non-coding RNA, and methylation.
- **Technology** - current technologies, their applications and limitations, the products already in the market, and in late-stage development.
- **Bioinformatics** - how data can be integrated into systems biology, and what new techniques are used today to collect, gather and interpret data.

Faculty and Team

The course is led by **Prof. Noam Shomron**, head of the Functional Genomics Laboratory at Tel Aviv University's School of Medicine. He is also head of the Rare Genomics Institute - Israel, the Djerassi Institute of Oncology, and a team at the Tel Aviv University Innovation Labs (TILabs).



Prof. Shomron received his Bachelor's degree in Biotechnology at Macquarie University in Sydney, Australia; his Master's degree in Gene Therapy at the Hebrew University of Jerusalem; and his graduate studies in Genetics at Tel Aviv University where he worked on regulatory RNA systems. As a Post-Doctorate affiliate at MIT in Cambridge, USA, Noam gained expertise in combining high-throughput data with computational analysis in order to decipher gene regulation in health and disease. Shomron is also the co-founder of several biotech companies.

The course is operated by [DigitalRosh](#). Based in Tel Aviv, Israel, DigitalRosh is a professional LLL (lifelong learning) platform catering to digital leaders in Israel and abroad. DigitalRosh is led by **Prof. Yesha Sivan**, founder, and CEO of i8 Ventures (<http://i8.ventures>) and an experienced advisor, researcher, and academic. He is also an MBA visiting professor focusing on digital, innovation, and venture at the Technion – Israel Institute of Technology. Prof. Sivan's professional experience includes developing and deploying innovative solutions for corporate, hi-tech, government, and defense environments.



The course is managed by **Dr. Vladi Dvoyris**, Director of Digital Health Programs at DigitalRosh. A DMD (Hebrew University) and MBA (Technion - Israel Institute of Technology) graduate, a practicing clinician in the field of dental implantology, and an evangelist of digital healthcare, Dr. Dvoyris combines hands-on clinical experience with a thorough understanding of information technology and an insightful approach towards healthcare delivery and management in the digital world.



Industry Speakers

The course will include guest lectures by leaders of data-driven medicine, who will share their hands-on experience from the field. The guest speakers in the course are:

Prof. Avi Schroeder - Head of the Targeted Drug Delivery and Personalized Medicine Group at the Faculty of Chemical Engineering, Technion - Israel Institute of Technology.



Dr. Michal Rosen-Zvi - Director, AI for Accelerated Healthcare & Life Sciences Discovery at IBM Research and a Professor at the Faculty of Medicine at the Hebrew University of Jerusalem.



Prof. Varda Shalev - Co-Founder and Chief Medical Officer at Alike.Health; Managing Partner at Team8.



Dr. Eyal Zimlichman - Deputy Director General; Chief Medical Officer; and Chief Innovation and Commercialization Officer at Sheba Medical Center (selected as one of the Top-10 hospitals in the world by Newsweek).



Dr. Dana Bar-On - Senior Director, Head of Academic Affairs and Networks, Specialty R&D at Teva Pharmaceuticals.



Dr. Christian Tidona - Founder and General Manager, BioMed X Institute



Mr. Eyal Toledano - Co-Founder and former CTO of Zebra Medical Vision. Co-Founder, stealth startup.



Ms. Gila Tolub - Partner at McKinsey, leading the Israeli chapter of McKinsey's global health technology network.



Outline of the meetings

Session 1: The Context

When: Monday, 1-MAY-2023	17:00-20:00 IDT • 10:00-13:00 EST
Theory 1	Theory 2
Explanation of the big picture. The coil example.	The AGI Elephant - Prof. Yesha Sivan
Practice	
Introduction to the course participants - getting to know each other.	
Details In this session we will explore the basic units of living organisms, the cells, their content, and how they transfer information from generation to generation. How does a cell grow, divide, differentiate, and specialize? What are genes and what information do they carry?	
<ul style="list-style-type: none"> • The cell, organs, the body • DNA, RNA, proteins • Systems and complexity • What might go wrong 	

Session 2: Biology

When: Monday, 8-MAY-2023	17:00-20:00 IDT • 10:00-13:00 EST
Theory	Practice
Types of genetics and epigenetics.	<p>Group discussion: Discuss the complexity of identifying changes in genetics and epigenetics, how they would affect physical health, and what ways might be used to resolve or consolidate these multiple layers?</p> <p>Multiple choice quiz - Basic Biological Concepts</p>
Details In this session we will understand how genetic inheritance works, how epigenetics influence and intervene with our genetic fate, and how all these interact in complex systems. We will also look at where genomics might go wrong and how the body deals with these changes.	
<ul style="list-style-type: none"> • Genetics and inheritance • Epigenetic mechanisms • Systems and complexity • What might go wrong 	

Session 3: Genetics

When: Monday, 15-MAY-2023		17:00-20:00 IDT • 10:00-13:00 EST
Theory	Guest Lecture	Practice
Inheritance, mutations, screening.	Prof. Varda Shalev	Group discussion: If you could predict 3 genetic traits and 3 diseases, what would they be and who would you screen for them (all the population/part of it / symptomatic, and so on.)
Details In this capacity we will discuss the availability of genetic testing, what can be learned from reading your own DNA, and what are the methods to 'fix' it.		
Where can we take the technology to?		
<ul style="list-style-type: none"> • Should we look into our DNA - ethical aspects • What can go wrong • Can we fix it • Where are we heading 		

Session 4: DNA

When: Monday, 22-MAY-2023		17:00-20:00 IDT • 10:00-13:00 EST
Theory	Guest Lecture	
Machines and data generators	Dr. Michal Rosen-Zvi	
Details		
<ul style="list-style-type: none"> • Where and when did sequencing begin • Accumulating data and databases • Mutations and rare diseases • Somatic changes and cancer • Cell-free DNA, advantages and limitations 		

Session 5: RNA and More

When: Monday, 29-MAY-2023	17:00-20:00 IDT • 10:00-13:00 EST
Theory	Guest Lecture
More than DNA: types of data collection and analysis	Prof. Avi Schroeder
Details	
<ul style="list-style-type: none"> • Gene expression • Micro-RNA expression • Non-coding RNA • Methylation, Chip-seq, transcription sites, etc. 	

Session 6: Technology

When: Monday, 5-JUN-2023		17:00-20:00 IDT • 10:00-13:00 EST
Theory	Guest Lecture	Practice
Sequencing, NGS, microarrays	Dr. Christian Tidona	Group discussion: If you had a ubiquitous DNA-reading technology, where would you take it and what would you do with it?
Details		
Here we will learn about the history of DNA sequencing from the first DNA read, in the 1960s, to the first complete human-sequenced DNA in 2001. How has this technology advanced by quantum leaps and what can we do with all the data collected?		
What kind of analysis do we want to perform?		
<ul style="list-style-type: none"> • Simple low throughput analysis • High-throughput screening • Adding complexity • Advanced and beyond 		

Session 7: Research

When: Monday, 12-JUN-2023	17:00-20:00 IDT • 10:00-13:00 EST
Special Research Session	Guest Lecture
<p>Presentation of state-of-the-art medical research in collaboration with Teva's National Bioinnovators Forum</p> 	Dr. Dana Bar-On
Details	
<p>Teva's National Bioinnovators Forum is a unique program supporting and promoting the translational aspects of biological therapies between academia and industry and advancing entrepreneurship in the biomedical field.</p> <p>The program awards Ph.D. students and post-doctoral fellows with scholarships on the basis of excellence in studies and scientific research in the fields of brain disorders, immunomodulation, protein engineering, drug delivery systems, mRNA-based therapy, adverse reaction prediction, AI and big-data tools and approaches for all the above, and more.</p> <p>In the special Research session of the course, we will meet the 2022-2023 Bioinnovation Program participants, who will share with us the foci and recent advances of their research - a unique exposure to state-of-the-art medical research that would change the face of medicine in the years to come.</p>	

Session 8: Bioinformatics and Systems

When: Monday, 19-JUN-2023	17:00-20:00 IDT • 10:00-13:00 EST
Theory	Practice
Data and advanced analysis of systems	Group discussion: Plan an experiment that would help you to deepen your understanding of a certain disease? Which disease, and how would you plan the experiment?
Details Now that we know all about the cells, the DNA, and how to read it, we will learn how to parse, organize, store and analyze the data. How can valuable information be retrieved from large DNA experiments and what applications are there to human health?	
<ul style="list-style-type: none"> • Collecting data • Trying to make sense out of it • Beware of overfitting • Bioinformatics and beyond • Integrating data into systems biology • Alignment, assembly, variant calling • Gene expression pathways and ontologies • Nanopore sequencing 	

Session 9: Applications

When: Monday, 26-JUN-2023	17:00-20:00 IDT • 10:00-13:00 EST
Theory	
How to bring data and findings to the market	
Guest Lecture	Guest Lecture
Mr. Eyal Toledano	Ms. Gila Tolub
Details	
<ul style="list-style-type: none"> • Clinical interpretation • Applications and products • Regulations and approvals 	

Session 10: Management

When: Monday, 03-JUL-2023	17:00-20:00 IDT • 10:00-13:00 EST
Theory	Guest Lecture
Navigating the change	Dr. Eyal Zimlichman
	Practice
	Group Discussion: Take away lessons - where would you take the technology?
Details	
In this lesson we will see examples of DNA and RNA data analysis that has led to start-up companies with promising horizons.	
Bringing digital technology to the medical practice.	
<ul style="list-style-type: none"> ● Leaving the lab ● Looking for a market ● Building a product ● Doing good ● Making money 	

Participants of DigitalRosh courses say:

“The LLL model is the new standard that should now be everywhere, both for us as individuals and in organizations, each in their own field. Everything is changing and we have to learn constantly. Thank you so very much” **Lee Betzer**

More Details and Registration

Course language:

The program is delivered in English, as well as all the course materials.

Scope:

- Group and peer learning: 30 academic hours in online meetings, on Mondays, 15:00-18:00 UTC/ 16:00-19:00 CET/ 17:00-20:00 IDT/ 10:00-13:00 EST.
- Theory: Watching, reading, and self-learning for about 18 hours
- Practice: Watching, reading, and self-learning for about 18 hours

Tuition Fees:

“Early Bird” – until February 28, 2023: USD 1,200 (~NIS 4,060, IL VAT included)

Full tuition fee – until March 31, 2023: USD 1,800 (~NIS 6,090, IL VAT included)

Late registration fee (upon availability): USD 2,200 (~NIS 7,440, IL VAT included)

The tuition fee is payable via bank transfer or credit card.

If you wish to pay via bank transfer please contact Dr. Vladi Dvoyris, the course manager, at vladi.dvoyris@digitalrosh.com

Registration is open until Saturday, April 15, 2023, subject to availability.

DigitalRosh membership:

The participants will receive a **DigitalRosh PRO** membership and enjoy the site and the community services, among others:

- Full access to DigitalRosh Corpus, with over 1500 knowledge items: articles, guides & tools, and case studies.
- Networking opportunities with DigitalRosh community members
- Invite to DigitalRosh LIVE webinar series and other community events.

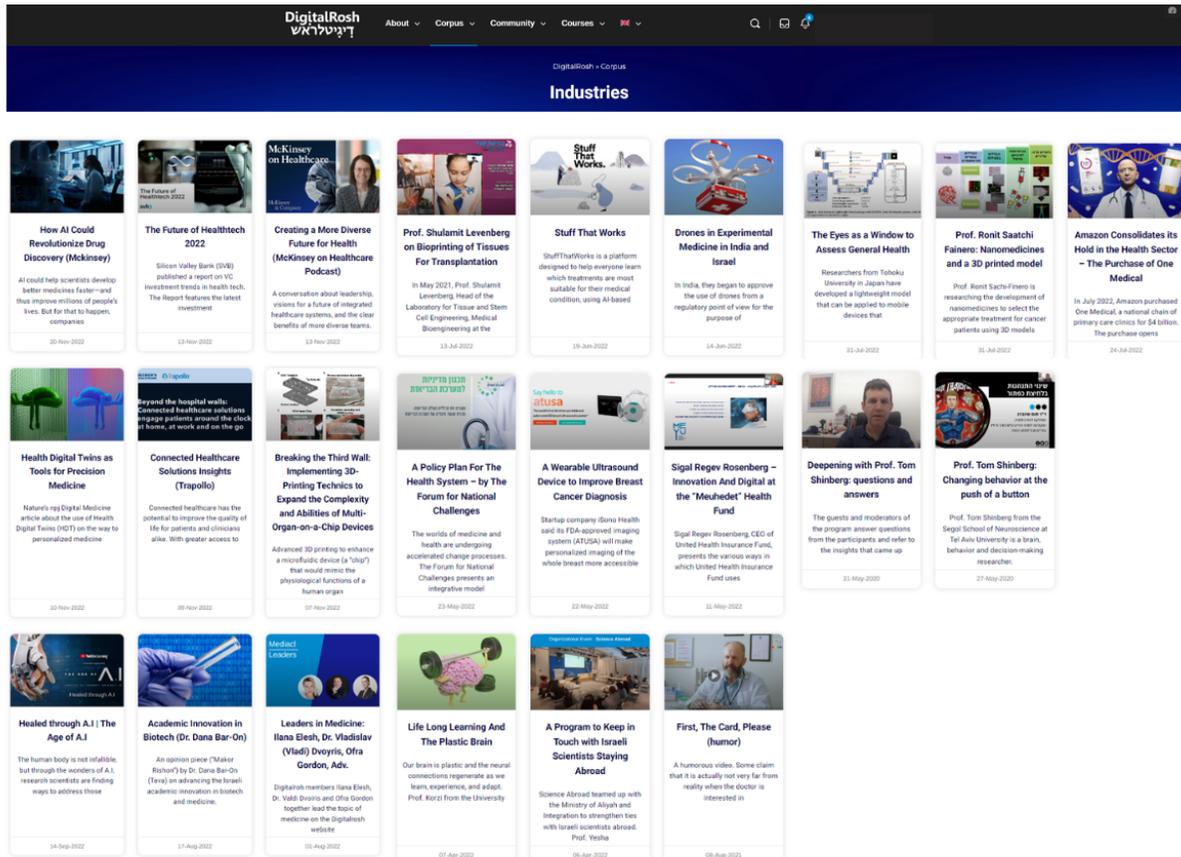
Full information about our services is available at <https://digitalrosh.com>

What's next?

You are invited to register for the course at the [registration page](#)

Have questions? Wish to speak with the course manager? Fill in the [interest form](#) or contact Dr. Vladi Dvoyris, the course manager: vladi.dvoyris@digitalrosh.com

Appendix 1: The World of Digital Medicine on DigitalRosh



A curated selection of knowledge items on Digital Medicine is available to course participants on DigitalRosh.

Appendix 2: Testimonials of Previous Courses' Participants

"The wide variety of participants is excellent. I liked the discussion groups and enjoyed the new directions I encountered while working in a group. I made new friends with whom I continued the professional conversation beyond the course time."

Karin Witzfeld, IDF

"This is an excellent course, delivered digitally. The lecturers were fantastic, the subject is super interesting and relevant. Additionally, the platform made it great - lots of additional content and easy to navigate. Thank you,

Yuval Sagron, Entrepreneur, Virgo.

"I learned many concepts that bring sense and order. I greatly appreciate learning how you take a process and make it accessible. I was also amazed by the usage of Zoom: how new worlds become accessible and how it enables learning for busy people."

Dorit Yaron, Head of IT, population authority, Interior Ministry

"There is generosity in DigitalRosh courses - the guest lectures, the availability of the whole corpus, DigitalRosh LIVE webinars and the constant support"

Yossi Ani, GM, Madatech

"The wide variety of participants is excellent. I liked the discussion groups and enjoyed the new directions I encountered while working in a group. I made new friends with whom I continued the professional conversation beyond the course time."

Karin Witzfeld, IDF

"The digital community is not necessarily a community of technological people, because digital affects all sectors and we see that there are people here from the field of education, management, retail, health, etc. and in the end they all have a common denominator - to make the digital revolution."

Udi Kauf, Head of defense sector, EMT Technologies

"Throughout the course I found myself quite often telling my team insights I was inspired by during learning. The mentors contribute a lot to the process. You have managed to create a strong desire for continuity and there is so much more material to connect with."

Shoshi Becker, Bar Ilan University

"The course made it clear to me how to look at the process that my organization is going through these days, and gave me tools that I brought up to our management."

Amnon Vidan, Head of Operations and Resources, Clalit Innovation