

Efi Arazi School of Computer Science
Reichman University Herzliya

M.Sc. Program in Machine Learning and Data Science

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Dean

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Program Director

Ms. Shlomit Stern
Head of Student Administration

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Executive Administrator

A great deal of effort has been expended in preparing this handbook, in order to ensure that its content is complete and accurate. However, changes and alterations to the information are possible. The Reichman University Academic Authorities may cancel, alter or add courses and/or specialization programs, and generate changes in the times of lectures or in the assigned lecturer. Such changes will be published over the course of the year by various means, such as the online handbook on the university website, and will apply to all the university students, including students of the Raphael Recanati International School, unless specified otherwise.

Introduction

Reichman University's Efi Arazi School of Computer Science has built an innovative and intensive M.Sc. program aimed at providing deep theoretical and practical understanding of data science, machine learning and big-data technologies to students with a strong quantitative background and education.

The program will endow the students with knowledge, as well as skills and tools, in central fields such as machine learning, algorithms, databases, and statistical inference. Students will attend frontal lectures, seminars, and produce projects of different scales providing them hands-on experience in the data-science and machine learning domains. The conducive learning environment at the Efi Arazi School of Computer Science provides a community and team-up opportunities for students, scientists and researchers from the entire scientific spectrum.

Upon completing our M.Sc. program in data science, our graduates will have gained a strong background in the science and the technology that form the basis to the growing activity in data analysis, data collection and processing and related usage. They will also have acquired expertise in programming for data science using Python, including skills in using programming in statistical analysis and advanced machine learning. Additionally, they will have acquired deeper specialization in data science based on the elective courses of the program: infrastructure courses, big-data and databases, neural networks and deep learning, statistics, optimization, scientific computing, modern bioinformatics and environmental informatics, computer graphics and vision, numerical analysis, and biomedical data science.

The curriculum of the M.Sc. Program in Machine Learning and Data Science includes:

- 5 Mandatory core courses (16 credits)
- 5 Elective courses (15 credits) out of which:
 - At least 1 Mandatory Applied Data Science Elective (at least 3 credits)
- 1 Mandatory project (5 credits)
- 3 Preparatory CS courses -- only for non-CS graduates
- Preparatory math courses – if necessary

Overall, the M.Sc. students are required to complete 36 credits.

Program of Studies

Year 1

Mandatory core courses

Course No.	Course Name	Lecture Hours	Recitation Hours	Total Credit Points	Final Course Assignment
Fall Semester					
3620	Statistics and Data Analysis Prof. Zohar Yakhini Dr. Leon Anavy	3	1	4	Exam
3605	Big Data Platforms ▼ Dr. Gil Vernik	3		3	Submitted work
Spring Semester					
3141	Introduction to Machine Learning from Data Prof. Zohar Yakhini Prof. Ariel Shamir	3	1	3	Exam

▼ "Big Data Platforms" will have 6 meetings during the semester.

Elective courses

The students must select at least one of the following core applied Data Science elective courses. The rest of the credits can be taken as 4 elective courses from either the core applied data science course list or the CS elective course list. Student can take 1-2 electives during their first year of study and 2-4 electives during their second year, for a total of 5 elective courses.

Core Applied Data Science Electives

Course No.	Course Name	Lecture Hours	Total Credit Points	Final Course Assignment
Fall Semester				
217	Computer Vision Prof. Yael Moses	3	3	Exam
3575	Probabilistic Models for Data Analysis Dr. Ilan Gronau	3	3	Exam
3604	Data Streaming Algorithms and Online Learning Dr. Aviv Yehezkel	3	3	Submitted work
3664	Cyber Security and Artificial Intelligence Mr. Yoni Birman	3	3	Exam

3614	Practical probability Models for Computer Science Seminar ■ Dr. Gail Gilboa Freedman	3	3	Submitted work
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Spring Semester

3660	Modern Algebra Mr. Lev Yohananov	3	3	Submitted work
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CS elective courses

Course No.	Course Name	Lecture Hours	Total Credit Points	Final Course Assignment
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Fall Semester

611 ◆	Advanced Topics In IP Networks Prof. Anat Bremler-Barr Dr. Yotam Harchol	3	3	Submitted work
3169	Artificial intelligence and Morality ● Dr. Udi Boker Dr. Aviv Gaon	3	3	Submitted work
3559	Coding Theory Prof. Elette Boyle	3	3	Exam
3626	Blockchains and Cryptocurrencies Prof. Tal Moran	3	3	Submitted work

Spring Semester

159	Cryptography Prof. Tal Moran	3	3	Exam
287	Digital Systems Construction Prof. Shimon Schocken	3	3	Exam
3031	Cloud computing ● Mr. Oren Eini Mr. Dan Amiga	3	3	Submitted work
3123	Databases ● Dr. Dizza BeimeI Dr. Sivan Albagli-Kim	3	3	Exam
3327	Numerical Optimization with Python Dr. Yonathan Mizrahi	3	3	Submitted work

3472	High-Performance Parallel Computing Systems Dr. Yariv Aridor	3	3	Exam
3510	Distributed Algorithms Prof. Gadi Taubenfeld	3	3	Exam
3589	Automata and Games Prof. Udi Boker	3	3	Exam
3606	Topics in Data Mining and Genomics Prof. Yaniv Erlich	3	3	Submitted work
3612	Seminar on Quantum Computation ♦ Dr. Gil Kalai	3	3	Submitted work
3616	Game Theory Prof. Gil Kalai	3	3	Submitted work
3619	Introduction to Property Testing Dr. Reut Levi	3	3	Exam
3665	The Probabilistic Method in Computer Science Dr. Reut Levi	3	3	Exam
3659	Introduction to quantum computation Prof. Shay Mozes	3	3	Exam
3662	Learning and Graphics Seminar: Virtual Humans ■ ♦ Dr. Ohad Fried	3	3	Submitted work

- ◆ The course will be held only via Zoom.
- Only one of the elective courses can be a seminar.
- ◆ Registration for these seminars will be open on the second day of the registration period.
- Advanced undergraduate elective courses can only be enrolled during the change period.

Year 2

Mandatory core courses

Course No.	Course Name	Lecture Hours	Recitation Hours	Total Credit Points	Final Course Assignment
Annual Courses					
3624	Final Project *			5	Project
Fall Semester					
3600	Deep Learning Dr. Chaim Baskin Dr. Kfir Bar	3	1	3	Submitted work
Spring Semester					
3603	Advanced Machine Learning ** Dr. Shai Fine	3	1	3	Submitted work

* Individual meetings that will be scheduled directly with the project team (from Academia or Industry).

** Can be substituted by either Advanced Statistics (Dr. Alon Kipnis) or Advanced Algorithms (Prof. Tami Tamir). Substitution requires approval from the Program Director.

Elective courses

The students must select at least one of the following core applied Data Science elective courses. The rest of the credits can be taken as 4 elective courses from either the core applied data science course list or the CS elective course list. Student can take 1-2 electives during their first year of study and 2-4 electives during their second year, for a total of 5 elective courses.

Core Applied Data Science Elective

Course No.	Course Name	Lecture Hours	Total Credit Points	Final Course Assignment
Fall Semester				
217	Computer Vision Prof. Yael Moses	3	3	Exam
3575	Probabilistic Models for Data Analysis Dr. Ilan Gronau	3	3	Exam
3604	Data Streaming Algorithms and Online Learning Dr. Aviv Yehezkel	3	3	Submitted work
3639	Recommendation Systems *** Dr. Asnat Messike	3	3	Exam

3664	Cyber Security and Artificial Intelligence Mr. Yoni Birman	3	3	Exam
3674	Advanced topics in data analysis – Seminar ■**** Prof. Zohar Yakhini	3	3	Submitted work
3614	Practical probability Models for Computer Science Seminar ■ Dr. Gail Gilboa Freedman	3	3	Submitted work

Spring Semester

3523	Natural Language Processing *** Mr. Amir Cohen Dr. Kfir Bar	3	3	Submitted work
3640	Reinforcement Learning *** Dr. Moshe Butman	3	3	Submitted work
3655	Unsupervised Learning Methods *** Dr. Or Yair	3	3	Submitted work
3684	Advanced topics in Machine Learning *** Dr. Leon Anavy	3	3	Submitted work
3660	Modern Algebra Mr. Lev Yohananov	3	3	Submitted work
3676	Advanced Statistics **** Dr. Alon Kipnis	3	3	Exam

CS elective courses

Course No.	Course Name	Lecture Hours	Total Credit Points	Final Course Assignment
Fall Semester				
611 ◆	Advanced Topics In IP Networks Prof. Anat Bremler-Barr Dr. Yotam Harchol	3	3	Submitted work
3169	Artificial intelligence and Morality ● Dr. Udi Boker Dr. Aviv Gaon	3	3	Submitted work

3559	Coding Theory Prof. Elette Boyle	3	3	Exam
3626	Blockchains and Cryptocurrencies Prof. Tal Moran	3	3	Submitted work
3673	Art and Computer Vision - Seminar ♦ Prof. Yael Moses	3	3	Submitted work

Spring Semester

159	Cryptography Prof. Tal Moran	3	3	Exam
287	Digital Systems Construction Prof. Shimon Schocken	3	3	Exam
3031	Cloud computing ● Mr. Oren Eini Mr. Dan Amiga	3	3	Submitted work
3123	Databases ● Dr. Dizza Beimel Dr. Sivan Albagli-Kim	3	3	Exam
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3659	Introduction to quantum computation Prof. Shay Mozes	3	3	Exam
3662	Learning and Graphics Seminar: Virtual Humans ■ ◆ Dr. Ohad Fried	3	3	Submitted work

*** Prerequisites for this course include the course "Introduction to Machine Learning from Data" (code: 3141)

**** Prerequisites for this course include the course "Statistics and Data Analysis" (code: 3620)

- ◆ The course will be held only via Zoom.
- Only one of the elective courses can be a seminar.
- ◆ Registration for these seminars will be open on the second day of the registration period.
- Advanced undergraduate elective courses can only be enrolled during the change period.

Exam Schedule the dates of the examinations can be found on the University website under Students > Student Information > Course Catalog, Student Regulations and Syllabus > Search Exams A personal examinations schedule is published at the Student's Information website (My IDC).