Registration form

Name:
Affiliation:
Address:
E-mail:
Phone:
Supervisor (for students):

Registration rates

Regular:
- ○ early (until June 23, 2022) — ILS 480
- ○ late (after June 23, 2022) — ILS 530

Student (full-time graduate students only):
- ○ early (until June 23, 2022) — ILS 250
- ○ late (after June 23, 2022) — ILS 300

Method of payment

- ○ Wire transfer, bank requisites:
  - beneficiary: איגוד ישראלי לבקרה אוטומטית
  - bank: Leumi (10)
  - branch: 882
  - account: 43952575
- ○ Charge to institutional account
- ○ On-site payment (cash or checks only)

Filled registration forms are to be e-mailed to

mira.aran.iaac@gmail.com

with a proof of transfer, if applicable

טופס הרשמה

שם:
מקום עבודה:
כתובת:
דוא"ל:
טלפון:
מנחה (עבור סטודנטים):

דמי הרשמה

רישום מלא:
- ○ מוקדם (עד 23 ביוני 2022) — ₪480
- ○ מאוחר (לאחר 23 ביוני 2022) — ₪530

רישום סטודנט (סטו' לתארים מתקדמים בזמן מלא בלבד):
- ○ מוקדם (עד 23 ביוני 2022) — ₪250
- ○ מאוחר (לאחר 23 ביוני 2022) — ₪300

אמצעי תשלום

- ○ העברה בנקאית, פרטי הבנק:
  - מוטב: איגוד ישראלי לבקרה אוטומטית
  - בנק: לאומי (10)
  - סניף: 882
  - חשבון: 43952575
- ○ לחיוב תקציב מוסדי שמספרו
- ○ תשלום במקום (המחאה או מזומן בלבד)

את הטופס יש לשלוח לכתובת הדוא"ל

mira.aran.iaac@gmail.com

עם אישור העברה, אם רלוונטי

איגוד ישראלי לבקרה אוטומטית

National Member Organization of IFAC and IAIN

Invitation to IAAC guest workshop

From Data to Control

to be held in **VERT Lagoon**, Netanya
on Monday, June 27, 2022 (Sivan 28, 5782)

Speaker: **Mario Sznaier** (Northeastern University)

Organizer: **Leonid Mirkin** (Technion)

We are grateful to the organizations below, whose support makes holding IAAC events possible

- Applied Materials Israel Ltd.
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Foreword פתח דבר

A conventional wisdom has it that about 80% of time put in control design is devoted to developing, identifying, and validating process models. It is not surprising then that one of holy grails of control engineering has been the design of controllers from measured data. From dual control in ’60s, self-organizing control in ’70s, adaptive control in ’80s, robust identification in ’90s, there has always been a room for high hopes, as well for some letdowns.

The tremendous success of machine learning in numerous fields could not leave control engineering untouched. A new hope is that learning methods could help to alleviate the burden of modeling and finally render control design model free. Communities that perhaps never appreciated dynamic phenomena now solve data-driven LQR problems seamlessly, making MPC adepts a bit nervous and classical control aficionados a bit gloating (but not relaxed either).

This workshop aims at presenting a control-centric perspective on those fashionable trends. I can think of no better researcher to expose those ideas and provide insights and connections with a rich body of knowledge existing in the control literature. Professor **Mario Sznaier** is the Dennis Picard Chaired Professor at the Electrical and Computer Engineering Department, Northeastern University, Boston. His research interest include robust identification and control of hybrid systems, robust optimization, and dynamical vision. Dr. Sznaier is currently serving as chair of the IFAC Technical Committee on Robust Control and Editor In Chief of the section “AI and Machine Learning Control” of the journal *Frontiers in Control Engineering*. Past recent services include Program Chair of the 2017 IEEE Conference on Decision and Control, General Chair of the 2016 IEEE Multi Systems Conference and Associate Editor for *Automatica* (2005–2021). He is a distinguished member of the IEEE Control Systems Society and a Fellow of the IEEE for his contributions to robust control, identification and dynamic vision. The workshop will also feature a lecture of **Jared Miller**, who is also from NEU.

Leonid Mirkin (Technion), Workshop Organizer

Program תכנית

08:15–09:00	Registration
09:00–09:05	Opening
09:05–09:30	*Introduction and overview of classical systems identification methods*
09:30–10:45	*Sparsity in systems identification* – *promoting sparsity via optimization; convex surrogates for cardinality and rank* – *applications to identification with outliers and missing data, matrix completion and tracking*
10:45–11:10	Coffee / tea break
11:10–12:50	*Solving convex and polynomial optimization problems* jointly with J. Miller – *convex optimization methods: interior point and first order methods* – *polynomial optimization via sum-of-squares and moments-based approaches*
12:50–14:00	Lunch
14:00–15:55	*Data driven control (learning a controller directly from data)* – *data driven control of LTI systems* – *extensions to switched and nonlinear systems*
15:55–16:20	Coffee / tea break
16:20–17:45	*Research discussion* – *can we use off-the-shelf neural nets or reinforcement learning?* – *Koopman operator based architectures* – *things that we do not yet understand well: sample complexity, overparameterization / overfitting*
17:45	Closing

Description תיאור

Motivated by advances in Machine Learning, the past few years have seen renewed interest in new sparsity based System Identification methods, and in methods that learn controllers directly from data. In this workshop we will cover both trends. The first portion will cover methods that exploit sparsity to solve challenging identification problems such as identification with missing data and outliers. We will present several application examples, including damage mitigating control, tracking under occlusion and finding causal correlations in multi-agent data. In the second portion of the workshop we will concentrate on recently proposed approaches that identify a controller directly from data, eliminating the need for an intermediate plant identification step. We will start by considering the case of LTI systems, where we show that designing a controller directly from data reduces, in many cases to simply solving a Linear Matrix Inequality whose complexity is comparable to that of finding a controller for a known plant. We will then extend these results to Model Predictive Control of LTI systems and to data driven control of switched and non-linear systems.

The workshop will conclude with a discussion of the feasibility of learning controllers from data using “control agnostic” Machine Learning based methods. With some simple examples we will illustrate the challenges faced these methods and argue that these methods are unlikely to succeed in moderately difficult cases.