# Manas Mejari

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## Education

2015–2018 **Ph.D.**, *IMT School for Advanced Studies Lucca* , Italy.
Major: Data-driven modeling and Control.

2011-2013 **Master of Technology**, *University of Mumbai*, India, *CGPA: 9.8/10*.
Major: Control Systems

2007-2011 **Bachelor of Engineering**, *University of Mumbai*, India, *Distinction*.
Major: Electronics and Telecommunications

## PhD thesis

title *Towards automated data-driven modeling of linear parameter-varying systems.*

supervisors Prof. Alberto Bemporad (IMT Lucca), Dr. Dario Piga (SUPSI, Switzerland)

## Master thesis

title *Robust model predictive control for unmanned aerial vehicles.*

supervisors Prof. Faruk Kazi (VJTI, Mumbai), Prof. N.M.Singh (VJTI, Mumbai)

## Research Experience

2019-present **Researcher**, *Dalle Molle Institute for Artificial Intelligence*, Lugano.
My work is focused on the theoretical development and applications of machine learning algorithms for data-driven identification of dynamical systems.

2018-2019 **Postdoctoral researcher**, *University of Lille*, Lille.
I was a post-doc researcher under the supervision of Dr. Mihaly Petreczky (CNRS, France). The study focused on the development of realization and identification algorithms for stochastic linear parameter-varying state-space models.

2013-2014 **Senior Research Fellow**, *VJTI*, Mumbai.
I worked as a senior research fellow in the Centre of Excellence in Complex and Non-linear Dynamical Systems (CoE-CNDS), VJTI, Mumbai on the following projects:

- A system theoretic approach for modeling complex process in collaboration with *Board of Research in Nuclear Sciences* (BRNS), BARC Mumbai.
- Energy Management of Hybrid power sources: a novel non-linear control strategy was developed for fuel cell super-capacitor hybrid power source to ensure optimal energy management and to withstand the effects of load variations.

## Acquisition of research funds

### Hasler Foundation

2022-2023 **INHALE**: Interpretable Neural networks for Hybrid dynamicAL sysEtems

- Role: Principal Investigator.
- Total budget: 50'000 CHF.

## Participation to research projects

### Hasler project

2021 **ARES**: AI for fluoREscence Spectroscopy in oil

- Goal: Development of artificial intelligence (AI) algorithms to estimate the oil quality from fluorescence spectrometry.
- Role: Main responsible for technical developments of AI algorithms.

### Innosuisse project

2020-2021 **ASCENDENT**: Active Spark Control in WEDM for improving Precision and Productivity

- Role: Main responsible for statistical data analysis and development of AI algorithms.

### Innosuisse project

2019-2021 **SLAM 4.0**: Smart LAser Manufacturing for precision industry 4.0

- Goal: Development of artificial intelligence (AI) algorithms for process optimization in laser micro-machining and laser micro processing.
- Role: Main responsible for development and testing of AI algorithms.

## Publications

### Journal articles

2022 M. Mejari, B. Mavkov, M. Forgione, D. Piga, "Direct identification of continuous-time LPV state-space models via an integral architecture", *Automatica*, Vol. 142, 110407, 2022.

2022 M. Mejari, D. Piga, "Maximum-a-posteriori estimation of LTI state-space models via efficient Monte-Carlo sampling", *ASME Letters in Dynamic Systems and Control*, Vol. 2, 2022.

2022 A. Gupta, M. Mejari, P. Falcone, D. Piga, "Computation of Parameter Dependent Robust Invariant Sets for LPV Models with Guaranteed Performance", *accepted Automatica.*

2021 D. Piga, M. Mejari, M. Forgione, "Learning dynamical systems from quantized observations: a Bayesian perspective", *IEEE Transactions on Automatic Control*, In press. ISSN 0018-9286.

2020 M. Mejari, V. Naik, D. Piga, A. Bemporad, "Identification of Hybrid and LPV Models via Piecewise Affine Regression using Mixed Integer Programming", **Special issue**, *International Journal of Robust and Nonlinear Control*, Vol. 30, 2020.

2020 M. Mejari, V. Breschi, and D. Piga, "Recursive bias-correction method for identification of piecewise affine output-error models," *IEEE Control Systems Letters*, 970 - 975, 2020.

2018 M. Mejari, D. Piga, and A. Bemporad, "A bias-correction method for closed-loop identification of linear parameter-varying systems," *Automatica*, 87:128- 141, 2018.

2017 S. Mane, M. Mejari, F. Kazi, and N. M. Singh, "Improving Lifetime of Fuel Cell in Hybrid Energy Management System by Lure–Lyapunov-Based Control Formulation," *IEEE Transactions on Industrial Electronics*, vol. 64, pp: 6671-6679.

### Conference proceedings

2022 Kronauer S., B. Mavkov, M. Mejari, D. Piga, F. Jaques, Rino DAmario, R. Di Campli, A. Nasciuti, "Data-driven statistical analysis for discharge position prediction on Wire EDM", *ISEM XXI - Procedia CIRP*, Zurich, Switzerland, 2022.

2021 M. Mejari, B. Mavkov, M. Forgione, D. Piga, "An integral architecture for identification of continuous-time state-space LPV models", *Proc. of the 4th IFAC Workshop on Linear Parameter Varying Systems*, Milan, Italy (virtual), 2021.

2021 D. Piga, M. Forgione, M. Mejari, "Deep learning with transfer functions: new applications in system identification", *Proc. of the 19th IFAC Symposium on System Identification*, Padova (virtual), Italy, 2021.

2020 M. Mejari, V. Breschi, D. Piga, "A Bias-Correction Approach for the Identification of Piecewise Affine Output-Error Models", *Proc. of the IFAC World Congress*, Berlin, Germany, 2020.

2020 V. Breschi, M. Mejari, "Shrinkage Strategies for Structure Selection and Identification of Piecewise Affine Models", *IEEE Conference on Decision and Control (CDC 2020), Jeju Island (virtual), Korea, 2020.*

2019 M. Mejari, M. Petreczky, "Consistent and computationally efficient estimation for stochastic LPV state-space models: realization based approach", *IEEE Conference on Decision and Control (CDC'19)*, Nice, France, 2019.

2019 M. Mejari, M. Petreczky, "Realization and identification algorithm for stochastic LPV state-space models with exogenous inputs", *IFAC Workshop on Linear Parameter-Varying Systems (LPVS'19)*, Eindhoven, The Netherlands.

2019 M. Mejari, D. Piga, R. Toth and A. Bemporad, "Kernelized identification of linear parameter-varying models with linear fractional representation," in *Proc. 18th European Control Conference (ECC)*, Naples, Italy, 2019, pp. 337-342.

2018 M. Mejari, V. Naik, D. Piga, A. Bemporad "Energy Disaggregation using Piecewise Affine Regression and Binary Quadratic Programming", **Invited Paper**, *Proc. of the IEEE Conference on Decision and Control*, Miami Beach, Florida, USA, 2018.

2018 M. Mejari, V. Naik, D. Piga, A. Bemporad, "Regularized Moving-Horizon PWA Regression for LPV System Identification", *Proc. of the 18th IFAC Symposium on System Identification*, Stockholm, Sweden, 2018.

2017 M. Mejari, D. Piga, and A. Bemporad, "LPV model-order selection from noise-corrupted output and scheduling signal measurements," in *Proc. 20th IFAC World Congress*, Toulouse, France, 2017, pp. 8685–8690.

2017 V.V. Naik, M. Mejari, D. Piga, and A. Bemporad, "Regularized moving-horizon PWA regression using mixed-integer quadratic programming," in *25th Mediterranean Control Conference*, Valletta, Malta, July 2017, pp. 1349–1354.

2016 M. Mejari, D. Piga, and A. Bemporad, "Regularized least square support vector machines for order and structure selection of LPV-ARX models," in *Proc. European Control Conf.*, Aalborg, Denmark, 2016, pp. 1649-1654.

2016 S. Petkar, S. Umbarkar, M. Mejari, N. M. Singh, F. Kazi, "Robust tube based MPC for PVTOL trajectory tracking using systems flatness property", *International Conference on Unmanned Aircraft Systems (ICUAS)*, USA.

2015 M. Mejari, S. Mane, F. Kazi, N. Singh, "Absolute stability of fuel cell-super capacitor hybrid power source using Lure Lyapunov formulation for load variations", *International Conf. on Industrial Instrumentation and Control* , India, 2015

2014 M. Mejari, A. Gupta, M. Datar, V. Ketkar, N. Singh, F. Kazi, "Stabilization of 2-D spider-crane with non-convex constraints using MPC ", in *Advances in Control and Optimization of Dynamical Systems*, Kanpur, India.

2014 M. Datar, V. Ketkar, M. Mejari, A. Gupta, N. Singh, F. Kazi, "Motion planning for the three wheel mobile robot using the reachable set computation under constraints", in *Advances in Control and Optimization of Dynamical Systems*, Kanpur, India.

2013 M. Mejari, A. Gupta, F. Kazi, N. Singh, "Trajectory tracking of quadrotor with bounded thrust using model predictive control", in *Proc. of Conference on Advances In Robotics (AIR'13)*, Pune, India.

2013 A. Gupta, M. Mejari, F. Kazi, N. Singh, "Nonlinear model predictive control of pvtol aircraft under state and input constraints", in *Proc. of Conference on Advances In Robotics (AIR'13)*, Pune, India.

## Teaching activities

2022 ***Vertical Domain Application in Key Areas***, Bachelor in Data Science and Artificial Intelligence, Scuola Universitaria Professionale della Svizzera Italiana (SUPSI). Lecturer and teaching assistant.

2014 ***Optimal Control Theory***, Master of Technologies in Control Systems, VJTI, University of Mumbai. Lecturer.

## Languages

English **Full professional proficiency**

Marathi **Native proficiency**

Hindi **Full professional proficiency**

Italian **Intermediate**

## Skills and Tools

languages MATLAB, Python, PyTorch

## Miscellaneous

- University gold medal in Mathematics (score: 100/100) (Academic year: 2007-08)
- Recipient, Sir JRD Tata scholarship for academic excellence. (2008-2009)
- Recipient, "EXCEL Ericsson Telecom Professional Certification" by Ericsson Inc.
- TOEFL: 104/120 (September 2013).
- Graduate Recored Exam (GRE): 318/340 (November 2013)