

DR. ALI HEBBAL

Data Scientist/ Research Engineer

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Hybrid Intelligence - Capgemini

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EDUCATION

- 10/2017-01/2021 : Ph.D. at ONERA - The French Aerospace Lab and Laboratoire CRISAL (Université de Lille). Deep Gaussian processes for analysis and optimization of complex systems.
- 09/2016-09/2017 : Master of Research in Computer Science, MODO (Modeling, Optimization, Decision, Organization), Université Paris Dauphine.
- 09/2013-07/2016 : Engineering Curriculum. Industrial engineering with a specialization in supply chain engineering, Ecole Mohammadia d'Ingénieurs (Morocco).

EXPERIENCES

Hybrid Intelligence - Capgemini, Paris (France)

03/2021-present

Research Engineer/ Consultant

Data-science and optimization consultant for Merck where the goal is to optimize the processes in bio-reactors. Developed and deployed an application for process optimization, resulting in enhanced efficiency.

Data-science and optimization consultant on the Airline Sciences project of Airbus where the goal is to develop an Airline digital twin. Created an exploration tool for layout cabin configuration. Improved efficiency and decision-making through accurate simulation and optimization.

Responsible for the data axis on the project DTXIA for automatic system architecture.

ONERA - The French Aerospace Lab, Paris (France)

10/2017-01/2021

PhD thesis

- Contributions on Bayesian optimization using Deep Gaussian Processes for non-stationary problems, multi-fidelity modeling with varying input space dimensions, and multi-objective Bayesian optimization with correlated objectives.

ONERA - The French Aerospace Lab, Paris (France)

03/2017-09/2017

MRes internship

- Elaboration of methodologies for multi-objective design optimization problems of aerospace vehicles. Application of multi-objective evolutionary algorithms and surrogate based multi-objective approaches.

Compagnie de Transports au Maroc (CTM), Casablanca (Morocco)

02/2016-07/2016

Engineering internship

- Optimization of the allocation of vehicles to journeys, using various operational research approaches. Results: -reduction of the number of vehicles used by 30. -automatic and monthly planning of the assignment.

AWARDS AND DISTINCTIONS

2020: Best Ph.D. thesis at ONERA - TIS Department.

Deep Gaussian processes for analysis and optimization of complex systems.

2016: Best final year thesis at Ecole Mohammadia d'Ingénieurs - Supply chain option.

Optimization of the allocation of vehicles to journeys at CTM.

RESEARCH INTERESTS

Bayesian deep learning • Gaussian processes • Bayesian optimization • Operational research • Quantum Computing (Exploring/Familiarizing)

TECHNICAL PROFICIENCIES

Machine learning	supervised learning: regression, classification, kernel methods, Bayesian modeling, Gaussian processes non-supervised learning: clustering approaches, dimensionality reduction (PCA, probabilistic PCA), generative models (variational auto-encoders), anomaly detection
Bayesian inference	variational inference, expectation propagation, Monte Carlo Markov Chain
Optimization	operational research, evolutionary algorithms, gradient optimization, Bayesian optimization, multi-objective optimization
Applied mathematics	linear algebra, multivariate calculus, probability and statistics, numerical methods
Statistical modeling	probability density estimation, time series analysis, hypothesis testing
Design engineering	uncertainty quantification, multi-fidelity analysis, experimental design

COMPUTER SKILLS

Programming Languages	Python, R, Comet, Visual Basic .NET
Machine Learning libraries	TensorFlow, Torch, Keras, Sci-kit learn
Data analysis and visualization	NumPy, Pandas, Matplotlib, Seaborn, Plotly
Web Development and applications	Flask, Dash, RESTful APIs, Docker
Optimization	Cplex, ORTools, SciPy
Cloud platforms	AWS, Microsoft Azure, GCP
Version control	Git
Quantum computing	Qiskit (Exploring/Familiarizing)

COMMUNICATION SKILLS

Disseminating	communicating results to specialist audiences (international conferences) and non-specialist (popular science events)
Teaching	advanced training courses for engineers on optimization and also lectures on machine learning for Master students
Languages	english (fluent), french (fluent), arabic (mothertongue).

SOFT SKILLS

Analytical problem solving • Adaptability • Teamwork • Innovative thinking • Business acumen

ONLINE PRESENCE

Personal Website:	https://hebbalali.github.io/Hebbalali/
LinkedIn:	https://www.linkedin.com/in/ali-hebbal-625498104/
Scholar:	https://scholar.google.com/citations?user=llZT3L4AAAAJ
GitHub:	https://github.com/Hebbalali/

TEACHING AND TRAINING ACTIVITIES

- 2019-2021: Teaching assistant and course designer of the course **Machine Learning and Optimization** and lab sessions using *Python* held at Université de Lille for MRes 2 by Prof. Nouredine Melab.
- October 2019: Trainer for the training **Estimation and Optimization of Complex Systems** and lab sessions using *Python* held at EUROSAT Toulouse by Prof. Jérôme Morio.
- 2018-2019: Teaching assistant of the course **Probability and Statistics** held at Université de Versailles Saint-Quentin-en-Yvelines for L2 by Prof. Brigitte Chauvin.

PUBLICATIONS

Journal papers:

- Hebbal, A., Balesdent, M., Brevault, L., Melab, N., Talbi, E. G. (2022). Deep Gaussian process for multi-objective Bayesian optimization. *Optimization and Engineering*, 1-40.
- Hebbal, A., Brevault, L., Balesdent, M., Talbi, E. G., Melab, N. (2021). Multi-fidelity modeling with different input domain definitions using deep Gaussian processes. *Structural and Multidisciplinary Optimization*, 63, 2267-2288.
- Hebbal, A., Brevault, L., Balesdent, M., Talbi, E., and Melab, N., Bayesian optimization using deep Gaussian processes with applications to aerospace system design. *Optim Eng* (2020). <https://doi.org/10.1007/s11081-020-09517-8>
- Brevault, L., Balesdent, M., and Hebbal, A. (2020). Multi-objective multidisciplinary design optimization approach for partially reusable launch vehicle design. *Journal of Spacecraft and Rockets*, 57(2), 373-390.

Book chapters:

- Brevault, L., Pelamatti, J., Hebbal, A., Balesdent, M., Talbi, E. G., and Melab, N. (2020). MDO Related Issues : Multi-Objective and Mixed Continuous/Discrete Optimization. In *Aerospace System Analysis and Optimization in Uncertainty* (pp. 321-358). Springer, Cham.
- Brevault, L., Balesdent, M., and Hebbal, A. (2020). Expendable and Reusable Launch Vehicle Design. In *Aerospace System Analysis and Optimization in Uncertainty* (pp. 421-476). Springer, Cham.

Communications:

- Hebbal, A., Is the 21st century the promised Bayesian century, Hybrid Intelligence Conference, Birmingham , 03/2023.
- Hebbal, A., Brevault, L., Balesdent, M., Talbi, E., and Melab, N., Multi-fidelity modeling using DGPs : Improvements and a generalization to varying input space dimensions at 4th workshop on Bayesian Deep Learning (NeurIPS 2019), Vancouver, Canada.
- Hebbal, A., Brevault, L., Balesdent, M., Talbi, E., and Melab, N., A Deep Gaussian Process based model for Multi-Objective optimization at The 13th International Conference on Multiple Objective Programming and Goal Programming (MOPGP) 2019.
- Hebbal, A., Brevault, L., Balesdent, M., Talbi, E., and Melab, N., Multi-objective optimization using Deep Gaussian Processes : Application to Aerospace Vehicle Design, AIAA SciTech 2019.
- Hebbal, A., Brevault, L., Balesdent, M., Talbi, E., and Melab, N., Efficient Global Optimization with Deep Gaussian Processes,” Evolutionary Computation (CEC), 2018 IEEE Congress