

# GUILLAUME PEREZ

## PROFICIENT :

Algorithms & Data Structures, Optimization (discrete / numerical), Operational Research, (DEEP) Machine Learning, C++, C, Python (Numpy, Scipy, Tensorflow, Keras), Java.

## FAMILLIAR :

Matlab, PyTorch, R.

## LINKS

[Github](#)

[DBLP](#)

[Google Scholar](#)

[MY researches](#)

## CONTACT ME

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## EDUCATION

- **Postdoctoral position - Artificial Intelligence - 2017 - Now**  
Cornell University, USA  
Development of methods linking together advantages of machine learning and constraint optimization. Applications in materials science, biology and ecology.
- **PhD in computer science - Constraint Programming - 2014/2017**  
University Nice Sophia Antipolis, France  
Artificial Intelligence - Operational Research.
- **Master's degree in computer science - 2012/2014**  
University Nice Sophia Antipolis, France  
Promotion leader.

## EXPERIENCE

- **Teaching - 2013/2017**  
University Nice Sophia Antipolis, Sophia-Antipolis, France.  
Taught C++, PHP/JS, R HTML/CSS, and game theory.  
Taught Python & JEE at Orange/Softteam.
- **Three Constraint programming internships - 2012/2014**  
I3S laboratory, Sophia-Antipolis, France.  
Designed and developed compressing data structures algorithms for constraint solvers.

## LANGUAGES

**French**

**English**

**Spanish**

## COMPUTER SCIENCE PROJECTS

### C++

#### C++

**NMFSolver**: A non-negative matrix factorization (NMF) solver.

#### C++

**MCTS-RPG**: A Monte-Carlo driven tree search combined with constrained NMF solver.

#### C++ - JAVA - SCALA

Constraint implementation in CP solvers **OR-TOOLS**, **CHOCO**, **OscAR**.

#### C++

**LibGraph**: A game engine including graphics and controls for my C++ students.

#### C++

**TicTacToe**: A game using LibGraph for my AI students.

### C/PYTHON

#### PYTHON

Active learning based agents for **segmentation** of sea grass images (Adversarial and complimentary).

#### PYTHON

Neural network design (TensorFlow/ Keras) for **Crystal structure prediction** and autonomous experiments.

#### PYTHON

Implementation of the Multi-Armed Bandit for algorithm selection on **GitHub**.

#### C/PYTHON

Weighted Projected gradient descent for **Compressed sensing** and data reconstruction.

2018

- Objective as a Feature for Robust Search Strategies

Palmieri A. and Perez G.,  
CP. Lille, France (A)

- Extending the capacity of 1/f Noise Generation.

Perez G., Rappazzo B., Gomes C.,  
CP. Lille, France (A)

- Relaxed Projection Method for Constrained Non-negative Matrix Factorization (shortened title).

Bai J., Ament S., Perez G et al.  
CPAIOR, Delft, The Netherlands. (B)

- Parallel Algorithms for Operations on Multi-valued Decision Diagrams.

Perez G. and Régim J-C.  
AAAI, New Orleans, USA. (A\*)

2017

- MDDs : Sampling and Probability Constraints.

Perez G. and Régim J-C.  
CP. Melbourne, Australia. (A)

- Soft and Cost MDD Propagators.

Perez G. and Régim J-C.  
AAAI. San Francisco, USA (A\*)

- MDDs are Efficient Modeling Tools : An Application to some Statistical Constraints.

Perez G. and Régim J-C.  
CPAIOR. Padova, Italia. (B)

- Filtered bucket-clustering method for Projection onto the Simplex and the  $l_1$  ball.

Perez G. M Barlaud et al, GRETSI.  
Juan-les-Pins, France. (-)

2016

- Enforcing Structure on Temporal Sequences : The Allen Constraint.

Roy P., Perez G., et al.  
CP. Toulouse, France. (A)

- Constructions and In-Place Operations for MDDs Based Constraints.

Perez G. and Régim J-C.  
CPAIOR. Banff, Canada. (B)

- Compact-Table : Efficiently Filtering Table Constraints with Reversible Sparse Bit-Sets.

Demeulenaere J., Hartert R., Lecoutre C., Perez G., et al.  
CP. Toulouse, France. (A)

2015

- Efficient operations on MDDs for building constraint programming models.

Perez G. and Régim J-C.  
IJCAI. Buenos aires, Argentina. (A\*)

2014

- Improving GAC-4 for Table and MDD based constraints.

Perez G. and Régim J-C.  
CP. Lyon, France. (A)

Designed and developed efficient algorithms for **data compression** based on Multi-valued **Decision Diagrams (MDDs)**. Designed **graph-based manipulation algorithms** with low **complexity** specialized for large scale data set process in **parallel**. Efficient integration of MDDs and table into **constraint programming solvers**. Collaboration I3S, Google.

## MUSIC TEXT GENERATION

Modelization of a text and music generation problem under **constraints** using MDDs and **dynamic programming**. Designed algorithms preventing **plagiarism**. Designed a model for music generation with **temporal synchronization** between instruments using **Markov processes**. Designed a **temporal constraint** in constraint programming based on the **Allen algebra**. Designed efficient MDDs' **sampling** algorithms with respect to **probabilistic** distributions. Collaboration I3S, Sony.

## GEOMODELING RESERVOIR

Modelization of the **deconvolution** of raw data under **probabilistic** domain specific constraints. Designed an integration of **statistical constraints** based on **Markov processes** and **probability mass functions** into constraint programming solvers.

## MATERIALS DISCOVERY DATA SCIENCE

Designed and developed a **relaxed projection** method allowing to efficiently solve the convolutional **non-negative matrix factorization (NMF)** under constraints. Designed a **linear time** complexity projection operator onto the **simplex or  $l_1$  ball**. Defined an efficient representation of **combinatorial constraints** in numerical optimization, such as NMF, and designed a dual method for **solving** problems containing such constraints. Application in materials science for the discovery of new materials using **X-ray diffraction**. Cornell/Caltech/Toyota.

## IMAGE PROCESSING NEURAL NETWORK

Designed and developed a framework that allows **domain experts**, such as biologist, to quickly train an **image segmentation** classifier, namely a **convolutional neural network**. This is done by designing **reinforcement agents** for active learning with orthogonal behaviour. Collaboration Cornell CS/Biology depts.

## TREE SEARCH LEARNING

Designed a **feature extraction** function for **combinatorial optimization** problems based on the objective. Designed a generic **hybrid** combination of search strategies. Designed and developed a **reinforcement learning** based search strategy selection **online** for the embarrassingly **parallel search** in CP solvers. Collaboration Huawei.