# [Domingo Mery](#)

## BALU: A Matlab toolbox for computer vision, pattern recognition and image processing

By Domingo Mery
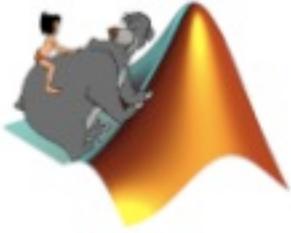


Balu Toolbox Matlab

**Citing**

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# Welcome to Balu Toolbox Matlab

## For computer vision, pattern recognition and image processing...

Considerable research efforts in computer vision applied to several areas have been developed in the last years, however,

they have been concentrated on using or developing tailored methods based on visual features that are able to solve a specific task. Nevertheless, today's computer capabilities are giving us new ways to solve complex computer vision problems. Now, we are able to extract, process and test in the same time more image features and classifiers than before. Using this general methodology that designs a computer vision system automatically, i.e., it finds -without human interaction- the features and the classifiers for a given application avoiding the classical trial and error methodology commonly used by human designers. The key idea of the proposed methodology is to select from a large set of features and a bank of classifiers those features and classifiers that achieve the highest performance. We tested in many applications yielding good classification performance of 96% or more in every case.

**HIGHLIGHTS:**

- More than 200 functions for image processing, feature extraction, feature transformation, feature analysis, feature selection, data selection and generation, classification, clustering, performance evaluacion, multiple-view analysis, image sequence processing and tracking with geometrical constraints, see examples.

- Each function has a "help" with one or more examples (see the code of knn classifier as example).

- It includes a general framework that designs a computer vision system automatically in only 12 lines code, or using 2 graphic user interfaces (for feature extraction and for feature and classifier selection). It finds (without human interaction) the features and the classifiers for a given visual task avoiding the classical trial and error framework commonly used by human designers.
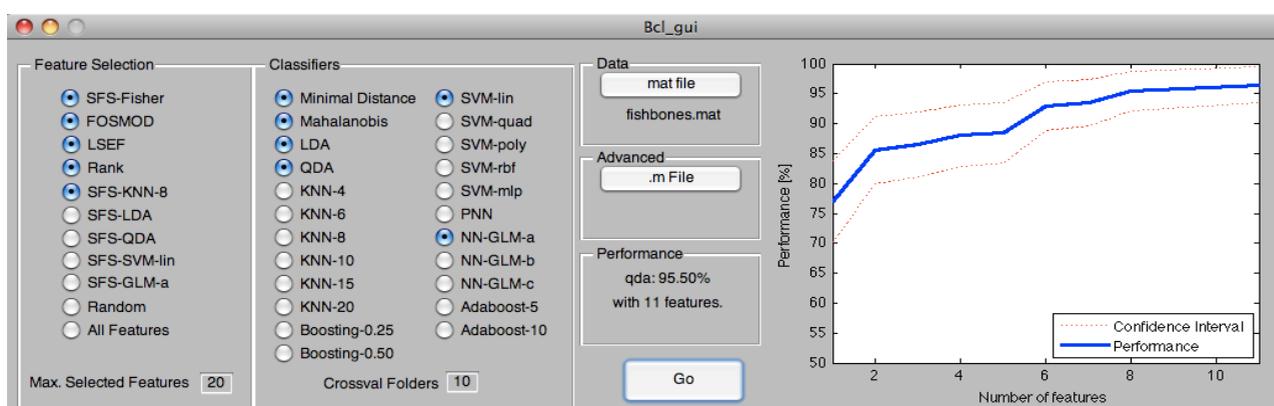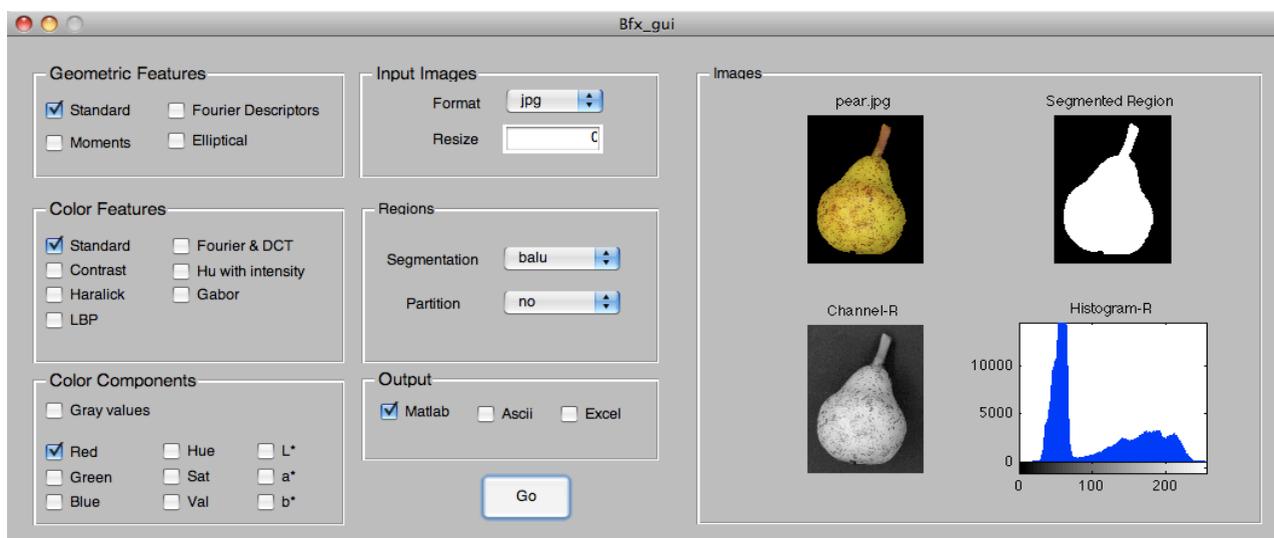


[ Feature Extraction GUI and Feature and Classifier Selection GUI ]

- It is really easy to include to our framework other functions, e.g. features or classifiers, see examples.

- It includes a new graphic user interface for detection using multiple view analysis (see video).

- We tested our framework on different food quality evaluation problems yielding a classification performance of 96% or more in every case (see application papers below).

**DOWNLOAD:**

Balu Toolbox is available here under this license (for non-commercial purposes).

**RELATED PUBLICATIONS:**

**> Overview**

- Mery, D.; Pedreschi, F.; Soto, A.: Automated Design of a Computer Vision System for Visual Food Quality Evaluation. International Journal of Food and Bioprocess Technology (accepted Jul. 2012). [ PDF ]

**> Image processing**

- Mery, D.; Pedreschi, F. (2005): Segmentation of Colour Food Images using a Robust Algorithm. Journal of Food Engineering, 66(3):353-360. [ PDF ]

**> Color conversion**

- León, K.; Mery, D.; Pedreschi, F., León, J. (2006): Color Measurements in L*a*b* units from RGB Digital Images.. Food Research International 39(10):1084-1091. [ PDF ]

**> Feature extraction**

- Mery, D. (2003): Crossing line profile: a new approach to detecting defects in aluminium castings. In Proceedings of the Scandinavian Conference on Image Analysis 2003 (SCIA 2003), June 29 – July 02, Göteborg. [ PDF ]

**> Feature and classifier selection**

- Mery, D., Soto, A. (2008): Features: The more the better. The 7th WSEAS International Conference on Signal Processing, Computational Geometry and Artificial Vision (ISCGAV-2008), Rodos Island, Greece, August 20-22. [ PDF ]

**> Multiple-view**

- Mery, D. (2011): Automated Detection in Complex Objects using a Tracking Algorithm in Multiple X-ray Views. Proceedings of the 8th IEEE Workshop on Object Tracking and Classification Beyond the Visible Spectrum (OTCBVS 2011), in Conjunction with Computer Vision and Pattern Recognition (CVPR 2011). Colorado Spring, USA. [ PDF ]

- Mery, D. (2003): Exploiting Multiple View X-Ray Testing: Part I- Theory. Materials Evaluation, 61(11):1226-1233. [ PDF ]

- Mery, D.; Ochoa, F.; Vidal, R. (2004): Tracking of points in a calibrated and noisy image sequence. Lecture Notes in Computer Science, LNCS 3211: 647-654. [ PDF ]

**> Applications in food industry**

- Mery, D.; Lillo, I.; Loebel, H.; Riffo, V.; Soto, A.; Cipriano, A.; Aguilera, J.M. (2011): Automated Fish Bone Detection using X-ray Testing. Journal of Food Engineering, 105(2011):485-492. [ PDF ]

- Mery, D.; Chanona-Perez, J.; Soto, A.; Aguilera, J.M.; Cipriano, A.; Velez-Riverab, N; Arzate-Vazquez, I, Gutierrez–Lopez, G. (2010): Quality Classification of Corn Tortillas using Computer Vision. Journal of Food Engineering 101(4):357-364. [ PDF ]

**> Applications in nondestructive testing**

- Mery, D. (2014): Inspection of Complex Objects Using Multiple X-ray Views. IEEE Transactions on Mechatronics (accepted March 2014). [ PDF ]

- Mery, D. (2011): Automated Detection of Welding Discontinuities without Segmentation. Materials Evaluation, June-2011:657-663. [ PDF ]

- Mery, D.; Berti, .M.A. (2003): Automatic Detection of Welding Defects using Texture Features. Insight, 45(10):676-

681. [ PDF ]

- Mery, D.; Filbert, D. (2002): Automated Flaw Detection in Aluminum Castings Based on The Tracking of Potential Defects in a Radioscopic Image Sequence. IEEE Transactions on Robotics and Automation, 18(6):890-901. [ PDF ]

- Mery, D.; da Silva, R.R.; Caloba, L.P.; Rebello, J.M.A. (2003): Pattern Recognition in the Automatic Inspection of Aluminium Castings. Insight, 45(7):431-439. [ PDF ]