Jaume Amores

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SUMMARY

- More than 20 years of experience in research and development of data science and machine learning solutions, both in academic and industrial environments. More than 15 years of experience after completion of Ph.D.

- Technical team lead of various interdisciplinary teams (5-10 people including data scientists and software engineers). Management of video analytics capability in UTRC-Ireland: roadmap, liason with universities and hiring.

- Large experience in intellectual property generation, proposal writing and software development. • Ph.D in Machine Learning and Computer vision. Experience as supervisor of Ph.D. students.

WORK EXPERIENCE

Principal Data Scientist, Johnson Controls — Apr 2018 - present

– Technical team leader and individual contributor of multiple AI projects: fault detection, energy optimization, video analytics, survival analysis, multi-variate time series.

– Developed solutions that went into production and generated abundant intellectual property.

– Worked on ML modelling, MLOps pipelines and Software Engineering.

– Generated abundant Intellectual Property in the form of patents and publications.

Staff Research Engineer, United Technologies Corporation — Mar 2017 - Mar 2018

– Technical leadership and coordination of Data Science projects in interdisciplinary teams (typical team sizes: 5 to 10 people coming from software engineering, data science and video analytics disciplines)

– Lead video analytics capability in UTRC-Ireland: roadmap, liason with universities and hiring.

– Main developer in multiple data Science systems, using python, java and C++.

Senior Research Engineer, United Technologies Corporation — Sept 2013 - Mar 2017

– Main developer in multiple data Science systems, using python, java and C++.

– Principal Investigator and Technical team lead.

– Intellectual Property generation, market analysis and customer value proposition in multiple innovation pipelines, European Project proposal writing.

Senior Researcher, Computer Vision Center — Sept 2009 - Sept 2013

– Design and development of novel methods in Machine Learning and Video Analytics.

– Supervision of Ph.D. students in Computer Vision and Machine Learning.

Postdoctoral Researcher, INRIA - Paris — Mar 2006 - Mar 2008

– Design and development of novel methods in Machine Learning and Video Analytics.

– Supervision of M.Sc. student in Computer Vision and Machine Learning.

Research assistant, Computer Vision Center — Sept 2001 - Sept 2005

– Research and Development on Computer Vision and Machine Learning.

– Implementation of novel methods in C++ and Matlab.

EDUCATION

2006   Ph.D. in Machine Learning and Computer Vision at **Universitat Autonoma de Barcelona**
2003   M.Sc. in Machine Learning and Computer Vision at **Universitat Autonoma de Barcelona**
2000   B.Sc. in Computer Science **Universitat de Valencia**

PROGRAMMING LANGUAGES, FRAMEWORKS AND TOOLS

- **Programming Languages**: **Python**: 8 years, **C++**: 7 years, **C**: 6 years, **Java**: 2 years, **Matlab**: 10 years

- **Deep Learning Frameworks**: **Tensorflow**: low-level and high-level (**Keras**): 7 years, **Pytorch**: 1 year, **FastaAI**: less than 1 year.

- **MLOPs tools**: **DVC**, **MLFlow**, **MetaFlow**

- **Documentation tools**: Sphinx, Doxygen, nbdev, quarto

- **Reproducibility**: Docker

- **CI/CD**: GitHub Actions, **Unit tests**: pytest

- **Package management and building**: conda/mamba, pip, CMake

- **Other**: git, gcc, gdb, Azure (VMs, Blob Storage, Container Registry, and others), Linux and Windows OS

PROJECTS

Fault Detection and Diagnosis

Detecting faulty state of machines based on multi-variate time-series analysis and Deep Learning. Modelling techniques included: 1) Variational AutoEncoders and LSTM for anomaly detection, and 2) using predictive models to analyze the discrepancy of current observations with respect to what the model predict would happen under normal conditions. The latter included use of change-point detection techniques and statistical analysis. Implementation in python.

Machine Health Analysis based on Supervised Learning

Given a large repository of human-annotated data in frequency-domain (Fourier transformed), I used different Neural Network architectures and traditional models (e.g., XGBoost) to detect problematic states of the machine. Implementation in python.

Energy Optimization

Used Deep Reinforcement Learning and Model-Predictive Control (MPC) to provide optimal HVAC set-point schedules that optimize energy cost while maintaining occupant comfort. Solution published in journal paper. Implementation in python.

Survival Analysis

Used traditional Survival Models such as parametric Weibull models and semi-parameteric Cox models, together with recent advances based on Deep Learning, to analyze the survival probability of different types of devices across time. Implementation in python.

Person Search across Multi-Camera CCTV Footage

This is a Video Analytics project where I developed Person ReIdentification solutions based on traditional techniques (e.g., LOMO visual signatures with different types of distance functions), very fast Deep Learning techniques (based on group convolutions, e.g., using ShuffleNet and SqueezeNet), person tracking, and frame clustering. Implementation in python.

Person Counting using low-resolution Infrared Cameras

Developed tracking techniques for counting people in different parts of the building based on a network of low-resolution infrared cameras. Implementation in C++ and python.

Gesture Recognition with Mobile Phone.

Using the accelerometer as sensor, recognize gestures performed by human using mobile phone. Implementation in python.

Data-driven optimization of distance functions.

Developed novel methods for estimating optimal distance functions for K-Nearest Neighbors. Published in PAMI 2008 and others. Implementation in Matlab and C.

Pedestrian detection.

Developed novel pedestrian detection system based on random forest ensembles of part-based detectors. Published in International Conference on Computer Vision (ICCV). Implementation in C++.

Image Classification and Retrieval.

Designed and developed an image classification system based on new image descriptors and machine learning algorithms. Published in PAMI 2007 and others. Implementation in C (mainly) and part in Matlab.

Video Compression.

Intelligent video compression based on object segmentation and optical flow. Published in SNRFAI 2001. Implementation in C.

Medical Image Registration and Retrieval.

Image Registration system for medical images. Published in Pattern Recognition Letters and others. Implementation in C and Matlab.

PUBLICATIONS

Journals

Jiang, Zhanhong, Michael J Risbeck, Vish Ramamurti, Sugumar Murugesan, Jaume Amores, Chenlu Zhang, Young M Lee, and Kirk H Drees (2021). "Building HVAC control with reinforcement learning for reduction of energy cost and demand charge". In: *Energy and Buildings* 239, p. 110833.

Ruiz, Idoia, Bogdan Raducanu, Rakesh Mehta, and Jaume Amores (2020). "Optimizing speed/accuracy trade-off for person re-identification via knowledge distillation". In: *Engineering Applications of Artificial Intelligence* 87, p. 103309.

Mehta, Rakesh and Jaume Amores (2018). "Improving detection speed in video by exploiting frame correlation". In: *Pattern Recognition Letters* 112, pp. 303–309.

González, Alejandro, David Vázquez, Antonio M López, and Jaume Amores (2016). "On-board object detection: Multicue, multimodal, and multiview random forest of local experts". In: *IEEE transactions on cybernetics* 47.11, pp. 3980–3990.

Amores, Jaume (2015). "MILDE: Multiple instance learning by discriminative embedding". In: *Knowledge and Information Systems* 42.2, pp. 381–407.

Mar'ın, Javier, David Vázquez, Antonio M López, Jaume Amores, and Ludmila I Kuncheva (2013). "Occlusion handling via random subspace classifiers for human detection". In: *IEEE transactions on cybernetics* 44.3, pp. 342–354.

Amores, Jaume (2013). "Multiple instance classification: Review, taxonomy and comparative study". In: *Artificial intelligence* 201, pp. 81–105.

Yu, Jie, Jaume Amores, Nicu Sebe, Petia Radeva, and Qi Tian (2008). "Distance learning for similarity estimation". In: *IEEE transactions on pattern analysis and machine intelligence* 30.3, pp. 451–462.

Amores, Jaume, Nicu Sebe, and Petia Radeva (2007). "Context-based object-class recognition and retrieval by generalized correlograms". In: *IEEE Transactions on Pattern Analysis and Machine Intelligence* 29.10, pp. 1818–1833.

Amores, Jaume, Nicu Sebe, and Petia Radeva (2006). "Boosting the distance estimation: Application to the k-nearest neighbor classifier". In: *Pattern Recognition Letters* 27.3, pp. 201–209.

Yu, Jie, Jaume Amores, Nicu Sebe, Qi Tian, et al. (2006). "Ranking metrics and evaluation measures". In: *Advances in Imaging and Electron Physics* 144, pp. 291–316.

Amores, Jaume and P Radeva (2005). "Registration and retrieval of highly elastic bodies using contextual information". In: *Pattern recognition letters* 26.11, pp. 1720–1731.

Amores, Jaume and Petia Radeva (2005a). "Retrieval of IVUS images using contextual information and elastic matching". In: *International journal of intelligent systems* 20.5, pp. 541–559.

Amores, Jaume and Petia Radeva (2005b). "Medical image retrieval based on plaque appearance and image registration." In: *Studies in Health Technology and Informatics* 113, pp. 26–54.

Proceedings

González, Alejandro, Gabriel Villalonga, Jiaolong Xu, David Vázquez, Jaume Amores, and Antonio M López (2015). "Multiview random forest of local experts combining rgb and lidar data for pedestrian detection". In: *2015 IEEE Intelligent Vehicles Symposium (IV)*. IEEE, pp. 356–361.

Marin, Javier, David Vázquez, Antonio M López, Jaume Amores, and Bastian Leibe (2013). "Random forests of local experts for pedestrian detection". In: *Proceedings of the IEEE international conference on computer vision*, pp. 2592–2599.

González, Alejandro, David Vázquez, Sebastian Ramos, Antonio M López, and Jaume Amores (2015). "Spatiotemporal stacked sequential learning for pedestrian detection". In: *Iberian Conference on Pattern Recognition and Image Analysis*. Springer, pp. 3–12.

Amores, Jaume (2010). "Vocabulary-based approaches for multiple-instance data: a comparative study". In: *2010 20th International Conference on Pattern Recognition*. IEEE, pp. 4246–4250.

Amores, Jaume, David Gerónimo, and Antonio López (n.d.). "Multiple Instance and Active Learning for weakly-supervised object-class segmentation". In: ().

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Yu, Jie, Jaume Amores, Nicu Sebe, and Qi Tian (2006). "A new study on distance metrics as similarity measurement". In: *2006 IEEE International Conference on Multimedia and Expo*. IEEE, pp. 533–536.

Yu, Jie, Qi Tian, Jaume Amores, and Nicu Sebe (2006). "Toward robust distance metric analysis for similarity estimation". In: *2006 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'06)*. Vol. 1. IEEE, pp. 316–322.

Amores, Jaume, Nicu Sebe, and Petia Radeva (2005a). "Fast spatial pattern discovery integrating boosting with constellations of contextual descriptors". In: *2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR'05)*. Vol. 2. IEEE, pp. 769–774.

Amores, Jaume, Nicu Sebe, and Petia Radeva (2005b). "Efficient object-class recognition by boosting contextual information". In: *Iberian Conference on Pattern Recognition and Image Analysis*. Springer, pp. 28–35.

Amores, Jaume, Nicu Sebe, Petia Radeva, Theo Gevers, and Arnold Smeulders (2004). "Boosting contextual information in content-based image retrieval". In: *Proceedings of the 6th ACM SIGMM international workshop on Multimedia information retrieval*, pp. 31–38.

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Amores, Jaume and Petia Radeva (2003b). "Non-rigid registration of vessel structures in IVUS images". In: *Iberian Conference on Pattern Recognition and Image Analysis*. Springer, pp. 45–52.

Amores, J, J Gutiérrezt, I Epifaniof, J Malos, and FJ Ferrit (2001). "using perceptually weighted quantization". In: *Pattern Recognition and Image Analysis* 6-7, p. 31.

Patents

Amores, Jaume, Young M Lee, Ian C Westmacott, Yohay Falik, and Amit Rozner (2022). *Hierarchical sampling for object identification.* US Patent 11,423,248.

Falik, Yohay, Amit Rozner, Jaume Amores, Lior Kirsch, and Young M Lee (2022). *Classification and re-identification.* US Patent 17/061,110.

Yous, Sofiane, Keith J Power, Kishore K Reddy, Alan Matthew Finn, Jaume Amores, Zhen Jia, and Yanzhi Chen (2022). *Video searching using multiple query terms.* US Patent 11,294,957.

Amores, Jaume, Young M Lee, Sugumar Murugesan, and Steven R Vitullo (2021a). *Robust fault detection and diagnosis by constructing an ensemble of detectors.* US Patent App. 16/725,644.

Amores, Jaume, Young M Lee, Sugumar Murugesan, and Steven R Vitullo (2021b). *Building system with early fault detection.* US Patent App. 16/725,952.

Murugesan, Sugumar, Young M Lee, and Jaume Amores Llopis (2021). *Building management system with dynamic energy prediction model updates.* US Patent 11,188,039.

Amores, Jaume, Young M Lee, Sugumar Murugesan, and Steven R Vitullo (2021c). *Building system with adaptive fault detection.* US Patent App. 16/725,940.

Lee, Young M, Sugumar Murugesan, ZhongYi Jin, Jaume Amores, Kelsey Carle Schuster, Steven R Vitullo, and Henan Wang (2019). *Adaptive training and deployment of single chiller and clustered chiller fault detection models for connected chillers.* US Patent App. 16/198,456.

Murugesan, Sugumar, Young M Lee, ZhongYi Jin, and Jaume Amores (2019). *Adaptive selection of machine learning/deep learning model with optimal hyper-parameters for anomaly detection of connected chillers.* US Patent App. 16/198,416.

Murugesan, Sugumar, Young M Lee, Zhong Yi Jin, and Jaume Amores (2019). *Automatic threshold selection of maching learning/deep learning model for anomaly detection of connected chillers.* US Patent App. 16/198,377.

Amores-Llopis, Jaume, Alan Matthew Finn, and Arthur Hsu (2018). *System and method for distant gesture-based control using a network of sensors across the building.* US Patent 10,095,315.