

# David Picard

## Senior Research Scientist

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## Personal

- Birth: 1st October 1982 in Leipzig (Germany)
- Citizenship: French
- Languages: Fluent in English, German and French

## Research Interests

- Machine Learning, Distributed Learning, Deep Learning, Kernel Methods
- Computer Vision, Image and Video Processing

## Research Experience

- Sep. 2019 -: **Senior Research Scientist** at IMAGINE, École des Ponts ParisTech, Champs-sur-Marne, France.
- Sep. 2017 - Sep. 2018 : **Délégation CNRS** at LIP6, Sorbonne Université
- Sep. 2010 - Aug. 2019: **Maître de conférences** (Associate professor) at ENSEA Engineering Graduate School (École Nationale Supérieure de L'Électronique et de ses Applications), Cergy, France.
- Jan. 2009 - Sep. 2010 : **Post-doctoral** researcher at LIP6, Université Pierre et Marie Curie, Paris, France.
- Sep. 2005 - Dec. 2008 : **Ph.D. in Signal and Image Processing**, Université de Cergy-Pontoise, France.

## Education

- 2017, **HDR in Signal and Image Processing**, Université de Cergy-Pontoise (France): "*Contributions à l'apprentissage de représentations pour l'indexation basée sur le contenu visuel*" (*Representation Learning for Visual Content Indexing*)
- 2008, **Ph.D. in Signal and Image Processing**, Université de Cergy-Pontoise (France): "*Recherche d'images sur un réseau à l'aide d'un système multi-agents*" ("*Distributed Image Retrieval using Multi-Agent Systems*"), Advisors: Prof. Arnaud Revel and Prof. Matthieu Cord.
- 2005, **Diplôme d'ingénieur en Électronique, option Informatique et Systèmes** (MSE in Electrical Engineering), ENSEA Engineering Graduate School (FRANCE).
- 2005, **M.Sc. in Signal and Image Processing**, Université de Cergy-Pontoise (France).

## Professional Services

### *Local Service*

- **Deputy managing director** of IMAGINE at École des Ponts

- **Head of Computer Science Department** of the ENSEA Engineering Graduate School (Feb. 2015 - Sep. 2017).
- Member of Scientific Council of the ENSEA Engineering Graduate School (Oct. 2011 - Dec. 2015).
- Member of Technical Council of the ENSEA Engineering Graduate School (Oct. 2011 - Dec. 2014).
- ICT Advisor at the ENSEA Engineering Graduate School (Sep. 2010 - Sep. 2017).

### *Conference Organization*

- Organizer of ICIIP 2018 special session on "Image processing for cultural heritage", Oct. 2018,
- Co-organizer of IPTA 2015 Special session on "Image processing for cultural heritage", Nov. 2015, Orléans, France.
- Organizer of GRETSI 2015 Special session on "Signal and image processing for cultural heritage", Sept. 2015, Lyon, France.
- Co-organizer of GeoDiff Workshop, Feb. 2013, Barcelona, Spain.
- Organizer of ESANN 2013 Special session on Machine Learning and Multimedia, Apr. 2013, Brugge, Belgium.

### *Program Committee*

- Technical Program Committee of CVPR 2016-2022.
- Technical Program Committee of ICCV 2019-2021, AAAI 2020, ECCV 2020, NeurIPS 2020-2021.
- Technical Program Committee of ESANN 2014 - 2018, Brugge, Belgium.
- Technical Program Committee of 3DOR 2014, 2015.

### *Reviewer activities*

- Reviewer for IEEE Trans. on Pattern Analysis and Machine Intelligence, IEEE Trans. on Multimedia, IEEE Trans. on Robotics, IEEE Signal Processing Letters, Journal of Machine Learning Research, Neurocomputing, Computer Vision and Image Understanding, Machine Vision and Applications, Neural Processing Letters, Multimedia Tools and Applications...

## Teaching Experience

- Machine Learning: Artificial Neural Networks, Kernel Methods, Support Vectors Machines.
- Image and Video Processing: Basics, 3D, Multimedia Indexing and Retrieval.
- Computer Science: Operating Systems, C/C++ and Java programming languages, Android.

## Advising

### *Ph.D.*

- Nicolas Dufour, "Deep Learning for joint dynamic scene understanding and synthesis", 2021-2024, with V. Kalegeiton at École Polytechnique and V. Lepetit at École des Ponts.
- Grégoire Petit, "Deep Learning with dynamic data", 2021-2024, co-advised with B. Delezoide and A. Popescu at CEA.
- Thibaut Issenhuth, "Interactive generative models", 2020-2023, co-advised with J. Mary at Criteo.
- Yue Zhu, "3D human body pose estimation in work environments", 2020 - 2023, with Ergonova.

- Valérie Lee-Gouet, "Artificial intelligence for conservation: case study at the French National Archives", 2020-2023, co-advised with J. Longhi at CY Paris University and C. Simon-Chane at ENSEA.
- Victor Besnier, "Safety in machine learning models", 2019-2022, co-advised with A. Briot at Valeo.
- Thomas Luka, "Cross-Modal Representation learning", 2019-2023.

Past:

- Marie-Morganne Paumard, "Deep Learning for 3D fragments re-assembly", co-advised with H. Tabia at Univ. Paris Saclay, 2017-2020.
- Pierre Jacob, "Automatic Labelling for Image Collections Exploration", co-advised with A. Histace at ENSEA, 2017 - 2020.
- Diogo Luvizon, "Activity recognition and classification from 3D videos", co-advised with H. Tabia at ENSEA, 2015-2019.
- Jérôme Fellus, "Distributed Image Retrieval in Decentralized Networks", co-advised with P.-H. Gosselin at ENSEA, 2012-2017.
- Romain Negrel, "Optimal Representations for Image Similarity Search in Patrimonial Collections", co-advised with Prof. P.-H. Gosselin at ENSEA, 2011-2014.

Post-doc

- Yi Ren, "Automatic labeling of cultural heritage images", 2015.
- Olivier Kihl, "Low-level Visual Descriptors for Video Categorization", 2012-2014.

## Projects

- **TOSAI: towards safety in AI**, 2021-2024, joint ANR-DFG-JST, 250k
- **Interactive generative models**, 2021-2023, Criteo, 120k
- **3D pose estimation in the wild**, 2021-2023, Ergonova, 110k
- **Dynamic scene understanding**, 2020 - 2024, École des Ponts, 105k
- **Unsupervised cross-modal representation learning**, 2019-2022, DGA, 59k
- **Archepuz'3D**, 2017-2020, Patrima, 105k
- **ALICE**, 2017-2020, i-Site Paris Seine, 105k
- **Activity recognition from 3D videos**, 2015-2018, CNPQ (Brasil), 105k
- **ASAP**, 2015, Patrima, 60k
- **Fast learning of Multiple Kernel Machines**, 2015, BQR ENSEA, 1k
- **CBI at Amsterdam Conservation Center**, 2015, BQR ENSEA, 3k
- **Qwant**, 2014, Qwant, 10k
- **Terrarush**, 2013-2015, PIA, 90k
- **Culture 3D Cloud**, 2012-2015, PIA, 155k
- **Représentations pour la recherche d'images**, 2011-2014, Patrima, 105k
- **GeoDiff**, 2011-2012, PEPS CNRS, 15k

## Grants

- **PEDR: Prime d'encadrement doctoral et de recherche** (bonus for high quality in doctoral advising and research), 2015-2019.
- **DAAD: Learning low level visual descriptors for image and video categorization**, 1 month collaboration with Dr. V. Willert at TU Darmstadt (Germany) in 2014.

## Developed Open Source Software

- JKernelMachines: Java Library for easy research in Kernel Machines (~10k download). <http://mloss.org/software/view/409/>
- VLAT: C/C++ library to compute efficient tensor based image features. <http://www.vlat.fr>

## Publications

### *International Journals*

- [1] Diogo C. Luvizon, David Picard, and Hedi Tabia. "Multi-Task Deep Learning for Real-Time 3D Human Pose Estimation and Action Recognition." In: *IEEE Transactions on Pattern Analysis and Machine Intelligence* 43.8 (2021), pp. 2752–2764. DOI: 10.1109/TPAMI.2020.2976014.
- [2] Pierre Jacob, David Picard, Aymeric Histace, and Edouard Klein. "DIABLO: Dictionary-based attention block for deep metric learning." In: *Pattern Recognition Letters* (2020).
- [3] Marie-Morgane Paumard, David Picard, and Hedi Tabia. "Deepzle: Solving Visual Jigsaw Puzzles With Deep Learning and Shortest Path Optimization." In: *IEEE Transactions on Image Processing* 29 (2020), pp. 3569–3581.
- [4] Michael Blot, David Picard, Nicolas Thome, and Matthieu Cord. "Distributed Optimization for Deep Learning with Gossip Exchange." In: *Neurocomputing* 330 (2019), pp. 287–296.
- [5] Diogo C Luvizon, Hedi Tabia, and David Picard. "Human pose regression by combining indirect part detection and contextual information." In: *Computers & Graphics* 85 (2019), pp. 15–22.
- [6] Diogo Carbonera Luvizon, Hedi Tabia, and David Picard. "Learning features combination for human action recognition from skeleton sequences." In: *Pattern Recognition Letters* 99 (2017), pp. 13–20.
- [7] Olivier Kihl, David Picard, and Philippe-Henri Gosselin. "Local polynomial space-time descriptors for action classification." In: *Machine Vision and Applications* 27.3 (2016), pp. 351–361.
- [8] Jerome Fellus, David Picard, and Philippe-Henri Gosselin. "Asynchronous gossip principal components analysis." In: *Neurocomputing* 169 (2015), pp. 262–271.
- [9] Olivier Kihl, David Picard, and Philippe-Henri Gosselin. "A unified framework for local visual descriptors evaluation." In: *Pattern Recognition* 48.4 (2015), pp. 1174–1184.
- [10] David Picard, Philippe-Henri Gosselin, and Marie-Claude Gaspard. "Challenges in Content-Based Image Indexing of Cultural Heritage Collections." In: *Signal Processing Magazine, IEEE* 32.4 (2015), pp. 95–102.
- [11] Romain Negrel, David Picard, and Philippe-Henri Gosselin. "Web scale image retrieval using compact tensor aggregation of visual descriptors." In: *IEEE Multimedia* 20.3 (2013), pp. 24–33.
- [12] David Picard and Philippe-Henri Gosselin. "Efficient image signatures and similarities using tensor products of local descriptors." In: *Computer Vision and Image Understanding* 117.6 (2013), pp. 680–687.
- [13] David Picard, Nicolas Thome, and Matthieu Cord. "JKernelMachines: A simple framework for Kernel Machines." In: *Journal of Machine Learning Research* 14.May (2013), pp. 1417–1421.
- [14] David Picard, Arnaud Revel, and Matthieu Cord. "An application of swarm intelligence to distributed image retrieval." In: *Information Sciences* 192.June 2012 (2012), pp. 71–81.
- [15] David Picard, Matthieu Cord, and Arnaud Revel. "Image retrieval over networks: Active learning using ant algorithm." In: *IEEE Transactions on Multimedia* 10.7 (2008), pp. 1356–1365.

*International Conferences*

- [1] Victor Besnier, David Picard, and Alexandre Briot. "Learning Uncertainty For Safety-Oriented Semantic Segmentation In Autonomous Driving." In: *ICIP 2021*. 2021.
- [2] Victor Besnier, Andrei Bursuc, David Picard, and Alexandre Briot. "Triggering Failures: Out-Of-Distribution detection by learning from local adversarial attacks in Semantic Segmentation." In: *International Conference on Computer Vision (ICCV)*. 2021.
- [3] Ryad Kaoua, Shen, Alexandra Durr, Stravos Lazaris, David Picard, and Mathieu Aubry. "Image Collation: Matching illustrations in manuscripts." In: *ICDAR 2021*. 2021.
- [4] Thomas Luka, Laure Soulier, and David Picard. "Unsupervised Word Representation Learning with Bilinear Convolutional Networks on Characters." In: *ESANN 2021*. 2021.
- [5] Pierre Jacob, David Picard, Aymeric Histace, and Edouard Klein. "Efficient Codebook and Factorization for Second Order Representation Learning." In: *ICIP 2019*. 2019.
- [6] Pierre Jacob, David Picard, Aymeric Histace, and Edouard Klein. "Metric Learning With HORDE: High-Order Regularizer for Deep Embeddings." In: *International Conference on Computer Vision (ICCV)*. 2019.
- [7] Micael Carvalho, Rémi Cadène, David Picard, Laure Soulier, Nicolas Thome, and Matthieu Cord. "Cross-modal retrieval in the cooking context: Learning semantic text-image embeddings." In: *International ACM SIGIR Conference on Research and Development in Information Retrieval (SIGIR)*. 2018.
- [8] Pierre Jacob, David Picard, Aymeric Histace, and Edouard Klein. "Leveraging Implicit Spatial Information in Global Features for Image Retrieval." In: *Image Processing (ICIP), 2018 IEEE International Conference on*. 2018.
- [9] Diogo Carbonera Luvizon, David Picard, and Hedi Tabia. "2D/3D Pose Estimation and Action Recognition using Multitask Deep Learning." In: *Computer Vision and Pattern Recognition (CVPR)*. 2018.
- [10] Marie-Morgane Paumard, David Picard, and Hedi Tabia. "Image Reassembly Combining Deep Learning and Shortest Path Problem." In: *European Conference on Computer Vision (ECCV)*. 2018.
- [11] Marie-Morgane Paumard, David Picard, and Hedi Tabia. "Jigsaw Puzzle Solving Using Local Feature Co-Occurrences in Deep Neural Networks." In: *Image Processing (ICIP), 2018 IEEE International Conference on*. 2018.
- [12] Patrice Abry et al. "Wove paper analysis through texture similarities." In: *Signals, Systems and Computers, 2016 50th Asilomar Conference on*. IEEE. 2016, pp. 144–148.
- [13] David Picard. "Preserving local spatial information in image similarity using tensor aggregation of local features." In: *Image Processing (ICIP), 2016 IEEE International Conference on*. IEEE. 2016, pp. 201–205.
- [14] David Picard, Thomas Henn, and Georg Dietz. "Non-negative dictionary learning for paper watermark similarity." In: *Signals, Systems and Computers, 2016 50th Asilomar Conference on*. IEEE. 2016, pp. 130–133.
- [15] Nicolas Cazin, Aymeric Histace, David Picard, and Benoit Gaudou. "On The Joint Modeling of The Behavior of Social Insects and Their Interaction With Environment by Taking Into Account Physical Phenomena Like Anisotropic Diffusion." In: *International Conference on Practical Applications of Agents and Multi-Agent Systems*. Springer, Cham. 2015, pp. 151–164.
- [16] Jerome Fellus, David Picard, and Philippe-Henri Gosselin. "Asynchronous decentralized convex optimization through short-term gradient averaging." In: *ESANN 2015*. Presses universitaires de Louvain. 2015, p. 255.
- [17] Hervé Le Borgne et al. "IRIM at TRECVID 2015: semantic indexing." In: *Proceedings of TRECVID*. 2015.

- [18] Nicolas Ballas et al. "Irim at TRECVID 2014: Semantic indexing and instance search." In: *Proceedings of TRECVID*. 2014.
- [19] Thibaut Durand, Nicolas Thome, Matthieu Cord, and David Picard. "Incremental learning of latent structural svm for weakly supervised image classification." In: *ICIP*. 2014.
- [20] Thibaut Durand, David Picard, Nicolas Thome, and Matthieu Cord. "Semantic pooling for image categorization using multiple kernel learning." In: *ICIP*. 2014.
- [21] Jerome Fellus, David Picard, and Philippe-Henri Gosselin. "Dimensionality reduction in decentralized networks by Gossip aggregation of principal components analyzers." In: *ESANN 2014*. 2014, pp. 171–176.
- [22] Romain Negrel, David Picard, and Philippe-Henri Gosselin. "Dimensionality reduction of visual features using sparse projectors for content-based image retrieval." In: *IEEE Int. Conf. on Image Processing (ICIP)*. 2014, pp. 2192–2196.
- [23] Romain Negrel, David Picard, and Philippe-Henri Gosselin. "Efficient Metric Learning Based Dimension Reduction Using Sparse Projectors For Image Near Duplicate Retrieval." In: *ICPR*. 2014.
- [24] Romain Negrel, David Picard, and Philippe-Henri Gosselin. "Evaluation of second-order visual features for land-use classification." In: *Content-Based Multimedia Indexing (CBMI), 2014 12th International Workshop on*. IEEE. 2014, pp. 1–5.
- [25] David Picard and Inbar Fijalkow. "Second order model deviations of local Gabor features for texture classification." In: *Signals, Systems and Computers, 2014 48th Asilomar Conference on*. IEEE. 2014, pp. 917–920.
- [26] David Picard, Ngoc-Son Vu, and Inbar Fijalkow. "Photographic paper texture classification using model deviation of local visual descriptors." In: *IEEE Int. Conf. on Image Processing*. 2014, pp. 5701–5705.
- [27] Hedi Tabia, Hamid Laga, David Picard, and Philippe-Henri Gosselin. "Covariance descriptors for 3D shape matching and retrieval." In: *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition*. 2014, pp. 4185–4192.
- [28] Mehdi Badr, Dan Vodislav, David Picard, Shaoyi Yin, and Philippe-Henri Gosselin. "Multi-criteria search algorithm: an efficient approximate k-*nn* algorithm for image retrieval." In: *Image Processing (ICIP), 2013 20th IEEE International Conference on*. IEEE. 2013, pp. 2901–2905.
- [29] Jerome Fellus, David Picard, and Philippe-Henri Gosselin. "Decentralized K-means using randomized Gossip protocols for clustering large datasets." In: *IEEE 13th International Conference on Data Mining Workshops*. IEEE. 2013, pp. 599–606.
- [30] Philippe-Henri Gosselin and David Picard. "Machine Learning and Content-Based Multimedia Retrieval." In: *ESANN 2013*. 2013, pp. 251–260.
- [31] Olivier Kihl, David Picard, and Philippe-Henri Gosselin. "A unified formalism for video descriptors." In: *Image Processing (ICIP), 2013 20th IEEE International Conference on*. IEEE. 2013, pp. 2416–2419.
- [32] Olivier Kihl, David Picard, and Philippe Henri Gosselin. "Local polynomial space-time descriptors for actions classification." In: *Proceedings of the 13. IAPR International Conference on Machine Vision Applications, MVA 2013, Kyoto, Japan, May 20-23, 2013*. IAPR. 2013, pp. 327–330.
- [33] David Picard, Aymeric Histace, and Marie-Charlotte Desseroit. "Joint MAS-PDE Modeling of Forest Pest Insect Dynamics: Analysis of the Bark Beetle's Behavior." In: *VISIGRAPP (Workshop GEODIFF)*. 2013, pp. 29–38.
- [34] Hedi Tabia, David Picard, Hamid Laga, and Philippe-Henri Gosselin. "3D shape similarity using vectors of locally aggregated tensors." In: *Image Processing (ICIP), 2013 20th IEEE International Conference on*. IEEE. 2013, pp. 2694–2698.

- [35] Hedi Tabia, David Picard, Hamid Laga, and Philippe-Henri Gosselin. "Compact vectors of locally aggregated tensors for 3d shape retrieval." In: *Eurographics workshop on 3D object retrieval*. 2013.
- [36] Hedi Tabia, David Picard, Hamid Laga, and Philippe-Henri Gosselin. "Fast Approximation of Distance Between Elastic Curves using Kernels." In: *British Machine Vision Conference*. BMVA Press. 2013.
- [37] Corina Iovan, David Picard, Nicolas Thome, and Matthieu Cord. "Classification of urban scenes from geo-referenced images in urban street-view context." In: *Machine Learning and Applications (ICMLA), 2012 11th International Conference on*. Vol. 2. IEEE. 2012, pp. 339–344.
- [38] Romain Negrel, David Picard, and P Gosselin. "Compact Tensor Based Image Representation for Similarity Search." In: *International Conference on Image Processing*. 2012.
- [39] Romain Negrel, David Picard, and Philippe-Henri Gosselin. "Using Spatial Pyramids with Compacted VLAT for Image Categorization." In: *ICPR*. Vol. 610. 2012.
- [40] David Picard, Nicolas Thome, Matthieu Cord, and Alain Rakotomamonjy. "Learning geometric combinations of Gaussian kernels with alternating Quasi-Newton algorithm." In: *ESANN 2012*. 2012, pp. 79–84.
- [41] David Picard and Philippe-Henri Gosselin. "Improving Image Similarity With Vectors of Locally Aggregated Tensors." In: *Image Processing (ICIP), 2011 18th IEEE International Conference on*. 2011, pages–669.
- [42] David Picard, Nicolas Thome, and Matthieu Cord. "An efficient system for combining complementary kernels in complex visual categorization tasks." In: *Image Processing (ICIP), 2010 17th IEEE International Conference on*. IEEE. 2010, pp. 3877–3880.
- [43] David Picard, Matthieu Cord, and Eduardo Valle. "Study of SIFT Descriptors for Image Matching based Localization in Urban Street View Context." In: *CMRT09 - CityModels, Roads and Traffic*. GITC. 2009, pp. 193–198.
- [44] Eduardo Valle, David Picard, and Matthieu Cord. "Geometric consistency checking for local-descriptor based document retrieval." In: *Proceedings of the 9th ACM symposium on Document engineering*. ACM. 2009, pp. 135–138.
- [45] David Picard, Arnaud Revel, and Matthieu Cord. "Image retrieval over networks: Ant algorithm for long term active learning." In: *Content-Based Multimedia Indexing, 2008. CBMI 2008. International Workshop on*. IEEE. 2008, pp. 439–445.
- [46] David Picard, Arnaud Revel, and Matthieu Cord. "Long term learning for image retrieval over networks." In: *Image Processing, 2008. ICIP 2008. 15th IEEE International Conference on*. IEEE. 2008, pp. 929–932.
- [47] David Picard, Matthieu Cord, and Arnaud Revel. "Cbir in distributed databases using a multi-agent system." In: *Image Processing, 2006 IEEE International Conference on*. IEEE. 2006, pp. 3205–3208.
- [48] David Picard, Arnaud Revel, and Matthieu Cord. "Performances of mobile-agents for interactive image retrieval." In: *Proceedings of the 2006 IEEE/WIC/ACM International Conference on Web Intelligence*. IEEE Computer Society. 2006, pp. 581–586.
- [49] Arnaud Revel, David Picard, and Matthieu Cord. "Ant-like mobile agents for Content-Based Image Retrieval in distributed databases." In: *Learning Techniques for Processing Multimedia Content*. 2005, p. 29.