MAXIME GASSE

Researcher in Machine Learning
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EDUCATION

Ph.D. in Machine Learning *2017*
Université Lyon 1
Probabilistic graphical models, multi-label classification

Master in Artificial Intelligence and Decision Making *2012*
Université Lyon 1
Machine learning, bio-inspired systems, combinatorial problems

Engineer in Computer Science and Communication Networks *2011*
CPE Lyon
Mathematics, computer architectures, signal processing, embedded systems, web, databases, networks

Bachelor's Degree in Computer Science (eq.) *2008*
IUT A Lyon 1, Bourg-en-Bresse
Mathematics, algorithms, databases, networks

French Baccalaureate in Sciences *2006*
Lycée René Cassin, Mâcon
Engineering track: mechanics, electronics

PROFESSIONAL EXPERIENCE

Class I researcher, Polytechnique Montréal *2020 - present*
Machine learning, causality Montréal, Canada

Post-doc, MILA/Polytechnique Montréal *2018 - 2020*
Supervisors: Laurent Charlin and Andrea Lodi Montréal, Canada
Machine learning for combinatorial optimization

Post-doc, CREATIS/INSA *2017 - 2018*
Supervisors: Fabien Millioz and Denis Friboulet Lyon, France
Machine learning for ultrasound imaging

Ph.D. student, LIRIS/Université de Lyon *2013 - 2017*
Supervisors: Haytham Elghazel and Alexandre Aussem Lyon, France
Probabilistic graphical model structure learning, multi-label prediction

Software developer, Logica IT Services *2008 - 2011*
Java JEE, C++, Oracle SQL, PL/SQL Lyon, France

TEACHING EXPERIENCE

Machine Learning — CPE Lyon
5th year engineer students — *2017/18*
Decision theory, supervised / unsupervised / reinforcement learning
Lectures (6h) + hands-on sessions (8h)

Probabilistic Graphical Models — Université Lyon 1
Graduate students (Master 2) — *2016/17*
Structure learning, causality, do-calculus
Hands-on sessions (8h)

C Programming — CPE Lyon
4th year engineer students — *2017/18*
Compilation, programming, data structures
Hands-on sessions (24h)

Algorithmics and Programming — Université Lyon 1
Undergrad students (License 2) — *2013/14, 14/15, 15/16*
Types, memory management, complexity, advanced data structures
Tutorials (36h) + hands-on sessions (136h)

Java / Object-Oriented Programming — CPE Lyon
4th year engineer students — *2013/14*
Inheritance, interfaces, abstraction, collections, types, GUI (Swing)
Hands-on sessions (24h)

ACCOMPLISHMENTS

Awards

Winner of the 11th GERAD postdoctoral fellowship competition in 2018 (25 000 CAD).

Community events

NeurIPS'21 competition: Machine Learning for Combinatorial Optimization (ML4CO)
`https://www.ecole.ai/2021/ml4co-competition/`
Lead organizer.

Peer Reviewing Service

Conferences

2021: NeurIPS (ongoing), ICML *(expert reviewer)*, ICLR *(outstanding reviewer, top 10%)*

2020: NeurIPS *(top reviewer, top 10%)*, ICML *(top reviewer, top 30%)*, ICRA

2019: NeurIPS *(best reviewer, top 40%)*

Journals: Machine Learning Journal, ESWA, IJAR, TUFFC, TMI, Ultrasonics, INFORMS Journal of Optimization.

Calls for projects: Croatian Science Foundation (HRZZ) 2021 - external reviewer

Current Supervision

Brice Rauby (PhD): deep learning methods for spatiotemporal ultrasound localization microscopy

Feng Yang Chen (Intern): actor-critic methods for learning to branch

Alumni

Vincent Fortin (Master): MCTS for combinatorial optimisation (2020)

Lara Scavuzzo (Intern): RL for branching (2020)

Avrech Ben-David (Intern): RL for cut selection (2020)

Bhanu Bhandari (Intern): RL for node selection (2020)

William Ngo (Intern): DAgger for branching (2019)

Giacomo Neri (Intern): architectures for solving time prediction (2018)

Nicola Ferroni (Intern): GNN architectures for branching (2018)

Denis Lecoeuche (Intern): multi-label classification (2017)

Science Popularization

Machine learning crash course (for researchers)

CORS conference, 1h30 lecture + 1h30 hands-on (2021)

ZIB institute, 2h lecture (2019)

GERAD lab, 2h lecture (2018)

CREATIS lab, 4h lecture (2017)

LIRIS lab, 4h lecture (2016)

Math à Modeler, introducing children to research in mathematics

Sathonay-Camp elementary school, 5x4h seminars (2015)

Public lectures

Lyon Data Science MeetUp, 1h lecture (2017)

Languages

French (native), English (fluent).

PUBLICATIONS

Ongoing Work

[Gas+21] Gasse, Maxime, Grasset, Damien, Gaudron, Guillaume, and Oudeyer, Pierre-Yves. "Causal Reinforcement Learning using Observational and Interventional Data." In: *NeurIPS (submitted)*. 2021.

Peer-Reviewed Journals & Conference Proceedings

[Mil+21] Milecki, Léo, Porée, Jonathan, Belgharbi, Hatim, Bourquin, Chloé, Damseh, Rafat, Delafontaine-Martel, Patrick, Lesage, Frédéric, Gasse, Maxime, and Provost, Jean. "A Deep Learning Framework for Spatiotemporal Ultrasound Localization Microscopy". In: *IEEE Transactions on Medical Imaging* 40.5 (2021), pp. 1428–1437.

[Gup+20] Gupta, Prateek, Gasse, Maxime, Khalil, Elias, Kumar, M. Pawan, Lodi, Andrea, and Bengio, Yoshua. "Hybrid Models for Learning to Branch." In: *NeurIPS*. 2020.

[Mül+20] Müller, Benjamin, Muñoz, Gonzalo, Gasse, Maxime, Gleixner, Ambros, Lodi, Andrea, and Serrano, Felipe. "On Generalized Surrogate Duality in Mixed-Integer Nonlinear Programming". In: *Integer Programming and Combinatorial Optimization*. Ed. by Bienstock, Daniel and Zambelli, Giacomo. Springer International Publishing, 2020, pp. 322–337.

[SGC20] Subakan, Cem, Gasse, Maxime, and Charlin, Laurent. "On the Effectiveness of Two-Step Learning for Generative Models with Learnable Priors." In: *IEEE 30th International Workshop on Machine Learning for Signal Processing (MLSP)*. 2020.

[Gas+19c] Gasse, Maxime, Chetelat, Didier, Ferroni, Nicola, Charlin, Laurent, and Lodi, Andrea. "Exact Combinatorial Optimization with Graph Convolutional Neural Networks." In: *NeurIPS*. 2019.

[Gas+17a] Gasse, Maxime, Millioz, Fabien, Roux, Emmanuel, Garcia, Damien, Liebgott, Hervé, and Friboulet, Denis. "High-Quality Plane Wave Compounding Using Convolutional Neural Networks". In: *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control* 64.10 (2017), pp. 1637–1639.

[GA16a] Gasse, Maxime and Aussem, Alexandre. "Algorithmes de factorisation d'une loi de probabilité jointe en facteurs indépendants et minimaux". In: *Journées Francophones sur les Réseaux Bayésiens et les Modèles Graphiques Probabilistes (JFRB)*. 2016.

[GA16b] Gasse, Maxime and Aussem, Alexandre. "F-Measure Maximization in Multi-Label Classification with Conditionally Independent Label Subsets." In: *ECML/PKDD*. Ed. by Frasconi, Paolo, Landwehr, Niels, Manco, Giuseppe, and Vreeken, Jilles. Vol. 9851. Lecture Notes in Computer Science. Springer, 2016, pp. 619–631.

[GA16c] Gasse, Maxime and Aussem, Alexandre. "Identifying the irreducible disjoint factors of a multivariate probability distribution." In: *PGM*. Ed. by Antonucci, Alessandro, Corani, Giorgio, and de Campos, Cassio Polpo. Vol. 52. JMLR Workshop and Conference Proceedings. JMLR.org, 2016, pp. 183–194.

[GAE15b] Gasse, Maxime, Aussem, Alexandre, and Elghazel, Haytham. "On the Optimality of Multi-Label Classification under Subset Zero-One Loss for Distributions Satisfying the Composition Property." In: *ICML*. Ed. by Bach, Francis R. and Blei, David M. Vol. 37. JMLR Proceedings. JMLR.org, 2015, pp. 2531–2539.

[Aus+14] Aussem, Alexandre, Caillet, Pascal, Klemm, Zara, Gasse, Maxime, Schott, Anne-Marie, and Ducher, Michel. "Analysis of risk factors of hip fracture with causal Bayesian networks." In: *IWBBIO*. Ed. by Rojas, Ignacio and Guzman, Francisco M. Ortuño. Copicentro Editorial, 2014, pp. 1074–1085.

[GAE14] Gasse, Maxime, Aussem, Alexandre, and Elghazel, Haytham. "A hybrid algorithm for Bayesian network structure learning with application to multi-label learning." In: *Expert Systems with Applications* 41.15 (2014), pp. 6755–6772.

[Le +14] Le Goff, Ronan, Garcia, David, Gasse, Maxime, and Aussem, Alexandre. "Optimal Sensor Locations for Polymer Injection Molding Process". In: *ESAFORM*. Vol. 611. Key Engineering Materials. Trans Tech Publications, 2014, pp. 1724–1733.

[GAE12] Gasse, Maxime, Aussem, Alexandre, and Elghazel, Haytham. "An Experimental Comparison of Hybrid Algorithms for Bayesian Network Structure Learning." In: *ECML/PKDD*. Ed. by Flach, Peter A., Bie, Tijl De, and Cristianini, Nello. Vol. 7523. Lecture Notes in Computer Science. Springer, 2012, pp. 58–73.

Ph.D. Thesis

[Gas17] Gasse, Maxime. "Probabilistic Graphical Model Structure Learning : Application to Multi-Label Classification". Theses. Université de Lyon, 2017.

Software

[Gam+20] Gamrath, Gerald, Anderson, Daniel, Bestuzheva, Ksenia, Chen, Wei-Kun, Eifler, Leon, Gasse, Maxime, Gemander, Patrick, Gleixner, Ambros, Gottwald, Leona, Halbig, Katrin, Hendel, Gregor, Hojny, Christopher, Koch, Thorsten, Le Bodic, Pierre, Maher, Stephen J., Matter, Frederic, Miltenberger, Matthias, Mühmer, Erik, Müller, Benjamin, Pfetsch, Marc E., Schlösser, Franziska, Serrano, Felipe, Shinano, Yuji, Tawfik, Christine, Vigerske, Stefan, Wegscheider, Fabian, Weninger, Dieter, and Witzig, Jakob. *The SCIP Optimization Suite 7.0*. Technical Report. Optimization Online, 2020.

[Pro+20] Prouvost, Antoine, Dumouchelle, Justin, Scavuzzo, Lara, Gasse, Maxime, Chételat, Didier, and Lodi, Andrea. *Ecole: A Gym-like Library for Machine Learning in Combinatorial Optimization Solvers*. NeurIPS LMCA Workshop. 2020.

COMMUNICATIONS

Invited Lectures & Seminars

[Gas22] Gasse, Maxime. "Data-Driven Combinatorial Optimization." Schloss Dagstuhl Seminar 20421, Leibniz Center for Informatics (postponed). 2022.

[Gas21a] Gasse, Maxime. "Causal Reinforcement Learning using Observational and Interventional Data." Microsoft Research (MSR) Montreal Seminar. 2021.

[Gas21b] Gasse, Maxime. "Ecole: A Gym-like Library for Machine Learning in Combinatorial Optimization Solvers." IPAM: Deep Learning and Combinatorial Optimization. 2021.

[Gas20] Gasse, Maxime. "Combinatorial Optimization: what can Machine Learning do ?" Mathematical Optimization group, TU Braunschweig. 2020.

[Gas19a] Gasse, Maxime. "Learning to branch". Konrad-Zuse-Zentrums für Informationstechnik Berlin (ZIB). 2019.

[Gas19b] Gasse, Maxime. "Learning to branch in MILP solvers". TTI-C Workshop on Automated Algorithms Design. 2019.

[Gas19c] Gasse, Maxime. "Statistical Learning for Combinatorial Optimization". Polytechnique Montréal, Séminaire département GIGL. 2019.

[Gas18] Gasse, Maxime. "Ultrasound image reconstruction using deep learning: a new paradigm". IEEE International Ultrasonics Symposium (IUS), invited speaker. 2018.

Tutorials

[Gas21d] Gasse, Maxime. "Foundations of Neural Networks." In: *Canadian Operational Research Society (CORS) Neural Networks Workshop*. 2021.

[Ché+20] Chételat, Didier, Gasse, Maxime, Khalil, Elias B., Prouvost, Antoine, Zarpellon, Giulia, Charlin, Laurent, and Lodi, Andrea. "Machine Learning for Combinatorial Optimization." In: *IJCAI-PRICAI tutorials*. 2020.

[Kha+20] Khalil, Elias B., Lodi, Andrea, Dilkina, Bistra, Chételat, Didier, Gasse, Maxime, Prouvost, Antoine, Zarpellon, Giulia, and Charlin, Laurent. "Recent Advances in Integrating Machine Learning and Combinatorial Optimization." In: *AAAI tutorials*. 2020.

Non peer-reviewed conferences

[Gas21c] Gasse, Maxime. "Ecole: A Gym-like Library for Machine Learning in Combinatorial Optimization Solvers." In: European Conference on Operational Research (EURO). 2021.

[Gas+19a] Gasse, Maxime, Chetelat, Didier, Charlin, Laurent, and Lodi, Andrea. "Learning to Branch With Graph Convolutional Neural Networks". In: *Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting*. 2019.

[Gas+19b] Gasse, Maxime, Chetelat, Didier, Charlin, Laurent, and Lodi, Andrea. "Learning to Branch With Graph Convolutional Neural Networks". In: *Canadian Operational Research Society (CORS) 61st Annual Conference*. 2019.

[Gas+18] Gasse, Maxime, Chetelat, Didier, Charlin, Laurent, and Lodi, Andrea. "Reinforcement Learning of Branching Strategies". In: *Institute for Operations Research and the Management Sciences (INFORMS) Annual Meeting*. 2018.

[Gas+17b] Gasse, Maxime, Millioz, Fabien, Roux, Emmanuel, Liebgott, Hervé, and Friboulet, Denis. "Accelerating plane wave imaging through deep learning-based reconstruction: An experimental study". In: *2017 IEEE International Ultrasonics Symposium (IUS)*. 2017.

[GAE15a] Gasse, Maxime, Aussem, Alexandre, and Elghazel, Haytham. "On the Factorization of the Label Conditional Distribution in the context of Multi-Label Classification". In: *ECML-PKDD Workshops, International Workshop on Big Multi-Target Prediction*. 2015.