

Joshua Knowles
Honorary
MSM General



Overview

Joshua Knowles is a research scientist at Schlumberger Cambridge Research Ltd, in Cambridgeshire, UK.

Current Employment

Honorary Professor

Honorary
MSM General
The University of Manchester
1 Aug 2020 → present

Principal Scientist

Schlumberger Cambridge Research
Cambridge, United Kingdom
11 Apr 2022 → present

Honorary Fellow

University of Birmingham
Birmingham, United Kingdom
2 Apr 2019 → present

Previous Employment

HONORARY PROFESSOR

Honorary
AMBS Central Services
1 Jun 2015 → 1 Jun 2018

Senior Researcher

Invenia Labs
Cambridge, United Kingdom
30 Jun 2020 → 15 Mar 2022

Research outputs (50 most recent)

Deep Optimisation: Transitioning the Scale of Evolutionary Search by Inducing and Searching in Deep Representations

Caldwell, J., Knowles, J., Thies, C., Kubacki, F. & Watson, R., 15 May 2022, In: *SN Computer Science*. 3, 3, 253.
DOI: 10.1007/s42979-022-01109-w

Expensive Optimization with Production-Graph Resource Constraints: A First Look at a New Problem Class

Pricopie, S., Allmendinger, R., López-Ibáñez, M., Fare, C., Benatan, M. & Knowles, J., 25 Mar 2022, (Accepted/In press) *GECCO '21: Proceedings of the Genetic and Evolutionary Computation Conference*.

Realistic utility functions prove difficult for state-of-the-art interactive multiobjective optimization algorithms

Shavarani, S. M., López-Ibáñez, M. & Knowles, J., 26 Jun 2021, *GECCO 2021 - Proceedings of the 2021 Genetic and Evolutionary Computation Conference*. Association for Computing Machinery, p. 457-465 9 p. (GECCO 2021 -

Proceedings of the 2021 Genetic and Evolutionary Computation Conference).
DOI: 10.1145/3449639.3459373

Deep Optimisation: Multi-scale Evolution by Inducing and Searching in Deep Representations

Caldwell, J., Knowles, J., Thies, C. & Kubacki, F., 2021, *Applications of Evolutionary Computation - 24th International Conference, EvoApplications 2021, Held as Part of EvoStar 2021, Proceedings*. Castillo, P. A. & Jiménez Laredo, J. L. (eds.). Springer Nature, p. 506-521 16 p. (Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics); vol. 12694 LNCS).
DOI: 10.1007/978-3-030-72699-7_32

An Improved and More Scalable Evolutionary Approach to Multiobjective Clustering

Garza-Fabre, M., Handl, J. & Knowles, J., 2018, In: *IEEE Transactions on Evolutionary Computation*. 22, 4, p. 515 - 535
DOI: 10.1109/TEVC.2017.2726341 10.1109/TEVC.2017.2726341

Sequential experimentation by evolutionary algorithms

Shir, O. M., Bäck, T., Knowles, J. & Allmendinger, R., 15 Jul 2017, *GECCO 2017 - Proceedings of the Genetic and Evolutionary Computation Conference Companion*. Association for Computing Machinery, p. 828-851 24 p. (GECCO 2017 - Proceedings of the Genetic and Evolutionary Computation Conference Companion).
DOI: 10.1145/3067695.3067701

Initialization of Bayesian Optimization Viewed as Part of a Larger Algorithm Portfolio

Morar, M. T., Knowles, J. & Sampaio, S., 1 May 2017, (Accepted/In press) *Data Science meets Optimization Workshop: CEC2017 & CPAIOR 2017: DSO 2017*. 6 p.

Editorial

Brockhoff, D., Knowles, J., Naujoks, B. & Sindhya, K., 1 Mar 2017, In: *Computers and Operations Research*. 79, p. 264-265 2 p.
DOI: 10.1016/j.cor.2016.11.023

Editorial: Special issue on understanding complexity in multiobjective optimization

Greco, S., Klamroth, K., Knowles, J. & Rudolph, G., 1 Jan 2017, In: *Journal of Multi-Criteria Decision Analysis*. 24, 1-2, p. 3-4 2 p.
DOI: 10.1002/mcda.1609

A new reduced-length genetic representation for evolutionary multiobjective clustering

Garza-Fabre, M., Handl, J. & Knowles, J., 2017, p. 236-251. 17 p.
DOI: 10.1007/978-3-319-54157-0_17

On using decision maker preferences with ParEGO

Hakanen, J. & Knowles, J. D., 2017, *Evolutionary Multi-Criterion Optimization*. p. 282-297 16 p.
DOI: 10.1007/978-3-319-54157-0_20

Simheuristics for the multiobjective nondeterministic firefighter problem in a time-constrained setting

Michalak, K. & Knowles, J. D., 2 Apr 2016, *Applications of Evolutionary Computation*.
DOI: 10.1007/978-3-319-31153-1_17

Generating, Maintaining and Exploiting Diversity in a Memetic Algorithm for Protein Structure Prediction

Garza-Fabre, M., Kandathil, S. M., Handl, J., Knowles, J. & Lovell, S. C., 2016, In: *Evolutionary Computation*.
DOI: 10.1162/EVCO_a_00176

Global network cooperation catalysed by a small prosocial migrant clique

Miller, S. & Knowles, J., 2016, *Unconventional Computation and Natural Computation*. p. 62-74 13 p.
DOI: 10.1007/978-3-319-41312-9_6

The emergence of cooperation in public goods games on randomly growing dynamic networks

Miller, S. & Knowles, J., 2016
DOI: 10.1007/978-3-319-31204-0_24

Using machine learning to explore the relevance of local and global features during conformational search in Rosetta

Garza-Fabre, M., Kandathil, S. M., Handl, J., Knowles, J. & Lovell, S. C., 11 Jul 2015, *GECCO 2015 - Companion Publication of the 2015 Genetic and Evolutionary Computation Conference*. Silva, S. (ed.). Association for Computing Machinery, p. 935-938 4 p. (GECCO 2015 - Companion Publication of the 2015 Genetic and Evolutionary Computation Conference).
DOI: 10.1145/2739482.2768441

Population Fluctuation Promotes Cooperation in Networks

Miller, S. & Knowles, J., 10 Jun 2015, In: *Scientific Reports*. 5, 11054.
DOI: 10.1038/srep11054

Multiobjective Optimization: When Objectives Exhibit Non-Uniform Latencies

Allmendinger, R., Handl, J. & Knowles, J., 1 Jun 2015, In: *European Journal of Operational Research*. 243, 2, p. 497-513 16 p.
DOI: 10.1016/j.ejor.2014.09.033

Machine Decision Makers as a Laboratory for Interactive EMO

Lopez-Ibanez, M. & Knowles, J., 18 Mar 2015, *Proceedings of the 2015 International Conference on Evolutionary Multi-Criterion Optimization (EMO'15)*. Berlin: Springer Nature, Vol. 9019. p. 295-309 14 p. (Lecture Notes in Computer Science (LNCS); vol. 9019).
DOI: 10.1007/978-3-319-15892-1_20

Molecular phenotyping of a UK population: defining the human serum metabolome

Dunn, W., Lin, W., Broadhurst, D., Begley, P., Brown, M., Zelena, E., Vaughan, A., Halsall, A., Harding, N., Knowles, J., Francis-McIntyre, S., Tseng, A., Ellis, D., O'Hagan, S., Aarons, G., Benjamin, B., Chew-Graham, S., Moseley, C., Potter, P., Winder, C. & 16 others, Potts, C., Thornton, P., McWhirter, C., Zubair, M., Pan, M., Burns, A., Cruickshank, K., Jayson, G., Purandare, N., Wu, F.C., Finn, J., Haselden, J.N., Nicholls, A.W., Wilson, I.D., Goodacre, R. & Kell, D., Feb 2015, In: *Metabolomics*. 11, 1, p. 9-26 18 p.
DOI: 10.1007/s11306-014-0707-1

Nature-inspired clustering

Handl, J. & Knowles, J., 1 Jan 2015, *Handbook of Cluster Analysis*. Hennig, C., Meila, M., Murtagh, F. & Rocci, R. (eds.). CRC Press and Balkema, p. 419-440 22 p.
DOI: 10.1201/b19706

A Minimal Model for the Emergence of Cooperation in Networks

Knowles, J., 2015, *European Conference on Artificial Life*.

Evolutionary Clustering

Handl, J., Corne, D. & Knowles, J., 2015, *Encyclopedia of Machine Learning (2nd edition)*.

MUSCLE: Automated Multi-objective Evolutionary Optimisation of Targeted LC-MS/MS Analysis

Bradbury, J., Genta-Jouve, G., Allwood, J. W., Dunn, W. B., Goodacre, R., Knowles, J. D., He, S. & Viant, M. R., 11 Nov 2014, In: *Bioinformatics*.
DOI: 10.1093/bioinformatics/btu740

Ephemeral Resource Constraints in Optimization

Knowles, J., Allmendinger, R., Datta, R. (ed.) & Deb, K. (ed.), 2014, *Evolutionary Constrained Optimization*. Springer Nature

Hellinger Distance Trees for Imbalanced Streams

Lyon, R., Brooke, J., Knowles, J. & Stappers, B., 2014, *22nd International Conference on Pattern Recognition (ICPR 2014)*.

Meta-Decoders: Self-Reproducing Genotype-Phenotype Maps

Webb, A. & Knowles, J., 2014, *ALIFE 14: The Fourteenth International Conference on the Synthesis and Simulation of Living Systems*.

Studying the evolvability of self-encoding genotype-phenotype maps

Webb, A. M. & Knowles, J., 2014, *Artificial Life 14 - Proceedings of the 14th International Conference on the Synthesis and Simulation of Living Systems, ALIFE 2014*. Sayama, H., Rieffel, J., Risi, S., Doursat, R. & Lipson, H. (eds.). MIT Press Journals, p. 79-86 8 p. (Artificial Life 14 - Proceedings of the 14th International Conference on the Synthesis and Simulation of Living Systems, ALIFE 2014).

Accuracy and tractability of a kriging model of intramolecular polarisable multipolar electrostatics and its application to histidine

Kandathil, S. M., Fletcher, T. L., Yuan, Y., Knowles, J. & Popelier, P. L. A., 2013, In: *Journal of Computational Chemistry*. p. 1-29

Comparing multi-objective and threshold-moving ROC curve generation for a prototype-based classifier

Aler, R., Handl, J. & Knowles, J. D., 2013, *GECCO 2013 - Proceedings of the 2013 Genetic and Evolutionary Computation Conference/GECCO - Proc. Genet. Evol. Comput. Conf.*. Association for Computing Machinery, p. 1029-1036 7 p.
DOI: 10.1145/2463372.2463504

Evidence accumulation in multiobjective data clustering

Handl, J. & Knowles, J., 2013, *host publication*. Springer Nature, Vol. 7811. p. 543-557 15 p.
DOI: 10.1007/978-3-642-37140-0_41

'Hang on a minute': Investigations on the effects of delayed objective functions in multiobjective optimization

Allmendinger, R. & Knowles, J., 2013, *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)/Lect. Notes Comput. Sci.*. Springer Nature, Vol. 7811. p. 6-20 14 p. (Lecture Notes in Computer Science, Volume 7811).
DOI: 10.1007/978-3-642-37140-0_5

On handling ephemeral resource constraints in evolutionary search

Allmendinger, R. & Knowles, J., 2013, In: *Evolutionary Computation*. 21, 3, p. 497-531 34 p.
DOI: 10.1162/EVCO_a_00097

Predicting skill from gameplay input to a first-person shooter

Buckley, D., Chen, K. & Knowles, J., 2013, *IEEE Conference on Computational Intelligence and Games, CIG/IEEE Conf. Comput. Intell. Games, CIG*. U.S.A.: IEEE
DOI: 10.1109/CIG.2013.6633655

Systematic construction of algorithm portfolios for a maintenance scheduling problem

Almakhlafi, A. & Knowles, J., 2013, *2013 IEEE Congress on Evolutionary Computation, CEC 2013/IEEE Congr. Evol. Comput., CEC*. IEEE, p. 245-252 7 p.
DOI: 10.1109/CEC.2013.6557577

Exploiting Genomic Knowledge in Optimising Molecular Breeding Programmes: Algorithms from Evolutionary Computing

O'Hagan, S., Knowles, J. & Kell, D. B., 21 Nov 2012, In: *PLoS ONE*. 7, 11, e48862.
DOI: 10.1371/journal.pone.0048862

The dual role of fragments in fragment-assembly methods for de novo protein structure prediction

Handl, J., Knowles, J., Vernon, R., Baker, D. & Lovell, S. C., Feb 2012, In: *Proteins: Structure, Function and Bioinformatics*. 80, 2, p. 490-504 14 p.
DOI: 10.1002/prot.23215

Selected aspects of natural computing

Corne, D. W., Deb, K., Knowles, J. & Yao, X., 1 Jan 2012, *Handbook of Natural Computing*. Springer Nature, Vol. 4-4. p. 1737-1801 65 p.

DOI: 10.1007/978-3-540-92910-9_52

Benchmarks for maintenance scheduling problems in power generation

Almakhlaifi, A. & Knowles, J., 2012, *2012 IEEE Congress on Evolutionary Computation, CEC 2012|IEEE Congr. Evol. Comput., CEC*. IEEE

DOI: 10.1109/CEC.2012.6252988

Clustering criteria for use in multiobjective clustering

Handl, J. & Knowles, J., 2012, *Parallel Problem Solving from Nature - PPSN XII*. Springer Nature, p. 32-41 10 p.

Clustering criteria in multiobjective data clustering

Handl, J. & Knowles, J., 2012, *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)|Lect. Notes Comput. Sci.*. Berlin/Heidelberg: Springer Nature, Vol. 7492. p. 32-41 9 p.

DOI: 10.1007/978-3-642-32964-7_4

Learning in Multiobjective Optimization (Dagstuhl Seminar 12041)

Knowles, J. D., Greco, S. (ed.), Miettinen, K. (ed.) & Zitzler, E. (ed.), 2012, *Leibniz-Zentrum für Informatik*. 50 p. (Dagstuhl Reports)

DOI: <http://dx.doi.org/10.4230/DagRep.2.1.50>

Efficient discovery of anti-inflammatory small-molecule combinations using evolutionary computing

Small, B. G., McColl, B. W., Allmendinger, R., Pahle, J., Lopez-Casteon, G., Rothwell, N. J., Knowles, J., Mendes, P., Brough, D. & Kell, D. B., Dec 2011, In: *Nature chemical biology*. 7, 12, p. 902-908 6 p.

DOI: 10.1038/nchembio.689

Procedures for large-scale metabolic profiling of serum and plasma using gas chromatography and liquid chromatography coupled to mass spectrometry

Dunn, W. B., Broadhurst, D., Begley, P., Zelena, E., Francis-Mcintyre, S., Anderson, N., Brown, M., Knowles, J. D., Halsall, A., Haselden, J. N., Nicholls, A. W., Wilson, I. D., Kell, D. B. & Goodacre, R., Jun 2011, In: *Nature protocols*. 6, 7, p. 1060-1083 23 p.

DOI: 10.1038/nprot.2011.335

Evolutionary search in lethal environments

Allmendinger, R. & Knowles, J., 2011, *ECTA 2011 FCTA 2011 - Proceedings of the International Conference on Evolutionary Computation Theory and Applications and International Conference on Fuzzy Computation Theory and Applications|ECTA FCTA - Proc. Int. Conf. Evol. Comput. Theory Appl. Int. Conf. Fuzzy Comput. Theory Appl.* p. 63-72 9 p.

On sequential online archiving of objective vectors

López-Ibáñez, M., Knowles, J. & Laumanns, M., 2011, *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)|Lect. Notes Comput. Sci.*. Berlin-Heidelberg: Springer Nature, Vol. 6576. p. 46-60 14 p.

DOI: 10.1007/978-3-642-19893-9_4

Policy learning in resource-constrained optimization

Allmendinger, R. & Knowles, J., 2011, *Genetic and Evolutionary Computation Conference, GECCO'11|Genet. Evol. Comput. Conf., GECCO*. Association for Computing Machinery, p. 1971-1978 7 p.

DOI: 10.1145/2001576.2001841

Convergent evolution to an aptamer observed in small populations on DNA microarrays

Rowe, W., Platt, M., Wedge, D. C., Day, P. J. R., Kell, D. B. & Knowles, J. D., Sep 2010, In: *Physical Biology*. 7, 3, 036007.

DOI: 10.1088/1478-3975/7/3/036007

Predictive models for population performance on real biological fitness landscapes

Rowe, W., Wedge, D. C., Platt, M., Kell, D. B. & Knowles, J., 17 Jul 2010, In: *Bioinformatics*. 26, 17, p. 2145-2152 7 p., btq353.

DOI: 10.1093/bioinformatics/btq353

Multiobjective evolutionary optimisation for surface-enhanced Raman scattering

Jarvis, R. M., Rowe, W., Yaffe, N. R., O'Connor, R., Knowles, J. D., Blanch, E. W. & Goodacre, R., Jul 2010, In: *Analytical and bioanalytical chemistry*. 397, 5, p. 1893-1901 8 p.

DOI: 10.1007/s00216-010-3739-z

Projects

Extend the functionality of an existing product platform by incorporating an algorithm to enable customers to develop optimised bioprocesses and reduce product costs.

Allmendinger, R. & Knowles, J.

1/01/17 → 31/12/18

Prizes

ACM GECCO Impact Award

Knowles, Joshua (Recipient), 1 Jun 2017

David Phillips Fellowship

Knowles, Joshua (Recipient), 1 Oct 2003

IEEE Transactions on Evolutionary Computation Outstanding Paper Award

Knowles, Joshua (Recipient), 1 Jun 2006

IEEE Transactions on Evolutionary Computation Outstanding Paper Award

Knowles, Joshua (Recipient), 1 Jun 2008

Marie Skłodowska-Curie Fellowship

Knowles, Joshua (Recipient), 1 Oct 2001