

# CURRICULUM VITAE OF CHRISTIAN BLUM

Last updated: August 2021

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## PERSONAL INFORMATION

**Job title** Senior Research Scientist

**Desk address** Artificial Intelligence Research Institute (IIIA)  
Spanish National Research Council (CSIC)  
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08193 Bellaterra (Spain)

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**Email** [christian.blum@iiia.csic.es](mailto:christian.blum@iiia.csic.es)



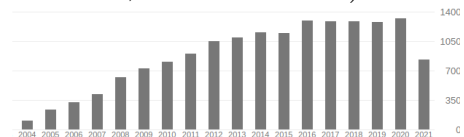
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## MAIN SCIENTIFIC MEASURES (BASED ON GOOGLE SCHOLAR, AUGUST 2021)

**h-index** 42

**Total number of citations** 16285

**Total number of JCR papers** 60



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## LATEST NEWS

- July 2021: together with three colleagues I won the **SEIO-BBVA award 2021** for the best methodological contribution in Operations Research (6.000 Euros)
- October 2020: my student Teddy Nurcahyadi and myself won the **best paper award** at the ANTS 2020 conference
- May 2020: as principal investigator I was granted a **new national project (CI-SUSTAIN, plan nacional)**

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## RESEARCH INTERESTS

My research interests are twofold: On one side I am interested in **swarm intelligence**, which is an artificial intelligence discipline based on the inspiration taken, for example, from the collective behaviour of social insects, flocks of birds, and fish schools. On the other side I am also interested in the **hybridization of metaheuristics** with more classical artificial intelligence and operations research methods such as, for example, branch & bound techniques and dynamic programming.

I make use of swarm intelligence concepts both for solving challenging combinatorial optimization problems and for problem solving in distributed environments such as adhoc and sensor networks. Well-known swarm intelligence algorithms for combinatorial optimization are ant colony optimization (ACO) and particle swarm optimization (PSO). In distributed environments I have lately made use of the self-desynchronization of the calling periods of Japanese tree frogs for graph coloring and large independent set finding. Concerning the second research line, I am currently working mainly on two different types of hybridization. First, the hybridization of metaheuristics based on the construction of solutions with concepts from branch & bound. Second, I am working on the development of hybrid algorithms based on problem instance reduction.

Concerning applications, my work has a **strong interdisciplinary flavour**. In fact, optimization and control tasks arise in many important application areas such as telecommunications, bio-informatics, neuroscience, and robotics. A representative example of my interdisciplinary work concerns the collaboration with the EPFL (Lausanne, Switzerland) on the *automated reconstruction of dendritic and axonal trees*. Concerning the bio-informatics (respectively, bio-medical) field, some of my recent work has focused on string problems such as the *far from most strings problem* and the *repetition-free longest common subsequence problem*.

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## EDUCATION

02/2004

### **PhD in Applied Sciences**

*Institution:* Université Libre de Bruxelles, Brussels, Belgium

*Dissertation title:* Theoretical and practical aspects of ant colony optimization

*Supervisor:* Prof. M. Dorigo

05/2002

### **DEA in Applied Sciences**

(Belgian Diplôme d'Etudes Approfondies en Sciences Appliquées)

*Institution:* Université Libre de Bruxelles, Brussels, Belgium

*Dissertation title:* Metaheuristics for group shop scheduling

*Supervisor:* Prof. M. Dorigo

- 07/1998      **Diplom in Mathematik**  
(German equivalent to a Masters degree in Mathematics)
- Institution:* Universität Kaiserslautern, Kaiserslautern, Germany  
*Dissertation title:* Optimality criteria and local search methods for node-weighted  $k$ -cardinality tree and subgraph problems (in German)  
*Supervisor:* Prof. H. W. Hamacher
- 10/1994      **Vordiplom in Mathematik**  
(degree necessary to obtain a diploma)
- Institution:* Johannes-Gutenberg Universität Mainz, Mainz, Germany
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## PROFESSIONAL EMPLOYMENT HISTORY

- From 01/2017      **Senior Research Scientist (in Spanish: Investigador Científico)**
- Institution:* Artificial Intelligence Research Institute (IIIA-CSIC), Spanish National Research Council (CSIC), Bellaterra, Spain
- 11/2012–12/2016      **Ikerbasque Research Professor**
- Institution:* University of the Basque Country, San Sebastian, Spain  
*Funding:* Ikerbasque, Basque Foundation for Science
- 12/2011–10/2012      **Associate Professor (Profesor titular interino)**
- Institution:* Universitat Politècnica de Catalunya, Barcelona, Spain
- 12/2006–11/2011      **Tenure Track Research Fellow**
- Institution:* Universitat Politècnica de Catalunya, Barcelona, Spain  
*Funding:* Programa **Ramon y Cajal**, a program of the Spanish Ministry of Science and Technology
- 12/2004–11/2006      **Post-doctoral Research Fellow**
- Institution:* Universitat Politècnica de Catalunya, Barcelona, Spain  
*Funding:* Programa **Juan de la Cierva**, a program of the Spanish Ministry of Science and Technology  
*Remark:* 1st place in the list of evaluated applications

- 07/2004–11/2004    **Post-doctoral Researcher**
- Institution:* Universitat Politècnica de Catalunya, Barcelona, Spain  
*Funding:* Project “SegraVis”, a research training network funded by the European Commission
- 02/2004–06/2004    **Post-doctoral Researcher**
- Institution:* IRIDIA, Université Libre de Bruxelles, Brussels, Belgium  
*Funding:* Project “Metaheuristics Network”, a research training network funded by the European Commission
- 11/2000–01/2004    **Pre-doctoral Researcher**
- Institution:* IRIDIA, Université Libre de Bruxelles, Brussels, Belgium  
*Funding:* Project “Metaheuristics Network”, a research training network funded by the European Commission
- 10/1999–09/2000    **Scientific Officer**
- Institution:* Imperial Cancer Research Fund (ICRF), Advanced Computation Laboratory, London, United Kingdom  
*Task:* Interfacing of a clinical decision support system with an electronic patient record systems
- 10/1997–04/1998    **Scientific Assistant**
- Institution:* Working group of Prof. H. W. Hamacher, Universität Kaiserslautern, Kaiserslautern, Germany
- 04/1997–06/1997    **Scientific Assistant**
- Institution:* DFKI (German Research Institute for Artificial Intelligence), Kaiserslautern, Germany  
*Funding:* German project ”PRODUKTION 2000, GIPP-S1”
- 01/1996–04/1997    **Scientific Assistant**
- Institution:* Centre for Learning Systems and Applications, Kaiserslautern, Germany  
*Funding:* Project “Diagnosis and monitoring of ulnar nerve lesions”
- 03/1995–04/1995    **Practical Training**
- Company:* BASF AG, Department of Molecular Modelling, Ludwigshafen, Germany  
*Task:* Development of optimization software for the determination of molecule structures

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## AWARDS

- 07/2021      **SEIO-BBVA Award** for the best methodological contribution in Operations Research. Prize money: 6000 Euros.
- 10/2020      **ANTS 2020 Best Paper Award** for the best paper presented at the *International Conference on Swarm Intelligence*.
- 07/2016      **GECCO 2016 Best Paper Award** for the best paper presented in the *ECOM track (Evolutionary Combinatorial Optimization)* of the Genetic and Evolutionary Computation (GECCO) conference.
- 06/2014      Director of a PhD thesis (by Dr. Hugo Hernández Pibernat) that has won the **premio extraordinario** in the 2014 call at the Universitat Politècnica de Catalunya (UPC).
- 01/2014      **Recognition of service award** bestowed by ACM (Association for Computing Machinery) for my service as editor-in-chief of the GECCO 2013 conference.
- 09/2013      **Best application-oriented paper award** at MAEB 2013 bestowed by the Spanish Association for Artificial Intelligence (AEPIA).
- 11/2012      Director of the thesis that won the **1st prize at the Certamen Arquímedes 2012**. Director's prize money: 2000 Euros
- 10/2011      **Wireless and Mobile Networking Conference Best Paper Award** for the best paper presented at the WMNC 2011 conference.
- 08/2010      **Theoretical Computer Science Top Cited Article 2005–2010 Award**, given to the most cited paper published in the journal *Theoretical Computer Science (Elsevier)* between 2005 and 2010.
- 06/2007      **IEEE Transactions on Evolutionary Computation Outstanding Paper Award 2005 (bestowed in 2007)**, given to the best paper published in the journal *IEEE Transactions on Evolutionary Computation* in 2005. Prize money: 1000 US dollars.
- 07/2006      **GECCO 2006 Best Paper Award** for the best paper presented in the *ECO track (Evolutionary Combinatorial Optimization)* of the Genetic and Evolutionary Computation (GECCO) conference.
- 12/2003      The paper *Local search algorithms for the k-cardinality tree problem* published in the journal *Discrete Applied Mathematics* was selected for the **Editors' choice volume of 2003**.

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## APPEARANCE IN THE MEDIA

- 07/2021            Upon winning the **SEIO-BBVA award 2021**, the CSIC published an article about our work in the part on success stories (<https://rdcsic.dicat.csic.es/tecnologias-fisicas-2/101-historias-de-exito/614-christian-blum-investigador-del-iiia-csic-recibe-el-premio-seio-fundacion-bbva-nuestro-algoritmo-hibrido-puede-aplicarse-en-la-resolucion-de-problemas-de-optimizacion-del-dia-a-dia>).
- 12/2020            An **article about our work on negative learning** was published on SINC, the scientific news website of the Spanish Government (<https://www.agenciasinc.es/Noticias/Un-algoritmo-inspirado-en-los-caminos-descartados-por-las-hormigas>).
- 12/2016            The **Diario Vasco**, one of the main daily newspapers in the Basque Country, dedicated a whole page on my work on the use of the self-desynchronization behaviour observed in Japanese tree frogs.
- 09/2015            An **article about one of my papers** was published on SINC, the scientific news website of the Spanish Government (<http://www.agenciasinc.es/Noticias/Las-ranas-resuelven-problemas-de-computacion>). This has led to various interviews and articles in newspapers such as La Vanguardia, ABC, and La Voz de Galicia.
- 07/2012            An **article about one of my papers** was published on SINC, the scientific news website of the Spanish Government (<http://www.agenciasinc.es/Noticias/El-canto-de-una-rana-inspira-un-algoritmo-para-redes-inalambricas>).
- 02/2009            An **interview on swarm intelligence** was broadcasted as part of the popular science program Tres14 by the Spanish channel TVE2 (<http://www.rtve.es/alacarta/videos/tres14/tres14-hormigas-en-la-red/458567/>).

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## RESEARCH PROJECTS AS SCIENTIST IN CHARGE

- 06/2020–05/2023    MINECO project with contract number PID2019-104156GB-I00  
Funding: 102.850 Euros
- 01/2013–12/2016    MINECO project with contract number TIN2012-37930-C02-02  
Funding: 20.124 Euros

01/2009–12/2010 Integrated action grant **AI-ES-AT**, contract MEC HA2008-0005  
Funding: 11.950 Euros

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#### OTHER RESEARCH PROJECTS

06/2018–05/2021 EU-funded project **LOGISTAR**, grant agreement number 76914  
*Scientist in charge:* Jordi Levy (IIIA-CSIC)

01/2016–12/2018 MINECO project **COLECTIVEWARE**, contr. TIN2015-66863-C2-1-R  
*Scientist in charge:* Juan Antonio Rodríguez Aguilar (IIIA-CSIC)

04/2018–03/2020 RecerCaixa project **AppPhil**  
*Scientist in charge:* Nardine Osman (IIIA-CSIC)

01/2007–10/2012 MICINN 6-year macro-project **FORMALISM**, contract TIN-2007-66523  
*Scientist in charge:* Fernando Orejas (UPC, Barcelona)  
Funding: 821.000 Euros

02/2008–04/2011 EU-funded project **FRONTS**, contract EU FP7-ICT-2007-1  
*Scientist in charge:* Josep Diaz (UPC, Barcelona)

06/2008–05/2011 EU-funded project **WISEBED**, contract EU FP7-ICT-2007-1  
*Scientist in charge:* Josep Diaz (UPC, Barcelona)

01/2006–12/2008 CICYT project **OPLINK**, contract TIN-2005-08818-C04  
*Scientist in charge:* Enrique Alba Torres (UMA, Málaga)

07/2004–11/2005 CICYT project **TRACER**, contract TIC-2002-04498-C05  
*Scientist in charge:* Joaquim Gabarró (UPC, Barcelona)

07/2004–11/2004 EU-funded research training network **SegraVis**,  
contract HPRN-CT-2002-00275  
*Scientist in charge:* Fernando Orejas (UPC, Barcelona)

11/2000–06/2004 EU-funded research training network **Metaheuristics Network**,  
contract HPRN-CT-1999-00106  
*Scientist in charge:* Marco Dorigo (ULB, Belgium)

04/1997–06/1997 German project **PRODUKTION 2000, GIPP-S1**,  
contract FKZ-02PV41092  
*Scientist in charge:* Harold Boley (DFKI GmbH, Germany)

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## SCIENTIFIC BOARDS AND STEERING COMMITTEES

Since 05/2014	<b>Member of the Steering Committee</b> of the EvoCOP conference series
Since 01/2010	<b>Member of the Steering Committee</b> of the LION conference series
Since 03/2010	<b>Member of the Scientific Advisory Board</b> of the company Reactive Search S.r.l.

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## EDITORIAL ACTIVITIES

Since 08/2020	<b>Associate Editor</b> for the journal Artificial Intelligence (ArtInt)
10/2020	<b>Co-editor</b> , proceedings of ANTS 2020 (LNCS 12421)
01/2019	<b>Co-editor</b> , proceedings of HM 2019 (LNCS 11299)
Since 12/2018	<b>Associate Editor</b> for the journal Engineering Applications of Artificial Intelligence (EAAI)
09/2018	<b>Co-editor</b> , proceedings of ANTS 2018 (LNCS 11172)
Since 01/2016	<b>Area Editor</b> for the journal Computers & Operations Research (COR)
09/2016	<b>Co-editor</b> , proceedings of HM 2016 (LNCS 9668)
Since 07/2015	<b>Associate Editor</b> for the journal Theoretical Computer Science (TCS)
05/2015	<b>Field Editor</b> for Swarm Intelligence concerning the Handbook of Computational Intelligence (Springer Verlag)
Since 03/2015	<b>Associate Editor</b> for the journal Natural Computing (NACO)
05/2014	<b>Co-editor</b> , proceedings of HM 2014 (LNCS 8457)
04/2014	<b>Co-editor</b> , proceedings of EvoCOP 2014 (LNCS 8600)
07/2013	<b>Co-editor</b> , proceedings of GECCO 2013 (ACM)
05/2013	<b>Co-editor</b> , proceedings of HM 2013 (LNCS 7919)
04/2013	<b>Co-editor</b> , proceedings of EvoCOP 2013 (LNCS 7832)



- 09/2012            **Co-editor**, proceedings of ANTS 2012 (LNCS 7461)
- 07/2012–12/2015    **Associate Editor** for the journal Applied Soft Computing (ASOC)
- Since 02/2012        **Member of the editorial board** of the journal Neural Computing & Applications (NC&A)
- Since 03/2011        **Field Editor for Swarm Intelligence** for a large book project on computational intelligence by Springer Verlag, Berlin, Germany
- 10/2010            **Co-editor**, proceedings of HM 2010 (LNCS 6373)
- 03/2010            **Co-editor** of a special issue on “Hybrid Metaheuristics” in the journal Computers & Operations Research (vol 37, issue 3, 2010)
- 01/2010            **Co-editor** of the proceedings of Learning and Intelligent Optimization (LION) 2010 (LNCS 6073)
- 10/2009            **Co-editor** of the proceedings of Hybrid Metaheuristics (HM) 2009 (LNCS 5818)
- 07/2009            **Co-editor** of the proceedings of the 2009 Genetic and Evolutionary Computation Conference (GECCO 2009), published by ACM press
- 10/2008            **Co-editor** of the proceedings of Hybrid Metaheuristics (HM) 2008 (LNCS 5296)
- 09/2008            **Co-editor** of the proceedings of ANTS 2008: Sixth International Workshop on Ant Colony Optimization and Swarm Intelligence (LNCS)
- 09/2008            **Co-editor** of the book *Swarm Intelligence–Introduction and Applications* published by Springer Verlag
- 05/2008            **Co-editor** of the book *Hybrid Metaheuristics–An Emerging Approach to Optimization* published by Springer Verlag
- 10/2007            **Co-editor** of the proceedings of Hybrid Metaheuristics (HM) 2007 (LNCS 4771)
- 12/2006–11/2011    **Associate editor** of the Swarm Intelligence journal (Springer)
- 10/2006            **Co-editor** of the proceedings of Hybrid Metaheuristics (HM) 2006 (LNCS 4030)
- 07/2006            **Co-editor** of the proceedings of the 2006 Genetic and Evolutionary Computation Conference (GECCO 2006), published by ACM press

- 04/2006            **Co-editor** of a special issue on “Hybrid Metaheuristics” in the Journal of Mathematical Modelling and Algorithms (vol 5, issue 1, 2006)
- Since 02/2006    **Member of the editorial board** of the ISE book series on Intelligent System Engineering (by NOVA publishers, NY, USA)
- 12/2005            **Co-editor** of a special issue on “Swarm Intelligence” in the journal Künstliche Intelligenz, the journal of the AI section of the German Society for Informatics (vol 4, 2005)
- 08/2005            **Co-editor** of the proceedings of Hybrid Metaheuristics (HM) 2005 (LNCS 3636)
- Since 08/2005    **Member of the editorial board** of the journal Computers & Operations Research (Elsevier)
- 06/2005            **Co-editor** of the proceedings of the 2005 Genetic and Evolutionary Computation Conference (GECCO 2005), published by ACM press.
- 09/2004            **Co-editor** of the proceedings of ANTS 2004: Fourth International Workshop on Ant Algorithms (LNCS 3172)
- 08/2004            **Co-editor** of the proceedings of Hybrid Metaheuristics (HM 2004) (ISBN 3-00-015331-4)

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#### ORGANIZATIONAL ACTIVITIES

- 10/2020            **Co-organizer** of the 12th International Conference on Swarm Intelligence (ANTS 2020), (Barcelona, Spain)
- 07/2018            **Co-chair** of the ECOM track of GECCO 2018: Genetic and Evolutionary Computation Conference (Kyoto, Japan)
- 09/2018            **Technical program co-chair** of the 11th International Conference on Swarm Intelligence (ANTS 2018), (Rome, Italy)
- 07/2017            **Special issues chair** of the 12th Metaheuristics International Conference (MIC 2017), (Barcelona, Spain)
- 06/2017            **Technical program co-chair** of the IEEE Congress on Evolutionary Computation (CEC 2017), (San Sebastian, Spain)

- 09/2016      **Workshop co-chair** of the 14th International Conference on Parallel Problem Solving from Nature (PPSN 2016), (Edinburgh, UK)
- 09/2016      **Program co-chair** of the 10th International Workshop on Hybrid Metaheuristics (HM 2016), (Plymouth, UK)
- 06/2014      **Organization committee member** of the 20th Conference of the International Federation of Operational Research Societies (IFORS 2014), (Barcelona, Spain)
- 05/2014      **Program co-chair** of the 9th International Workshop on Hybrid Metaheuristics (HM 2014), (Hamburg, Germany)
- 04/2014      **Program co-chair** of the 14th International Conference on Evolutionary Computation in Combinatorial Optimization (EvoCOP 2014), (Granada, Spain)
- 07/2013      **Editor-In-Chief** of the Genetic and Evolutionary Computation Conference (GECCO 2013), (Amsterdam, The Netherlands)
- 05/2013      **Program co-chair** of the 8th International Workshop on Hybrid Metaheuristics (HM 2013), (Ischia, Italy)
- 04/2013      **Program co-chair** of the 13th International Conference on Evolutionary Computation in Combinatorial Optimization (EvoCOP 2013), (Vienna, Austria)
- 09/2012      **Program co-chair** of the Eight International Conference on Swarm Intelligence (ANTS 2012), (Brussels, Belgium)
- 07/2012      **Co-chair** of the “Combinatorial Optimization” track of GECCO 2012: Genetic and Evolutionary Computation Conference (Philadelphia, USA)
- 07/2012      **Co-chair** of the “Late-Breaking Abstracts” workshop at GECCO 2012: Genetic and Evolutionary Computation Conference (Philadelphia, USA)
- 07/2011      **Co-chair** of the 1st International Workshop on Bio-inspired Solutions for Wireless Sensor Networks, (Dublin, Ireland)
- 07/2011      **Co-chair** of the “Late-Breaking Abstracts” workshop at GECCO 2011: Genetic and Evolutionary Computation Conference (Dublin, Ireland)
- 10/2010      **Program co-chair** of the 7th International Workshop on Hybrid Metaheuristics (HM 2010), (Vienna, Austria)
- 01/2010      **Chair of the Program Committee** of Learning and Intelligent Optimization (LION 4), (Venice, Italy)

- 10/2009      **Program co-chair** of the 6th International Workshop on Hybrid Metaheuristics (HM 2009), (Udine, Italy)
- 07/2009      **Co-chair** of the “Combinatorial Optimization” track of GECCO 2009: Genetic and Evolutionary Computation Conference (Montreal, Canada)
- 10/2008      **Program co-chair** of the 5th International Workshop on Hybrid Metaheuristics (HM 2008), (Málaga, Spain)
- 09/2008      **Program co-chair** of the Sixth International Conference on Ant Colony Optimization and Swarm Intelligence (ANTS 2008), (Brussels, Belgium)
- 10/2007      **Program co-chair** of the 4th International Workshop on Hybrid Metaheuristics (HM 2007), (Dortmund, Germany)
- 02/2007      **Organizer** of a special session on *hybrid metaheuristics* at the Congreso Español sobre Metaheurísticas, Algoritmos Evolutivos y Bioinspirados (MAEB 2007), (Tenerife, Spain)
- 10/2006      **Co-organizer** of the 3rd international workshop on Hybrid Metaheuristics (HM 2006), (Gran Canaria, Spain)
- 07/2006      **Chair** of the “ACO”/“swarm intelligence” track of GECCO 2006: Genetic and Evolutionary Computation Conference (Seattle, USA)
- 08/2005      **Co-organizer** of the 2nd international workshop on Hybrid Metaheuristics (HM 2005), (Barcelona, Spain)
- 06/2005      **Chair** of the “ACO”/“swarm intelligence” track of GECCO 2005: Genetic and Evolutionary Computation Conference (Washington, USA)
- 09/2004      **Publication co-chair** of ANTS 2004: Fourth International Workshop on Ant Algorithms (Brussels, Belgium)
- 08/2004      **Co-organizer** of the workshop Hybrid Metaheuristics (HM 2004) at ECAI 2004 (Valencia, Spain)
- 09/2002      **Member** of the *Local Organizations Committee* of ANTS 2002: 3rd International Workshop on Ant Algorithms (Brussels, Belgium)

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## PROGRAM COMMITTEES

Since 2013/2014 I am acting as **member of the program committee** for about 10 conferences and workshops per year. A complete list is omitted here due to limited space.

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## REFEREE ACTIVITIES

### **Projects**

Project referee for ANECA  
Project referee for the Austrian Science Fund  
Project referee for the Slovenian Research Agency  
Project referee for the Polish Ministry of Science and Higher Education  
Project referee for the Belgian Fonds de Recherche Scientifique (FNRS)  
Project referee for the Kuwait Foundation for the Advancement of Sciences

### **Journals**

Annals of Operations Research  
Artificial Life  
Artificial Intelligence  
Computational Optimization and Applications  
Computer Science Reviews  
Computers & Operations Research  
Constraints  
European Journal of Operational Research  
Evolutionary Computing  
IEEE Transactions on Evolutionary Computation  
  
IEEE Transactions on Systems, Man and Cybernetics – Part B  
Information Processing Letters  
Information Sciences  
INFORMS Journal on Computing  
International Journal of Approximate Reasoning  
International Journal of Control, Automation, and Systems  
International Journal of Production Research  
International Journal of Systems Science  
Journal of Artificial Intelligence Reviews  
Journal of Engineering Manufacture  
Journal of Experimental Algorithmics  
Journal of Heuristics  
Journal of Mathematical Modelling and Algorithms  
Journal of Scheduling  
Journal of Sound and Vibration  
Management Science  
Memetic Computing  
Networks  
Neurocomputing  
Novatica  
Optimization Letters  
Pattern Analysis and Applications  
Soft Computing  
Swarm Intelligence

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## TUTORIALS

- 10/2014      Invited tutorial on *swarm intelligence* at META 2014: International Conference on Metaheuristics and Bio-inspired Computing (Marrakesh, Morocco)
- 10/2012      Invited tutorial on *hybrid metaheuristics* at TPNC 2012: International Conference on Theory and Practice of Natural Computing (Tarragona, Spain)
- 08/2012      Invited tutorial on *swarm intelligence* at ICARIS 2012: International Conference on Artificial Immune Systems (Taromina, Italy)
- 07/2011      Invited tutorial on *ant colony optimization* at GECCO 2011: Genetic and Evolutionary Computation Conference (Dublin, Ireland)
- 07/2009      Invited tutorial on *ant colony optimization* at GECCO 2009: Genetic and Evolutionary Computation Conference (Montreal, Canada)
- 09/2008      Invited tutorial *Swarm Intelligence* at PPSN 2008: Parallel Problem Solving in Nature (Dortmund, Germany)
- 09/2007      Invited tutorial *Ant colony optimization: Introduction and recent hybridizations* at HIS 2007: Hybrid Intelligent Systems (Kaiserslautern, Germany)
- 07/2007      Invited tutorial on *ant colony optimization* at GECCO 2007: Genetic and Evolutionary Computation Conference (London, UK)
- 07/2006      Invited tutorial on *ant colony optimization* at GECCO 2006: Genetic and Evolutionary Computation Conference (Seattle, USA)
- 11/2005      Tutorial *Ant colony optimization: Introduction and recent advances* at HIS 2005: Hybrid Intelligent Systems (Rio de Janeiro, Brasil)
- 06/2005      Invited tutorial on *ant colony optimization* at GECCO 2005: Genetic and Evolutionary Computation Conference (Washington, USA)

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## INVITED TALKS AND KEYNOTE TALKS

- 07/2021      Keynote talk titled *On the Design of Matheuristics that make Use of Learning* at MOTOR 2021, Lake Baikal, Russia. Invited by **Anton Eremeev**.

- 05/2021 Keynote talk titled *Recent Topics in Swarm Intelligence and in Hybrid Metaheuristics* at ETI4.0 2021, Raigarh, India. Invited by **Siddharth S. Chakrabarti**.
- 04/2021 Keynote talk titled *On the Use of Learning in Hybrid Algorithms Combining Metaheuristics with Exact Techniques* at ISMSI 2021, Victoria, Seychelles. Invited by **Suash Deb**.
- 12/2020 Webinar on *Are you a Hybrid? Yes, of course, everyone is a Hybrid nowadays!*, University of Catania, Italy. Invited by **Mario Pavone**.
- 09/2020 Keynote talk titled *Are you a Hybrid? Yes, of course, everyone is a Hybrid nowadays!* at FedCSIS 2019, Sofia, Bulgaria. Invited by **Marcin Paprzycki**.
- 11/2019 Talk on *Construct, Merge, Solve & Adapt: A Recent Hybrid Approach for Combinatorial Optimization* at the 7th Math Colloquium BCAM, Bilbao, Spain. Invited by **José Antonio Lozano**.
- 10/2019 Talk on *Large-Scale Online Ride-Sharing* at the Operations & Marketing Seminar Series of the Universidad Pompeu Fabra, Barcelona, Spain. Invited by **Helena Ramalhinho**.
- 03/2019 Talk on *Construct, Merge, Solve & Adapt: A Hybrid Algorithm With a Resemblance to Evolutionary Algorithms* at SAINT 2019, Shenzhen, China. Invited by **Xin Yao**.
- 03/2019 Talk on *Construct, Merge, Solve & Adapt: A Hybrid Algorithm With a Resemblance to Evolutionary Algorithms*, City University of Hong Kong. Invited by **Qingfu Zhang**.
- 01/2019 Keynote talk titled *Large-Scale Online Ride-Sharing* at HM 2019, Concepción, Chile. Invited by **Pedro Pinacho Davidson**.
- 12/2018 Talk on *Construct, Merge, Solve and Adapt: A General Algorithm for Combinatorial Optimization*, BarcelonaTech, Barcelona, Spain. Invited by **Maria Albareda**.
- 11/2018 Keynote talk titled *Useful Optimization Techniques for String Problems From Computational Biology* at BBCC 2018, Naples, Italy. Invited by **Angelo Facchiano**.
- 10/2017 Keynote talk titled *CMSA: A Recent Example of an ILP-Based Hybrid Metaheuristic* at VNS 2017, Ouro Preto, Brazil. Invited by **Haroldo Gambini**.

- 06/2017 Talk on *CMSA: An Alternative to Large Neighborhood Search*, University of Angers, Angers, France. Invited by **Jin-Kao Hao**.
- 03/2017 Talk on *Optimization: Ants, Frogs, and Hybrids*, IN3 Institute of the UOC, Castelldefels, Spain. Invited by **Angel Juan**.
- 09/2016 Keynote talk titled *Combining Metaheuristics with ILP Solvers: Construct, Merge, Solve & Adapt* at BENELEARN 2016, Kortrijk, Belgium. Invited by **Patrick de Causmaecker**.
- 09/2016 Keynote talk titled *Combining Metaheuristics based on Solution Construction with Exact Techniques* at MATHEURISTICS 2016, Brussels, Belgium. Invited by **Thomas Stützle**.
- 10/2015 Keynote talk titled *Combinación de Metaheurísticas con Solvers ILP en la Optimización Combinatoria* at OPTIMA 2015, Antofagasta, Chile. Invited by **Jordi Pereira**.
- 10/2015 Talk on *Optimization: Ants, Frogs, and Hybrids*, Universidad Adolfo Ibáñez, Santiago de Chile. Invited by **Jordi Pereira**.
- 09/2015 Keynote talk titled *Combining Metaheuristics with ILP Solvers in Combinatorial Optimization* at INISTA 2015, Madrid, Spain. Invited by **David Camacho**
- 09/2014 Talk on *Swarm Intelligence and Hybrid Metaheuristics*, Manchester University, UK. Invited by **Joshua Knowles**.
- 06/2012 Keynote talk on *Hybrid Metaheuristics* at OPTMAS 2012, Valencia, Spain. Invited by **Juan A. Rodríguez**
- 06/2012 Talk on *Hybridizing of Metaheuristics* at the multidisciplinary seminar of the Department of Chemical Engineering of the Universitat Rovira i Virgili, Tarragona, Spain. Invited by **Roger Guimerà**
- 12/2010 Talk on *Hybrid Metaheuristics*, Nature Inspired Computation and Applications Laboratory (NICAL), University of Science and Technology of China, Hefei, China. Invited by **Xin Yao**
- 05/2010 Keynote talk on *Hybrid Metaheuristics* at BIOMA 2010, Ljubljana, Slovenia. Invited by **Jurij Silc**
- 12/2009 Talk on *Solving the k-cardinality tree problem*, EPFL, Lausanne, Switzerland. Invited by **Pascal Fua**



- 06/2009 Talk on *Integrating Beam-ACO with constraint programming for single machine job scheduling*, University of Viena, Austria. Invited by **Richard Hartl**
- 06/2009 Talk on *Integrating Beam-ACO with constraint programming for single machine job scheduling*, Technical University of Viena, Austria. Invited by **Günther Raidl**
- 09/2008 Talk on *Ant colony optimization hybrids* at ANTS 2008, Brussels, Belgium. Invited by **Marco Dorigo**
- 07/2008 Talk on *Ant colony optimization*, Center for Genomic Regulation, Comparative Bioinformatics Group, Barcelona. Invited by **Cedric Notredame**
- 01/2008 Talk on *Beam-ACO: Hybridizing ant colony optimization with beam search*, University of Viena, Austria. Invited by **Karl Dörner and Richard Hartl**
- 12/2007 Talk on *Beam-ACO: A hybrid between ant colony optimization and beam search*, University of Porto, Portugal. Invited by **Joao Pedroso**
- 09/2007 Member of a panel discussion on *The future and challenges of stochastic local search engineering* at SLS 2007, Brussels, Belgium. Invited by **Holger Hoos and Thomas Stützle**
- 03/2006 Talk on *Introduction to ant colony optimization*, University of Trento, Italy. Invited by **Roberto Battiti**

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#### PARTICIPATION IN PHD DEFENSE JURIES

- 05/2021 **Renzo Massobrio**, *Learning for Optimization with Virtual Savant*, Universidad de Cadiz, Spain
- 05/2021 **Marko Djukanovic**, *Exact and Heuristic Approaches for Solving String Problems from Bioinformatics*, TU Wien, Viena, Austria
- 06/2017 **Yi Zhou**, *Optimization Algorithms for Clique Problems*, University of Angers, Angers, France
- 12/2014 **Josu Ceberio**, *Solving Permutation Problems with Estimation of Distribution Algorithms and Extensions Thereof*, University of the Basque Country UPV/EHU, San Sebastian, Spain
- 03/2013 **Andrey Kostin**, *Development of advanced mathematical programming methods for supply chain management*, Universitat Rovira i Virgili, Tarragona, Spain

11/2012	<b>Francisco Javier Rodríguez</b> , <i>Hybrid and constructive metaheuristics: methods and applications</i> , University of Granada, Spain
08/2012	<b>Mustafa Misir</b> , <i>Intelligent Hyper-heuristics: A tool for solving generic optimisation problems</i> , Catholic University of Leuven, Belgium
11/2010	<b>Guillermo Molina Arribere</b> , <i>Técnicas de optimización para redes de sensores</i> , Universidad de Málaga, Spain
06/2008	<b>Todd James Treangen</b> , <i>Novel Computational Methods for Large-Scale Genome Comparison</i> , Universitat Politècnica de Catalunya, Spain
05/2007	<b>Stephen Gilmore</b> , <i>Meshing Structural Knowledge And Heuristics: Improving Ant Colony Optimization Via Kernelization-Based Templates</i> , MacQuarie University, Australia

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## TEACHING

Summer 2018	Classes on swarm intelligence and CMSA, MESS Metaheuristics International Summer School (2 hours)
Spring 2018	Metaheuristics Course, Graduate Course at BGSMath, the Barcelona Graduate School of Mathematics (2 hours)
Spring 2017	Metaheuristics and Hybrid Methods for Combinatorial Optimization, TU Wien, Austria (20 hours)
Fall 2011	Programming in C++ (PRO1), FIB, UPC, Barcelona (90 hours)
Fall 2011	Responsible professor for "Seminar of Algorithms and Programming" (SAP), Master program on software, Department LSI, UPC, Barcelona (12 hours)
Spring 2011	Algoritmia (ALG), Facultat d'Informàtica, UPC, Barcelona (28 hours)
Fall 2010	Programming in C++ (P1), FIB, UPC, Barcelona (90 hours)
Spring 2007	Algoritmia (ALG), Facultat d'Informàtica, UPC, Barcelona (20 hours)
Fall 2006	Informàtica I, Facultat de Matemàtiques i Estadístiques , UPC, Barcelona (28 hours)

Fall 2006	12 hours module on <i>metaheuristics</i> within the "Seminar of Algorithms and Programming" (SAP), Master program on software, Department LSI, UPC, Barcelona
03/2006	20 hours course on <i>metaheuristics</i> , Universidad de Málaga, Málaga, Spain (2 credits)
05/2004	2 hours course for undergraduate students on <i>metaheuristics in combinatorial optimization</i> , Universitat Politècnica de Catalunya, Barcelona, Spain
02/2004	2 hours course for PhD students on <i>metaheuristics in combinatorial optimization</i> at the Universitat Politècnica de Catalunya, Barcelona, Spain
11/2003	3 hours course for undergraduate students on <i>metaheuristics in combinatorial optimization</i> , Université Libre de Bruxelles, Brussels, Belgium
Fall 2010	Responsible professor for "Seminar of Algorithms and Programming" (SAP), Master program on software, Department LSI, UPC, Barcelona (12 hours)
Spring 2010	Programming in C++ (P1), Facultat d'Informàtica, UPC, Barcelona (28 hours)
Spring 2010	Algoritmia (ALG), Facultat d'Informàtica, UPC, Barcelona (20 hours)
Fall 2009	Programming in C++ (P1), Facultat d'Informàtica, UPC, Barcelona (56 hours)
Fall 2009	Responsible professor for "Seminar of Algorithms and Programming" (SAP), Master program on software, Department LSI, UPC, Barcelona (12 hours)
Spring 2009	Programming in C++ (P1), Facultat d'Informàtica, UPC, Barcelona (28 hours)
Spring 2009	Algoritmia (ALG), Facultat d'Informàtica, UPC, Barcelona (22 hours)
Fall 2009	Programming in C++ (P1), Facultat d'Informàtica, UPC, Barcelona (56 hours)
Fall 2009	16 hours module on <i>metaheuristics</i> within the "Seminar of Algorithms and Programming" (SAP), Master program on software, Department LSI, UPC, Barcelona
Spring 2008	Algoritmia (ALG), Facultat d'Informàtica, UPC, Barcelona (22 hours)

Fall 2007                    16 hours module on *metaheuristics* within the "Seminar of Algorithms and Programming" (SAP), Master program on software, Department LSI, UPC, Barcelona

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#### GRADUATE STUDENTS

07/2019                    **Guillem Rodríguez**, *Biased Random Key Genetic Algorithms for the Minimum Independent Domination Problem*

07/2016                    **Aitor Alkorta**, *Reverse Engineering in Polymerization Processes: Optimization of Reaction Conditions*

01/2012                    **Sergi Mateo Bellido**, *Híbrido de optimización por colonia de hormigas para el problema de hallar la arborescencia enraizada con peso mínimo*

07/2008                    **Pedro Jesús Copado Méndez**, *Hibridación de la Metaheurística ACO para el Shortest Capacitated Paths Problem*

07/2006                    **Mateu Yábar Vallès**, *Ant Colony Optimization for DNA Sequencing by Hybridization*

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#### MASTER STUDENTS

07/2021                    **Guillem Rodríguez**, *Metaheuristics for Network Alignment: An Integrative View*

06/2016                    **Alex Hagg**, *Hierarchical Training of Local Surrogate Models for Evolutionary Optimization of Streamlined 2D Shapes*

07/2010                    **Pedro Jesús Copado Méndez**, *Development of a Hybrid Metaheuristic for the Efficient Solution of Strategic Supply Chain Management Problems: Application to the Energy Sector*

07/2008                    **Hugo Hernández Pibernat**, *Ant Colony Optimization for Energy-Efficient Multi-Casting in Wireless Ad-Hoc Networks*

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#### PHD STUDENTS

05/2021                    **Marko Djukanovic**, *Exact and Heuristic Approaches for Solving String Problems from Bioinformatics*

- 07/2017      **Pedro Pinacho Davidson**, *Development of hybrid metaheuristics based on instance reduction for combinatorial optimization problems*
- 06/2013      **Salim Bouamama**, *Design of a Learning Method for Automatic Data Extraction*
- 06/2012      **Hugo Hernández Pibernat**, *Swarm Intelligence Methods for Optimization and Management Tasks in Sensor Networks*
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#### SUPERVISION OF OTHER PROJECTS

- 03/2004      **Co-supervisor** of a pilot project on hybridizing ant colony optimization and constraint programming. In cooperation with Bernd Meyer, Monash University, Australia
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#### EVALUATIONS IN THE SPANISH RESEARCH SYSTEM

- 05/2011      *Agreditación de profesor titular (TU)* obtained from the Agencia Nacional de Evaluación de la Calidad y Acreditación (ANECA)
- 01/2011      Positive evaluation within the *I3 program* of the Spanish Ministry of Science and Innovation
- 12/2010      Validation of the equivalence of my PhD (in Spanish: *homologación*) at the Universitat Politècnica de Catalunya
- 07/2009      *Acreditació de recerca* obtained from the Agència per a la Qualitat del Sistema Universitari de Catalunya (AQU)
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#### VARIOUS

- Programming**
- Java** (Swing, RMI, Jini, CORBA, JDBC, XML DOM)  
*Experience: 3 years*
  - C++** (development of optimization software)  
*Experience: 20 years*
  - Smalltalk** (development of AI applications)  
*Experience: 3 years*
- Basic knowledge of **Pascal, Modula2, Fortran, Lisp, Prolog**

**Languages**

**German** (mother language)

**English** (fluent, written and spoken)

**Spanish** (fluent, written and spoken)

**French** (basic knowledge)

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## PUBLICATIONS

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### JOURNALS

- [1] Ewa Andrejczuk, Filippo Bistaffa, Christian Blum, Juan A. Rodríguez-Aguilar, and Carles Sierra. Synergistic team composition: A computational approach to foster diversity in teams. *Knowledge-Based Systems*, 2019. **Impact factor: 5.921, Rank 15 out of 137 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <https://doi.org/10.1016/j.knosys.2019.06.007>.
- [2] Samir Balbal, Salim Bouamama, and Christian Blum. A greedy heuristic for maximizing the lifetime of wireless sensor networks based on disjoint weighted dominating sets. *Algorithms*, 14(6):170, 2021. <https://doi.org/10.3390/a14060170>.
- [3] Filippo Bistaffa, Christian Blum, Jesús Cerquides, Alessandro Farinelli, and Juan A. Rodríguez-Aguilar. A computational approach to quantify the benefits of ridesharing for policy makers and travellers. *IEEE Transactions on Intelligent Transportation Systems*, 22(1):119–130, 2021. **Impact factor: 6.492, Rank 6 out of 38 journals in category TRANSPORTATION SCIENCE & TECHNOLOGY.** <https://doi.org/10.1109/TITS.2019.2954982>.
- [4] M. J. Blesa and C. Blum. Finding edge-disjoint paths in networks: An ant colony optimization algorithm. *Journal of Mathematical Modelling and Algorithms*, 6(3):361–391, 2007. **Citations on Google Scholar: 14.** <http://dx.doi.org/10.1007/s10852-007-9060-y>.
- [5] C. Blum. Ant colony optimization: Introduction and recent trends. *Physics of Life Reviews*, 2(4):353–373, 2005. **Impact factor: 3.774, Rank 17 out of 74 journals in category BIOPHYSICS.** <http://dx.doi.org/10.1016/j.plrev.2005.10.001>.
- [6] C. Blum. Beam-ACO—Hybridizing ant colony optimization with beam search: An application to open shop scheduling. *Computers & Operations Research*, 32(6):1565–1591, 2005. **Impact factor: 2.116, Rank 9 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.cor.2003.11.018>.
- [7] C. Blum. Iterated local search and constructive heuristics for error correcting code design. *International Journal of Innovative Computing and Applications*, 1(1):14–22, 2007. **Citations on Google Scholar: 3.** <http://dx.doi.org/10.1504/IJICA.2007.013398>.
- [8] C. Blum. Revisiting dynamic programming for finding optimal subtrees in trees. *European Journal of Operational Research*, 177(1):102–115, 2007. **Impact factor: 2.093, Rank 10 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.ejor.2005.11.005>.
- [9] C. Blum. Beam-ACO for simple assembly line balancing. *INFORMS Journal on Computing*, 20(4):618–627, 2008. **Impact factor: 1.318, Rank 23 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <https://doi.org/10.1287/ijoc.1080.0271>.

- [10] C. Blum. Iterative beam search for simple assembly line balancing with a fixed number of work stations. *Statistics and Operations Research Transactions*, 35(2):145–164, 2011. **Impact factor: 0.250, Rank 71 out of 75 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.**
- [11] C. Blum and M. J. Blesa. A comprehensive comparison of metaheuristics for the repetition-free longest common subsequence problem. *Journal of Heuristics*, 24(3):551–579, 2018. In Press. **Impact factor: 1.807, Rank 37 out of 104 journals in category COMPUTER SCIENCE, THEORY & METHODS.** <https://doi.org/10.1007/s10732-017-9329-x>.
- [12] C. Blum, M. J. Blesa, and M. López Ibáñez. Beam search for the longest common subsequence problem. *Computers & Operations Research*, 36(12):3178–3186, 2009. **Impact factor: 2.116, Rank 9 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.cor.2009.02.005>.
- [13] C. Blum and M.J. Blesa. New metaheuristic approaches for the edge-weighted  $k$ -cardinality tree problem. *Computers & Operations Research*, 32(6):1355–1377, 2005. **Impact factor: 2.116, Rank 9 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.cor.2003.11.007>.
- [14] C. Blum and B. Calvo. A matheuristic for the minimum weight rooted arborescence problem. *Journal of Heuristics*, 21(4):479–499, 2015. **Impact factor: 1.359, Rank 27 out of 102 journals in category COMPUTER SCIENCE, THEORY & METHODS.** <http://dx.doi.org/10.1007/s10732-015-9286-1>.
- [15] C. Blum, B. Calvo, and M. J. Blesa. FrogCOL and FrogMIS: New decentralized algorithms for finding large independent sets in graphs. *Swarm Intelligence*, 9(2):205–227, 2015. **Impact factor: 2.577, Rank 26 out of 130 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <http://dx.doi.org/10.1007/s11721-015-0110-1>.
- [16] C. Blum and M. Dorigo. The hyper-cube framework for ant colony optimization. *IEEE Transactions on Systems, Man, and Cybernetics – Part B*, 34(2):1161–1172, 2004. **Impact factor: 3.007, Rank 11 out of 103 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <https://doi.org/10.1109/TSMCB.2003.821450>.
- [17] C. Blum and M. Dorigo. Search bias in ant colony optimization: On the role of competition-balanced systems. *IEEE Transactions on Evolutionary Computation*, 9(2):159–174, 2005. **Impact factor: 4.589, Rank 2 out of 103 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE. Winner of the IEEE Transactions on Evolutionary Computation Outstanding Paper Award (prize money: 1000 US dollars).** <https://doi.org/10.1109/TEVC.2004.841688>.
- [18] C. Blum and M. Ehrgott. Local search algorithms for the  $k$ -cardinality tree problem. *Discrete Applied Mathematics*, 128:511–540, 2003. **Impact factor: 0.816, Rank 105 out of 204 journals in category MATHEMATICS, APPLIED. Selected for the Editors’ choice volume of 2003** [http://dx.doi.org/10.1016/S0166-218X\(02\)00548-6](http://dx.doi.org/10.1016/S0166-218X(02)00548-6).



- [19] C. Blum, J. A. Lozano, and P. Pinacho Davidson. An artificial bioindicator system for network intrusion detection. *Artificial Life*, 21(2):93–118, 2015. **Impact factor: 1.930, Rank 14 out of 102 journals in category COMPUTER SCIENCE, THEORY & METHODS.** [http://dx.doi.org/10.1162/ARTL\\_a\\_00162](http://dx.doi.org/10.1162/ARTL_a_00162).
- [20] C. Blum, J. A. Lozano, and P. Pinacho Davidson. Mathematical programming strategies for solving the minimum common string partition problem. *European Journal of Operational Research*, 242(3):769–777, 2015. **Impact factor: 2.679, Rank 9 out of 82 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.ejor.2014.10.049>.
- [21] C. Blum and C. Miralles. On solving the assembly line worker assignment and balancing problem via beam search. *Computers & Operations Research*, 38(1):328–339, 2011. **Impact factor: 2.116, Rank 9 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.cor.2010.05.008>.
- [22] C. Blum, P. Pinacho, M. López-Ibáñez, and J. A. Lozano. Construct, merge, solve & adapt: A new general algorithm for combinatorial optimization. *Computers & Operations Research*, 68:75–88, 2016. **Impact factor: 2.6, Rank 16 out of 83 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <https://doi.org/10.1016/j.cor.2015.10.014>.
- [23] C. Blum, J. Puchinger, G. Raidl, and A. Roli. Hybrid metaheuristics in combinatorial optimization: A survey. *Applied Soft Computing*, 11(6):4135–4151, 2011. **Impact factor: 2.415, Rank 22 out of 103 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <http://dx.doi.org/10.1016/j.asoc.2011.02.032>.
- [24] C. Blum and G. R. Raidl. Computational performance evaluation of two integer linear programming models for the minimum common string partition problem. *Optimization Letters*, 10(1):189–205, 2016. **Impact factor: 0.934, Rank 104 out of 257 journals in category APPLIED MATHEMATICS.** <https://doi.org/10.1007/s11590-015-0921-4>.
- [25] C. Blum and A. Roli. Metaheuristics in combinatorial optimization: Overview and conceptual comparison. *ACM Computing Surveys*, 35(3):268–308, 2003. **Impact factor: 7.667, Rank 1 out of 92 journals in category COMPUTER SCIENCE, THEORY & METHODS, Citations on Google Scholar: 2159. Most cited survey paper on metaheuristics published in a journal.** <https://doi.org/10.1145/937503.937505>.
- [26] C. Blum and M. Sampels. An ant colony optimization algorithm for shop scheduling problems. *Journal of Mathematical Modelling and Algorithms*, 3(3):285–308, 2004. **Citations on Google Scholar: 215.** <http://dx.doi.org/10.1023/B:JMMA.0000038614.39977.6f>.
- [27] C. Blum, M. Yabar, and M. J. Blesa. An ant colony optimization algorithm for DNA sequencing by hybridization. *Computers & Operations Research*, 35:3620–3635, 2008. **Impact factor: 2.116, Rank 9 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.cor.2007.03.007>.
- [28] Christian Blum. Minimum common string partition: on solving large-scale problem instances. *International Transactions in Operational Research*, 27(1):91–111, 2020. **Im-**

**pact factor: 4.193, Rank 22 out of 84 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <https://doi.org/10.1111/itor.12603>.

- [29] Christian Blum and Maria J. Blesa. Hybrid techniques based on solving reduced problem instances for a longest common subsequence problem. *Applied Soft Computing*, 62:15–28, 2018. **Impact factor: 3.907, Rank 17 out of 132 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <https://doi.org/10.1016/j.asoc.2017.10.005>.
- [30] Christian Blum, Marko Djukanovic, Alberto Santini, Hua Jiang, Chu-Min Li, Felip Manyà, and Günter R Raidl. Solving longest common subsequence problems via a transformation to the maximum clique problem. *Computers & Operations Research*, 125:105089, 2021. **Impact factor: 4.008, Rank 25 out of 84 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <https://doi.org/10.1016/j.cor.2019.104827>.
- [31] Christian Blum and Gabriela Ochoa. A comparative analysis of two matheuristics by means of merged local optima networks. *European Journal of Operational Research*, 290(1):36–56, 2021. **Impact factor: 5.334, Rank 15 out of 84 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <https://doi.org/10.1016/j.ejor.2020.08.008>.
- [32] Christian Blum, Marta Verdaguier, Hèctor Monclús, and Manel Poch. A new optimization model for wastewater treatment planning with a temporal component. *Process Safety and Environmental Protection*, 136:157–168, 2020. **Impact factor: 6.158, Rank 13 out of 54 journals in category ENGINEERING, ENVIRONMENTAL.** <https://doi.org/10.1016/j.psep.2019.12.034>.
- [33] S. Bouamama and C. Blum. A hybrid algorithmic model for the minimum weight dominating set problem. *Simulation Modelling Practice and Theory*, 64:57–68, 2016. **Impact factor: 1.383, Rank 32 out of 104 journals in category COMPUTER SCIENCE, SOFTWARE ENGINEERING.** <https://doi.org/10.1016/j.simpat.2015.11.001>.
- [34] S. Bouamama, C. Blum, and A. Boukerram. A population-based iterated greedy algorithm for the minimum weight vertex cover problem. *Applied Soft Computing*, 12(6):1632–1639, 2012. **Impact factor: 2.415, Rank 22 out of 103 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <http://dx.doi.org/10.1016/j.asoc.2012.02.013>.
- [35] Salim Bouamama and Christian Blum. An improved greedy heuristic for the minimum positive influence dominating set problem in social networks. *Algorithms*, 14(3):79, 2021. <https://doi.org/10.3390/a14030079>.
- [36] Salim Bouamama, Christian Blum, and Jean-Guillaume Fages. An algorithm based on ant colony optimization for the minimum connected dominating set problem. *Applied Soft Computing*, 80:672–686, 2019. **Impact factor: 5.472, Rank 20 out of 137 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <https://doi.org/10.1016/j.asoc.2019.04.028>.

- [37] D. Chalupa and C. Blum. Mining k-reachable sets in real-world networks using domination in shortcut graphs. *Journal of Computational Science*, 22:1–14, 2017. **Impact factor: 1.748, Rank 38 out of 104 journals in category COMPUTER SCIENCE, THEORY & METHODS.** <https://doi.org/10.1016/j.jocs.2017.07.012>.
- [38] P. J. Copado-Méndez, C. Blum, G. Guillén-Gosálbez, and L. Jiménez. Large neighbourhood search applied to the efficient solution of spatially explicit strategic supply chain management problems. *Computers & Chemical Engineering*, 49(11):114–126, 2013. **Impact factor: 2.320, Rank 17 out of 99 journals in category COMPUTER SCIENCE, INTERDISCIPLINARY APPLICATIONS.** <http://www.sciencedirect.com/science/article/pii/S0098135412002840?v=s5>.
- [39] Marko Djukanovic, Christoph Berger, Günther R Raidl, and Christian Blum. An A\* search algorithm for the constrained longest common subsequence problem. *Information Processing Letters*, 166:106041, 2021. **Impact factor: 0.959, Rank 148 out of 162 journals in category COMPUTER SCIENCE, INFORMATION SYSTEMS.** <https://doi.org/10.1016/j.ipl.2020.106041>.
- [40] Marko Djukanovic, Günther R. Raidl, and Christian Blum. Anytime algorithms for the longest common palindromic subsequence problem. *Computers & Operations Research*, 114, 2020. **Impact factor: 4.008, Rank 25 out of 84 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <https://doi.org/10.1016/j.cor.2019.104827>.
- [41] Marko Djukanovic, Günther R. Raidl, and Christian Blum. Finding longest common subsequences: New anytime A\* search results. *Applied Soft Computing*, 95:106499, 2020. **Impact factor: 6.607, Rank 24 out of 140 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <https://doi.org/10.1016/j.asoc.2020.106499>.
- [42] M. Dorigo and C. Blum. Ant colony optimization theory: A survey. *Theoretical Computer Science*, 344(2-3):243–278, 2005. **Impact factor: 0.943, Rank 52 out of 92 journals in category COMPUTER SCIENCE, THEORY & METHODS. Winner of the Theoretical Computer Science Top Cited Article 2005–2014 Award.** <http://dx.doi.org/10.1016/j.tcs.2005.05.020>.
- [43] C. García-Martínez, C. Blum, F. J. Rodríguez, and M. Lozano. The firefighter problem: Empirical results on random graphs. *Computers & Operations Research*, 60:55–66, 2015. **Impact factor: 1.718, Rank 19 out of 79 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.cor.2015.02.004>.
- [44] V. Hemmelmayr, V. Schmid, and C. Blum. Variable neighbourhood search for the variable sized bin packing problem. *Computers & Operations Research*, 39(5):1097–1108, 2012. **Impact factor: 2.116, Rank 9 out of 73 journals in category OPERATIONS RESEARCH & MANAGEMENT SCIENCE.** <http://dx.doi.org/10.1016/j.cor.2011.07.003>.
- [45] H. Hernández and C. Blum. Ant colony optimization for multicasting in wireless ad hoc networks. *Swarm Intelligence*, 3(2):125–148, 2009. **Impact factor: 0.640, Rank 89 out of 114 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <https://doi.org/10.1007/s11721-009-0027-7>.

- [46] H. Hernández and C. Blum. Foundations of ANTCYCLE: Self-synchronized duty-cycling in mobile sensor networks. *The Computer Journal*, 54(9):1427–1448, 2011. **Impact factor: 1.394, Rank 17 out of 49 journals in category COMPUTER SCIENCE, HARDWARE & ARCHITECTURE.** <http://dx.doi.org/10.1093/comjnl/bxq099>.
- [47] H. Hernández and C. Blum. Minimum energy broadcasting in wireless sensor networks: An ant colony optimization approach for a realistic antenna model. *Applied Soft Computing*, 11(8):5684–5694, 2011. **Impact factor: 2.415, Rank 22 out of 103 journals in category COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE.** <http://dx.doi.org/10.1016/j.asoc.2011.03.023>.
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