Tiago Carneiro Pessoa

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I received my Master's degree in Computer Science from the State University of Ceará (Brazil) and my PhD in Computer Science – with international mobility at INRIA Lille (France) – from the Federal University of Ceará (Brazil). Since 2010, I research different topics related to parallel and distributed computing, mainly the use of heterogeneous architectures for solving combinatorial optimization problems. Currently, I'm a research associate in the Parallel Computing & Optimization Group at the University of Luxembourg. My research is focused on the use of high-productivity languages for the design and implementation of large-scale distributed heterogeneous algorithms.

Research Interests: Parallel and distributed algorithms, GPU and heterogeneous computing, combinatorial optimization, high-productivity languages.

Google Scholar: https://scholar.google.com/citations?user=aHpFVBMAAAAJq&hl
Researchgate: https://www.researchgate.net/profile/Tiago_Pessoa/
Publons: https://publons.com/researcher/1481471/tiago-carneiro-pessoa/
Personal website: https://tcarneirop.github.io/

EDUCATION

PhD in Computer Science   *2013 - 2017*
Federal University of Ceará (UFC). Fortaleza - CE, Brazil

· *Thesis*: GPU-Based Backtracking Strategies for Solving Permutation Combinatorial Problems. *Supervisor:* Dr. Francisco Heron de Carvalho Junior.
· *International mobility*: from September 2015 to August 2016 at INRIA Lille - Nord Europe, under the supervision of Prof. Nouredine Melab (Dolphin team).

Master's Degree in Computer Science   *2010 - 2012*
State University of Ceará (UECE). Fortaleza - CE, Brazil

· *Thesis*: GPU-based branch-and-bound algorithms for the asymmetric travelling salesman problem (*text in Portuguese*). *Supervisors:* Dr. Gustavo Augusto Lima de Campos and Dr. Marcos Negreiros.

Bachelor's Degree in Computer Science   *2004 - 2009*
State University of Ceará (UECE). Fortaleza - CE, Brazil

· *Monograph*: The Jurema Method: a new branch-and-bound strategy for the asymmetric travelling salesman problem (*text in Portuguese*) *Supervisor:* Dr. Marcos Negreiros.

AWARDS

· [**2021**] The **Outstanding Paper Award** received in the International Conference on High Performance Computing & Simulation - HPCS 2020 for the work *Towards Chapel-based Exascale Tree Search Algorithms: dealing with multiple GPU accelerators.*
· [**2016**] **Certification of Outstanding Contribution in Reviewing** for the year of 2016 received from the Journal of Parallel and Distributed Computing (JPDC).

LANGUAGES

· Portuguese (Native), English (full professional proficiency), and French (working proficiency).

SKILLS

Programming Languages	C/C++, Chapel, Fortran, Julia, Java, and Python
Parallel Programming	CUDA, OpenCL, OpenACC, OpenMP, PThreads MPI, PGAS, Numba, and Vectorization

WORK EXPERIENCE

Research associate   Mar 2021 - present
[University of Luxembourg](), Luxembourg

· As a member of the Parallel Computing & Optimisation Group ([PCOG]()) at the University of Luxembourg, my efforts are put into two projects: *[EuroCC]()* and *productivity-aware ultra-scale optimization*. The objective of the first project is promoting the use of HPC or HPC-related technologies in Luxembourg. In turn, the objective of the second project is to design and implement large-scale exact distributed optimization algorithms taking into account CPU-GPU heterogeneity, but also dealing with productivity and parallel efficiency.

Postdoctoral researcher   Nov 2018 - Jun 2020
[INRIA Lille - Nord Europe](), France.

· I researched the use of high-productivity languages for the design and implementation of large-scale distributed exact optimization algorithms, taking into account heterogeneity, fault tolerance, and parallel efficiency. More specifically:

· I worked with Chapel high-productivity language, but other languages were employed in this project: Julia, Python/Numba, and C/C++ (OpenMP and MPI). This project, Chapel-based Optimization – ChOp, is pioneering in the parallel optimization field and recognized by the Chapel team (Cray/HPE) as one of the featured projects based on the Chapel language. I also visited the Chapel team, in Seattle - USA, for two weeks aiming at improving the knowledge of the Bonus team in high-productivity languages.

· In addition to the research and development activities, I also taught in the Master's Program in Nano-science and Nano-technologies for Civil Engineering at the University of Lille[1] and organized tutorial sections and workshops.

Postdoctoral researcher   Mar 2018 - Oct 2018
Federal Institute of Education, Science and Technology of Ceará ([IFCE]()). Fortaleza-CE, Brazil.

· As a member of the [LAPISCO Lab.](), I researched the parallelization of deep/machine learning applications for computer vision. The technologies employed in the research activities encompass CUDA, OpenCV, Google Colaboratory cloud, and different machine learning frameworks, such as Keras, TensorFlow, PyTorch, and YOLO. In this opportunity, I was also a member of the Graduate Program in Computer Science ([PPGCC-IFCE]()).

International mobility   Sep 2015 - Aug 2016
[INRIA Lille - Nord Europe](), France.

· I visited the INRIA Lille research center for one year, as a part of my PhD. During this opportunity, I researched with members of the Dolphin team on parallel optimization under the supervision of [Prof. Nouredine Melab](). I was supported by the Institutional Program of Overseas Sandwich Doctorate ([PDSE-CAPES]()), grant 3376/2015-00.

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[1]Refer to Table 1 for more information concerning my teaching experience.

PhD student / Research intern   Mar 2013 - Dec 2017

Federal University of Ceará (UFC). Fortaleza-CE, Brazil.

· As a member of the Parallelism, Graphs and Optimization Group (ParGO) of the Graduate Program in Computer Science (MDCC), my research was focused on the design and implementation of heterogeneous (GPU, MIC) exact algorithms for solving combinatorial optimization problems. The most significant part of this research aimed at investigating the feasibility of using an enhancement of the GPU programming model, called CUDA Dynamic Parallelism (CDP), for solving big optimization problems. The technologies employed were mainly C/C++, MPI, CUDA, OpenCL, OpenMP, and vectorization.

· Besides the research activities, I also taught 64 hours at the MDCC. I received a full scholarship from the Coordination for the Improvement of Higher Education Personnel (CAPES), a foundation of the Brazilian Ministry of Education (MEC).

Lecturer   Aug 2012 - Jul 2014

State University of Ceará (UECE). Fortaleza-CE, Brazil

· As a lecturer at the Computer Science department, I taught 4 different courses (see Table 1), supervised 3 Bachelor's degree monographs, an internship and a young researchers project.

Lecturer   Aug 2012 - Jul 2013

Christus University Center - UniChristus. Fortaleza-CE, Brazil

· I taught 2 courses at the Informatics Department: compilers and automata theory. See Table 1 for more details.

Master student / Research intern   Mar 2010 - Jun 2012

State University of Ceará (UECE). Fortaleza-CE, Brazil

· As a member of the Scientific Computing Laboratory (LCC) of the Graduate Program in Computer Science (MACC), I investigated the feasibility of using GPUs in the context of exact tree-based optimization, which was pioneering research at the time. The languages employed were mainly C/C++, OpenMP, and CUDA. I received a full scholarship from the Coordination for the Improvement of Higher Education Personnel (CAPES).

Research intern   Mar 2008 - Jul 2009

State University of Ceará (UECE). Fortaleza-CE, Brazil.

· As an intern at the Computer Networks and Security Laboratory (LARCES), my research activities were focused on the design and implementation of bio-inspired distributed algorithms for solving problems related to peer-to-peer (P2P) networks. The programming languages employed were manly Java and the JXTA protocol.

Trainee   Feb 2007 - Sep 2007

State University of Ceará (UECE). Fortaleza-CE, Brazil.

· In this first development experience, I programmed embedded commercial C/C++ applications for x86 micro-terminals. This project was a cooperation between the Computer Science Department of the State University of Ceará, and the Bematech Co., a Brazilian enterprise that produces software and hardware solutions for commerce.

TEACHING EXPERIENCE

As one can see in Table 1, I taught more than 650 hours at four high education institutions in two countries, for both graduate and undergraduate levels. The 64 hours taught at the UFC correspond to a teaching internship required to obtain the PhD degree in computer science. In turn, the Introduction to OpenMP course was taught when I was a postdoc at INRIA Lille.

Table 1: Summary of courses taught

Level / Degree / Institution	Module	Hours	Year(s)	Total (h)
Master's / Nano-science and nano-technologies for civil engineering/ Polytech'Lille	Introduction to OpenMP (in English)	4	2019	4
Graduate program / Computer Science / UFC	High-performance Computing	32	2013–2014 (2×)	64
Undergraduate / Computer Science / UECE	Concepts of programming languages	68	2012–2014 (4×)	272
Undergraduate / Computer Science / UECE	Data structures	68	2013	68
Undergraduate / Computer Science / UECE	High-performance computing	68	2012	68
Undergraduate / Informatics / UECE	Introduction to logic	68	2012	68
Undergraduate / Informatics / UECE	Computers architecture	68	2012	68
Undergraduate / Information Technology / UniChristus	Compilers	20	2012	20
Undergraduate / Information Technology / UniChristus	Formal languages and automata theory	20	2013	20
TOTAL	**9**	**416**	**–**	**652**

SUPERVISION ACTIVITIES

The following supervisions were performed when I was a fixed-term lecturer of the computer science department at the State University of Ceará (UECE) - Brazil, from Aug 2012 to Jul 2014.

Bachelor's degree monograph supervisions:
a monograph is required to receive the Bachelor's degree in computer science from the State University of Ceará (UECE).

· **[2014] Moraes Freire, L.P.** *A massively parallel GRASP approach to the Job-Shop Scheduling Problem* (text in Portuguese).

· **[2014] Samua, S.** *A Proposal of an integrated learning system for schools* (text in Portuguese).

· **[2014] Facundo, T.** *Dimensional reduction in color digital images using principal component analysis* (text in Portuguese).

[2012] Young researchers supervision:

· Supervision performed in the context of the Institutional Research Scholarship Program (PIBIC) of the Brazilian Ministry of Education (MEC), which provides a scholarship for young researchers. I supervised the students Luana Samara PAULINO MAIA, Paulo Henrique dos SANTOS ALVES, and Marcelina PEREIRA BERNARDO, members of the Robotics Laboratory of the Plácido Aderaldo Castelo School, a state high-school in Fortaleza-CE, Brazil. The students developed a SMS system to broadcast news related to the school. The research results were presented in the XVII Congress of the State University of Ceará (UECE), and published in the annals of the conference.

[2012] Internship supervision:

· I supervised the final internship of the student Henrique SILVA, which is a requirement to receive the Bachelor's degree in computer science from the State University of Ceará (UECE). This internship was performed in the Intelligent Computing Laboratory (LACONI), at the Department of Computer Science. During the internship, the student designed and implemented tree-based search algorithms for solving combinatorial problems.

ADDITIONAL INFORMATION

Visit to Cray Inc., a Hewlett Packard Enterprise company   01/12/2019 - 15/12/2019

· I visited for **two weeks** the Cray Inc. offices in Seattle-USA to work with the Chapel team. Cray is a pioneering HPC builder and the responsible for the Chapel language, which is one of the main high-performance high-productivity languages. The close contact with the Chapel team aimed at boosting my research at INRIA Lille (2018–2020) on productivity-aware distributed algorithms towards CPU-GPU heterogeneity.

Workshop organization:

· [**2020**] The 2nd International Workshop on Parallel Optimization using/for Multi and Many-core High Performance Computing (POMCO 2020). Held as part of the International Conference on High Performance Computing & Simulation (HPCS 2020). Online event. **Date:** 22-27 March 2021. **Organizers**: Melab, N.; Carneiro, T.

· [**2019**] International Workshop on the Synergy of Parallel Computing, Optimization and Simulation - PaCOS. Held as part of the International Conference on High Performance Computing & Simulation (HPCS 2019). **Date:** 15-19/07/2019. **Organizers:** Melab, N.; Carneiro, T.; Gmys, J.; Dorronsoro, B.

Conference program committee:

· [**2021**] IV Ibero-American Conference on Smart Cities is organized by the CITIES network, held as part of the Ibero-American Program for Science and Technology Development.

· [**2020**] International Workshop on the Synergy of Parallel Computing, Optimization and Simulation - PaCOS. Held as part of the International Conference on High Performance Computing & Simulation (HPCS 2020).

· [**2018**] International Workshop on the Synergy of Parallel Computing, Optimization and Simulation - PaCOS. Held as part of the International Conference on High Performance Computing & Simulation (HPCS 2018).

Tutorial sections organization:

· [**2021**] **11th HPC School - University of Luxembourg**. In this school, the UL HPC Research Computing and operations team offers instructions, hands-on and guided sessions on a variety of topics representative of research activities and domains present at the university. More specifically, I was responsible for the OpenCl and the OpenACC – hands on tutorial sections. **Date:** November 12–19, 2021.

· [**2018**] **GRID'5000: getting started and Introduction to GPU Computing**. Tutorial section organized by INRIA Lille's BONUS Team at the University of Lille. The objective of this tutorial was to show how to access, reserve resources, and deploy jobs on the clusters of GRID'5000. Moreover, a part of this tutorial was dedicated to the introduction of GPU computing. **Organizers**: Jan Gmys, Dimitri Delabroye and Tiago Carneiro. **Date: 07/12/2018**.

Participation in research projects:

· [**2022**] **Parallelism and Algorithms for Combinatorial Optimization and Complexity (Title in Portuguese:** ***Paralelismo e Algoritmos Para Otimização Combinatória e Complexidade (PAPOCCO)***. *Parallelism, Graphs and Optimization Group (ParGO) of the Graduate Program in Computer Science (MDCC) Federal University of Ceará (UFC). Fortaleza-CE, Brazil.* I'll participate in this project as an international member and parallel computing specialist. **Date**: the project starts in Mar 2022.

- **Summary**: the objective of this project is to propose models, formulations and structural properties for combinatorial optimization problems, especially those defined on graph coloring, graph connectivity and graph diffusion.

- **Members:** Rudini Menezes (Coordinator), the professors of the ParGO group, as well as researchers from other universities. The complete list will be released in Mar 2022.

- **Funding agency**: Foundation for Scientific Development of the Ceará State (Funcap), Ceará, Brazil.

· **[2013 – 2017] HPC Shelf - A Component-Based Cloud Computing Platform for HPC Applications and Services**. *Federal University of Ceará (UFC). Fortaleza-CE, Brazil.* I participated in this project as a graduate researcher. My PhD thesis and publications were performed in the context of this project. **Date**: Mar 2013 – Dec 2017.

- **Summary**: HPC Shelf is a component-based platform for clouds that provide services for development, deployment and execution of HPC applications whose requirements of computational power for solving problems of interest to specialists in a given domain justifies the employment of a set of parallel computing platforms.

- **Members:** de Carvalho Júnior, F.H (Leader); Carneiro, T.; Araújo de Rezende, C.; de Carvalho Silva, J.; Al-Alam, W.; Boettge Pinheiro, A.

- **Funding agency**: National Council for Scientific and Technological Development (CNPq), Brazil.

· **[2010] Exact Combinatorial Methods for Dynamic Grouping Problems**. *Federal University of Santa Maria. Santa Maria-RS (UFSM), Brazil.* I participated in this project as a graduate student researcher. More specifically, my research aimed at improving the Jurema Search algorithm, a tree-based search for solving permutation combinatorial problems. **Date:** Mar 2010 – Dec 2010.

- **Summary**: this project was a scientific mission of the Federal University of Santa Maria, in conjunction with the State University of Ceará, to produce new exact and heuristic algorithms for Dynamic Grouping Problems.

- **Members:** Negreiros, M. (Leader); Carneiro, T.; de Castro Palhano, A.W.; Dhein, G.; Bassi de Araújo, O.C.

- **Funding agency**: National Council for Scientific and Technological Development (CNPq), Brazil.

Invited talks:

· *Towards Exascale Tree-based Big Optimization.* Master Program in High Performance Computing, Simulation, specialized in scientific computing. University of Lille, France. **Dates: 19/02/2021, 07/11/2019**.
· *GPU-based branch-and-bound for solving the asymmetric travelling salesman problem.* Seminars of the Parallelism, Graphs and Optimization Group (ParGO), Federal University of Ceará (UFC), Brazil. **Date: 11/01/2013**.
· *GPU computing for solving combinatorial optimization problems.* Teleinformatics Department (DETI), Federal University of Ceará (UFC), Brazil. **Date: 22/02/2013**.
· *A new GPU-based branch-and-bound algorithm.* XVI Congress of the State University of Ceará (UECE), Brazil. **Date: 21/11/2011**.
· *GPU and heterogeneous computing.* Electrical Engineering Department, Federal University of Santa Maria (UFSM), Brazil. **Date: 05/09/2010**.

Journal reviewer:

· ACM Computing Surveys. ISSN: 0360-0300.

- Swarm and Evolutionary Computation (SWEVO). ISSN: 2210-6502.
- IEEE Transactions on Parallel and Distributed Systems. ISSN: 1045-9219.
- Journal of Parallel and Distributed Computing. ISSN: 0743-7315.
- Journal of Computational Science. ISSN:1877-7503.
- Concurrency and Computation: Practice and Experience. ISSN:1532-0634.
- IEEE Access. ISSN: 2169-3536.
- Institute of Electronics, Information and Communication Engineers (IEICE) Transactions on Information and Systems. ISSN: 1745-1361.

LIST OF PUBLICATIONS

Table 2: Summary	
International journals	7
International conferences	16
National conferences	5
Other	5
Software development	3
Total	36

Selected publications:

- [**1**] Carneiro, T.; Melab, N.; Hayashi, A.; Sarkar, V. Towards Chapel-based Exascale Tree Search Algorithms: dealing with multiple GPU accelerators. In: The International Conference on High Performance Computing & Simulation - HPCS 2020 - held in March 2021. **Outstanding Paper Award**.

- [**2**] Gmys, J.; Carneiro, T.; Melab, N.; Tuyttens, d.; Talbi, E-G. A Comparative Study of High-productivity High-performance Programming Languages for Parallel Metaheuristics. Swarm and Evolutionary Computation, 57:100720 (2020). DOI: 10.1016/j.swevo.2020.100720.

- [**3**] Carneiro, T.; Gmys, J.; Melab, N.; Tuyttens, D. Towards Ultra-scale Branch-and-Bound Using a High-productivity Language. Future Generation Computer Systems, 105: 196-209 (2020). DOI: 10.1016/J.future.2019.11.011.

- [**4**] Carneiro Pessoa, T.; Gmys, J.; de Carvalho Junior, F. H.; Melab, N.; Tuyttens, D. GPU-accelerated Backtracking Using CUDA Dynamic Parallelism. Concurrency and Computation: Practice and Experience, Wiley Online Library, 30(9): e4374 (2018). DOI: 10.1002/cpe.4374.

- [**5**] Carneiro, T.; Medeiros da Nóbrega, R.V; Nepomuceno, T.; Bian, G-B; de Albuquerque, V.H.; Rebouças Filho, P.P. Performance Analysis of Google Colaboratory as a Tool for Accelerating Deep Learning Applications. IEEE Access, 6: 61677-61685 (2018). DOI: 10.1109/ACCESS.2018.2874767.

International journal publications:

- [**2021**] de Souza, A.B.; do Rego, P.A.L; Carneiro, T.; Rocha, P.H.G; de Souza, J.N. A Context-Oriented Framework for Computation Offloading in Vehicular Edge Computing using WAVE and 5G Networks. Vehicular Communications. DOI: 10.1016/j.vehcom.2021.100389 *Impact factor: 6.91*

- [**2020**] Carneiro, T.; Gmys, J.; Melab, N.; Tuyttens, D.Towards Ultra-scale Branch-and-Bound Using a High-productivity Language. Future Generation Computer Systems, 105: 196-209 (2020). DOI: 10.1016/J.future.2019.11.011. *Impact factor: 7.187*

- **[2020]** Gmys, J.; <u>Carneiro, T.</u>; Melab, N.; Tuyttens, d.; Talbi, E-G. A Comparative Study of High-productivity High-performance Programming Languages for Parallel Metaheuristics. Swarm and Evolutionary Computation, 57:100720 (2020). DOI: 10.1016/j.swevo.2020.100720. *Impact factor: 7.177*

- **[2020]** Souza, A.B.; Rego, P.A.L.; <u>Carneiro, T.</u>; Rodrigues, J.D.C.; Rebouças Filho, P.P.; De Souza, J.N; Chamola, V.; Sikdar, B.; de Albuquerque, V.H.C. Computational Offloading for Vehicular Environments: A Survey. IEEE Access. DOI: 10.1109/ACCESS.2020.3033828. *Impact factor: 3.367*

- **[2019]** Almeida, J.S.; Rebouças Filho, P.P.; <u>Carneiro, T.</u>; Wei, W.; Damasevicius, R.; Maskeliunas, R.; de Albuquerque, V.H.C. Detecting Parkinson's Disease With Sustained Phonation and Speech Signals Using Machine Learning Techniques. Pattern Recognition Letters, 125: 55-62 (2019). DOI: 10.1016/J.patrec.2019.04.005. *Impact factor: 3.756*

- **[2018]** <u>Carneiro, T.</u>; Medeiros da Nóbrega, R.V; Nepomuceno, T.; Bian, G-B; de Albuquerque, V.H.; Rebouças Filho, P.P. Performance Analysis of Google Colaboratory as a Tool for Accelerating Deep Learning Applications. IEEE Access, 6: 61677-61685 (2018). DOI: 10.1109/ACCESS.2018.2874767. *Impact factor: 3.367*

- **[2017]** <u>Carneiro Pessoa</u>, T.; Gmys, J.; de Carvalho Junior, F. H.; Melab, N.; Tuyttens, D. GPU-accelerated Backtracking Using CUDA Dynamic Parallelism. Concurrency and Computation: Practice and Experience, Wiley Online Library, 30(9):e4374 (2017). DOI: 10.1002/cpe.4374. *Impact factor: 1.536*

Peer-reviewed international conferences:

- **[2021]** <u>Carneiro, T.</u>; Melab, N.; Hayashi, A.; Sarkar, V. Towards Chapel-based Exascale Tree Search Algorithms: dealing with multiple GPU accelerators. In: The International Conference on High Performance Computing & Simulation - HPCS 2020 - held in March 2021. **Outstanding Paper Award** *Core rank: B*[2]

- **[2021]** Koutsantonis, L.; <u>Carneiro, T.</u>; Kieffer, E.; Pinel, F.; Bouvry, P. *A Data-Driven Reconstruction Technique based on Newton's Method for Emission Tomography*. In: The 2021 IEEE Nuclear Science Symposium and Medical Imaging Conference (IEEE NSS-MIC).

- **[2021]** Koutsantonis, L.; Makki, A.; <u>Carneiro, T.</u>; Kieffer, E.; Bouvry, P. A Bayesian Optimization Approach for Attenuation Correction in SPECT Brain Imaging. In: The 2021 IEEE Nuclear Science Symposium and Medical Imaging Conference (IEEE NSS-MIC).

- **[2020]** de Souza, A.B; Rego, P.A.L; Rocha, P.H.G; <u>Carneiro, T.</u>; Souza, J.N. A Task Offloading Scheme for WAVE Vehicular Clouds and 5G Mobile Edge Computing. In: IEEE Global Communications Conference - Globecom 2020. DOI: 10.1109/GLOBECOM42002.2020.9348130 *Core rank: B*

- **[2020]** Nepomuceno, T.; <u>Carneiro, T.</u>; Maia, P; Nepomuceno, T.; Adnan, M.; Martin, A. Autoiot: a framework based on user-driven MDE for generating IoT applications. In: ACM/SIGAPP Symposium on Applied Computing - SAC 2020. DOI: 10.1145/3341105.3373873. *Core rank: B*.

- **[2019]** <u>Carneiro, T.</u>; Melab, N. An Incremental Parallel PGAS-based Tree Search Algorithm. In: The 2019 International Conference on High Performance Computing & Simulation - HPCS 2019, pp. 19-26, DOI: 10.1109/HPCS48598.2019.9188106. *Core rank: B*

- **[2019]** <u>Carneiro, T.</u>; Melab, N. Productivity-aware Design and Implementation of Distributed Tree-based Search Algorithms. In: The International Conference on Computational Science - ICCS 2019. Lecture notes in computer science, vol. 11536 (253-266), Springer. DOI: 10.1007/978-3-030-15996-2_2. *Core rank: A*

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[2]The Core Rank presented corresponds to the year of 2020.

- [**2018**] Carneiro, T.; Gmys, J.; Melab, N.; de Carvalho Junior, F. H.; Rebouças Filho, P.P.; Tuyttens, D. Dynamic Configuration of CUDA Runtime Variables for CDP-based Divide-and-conquer Algorithms. In: 13th International Meeting on High Performance Computing for Computational Science - VECPAR 2018. Lecture notes in computer science, vol. 11333 (16-30), Springer. DOI: 10.1007/978-3-030-15996-2_2. *Core rank: B*

- [**2018**] Nepomuceno, T.; Carneiro, T.; Korn, C.; Martin, A. A GUI-based Platform for Quickly Prototyping Server-side IoT Applications. In: European Conference on Smart Objects, Systems and Technologies - Smart Systech 2018.

- [**2016**] Pessoa, T.C.; Gmys, J.; Melab, N.; de Carvalho Junior, F.H.; Tuyttens, D. A GPU-based Backtracking Algorithm for Permutation Combinatorial Problems. In: Algorithms and Architectures for Parallel Processing - IC3APP 2016. Lecture notes in computer science, vol. 10048 (310-324), Springer. DOI: 10.1007/978-3-319-49583-5_24. *Core rank: B*

- [**2014**] Pinheiro, A.B.; de Carvalho Junior, F.H.; Arruda, N.G.P.B.; Carneiro, T. Fusion: abstractions for multicore/manycore heterogenous parallel programming using GPUs. In: Brazilian Symposium on Programming Languages - SBLP 2014. Lecture notes in computer science, vol. 8771 (109-123), Springer. DOI: 10.1007/978-3-319-11863-5_8. *Core rank: B*

- [**2014**] Carneiro, T.; Arruda, N.G.P.B.; de Carvalho Junior, F.H.; Pinheiro, A.B. A Literature Review on Solving Combinatorial Optimization Problems Through the Use of GPUs - **text in Portuguese:** (*Um levantamento na literatura sobre a resolução de problemas de otimização combinatória através do uso de aceleradores gráficos*). In: XXXV Ibero-latin American Congress on Computational Methods in Engineering - CILAMCE 2014.

- [**2014**] Arruda, N.G.P.B.; de Carvalho Junior, F.H.; Carneiro, T.; Pinheiro, A.B. An Evaluation of Code Optimization Techniques Applied to Modern Graphics Accelerators - **text in Portuguese:** (*uma avaliação de técnicas de otimização de código aplicadas a aceleradores gráficos modernos*). In: XXXV Ibero-latin American Congress on Computational Methods in Engineering - CILAMCE 2014.

- [**2011**] Carneiro, T.; Muritiba, A.E.; Negreiros, M.; de Campos, G.A.L. A New Parallel Schema for Branch-and-bound Algorithms Using GPGPU. In: 23rd International Symposium on Computer Architecture and High Performance Computing - SBAC-PAD 2011. p. 41–47. DOI: 10.1109/sbac-pad.2011.20. *Core rank: B*

- [**2011**] Oliveira, T.Q. ; Pessoa, T.C. ; Cardoso, A. ; Celestino Júnior, J. Wchord: a hybrid and bio-inspired architecture to peer to peer networks. In: Third World Congress on Nature and Biologically Inspired Computing - NABIC 2011. p. 353–358, DOI: 10.1109/nabic.2011.6089617.

- [**2011**] Carneiro, T.; Muritiba, A.E.F.; Negreiros, M.; de Campos, G.A.L. Solving ATSP Hard Instances by New Parallel Branch and Bound Algorithm using GPGPU. In: XXXII Ibero-latin American Congress on Computational Methods in Engineering - CILAMCE 2011.

Peer-reviewed national conferences:

- [**2018**] Honório Filho, P.; da Silva, S.P.P.; Almeida, J.S.; Marinho, L.B.; Carneiro, T.; Rodrigues, A.W.O.; Rebouças Filho, P.P. An Approach to Navigation in Outdoor and Indoor Environments With Unmanned Aerial Vehicle Using Visual Topological Map. In: 31st Conference on Graphics, Patterns and Images - SIBGRAPI 2018, Workshop of Works in Progress (WIP).

- [**2016**] Nepomuceno, T.G.; Pessoa, T.C.; Nepomuceno, T.G. Formula Optimizer: fast way to formulate and solve multi-objective combinatorial optimization problems. In: XLVIII Brazilian Symposium of Operations Research - SBPO 2016.

- [**2014**] Arruda, N.G.P.B.; de Carvalho Junior, F.H.; Carneiro, T.; Pinheiro, A.B. Analysis of Drawbacks in Loop Unfolding Relative to GPU Associative Caches - text in Portuguese (*Análise de drawbacks no*

desdobramento de laços relativo a caches associativas de GPUs). In: Symposium on High Performance Computing Systems - WSCAD 2014.

· [**2012**] Carneiro, T.; Nobre, R.H.; Negreiros, M.; de Campos, G.A.L. Depth-first Search Versus Jurema Search on GPU Branch-and-Bound Algorithms: a case study. In: NVIDIA's GPU Computing Developer Forum. Held by the XXXII Congress of the Brazilian Society of Computer Science - CSBC 2012.

· [**2010**] Pessoa, T.C.; Gomes, M.J.N. Jurema, a New Branch & Bound Anytime Algorithm for the Asymmetric Travelling Salesman Problem. In: XLIII Brazilian Symposium of Operations Research - SBPO 2010.

Project proposal:

· [**2021**] Melab, N.; Talbi, E-G.; Carneiro, T.; Gmys, J.; Danoy, G.; Bouvry, P.; Pinel, F.; Kieffer, E. *Ultra-scale Computing for solving Big Optimization Problems.* Joint project proposal between INRIA Lille - Bonus team and the Parallel Computing & Optimisation Group (PCOG), University of Luxembourg. **Proposal submitted to the French National Research Agency** (ANR).

Tutorials:

· [**2021**] Carneiro, T., Koutsantonis, L. the Introduction to OpenCL programming. The 11th HPC School - University of Luxembourg.

· [**2021**] Koutsantonis, L. Carneiro, T. Solving the Laplace Equation on GPU with OpenACC. The 11th HPC School - University of Luxembourg.

Other research reports:

· [**2017**] Pessoa, T.C. (2017), GPU-based Backtracking Strategies for Solving Permutation Combinatorial Problems. PhD Thesis, Department of Computer Science, Federal University of Ceará (UFC), Brazil.

· [**2012**] Pessoa, T.C. (2012), GPU-based Branch-and-bound Algorithms for the Asymmetric Travelling Salesman Problem (*text in Portuguese*). Master's thesis, Department of Computer Science, State University of Ceará (UECE), Brazil.

SOFTWARE PRODUCTION

· **Chapel-based Optimization (ChOp)**: The objective of the ChOp project is to design and implement large-scale exact distributed optimization algorithms taking into account CPU-GPU heterogeneity, but also achieving high productivity and parallel efficiency. The prototypes are programmed to enumerate all feasible and complete configurations of the N-Queens. The final versions of the distributed algorithms solve to the optimality instances of combinatorial optimization problems, such as the flow-shop scheduling (FSP) and the asymmetric travelling salesman problem (ATSP). This study is pioneering within the context of parallel exact optimization.

· This is pioneering in the parallel optimization field and recognized by the Chapel team (Cray/HPE) as one of the featured projects based on the Chapel language.

  - **Status:** active, **Lines of code:** 10000+

  - **Related publications:** featured publications [1–3], Carneiro and Melab (2019a,b).

  - **Github repository**: tcarneirop/ChOp

· **Monte Carlo simulator of Y-photon propagation in voxelized structures**: high-performance GPU implementation (CUDA) of an Monte Carlo (MC) simulator of photon propagation in matter. The simulator uses anatomical information provided in voxelized formats by CT scans to simulate the absorption and scattering (Klein-Nishina) of photons in the volume of interest. The simulator was developed to be used for medical imaging and especially to provide data for AI applications. It uses GPU-related load balancing approaches to make the generation and propagation of photons on GPU more efficient.

- **Status:** <u>active</u>, **Lines of code:** 2500+

- **Publications:** Koutsantonis *et al.* (2021a,b)

- **Github repository**: tcarneirop/spectsim

· **Formula Optimizer** is a software programmed in Java and JavaFX designed to formulate and solve multi-objective combinatorial optimization problems with no programming expertise. Formula was created based on the premise that it is possible to formulate multi-objective problems easily than state-of-art solvers, with no programming expertise, and solve them with low performance loss. It provides a GUI on which the user formulates its problem. Then, code is generated for jMetal, a well-known framework for metaheuristics in Java. The Formula Optimizer also provides a set of on-line metrics collected during the execution.

- **Status:** <u>inactive</u>, **Lines of code:** 3000+

- **Related publication:** Nepomuceno, Pessoa, Nepomuceno (2016).

- **Repository**: https://bitbucket.org/formulapaper/formulapaper/src/master/