

Cosmin E Oancea: Curriculum Vitae (CV)

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PERSONAL INFORMATION

Citizenship: Romanian, Canadian. *Born:* Bucharest, 3rd of July 1976.
Languages: fluent Romanian, English.

RESEARCH INTERESTS

Interests in a variety of topics from computer system field, including programming language design and implementation, optimizing compilers for highly-parallel systems, high-performance implementation of AI algorithms, parallel algorithms, memory management, computer algebra.

ACADEMIC POSITIONS AND EDUCATION

Associate Professor, DIKU, University of Copenhagen, Denmark. Dec. 2017 - present.
Assistant Professor, DIKU, University of Copenhagen, Denmark. Dec. 2013 - 2017.
Post-Doctoral Fellow, DIKU, University of Copenhagen, Denmark. Dec. 2011 - 2013.
Post-Doctoral Fellow, Texas A&M University, College Station, USA. Sept. 2009 - Oct. 2011.
“Hybrid Analysis for Automatic Parallelization”. Mentor: Lawrence Rauchwerger.
Post-Doctoral Fellow, University of Cambridge, UK. 2007-09.
“Run-Time Techniques to Extract Parallelism”. Mentor: Alan Mycroft.
Ph.D. in Computer Science, Oct 2000 - Nov 2005. Ph.D. Advisor: Stephen Watt.
“*Parametric Polymorphism for Software Component Architectures and Optimizations.*”
Computer Science Department, The University of Western Ontario, London, ON, Canada.

SELECTED PROGRAM COMMITTEE WORK

- **Vice-Chair:** Programming Models track of 32nd IEEE International Parallel & Distributed Processing Symposium (IPDPS), 2018.
- **Co-Chair:** Workshop on Functional High-Performance Computing (FHPC), 2017.
- **Primary PC member (top conferences):**
 - Int. Conf. on Parallel Computing (ICPP), 2018, 2020,
 - Int. Conf. on Parallel Architectures and Compilation Techniques (PACT), 2015, 2016, 2019,
 - Int. Symp. on Principle and Practice of Parallel Programming (PPoPP), 2017 (also in ERC 2019, 2021)
 - EuroPar 2020, track: Parallel and Distrib. Programming, Interfaces and Languages.
 - Int. Conf. on Supercomputing (ICS), 2014.

EXTERNAL FUNDING

Role	Funding Source/Amount	Project Title	From	To
CO-PI	DFE-Research Project 1 2.500.000DKK	Monitoring Changes in Big Satellite Data via Massively Parallel AI	2019	2023
CO-PI	DFE-Research Project 2 5.903.550 DKK	FUTHARK: Functional Technology for High-performance Architectures	2018	2022
University Co-Adviser	Innovation Found 1.072.000 DKK	Industrial PhD at SimCorp (Wojciech Michal Pawlak)	2017	2020
Junior Investigator	The Danish Industry Foundation 5.000.000 DKK	Industrial Data Analysis Service (IDAS)	2015	2020
Junior Investigator	Danish Council for Strategic Research (DSF) 31.416.136 DKK	Functional high-performance computing for financial information technology (HIPERFIT), grant no. 10-092299	2010	2017

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SELECTED AWARDS AND BURSARIES

- HiPEAC 2017 and 2018 Paper Award.
- “DIKU Teacher of the Year Award”, twice in 2013 and 2015.
- Special DIKU Recognition Award, 2014 (for work in revising the bachelor program).
- NSERC Post-Doctoral Scholarship, December 2007 - 2009 (80000CAD)

SUPERVISION TEACHING

2018 - present: Post-Doctoral mentoring of Troels Henriksen,
2019 - present: main PhD supervisor of Philip Munksgaard (DFF Project 2 grant),
2020 - present: main PhD supervisor of Dmitry Serykh (DFF Project 1 grant),
2014 - 2018: main PhD supervisor of Troels Henriksen (with Fritz Henglein),
2017 - 2020: PhD co-supervisor of Wojciech Michal Pawlak (with Martin Elsmann),
2012 - present: Supervision of over forty master and bachelor thesis and projects.
2012 - 2019 ”Implementation of Programming Languages”: mandatory, 2nd-year BSc course.
2014 - present ”Programming Massively Parallel Hardware”: optional 2nd-year MSc course.
2019 - present ”Functional Parallel Programming”: optional 2nd-year MSc course.

FUTHARK

Cosmin Oancea and Troels Henriksen are the main architects of the data-parallel Futhark core language and optimizing compiler [3,6,9,12,13,18,19,20], which have been found to offer performance competitive with hand-written, low-level GPU code on a number of applications and benchmarks from various domains such as finance [5,8,14,23], machine learning [2,4,16], statistics, physics, molecular dynamics [3,8]. See Futhark’s webpage: <https://futhark-lang.org>.

PUBLICATION SUMMARY

Cosmin has co-authored over thirty refereed articles in international peer-reviewed conference proceedings and journals including:

- premiere forums in their fields, marked with double asterisks (**), such as PLDI [9,22], PPOPP [6], ICFP [7], OOPSLA [30] (*programming language design and implementation*), SC [2] (*high-performance computing*), ICML [16], Knowledge-Based Systems Journal [10] (*machine learning*), TACO [14], CGO [15] (*compiler optimization*), ICDE [4] (*data engineering*), SPAA [25] (*parallel algorithms*), ISMM [26] (memory management), ISSAC [31] (symbolic computer-algebra systems),
- international symposiums in the fields of *machine-learning* [2,11,17] and computer algebra [35,36], such as BigData, ESANN, EACA,
- a set of workshops specialized on topics related to languages and compilers for high-performance computing, such as LCPC, ARRAY, FHPC, IWMSE
- education-oriented conferences such as ASEE and FIE [37,38].

Notably, Cosmin’s contributions range over all kinds of (co-author) roles:

- first author [2,15,21-33,35],
- main supervisor of the first author [1,3,6,8,9,12,13,18,19,20],
- primary [2,4,14,31,33,35] and secondary [10,11,16,19,36] roles in inter-disciplinary collaborations.

GOOGLE SCHOLAR & ACM PROFILES

Google Scholar (total/last 5 years): Citations 723/428, H-index 17/12, i10-index:22/12
<https://scholar.google.dk/citations?user=RpmM52IAAAAJ&hl=en>
ACM profile: 336 citations, 25 publication counts, <https://dl.acm.org/profile/81100509575>

Cosmin E Oancea: Curriculum Vitae (CV)

REFEREED
CONFERENCE
PROCEEDINGS
AND JOURNALS

- [1] P. Munksgaard, S. Breddam, T. Henriksen, F. Gieseke and **C. E. Oancea**, “Dataset Sensitive Autotuning of Multi-Versioned Code based on Monotonic Properties”, *accepted for presentation at 22nd Int. Symp. on Trends in Functional Programming (TFP)*, 2021.
- [2] **C. E. Oancea**, T. Robroek and F. Gieseke, “Approximate Nearest-Neighbour Fields via Massively-Parallel Propagation-Assisted KD Trees”, *IEEE Int. Conf. on Big Data, special track of Machine Learning and Big Data (MLDB)*, 2020.
- [3]** T. Henriksen, S. Hellfritsch, P. Sadayappan and **C. E. Oancea**, “Compiling Generalized Histograms for GPU”, *Int. Conf. for High Performance Computing, Networking, Storage and Analysis (SC)*, 2020.
- [4]** F. Gieseke, S. Rosca, T. Henriksen, J. Verbesselt and **C. E. Oancea**, “Massively-Parallel Change Detection for Satellite Time Series Data with Missing Values”, *IEEE 36th International Conference on Data Engineering (ICDE)*, pages 385-396, 2020.
- [5] W. Pawlak, M. Elsmann and **C. E. Oancea**, “A Functional Approach to Accelerating Monte Carlo based American Option Pricing”, *31st Int. Symp. on Implementation and Application of Functional Languages (IFL’19)*. Singapore. September, 2019.
- [6]** T. Henriksen, F. Thorøe, M. Elsmann and **C. E. Oancea**, “Incremental Flattening for Nested Data Parallelism”, *Int. Symp. on Principles and Practice of Parallel Programming (PPoPP)*, pp 53–67, Washington D.C., US, 2019.
- [7]** M. Elsmann, T. Henriksen, D. Annenkov and **C. E. Oancea**, “Static Interpretation of Higher-order Modules in Futhark: Functional GPU Programming in the Large”, *Proc. ACM Program. Lang. (ICFP’18)*, pp 97:1–97:30, St. Louis, US, 2018.
- [8] T. Henriksen, M. Elsmann and **C. E. Oancea**, “Modular Acceleration: Tricky Cases of Functional High-Performance Computing”, *Procs. of Workshop on Functional High-Performance Computing (FHPC)*, St. Louis, US, 2018.
- [9]** T. Henriksen, N. G. Serup, M. Elsmann, F. Henglein and **C. E. Oancea**, “Futhark: Purely Functional GPU-programming with Nested Parallelism and In-place Array Updates”, *Int. Conf. Programming Languages Design and Implementation (PLDI)*, Barcelona, Spain, 2017.
- [10] F. Gieseke, **C. E. Oancea** and C. Igel. “Bufferkdtree: A Python library for massive nearest neighbor queries on multi-many-core devices”, *Knowledge-Based Systems Journal*, 120:13, 2017.
- [11] F. Gieseke, **C. E. Oancea**, A. Mahaba, C. Igel and T. Heskes. “Bigger Buffer k-d Trees on Multi-Many-Core System”, *In Workshop on Big Data & Deep Learning in HPC*, 172-180, 2016.
- [12] T. Henriksen, M. Dybdal, H. Urms, A. S. Kiehn, D. Gavin, H. Abelskov, M. Elsmann and **C. Oancea**, “APL on GPUs: A TAIL from the Past, Scribbled in Futhark”, *5th Int. Workshop on Functional High Performance Computing (FHPC)*, Nara, Japan, 2016.
- [13] T. Henriksen, K. F. Larsen and **C. E. Oancea**, “Design and GPGPU Performance of Futhark’s Redomap Construct”, *3rd Int. Workshop on Libraries, Languages and Compilers for Programming (ARRAY)*, pp 17–24, Santa Barbara, US, 2016.
- [14]** C. Andretta, V. Begot, J. Berthold, M. Elsmann, F. Henglein, T. Henriksen, M. Nordfang and **C.E. Oancea**, “FinPar: A Parallel Financial Benchmark”, *ACM Journal Trans. Archit. Code Optim. (TACO)*, vol. 13(2), pp. 18.1–18.27, 2016.

Cosmin E Oancea: Curriculum Vitae (CV)

- [15]** C. E. Oancea and L. Rauchwerger, “Scalable Conditional Induction Variables (CIV) Analysis, *13th Int. Symp. on Code Generation and Optimization (CGO)*, pp. 213–224, San Francisco, California, 2015.
- [16]** F. C. Gieseke, J. Heineremann, C. E. Oancea and C. Igel, “Buffer k-d trees: processing massive nearest neighbor queries on GPUs”, *31st Int. Conf. on Machine Learning (ICML)*, pp. 172–180, Beijing, China, 2014.
- [17] F. C. Gieseke, k. L. Polsterer, C. E. Oancea and C. Igel, “Speedy Greedy Selection: Better Redshift Estimation via Massive Parallelism”, *22nd European Symposium on Artificial Neural Networks (ESANN)*, pp. 87–92, Belgium, 2014.
- [18] T. Henriksen, M. Elsmann and C. E. Oancea, “A Hybrid Approach to Size Inference in Futhark”, *3rd Int. Workshop on Functional High Performance Computing (FHPC)*, Guthen- burg, Sweden, 2014.
- [19] T. Henriksen and C. E. Oancea, “Bounds Checking: An Instance of Hybrid Analysis”, *1st Int. Workshop on Libraries, Languages and Compilers for Programming (ARRAY)*, Edinburgh, UK, 2014.
- [20] T. Henriksen, and C. E. Oancea, “A T2 Graph-Reduction Approach to Fusion”, *2nd Int. Workshop on Functional High Performance Computing (FHPC)*, Boston, US, 2013.
- [21] C. E. Oancea and L. Rauchwerger, “A Hybrid Approach to Proving Memory Refer- ence Monotonicity”, *24th Annual Workshop Languages and Compilers for Parallel Computing (LCPC)*, LNCS Vol. 7146, pp 61–75, Fort Collins, CO, USA, 2013.
- [22]** C. E. Oancea and L. Rauchwerger, “Logical Inference Techniques for Loop Paralleliza- tion”, *In ACM Procs. 33rd Int. Conf. on Programming Language Design and Implementation (PLDI)*, pp 509–520, Beijing, China, 2012.
- [23] C. E. Oancea, C. Andreetta, J. Berthold, A. Frisch and F. Henglein. “Financial software on GPUs: between Haskell and Fortran.” *In Procs of ACM Workshop on Functional high- performance computing (FHPC)*, pp 61–72, Copenhagen, Denmark, 2012.
- [24] C. E. Oancea and S. M. Watt, “An Architecture for Generic Extensions”, *Science of Computer Progr. Journal*, Elsevier, Vol.76(4), pp 258–277, doi:10.1016/j.scico.2009.09.008, 2011.
- [25]** C. E. Oancea, A. Mycroft and T. Harris, ‘ “A Lightweight In-Place Implementation for Software Thread-Level Speculation”, *In Procs. 21st ACM Symposium on Parallelism in Algorithms and Architectures (SPAA)*, pp: 223–232, Calgary, Canada, 2009.
- [26]** C. E. Oancea, A. Mycroft, and Stephen M. Watt, “A New Approach to Parallelising Tracing Algorithms”, *In Procs. Int. Symposium on Memory Management (ISMM)*, pp: 10–19, Dublin, Ireland, 2009.
- [27] C. E. Oancea and A. Mycroft, “Set-Congruence Dynamic Analysis for Software Thread- Level Speculation” *21st Annual Workshop Languages and Compilers for Parallel Computing (LCPC)*, LNCS 5535, pp 156–171, Edmonton, Canada, 2008.
- [28] C. E. Oancea and A. Mycroft, “Software Thread-Level Speculation: an Optimistic Library Implementation”, *In Procs. Int. Workshop on Multicore Software Engineering (IWMSE)*, pp 23–32 (ACM Digital Library), Leipzig, Germany, 2008.

Cosmin E Oancea: Curriculum Vitae (CV)

- [29] **C. E. Oancea** and S. M. Watt, “Generic Library Extension in a Heterogeneous Environment”, *In Procs. Workshop on Library-Centric Software Design LCSD*, pp. 25–35, Portland, USA, 2006. (Extended and improved in [13].)
- [30]** **C. E. Oancea** and S. M. Watt, “Parametric Polymorphism for Software Component Architectures,” *ACM Procs of 20st Int. Conf. Object-Oriented Programming, Systems, Languages and Applications (OOPSLA)*, pp. 147–166, San Diego, USA, 2005.
- [31]** **C. E. Oancea** and S. M. Watt, “Domains and Expressions: An Interface Between Two Approaches to Computer Algebra,” *In ACM Procs. of the Int. Symposium on Symbolic and Algebraic Computation (ISSAC)*, pp. 261–269, Beijing, China, 2005.
- [32] **C. E. Oancea**, J. W. Selby, M. Giesbrecht, and S. M. Watt, “Distributed Models of Thread Level Speculation,” *In Procs. Int. Conf. on Parallel and Distributed Processing Techniques and Applications (PDPTA)*, pp. 920–927, Las Vegas, USA, 2005.
- [33] **C. E. Oancea**, C. So, and S. M. Watt, “Generalization in Maple,” *Maple Conference*, pp. 377–382, Waterloo, ON, Canada, 2005.
- [34] Y. Chicha, M. Lloyd, **C. E. Oancea**, and S. M. Watt, “Parametric Polymorphism for Computer Algebra Software Components,” *In Procs. 6th Int. Symp. on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC)*, pp. 119–130, Timisoara, Romania, 2004.
- [35] **C. E. Oancea** and S. M. Watt, “A Framework for Using Aldor Libraries with Maple,” *In Procs. EACA*, pp. 219–224, June 2004, Universidad de Santander, Spain.
- [36] F. Boulier, M. Moreno Maza, and **C. E. Oancea**, “A new henselian construction and its application to polynomial GCDs over direct products of fields,” *In Procs. EACA*, pp. 47–52, June 2004, Universidad de Santander, Spain.
- [37] R. G. Belu, **C. E. Oancea**, and A. C. Belu, “A Wavelet-Based Simulation for Identification and Classification of Short-Term Power Disturbances and Transients,” *In Procs Annual ASEE Conference*, pp. 1380–4. June 2003, Nashville, USA.
- [38] R. G. Belu and **C. E. Oancea**, “A 2-D indoor radio propagation modeling,” *In Procs. FIE (Frontiers in Education) Conference*, pp. 1780–4. November 2003, Boulder, CO, USA.