

Didem Unat, Ph.D.

Assistant Professor, Koç University, Istanbul, Turkey

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TEDx Talk: on Youtube

Professional Memberships: IEEE, ACM, SIAM

Research Interest

Parallel computing, supercomputing, parallel programming model design, performance modeling, system software, multi-core and heterogeneous architectures, and runtime systems

Education

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|---|------------|
| <i>Doctor of Philosophy, Computer Science and Engineering</i> University of California-San Diego, CA, USA <i>Thesis: Domain-specific Translator and Optimizer for Massive On-Chip Parallelism</i> | March 2012 |
| <i>Master of Science, Computer Science and Engineering</i> University of California-San Diego, CA, USA | June 2009 |
| <i>Bachelor of Science, Computer Engineering,</i> Boğaziçi University, Istanbul, Turkey | June 2006 |

Honors and Awards

- **ACM/SigHPC Emerging Woman Leader** in Technical Computing Award 2021
- **First ERC (European Research Council)** grant in Computer Science from Turkey 2021-2026
- **Outstanding Faculty** award in Engineering at Koç University 2020
- **Newton Advanced Fellowship** from British Royal Society 2020-2023
- **Best Artifact Award** at Euro-Par Conference 2020
- **Best Paper and Best Student Paper Nominee** at IEEE/ACM Supercomputing 2019
- Science Academy of Turkey, Young Scientist Award (BAGEP) 2019
- **Marie Skłodowska-Curie Individual Fellowship, Success rate %16.8** 2015-2017
- **Luis Alvarez Postdoctoral Fellowship** from Lawrence Berkeley National Laboratory 2012-2014
- Simula Research Laboratory Ph.D. Fellowship 2007-2011
- Alarko Education and Culture Foundation Undergraduate Scholarship 2005-2006
- Boğaziçi University Honor Scholarship 2002-2006
- Türkiye İşbankası Scholarship 2001
- **2nd place** in National University Entrance Exam (OSS) among **1.5 million** applicants 2001

Work Experience

- **Department of Computer Engineering, Koç University**
Assistant Professor Istanbul, Turkey, 2014-present
- **Lawrence Berkeley National Laboratory**
Postdoctoral Fellow Berkeley, CA, USA, 2012-2014
- **University of California-San Diego**
Research Assistant La Jolla, CA, USA, 2006-2012

- **Simula Research Laboratory**
Visiting Research Assistant Oslo, Norway, Summer 2008 and 2010
- **SAS, Financial Systems Modeling Department** San Diego, USA, Summer 2007
- **NCSA, National Center for SuperComputing Applications** IL, USA, Summer 2005

Refereed Journals and Conference Publications

1. M.A. Sasongko, M. Chabbi, M.B. Marzijarani and D.Unat, "ReuseTracker: Fast Yet Accurate Multicore Reuse Distance Analyzer" *ACM Transactions on Architecture and Code Optimization*, Volume 19, Issue 1, March 2022 Article No.: 3 pp 1-25
2. A. Dubey, M. Berzins, C. Burstedde, M. L. Norman, D. Unat and M. Wahib, "Structured Adaptive Mesh Refinement Adaptations to Retain Performance Portability With Increasing Heterogeneity", *Computing in Science & Engineering*, vol. 23, no. 5, pp. 62-66
3. F. Qararyah, M. Wahib, D. Dikbayir, M.E. Belviranli, D. Unat, "A Computational-Graph Partitioning Method for Training Memory-Constrained DNNs", *Elsevier Parallel Computing*, vol. 104105, July 2021, 102792
4. Najeeb Ahmad, Buse Yilmaz, Didem Unat, "A Split Execution Model for SpTRSV", *IEEE Transactions on Parallel and Distributed Systems*, vol. 32, no. 11, pp. 2809-2822
5. Palwisha Akhtar, Erhan Tezcan, Fareed Mohammad Qararyah and Didem Unat, "ComScribe: Identifying Intra-node GPU communication" *BenchCouncil International Symposium on Benchmarking, Measuring and Optimizing, Bench 2020, Lecture Notes in Computer Science, vol 12614. Springer*
6. Najeeb Ahmad, Buse Yilmaz, Didem Unat, "A Prediction Framework for Fast Sparse Triangular Solves", *26th European International Conference on Parallel and Distributed Computing, EuroPar20, (acceptance rate: 24.5%), Best Artifact Award*
7. Buse Yilmaz, Bugra Sipahioglu, Najeeb Ahmad, Didem Unat, "Adaptive Level Binning: A New Algorithm for Solving Sparse Triangular Systems", *2020 ACM International Conference on High Performance Computing in Asia-Pacific Region. HPCAsia 2020*
8. Burak Bastem, Didem Unat, "Tiling-Based Programming Model for Structured Grids on GPU Clusters", *2020 ACM International Conference on High Performance Computing in Asia-Pacific Region. HPCAsia 2020*
9. M. Aditya Sasongko, Palwisha Akhtar, Milind Chabbi, Didem Unat, "ComDetective: A Lightweight Communication Detection Tool for Threads" *IEEE/ACM Supercomputing Conference, 2019 Best Student Paper and Best Paper finalist.*
10. M. Nufail Farooqi, Tan Nguyen, Weiqun Zhang, Ann Almgren, John Shalf, and Didem Unat, "Asynchronous AMR on Multi-GPUs", *34th International Conference on High Performance Computing, ISC High Performance 2019; Frankfurt; Germany; Volume 11887 LNCS, Pages 113-123*
11. M. Nufail Farooqi, Tan Nguyen, Weiqun Zhang, Ann Almgren, John Shalf, and Didem Unat, "Phase Asynchronous AMR Execution for Productive and Performant Astrophysical Flows", *IEEE/ACM Supercomputing Conference, SC 2018 (24% acceptance rate)*
12. Mohammad Laghari, Najeeb Ahmad, and Didem Unat. "Phase-Based Data Placement Scheme for Heterogeneous Memory Systems", *The International Symposium on Computer Architecture and High Performance Computing (SBAC-PAD) 2018*
13. Hassan Salehe Matar and Didem Unat, "Runtime Output Nondeterminism Detection for OpenMP Tasks", *The 24th European International Conference on Parallel and Distributed Computing, EuroPar'18 (28.9% acceptance rate)*
14. P. N. Soomro, M. A. Sasongko, D. Unat, "BindMe: A Thread Binding Library with Advanced Mapping Algorithms", *Concurrency and Computation: Practice and Experience, Vol 30, Issue 21, June 2018*

15. D. Dikbayir, B.E. Coban, I. Kesen, D. Yuret, D. Unat, "Fast Multidimensional Reduction and Broadcast Operations on GPU for Machine Learning", *Concurrency and Computation: Practice and Experience*, Vol 30, Issue 21, June 2018
16. Najeeb Ahmad, Muhammad Nufail Farooqi and Didem Unat, "Load Balancing for Parallel Multiphase Flow Simulation", *Scientific Programming. Volume 2018 (2018)*, Article ID 6387049, 14 pages
17. H. Matar, E. Mutlu, S. Tasiran, D. Unat. "Output Nondeterminism Detection for Programming Models Combining Dataflow with Shared Memory", *Parallel Computing*, vol. 71, pp 42-57, Jan 2018
18. M. Laghari and D. Unat. "Object Placement for High Bandwidth Memory Augmented with High Capacity Memory", *The International Symposium on Computer Architecture and High Performance Computing, (SBAC-PAD) 2017*
19. H. Matar, S. Tasiran, D. Unat. "EmbedSanitizer: Runtime Race Detection Tool for 32-bit Embedded ARM", *17th International Conference on Runtime Verification, RV'17*
20. B. Bastem, D. Unat, W. Zhang, A. Almgren, and J. Shalf. "Overlapping Data Transfers with Computation on GPU with Tiles", *46th International Conference on Parallel Processing, ICPP 2017 (28.4% acceptance rate)*
21. D. Unat, A. Dubey, T. Hoefler, J Shalf and et al. "Trends in Data Locality Abstractions for HPC Systems", *IEEE Transactions on Parallel and Distributed Systems, IEEE TPDS*, vol. 28, no. 10, pp. 3007-3020, Oct. 1 2017
22. M.N. Farooqi, D. Unat, T. Nguyen, W. Zhang, J. Shalf, and A. Almgren. "Nonintrusive AMR Asynchrony for Communication Optimization", *23rd European International Conference on Parallel and Distributed Computing, Euro-Par 2017 (30% acceptance rate)*
23. M. Farooqi, D. Izbassarov, M. Muradoglu, D. Unat, "Communication Analysis and Optimization of 3D Front Tracking Method for Multiphase Flow Simulations", *International Journal of High Performance Computing Applications (IJHPCA)*, 2017
24. D. Unat. "Access Pattern-Aware Data Placement for Hybrid DRAM/NVM Memories", *Turkish Journal of Electrical Engineering and Computer Science*, 2017
25. T. Nguyen, D. Unat, W. Zhang, N. Farooqi, A. Almgren, J. Shalf, "Perilla: metadata-based optimizations of an asynchronous runtime for adaptive mesh refinement", *IEEE/ACM Supercomputing (SC)*, 2016 (18% acceptance rate)
26. W. Zhang, A. Almgren, M. Day, T. Nguyen, J. Shalf, D. Unat, "BoxLib with Tiling: An AMR Software Framework", *SIAM Journal on Scientific Computing (SISC)*, vol. 38(5), pp 156S172, 2016
27. D. Unat, T. Nguyen, N. Farooqi, B. Bastem, W. Zhang, G. Michelogiannakis, A. Almgren, J. Shalf, "TiDA: High-Level Programming Abstractions for Data Locality Management", *31st International Supercomputing Conference, (ISC) High Performance*, 2016
28. D. Unat, C. Chan, W. Zhang, S. Williams, J. Bachan, J. Bell, J. Shalf. "ExaSAT: An Exascale Co-design Tool for Performance Modeling", *International Journal of High Performance Computing Applications (IJHPCA)*, vol. 29, no. 2, pp 209-232, 2015
29. J. Ang et al. "Abstract Machine Models for Proxy Architectures for Exascale Computing", *Hardware-Software Co-Design for High Performance Computing (Co-HPC)*, 2014
30. H. S. Kim, D. Unat, S. B. Baden, Jurgen P. Schulze, "A new approach to interactive viewpoint selection for volume datasets", *Information Visualization (InfoVis)*, vol. 12, no. 3-4, pp. 240 256, 2013
31. C. Chan, D. Unat, M. Lijewski, W. Zhang, J. Bell, J. Shalf. "Software Design Space Exploration for Exascale Combustion Co-design", *International Supercomputing Conference (ISC)*, 2013
32. M. R. Meswani, L. Carrington, D. Unat, A. Snively, S. B. Baden, S. Poole. "Modeling and predicting performance of high performance computing applications on hardware accelerators", *International Journal of High Performance Computing Applications (IJHPCA)*, vol 27, no. 2, pp. 89 - 108

33. J. Zhou, D. Unat, D. Choi, C. Guest, Y. Cui. “Hands-on Performance Tuning of 3D Finite Difference Earthquake Simulation on GPU Fermi Chipset”, *Proceedings of the International Conference on Computational Science (ICCS)*, 2012
34. D. Unat, J. Zhou, Y. Cui, S. Baden, X. Cai. “Accelerating a 3D Finite Difference Earthquake Simulation with a C-to-CUDA Translator”, *Computing in Science and Engineering Journal (CiSE)*, vol. 14, no. 3, pp 48-59, 2012
35. H. Kim, D. Unat, S. Baden, J. Schulze. “Interactive Data-centric Viewpoint Selection”, *Visualization and Data Analysis, Proc. SPIE 8294*, 2012
36. M. Meswani, L. Carrington, D. Unat, J. Peraza, A. Snavely, S. Baden, S. Poole. “Modeling and Predicting Application Performance on Hardware Accelerators”, *International Symposium on Workload Characterization (IISWC)*, IEEE 2011
37. D. Unat, X. Cai, and S. Baden. “Mint: Realizing CUDA performance in 3D Stencil Methods with Annotated C”, *International Conference on Supercomputing (ICS)*, 2011
38. D. Unat, T. Hromadka III, and S. Baden. “An Adaptive Sub-Sampling Method for in-memory Compression of Scientific Data”, *Data Compression Conference (DCC)* 2009

Selected Presentations and Invited Talks

1. D. Unat, “Parallel Software for HPC and AI”, invited virtual talk at High Performance Computing Application Workshop, Ankara, Turkey (March 2021)
2. D. Unat, “A Dataflow-Graph Partitioning Method for Training Large Deep Learning Models”, invited virtual talk at Runtime and Operating Systems for Supercomputers (ROSS Workshop) (Nov 2020)
3. D. Unat, “A Graph Partitioning Method for Memory Constrained DNNs”, invited virtual talk at KAUST (Oct 2020)
4. D. Unat, “A Lightweight Tool for Detecting Inter-Thread Communication”, seminar at Barcelona Supercomputing Center, Barcelona, Spain (Nov 2019)
5. D. Unat, “Monitoring Inter-Thread Communication”, at PADAL Workshop’19, INRIA Bordeaux, France (Sept 2019)
6. D. Unat, “Programming for Data Locality and Parallelism”, Keynote at 3rd Workshop on Data Locality co-located with Euro-Par, Gottingen, Germany (August 2019)
7. D. Unat, “A Lightweight Tool for Detecting Inter-Thread Communication”, seminar at Argonne National Laboratory, Chicago, USA (July 2019)
8. D. Unat, “Phase Asynchronous AMR Execution on Heterogeneous Architectures”, invited speaker at PASC Mini-symposium in Adaptive Mesh Refinement in the Era of Platform Heterogeneity, Zurich, Switzerland (June 2019)
9. D. Unat, “Monitoring Inter-Thread Communication”, invited speaker at ISC High Performance, Frankfurt, Germany (Jun 2019)
10. D. Unat, “Why are Supercomputers super?”, invited speaker at TEDx Istanbul (Oct 2018)
11. D. Unat, “Thread and Data Placement on Multicore Architectures”, invited speaker at Dagstuhl Seminar on Performance Portability in Extreme Scale Computing: Metrics, Challenges, Solutions, Leibniz-Zentrum für Informatik, Germany (Oct 2017)
12. D. Unat, “Locality and Parallelism in Emerging Heterogeneous Architectures”, faculty seminar at University of Chicago, Chicago, USA (Aug 2017)
13. D. Unat, “Addressing Locality and Parallelism at Emerging Multicore Architectures”, faculty seminar at University of Colorado, Boulder, USA (April 2017)
14. D. Unat, “Data Locality Management with High Level Programming Abstractions”, invited speaker at SHAXC’16 Jeddah, Saudi Arabia (May 2016)

15. D. Unat, “Towards Exascale Memory Systems”, invited panelist at the SIAM Parallel Processing for Scientific Computing, Paris, (April 2016)
16. D. Unat, “A Tiling Based Programming Model and Its Supportive Tools”, invited speaker at the SPPEXA Symposium at Technische Universität München (Jan 2016), Sabancı University, Istanbul (Nov 2015)
17. D. Unat, “Abstractions for Data-Centric Computing”, faculty seminar at Imperial-College London (July 2015), Simula Research Laboratory, Oslo (August 2015)
18. D. Unat, “Tiling Abstraction for Data-Centric Computing”, invited speaker at PASC Symposium, Zurich, Switzerland (June 2015)
19. D. Unat, “Compiler-Driven Performance Modeling and Analysis Tool for Exascale Co-design”, INRIA-Bordeaux, France (Oct 2014)
20. D. Unat, “Data Locality Challenges and Tiling Abstractions to Manage Data Locality”, Computing Sciences Exascale Seminar Series, Berkeley USA (June 2014)

Professional Activities

Editorship

- IEEE Transactions on Parallel and Distributed Systems (TPDS), Associate Editor
- Elsevier Parallel Computing Journal (PARCO), Subject Area Editor
- SAGE Int’l Journal of High Performance Computing Applications (IJHPCA), Subject Area Editor

Program and Track Chairs

- Supercomputing 2022 Post-Moore Computing - Track Chair
- IPDPS 2022 Programming Models and Compilers - Track Chair
- ICPP 2022 Architecture - Track Chair
- ISC 2022 Algorithms - Track Chair
- Supercomputing 2021 Programming Systems - Track Chair
- Euro-Par 2021 Performance and Power Modeling, Prediction and Evaluation - Track Chair
- ISC 2019 Algorithms - Track Chair
- Organizer of Turkish High Performance Computing Conference in 2017
- Organizer of Workshop on Programming Abstractions for Data Locality in 2014, 2015, 2016, 2017, 2019
- Organizer of SC’14 Birds of Feathers on Programming Abstractions for Data Locality Supercomputing 2014 - New Orleans, USA
- Organizer of SIAM’14 Mini-symposium on Hierarchical and Iteration Space Tiling Portland, USA

Technical Program Committees

- PACT 2021 Program Committee
- HiPC 2020 Program Committee
- PACT 2020 Program Committee
- ICS 2020 Program Committee
- ISC 2020 Program Committee in Algorithms Track
- IPDPS 2020 Program Committee in Experiments Track
- IPDPS 2019 Program Committee in Experiments Track

- CCGRID 2019 Program Committee
- PACT 2019 Program Committee
- HIPC 2018 System Software Track
- Supercomputing 2017 Programming Systems Track
- Euro-Par 2017 Parallel and Distributed Programming, Interfaces, and Languages Track
- Supercomputing 2016 Programming Systems Track and Tutorials
- IPDPS 2016 Program Committee in Software Track
- PACT 2016 Program Committee
- Supercomputing 2015 Program Committee in Algorithms Track and Tutorials
- CCGrid 2015 Program Committee in Programming Models and Runtime Track
- Supercomputing 2014 Program Committee in Programming Systems
- Reviewer at ACM Transactions on Parallel Computing
- Reviewer at Elsevier Parallel Computing
- Reviewer at IEEE Transactions on Parallel and Distributed Systems
- Reviewer at Elsevier Journal of Parallel and Distributed Computing
- Reviewer at SAGE International Journal of High Performance Computing Applications

Others

- Big Data and Cloud Computing Technologies Advisory Board Member at TUBITAK, 2020 -
- HPC Advisory Board Member at TUBITAK - TRUBA, 2016 - 2019

Supervision

I currently supervise 2 Ph.D. and 7 M.Sc. students. Under my supervision 4 Ph.D. and 7 M.Sc. theses are completed.

- COMPLETED
 1. Pirah Noor Soomro, M.Sc, "A Framework for Task Placement on Multicore Architectures", Jan 2018
 2. Hassan Salehe Matar, Ph.D., "Runtime Race Detection for Shared Memory Programming Models", Jun 2018
 3. Mohammad Laghari, M.Sc, "Data Placement on Heterogeneous Memory Architectures", August 2018
 4. Muhammad Nufail Farooqi, Ph.D, "Asynchronous Runtime for AMR Applications on Exascale Systems", Sept 2018
 5. Burak Bastem, M.Sc, "Tiling-Based Programming Model for GPU Clusters Targeting Structured Grids", April 2019
 6. Doga Dikbayir, M.Sc, "Kernel and Launch Time Optimizations For Deep Learning Frameworks", July 2019
 7. Fareed Mohammed Qararyah, M.Sc, "Training Memory-Constrained Deep Learning Models Using Automatic Dataflow-Graph Partitioning", Sept 2020
 8. Ilyas Turimbetov, M.Sc, "Increasing Efficiency of Combinatorial Optimization Problems on Quantum Annealers Using Classical Computers", Jan 2021
 9. Palwisha Akhtar, M.Sc, "ComScribe: A Communication Monitoring Tool for Multi-GPU Platforms", Jan 2021

10. Najeeb Ahmad, Ph.D., “Platform and Data-Aware Execution of Sparse Triangular Solve on CPU-GPU Heterogeneous Systems”, April 2021
 11. Mohammad Aditya Sasongko, Ph.D.,: “Precise Event Sampling: In-depth Analysis and Sampling-based Profiling Tools for Data Locality”, Jan 2022
- IN PROGRESS
 1. Erhan Tezcan, M.Sc. Thesis Topic: ‘Mixed Precision Support for Sparse Computation’”, expected graduation 2021
 2. Mandana Bagheri Marzijarani, M.Sc. Thesis Topic: “A Launch-time Runtime System”, expected graduation 2022
 3. Mustafa Orkun Acar, M.Sc.Thesis Topic: “Performance Optimizations for Deep Graph Library”, expected graduation 2022
 4. Endi Merkuri, M.Sc. Thesis Topic: “Programming Models for IPU’s”, expected graduation 2022
 5. Aydin Ozcan, M.Sc. Thesis Topic: “Unveiling Chip Layout”, expected graduation 2023
 6. Javid Baydamirli, M.Sc. Thesis Topic: “GPU-initiated Communication and its Optimization”, expected graduation 2024
 7. Ismayil Ismayilsoy, M.Sc. Thesis Topic: “NVSHMEM and its application on stencil computation”, expected graduation 2024
 8. Muhammet Abdullah Soy Turk, Ph.D. Thesis Topic: “A Novel Programming Model for Heterogeneous Systems”, expected graduation 2024
 9. Ilyas Turimbetov, Ph.D. Thesis Topic: “An Efficient Execution Model for Beyond Moore Heterogeneous Systems”, expected graduation 2025

On-Press

- “Dünyanın süper bilgisayarları” - News about me in Sabah Newspaper, [Link](#) (in Turkish)
- Parallel Computing: BeyondMoore - Q&AI: podcast by KUIS AI Lab, [Podcast on Spotify](#) (in English)
- EuroHPC JU funded SparCity project - Interview by Primeur Magazine, [Link](#) (in English)
- Süper Bilgisayarlar ve Gelecek - Interview by the economist Emin Capa, [Video on Youtube](#) (in Turkish)
- Why are supercomputers super? TEDx Talk, [Video on Youtube](#) (in Turkish)

Research Fundings

Project: BEYONDMOORE: Pioneering a New Path in Parallel Programming Beyond Moore’s Law

Investigators: Didem Unat (PI)

Source of Support: European Research Commission (ERC Starting Grant)

Duration: August 2021 - August 2026

Total Funding: 1.5M Euros

Status: ACTIVE

Project: SparCity: An Optimization and Co-design Framework for Sparse Computation

Investigators: Didem Unat (Consortium Coordinator)

Partners: Koç University, Sabanci University, Simula Research Laboratory, INESC-ID, Ludwig-Maximilians-Universität München, GraphCore AS

Source of Support: European Commission, H2020-JTI-EuroHPC-2019-1

Duration: April 2021 - March 2024

Total Funding: 2.6M Euros

Status: ACTIVE

Project: Vera: Data Movement Detectives

Investigators: Didem Unat

Source of Support: TUBITAK 1001
Duration: March 2021 - March 2024
Total Funding: 467,500 TL
Status: ACTIVE

Project: Diagnostic Tools for Communication Pathologies in Parallel Architectures

Investigators: Didem Unat (co-PI)
Source of Support: Royal Society-Newton Advanced Fellowship
Duration: Dec 2020 - Dec 2023
Total Funding: £111,000.00
Status: ACTIVE

Project: Effortless Parallelization of Deep Learning Frameworks

Investigators: Didem Unat (PI)
Source of Support: TUBITAK 1001
Duration: August 2019 - August 2021
Total Funding: 588,600 TL
Status: COMPLETED

Project: Data Locality Abstractions for Unstructured Meshes in High Performance Reservoir Simulation

Investigators: Didem Unat (PI)
Source of Support: Saudi Aramco
Duration: May 2017 - May 2020
Total Funding: 300,000 US Dollars
Status: COMPLETED

Project: Developing Parallel Data-Movement Optimizations Techniques for Large-Scale Flow Simulations

Investigators: Didem Unat (PI)
Source of Support: TUBITAK 1001
Duration: July 2016 - Dec 2019
Total Funding: 473,051 TL
Status: COMPLETED

Project: Software Tools for Homogeneous and Heterogeneous Parallel Architectures

Investigators: Didem Unat (PI)
Source of Support: TUBITAK 3501- Career Award
Duration: April 2016 - Oct 2018
Total Funding: 379,200 TL
Status: COMPLETED

Project: Computational Modeling of Soluble Surfactant and Viscoelasticity in 3D Multi-Phase Flow

Investigators: Metin Muradoglu (PI), Didem Unat (Researcher)
Source of Support: TUBITAK 1001
Duration: Nov 2015- May 2018
Total Funding: 246,300 TL
Status: COMPLETED

Project: Reducing Vertical and Horizontal Data Movement on Multicore Systems

Investigators: Didem Unat (PI)
Source of Support: TUBITAK 2232
Duration: May 2016-May 2018
Total Funding: 102,300 TL
Status: COMPLETED

Project: Advanced Programming Environments for Exascale Data-Centric Computing

Investigators: Didem Unat (PI)

Source of Support: European Commission, Marie Curie Individual Fellowships

Duration: April 2015 - April 2017

Total Funding: 145,846 Euros

Status: COMPLETED

TOTAL GRANTS since 2015: (\approx €2,600,000)