

## Adaptive Systems Laboratory



Ben Abdallah Abder-  
azek  
Senior Associate Pro-  
fessor



Yuichi Okuyama  
Associate Professor

Research at the adaptive systems laboratory focuses on the study and development of innovative algorithms, software, and hardware for energy-efficient high-performance computer systems. We also investigate novel adaptive systems with on-chip learning and cognitive capabilities. Our research spans several topics, including dynamic reconfiguration, fault-tolerant intra- and inter-chip communication networks, neuromorphic computing, and modelling and design space exploration of ultra-low-energy many-core SoCs.

Short history of the Lab.:

-Computer Education Laboratory started in 1993. -1993-1998 Prof. A. Taubin -2000-2012 Prof. K. Kuroda -2002-2014 Prof. J. Kitamichi. -2005- Prof. Y. Okuyama joined. -2007- Prof. A. Ben joined. -2008- The title of the laboratory changed to "Adaptive Systems Laboratory".

Members of the Adaptive Systems Laboratory:

Members of our laboratory are 2 Professors, 3 PhD students, 5 Master's students, and 15 bachelor students

Prof. Abderazek Ben Abdallah: He received the Dr. Eng. Degree in computer engineering from the University of Electro-Communications at Tokyo in 2002. He is currently a Professor, University of Aizu. He was an Associate Professor from 2011 to 2014, and Assistant Professor from 2007 to 2011. Before joining the University of Aizu, he was a Research Associate and then an Assistant Professor at the Graduate School of Information Systems, the University of Electro-Communications at Tokyo from 2002 to 2007. He has been/is a visiting professor at several universities including Hong Kong University of Science and Technology and Huazhong University of Science and Technology. His general area of research lies in energy-efficient high-performance system design and multicore systems-on-chip design. He is also

## Division of Computer Engineering

active in the area of neuromorphic computing architectures.

Prof. Yuichi Okuyama: He was born in 1975. He received the M.S and Ph.D degrees in computer science and engineering from the University of Aizu in 1999 and 2002, respectively. He entered NTT Network Innovation Laboratories and was engaged with the development of PCA (Plastic Cell Architecture) devices. He joined the University of Aizu in 2005 as an assistant professor. His current interests are implementation of applications on hardware, tool development for design automation on reconfigurable device (FPGA and other devices) and design of hardware for scientific calculations.

## Refereed Journal Papers

[benab-01:2014] Abderazek Ben Abdallah Achraf Ben Ahmed. Hybrid Silicon-Photonic Network-on-Chip for Future Generations of High-performance Many-core Systems. *Journal of Supercomputing*, 71(Issue 12):4446–4475, 12 2015.

Published.

[okuyama-01:2014] Kenta Shimizu and Yoshifumi Ohtsuka and Yuichi Okuyama and Naohiko Shimizu. FPGA and System on Chip Education for Embedded Engineer. *The International Journal of E-Learning and Educational Technologies in the Digital Media (IJEETDM)*, 1(2):68–80, 2015.

## Refereed Proceeding Papers

[benab-02:2014] Yuichi Okuyama Abderazek Ben Abdallah Xuan-Tu Tran Khanh N. Dang, Michael Meyer. A Soft-Error Resilient 3D Network-on-Chip Router. In *Proc. of IEEE 7th International Conference on Awareness Science and Technology (iCAST 2015)*, pages 84–90. IEEE, 2015.

Published

[benab-03:2014] Yuichi Okuyama Abderazek Ben Abdallah Michael Meyer, Akram Ben Ahmed. FTTDOR: Microring Fault-resilient Optical Router for Reliable Network-on-Chip Systems. In *Proc. of IEEE 9th International Symposium on Embedded Multicore/Many-core SoCs (MCSoc-15)*, pages 227–234. IEEE CSP, 2015.

Published

[benab-04:2014] Abderazek Ben Abdallah Achraf Ben Ahmed, Yuichi Okuyama. Contention-free Routing for Hybrid Photonic Mesh-based Network-on-Chip Systems. In *Proc. of IEEE 9th International Symposium on Embedded Multicore/Many-core SoCs (MCSoc-15)*, pages 235–242. IEEE CSP, 2015.

Published

[benab-05:2014] Akram Ben Ahmed Michael Meyer Yuichi Okuyama Abderazek Ben Abdallah, Mitsuhiro Nakamura. Fault-tolerant Router for Highly-

## Summary of Achievement

reliable Many-core 3D-NoC Systems. In *Proc. of the 3rd International Scientific Conference on Engineering and Applied Sciences (ISCEAS 2015)*, pages July 29–31, 2015, 2015.

Published

[benab-06:2014] Yuichi; Ben Abdallah Abderazek Ben Ahmed, Achraf; Okuyama. Non-blocking electro-optic network-on-chip router for high-throughput and low-power many-core systems. In *Information Technology and Computer Applications Congress (WCITCA)*,, pages 1–7. IEEE CSP, 2015.

Published

[benab-07:2014] Yuichi Okuyama Abderazek Ben Abdallah Achraf Ben Ahmed, Michael Meyer. Efficient Router Architecture, Design and Performance Exploration for Many-core Hybrid Photonic Network-on-Chip (2D-PHENIC). In *Proc. of the International Conference on Information Science and Control Engineering*, pages 202–206. IEEE CSP, 2015.

Published

[benab-08:2014] Yuki Tanaka Abderazek Ben Abdallah Michael Meyer, Akram Ben Ahmed. On the Design of a Fault-tolerant Photonic Network-on-Chip, Oct. 9-12, 2015, pp. 227-234. In *Proc. of IEEE International Conference on Systems, Man, and Cybernetics (SMC2015)*, pages 821–826. IEEE, 2015.

Published

[benab-09:2014] Achraf Ben Ahmed, Michael Meyer, Yuichi Okuyama, and Abderazek Ben Abdallah. Hybrid Photonic NoC based on Non-blocking Photonic Switch and Light-weight Electronic Router. In *Proc. of IEEE International Conference on Systems, Man, and Cybernetics (SMC2015)*, pages 56–61, 2015.

Published

[okuyama-02:2014] Yuichi Okuyama, Ye Chan, and Naohiko Shimizu. Educational Program for Systems on Chip Design Using Minimal Set of Standalone Computer. In *ITC-CSCC 2014*, pages 90–98, Nov. 2014.

Minimal Set of Standalone Computer ” , ITC-CSCC, pp.627–630, Phuket, Thailand, 2014.

- [okuyama-03:2014] Ohtsuka, Kenta Shimizu, Yuichi Okuyama, and Naohiko Shimizu. Rapid Method for Embedded Systems Hardware and Software Education. In *The International Conference on Computer Science, Computer Engineering, and Education Technologies (CSCEET2014)*, pages 90–98, Nov. 2014.

## Unrefereed Papers

- [okuyama-04:2014] Shun Hayamizu and Yuichi Okuyama. Accuracy Analysis of Learning with Restricted Boltzmann Machines and Contrastive Divergence for hardware design. In *3rd IPSJ Tohoku Branch Workshop 2015*, pages A2–4, Japan, January 2015. IPSJ.

in Japanese

- [okuyama-05:2014] Yuichi Okuyama, Takao Onoe, Tomonori Izumi, and Hiroshi Tsutui. Report of Logic Circuit Design Lectures in Myanmar using PARTHENON Tools. In *40th PARTHENON Technical Workshop (Invited lecture)*, pages 15–18, Japan, September 2014. PARTHENON Technical Society.

in Japanese

- [okuyama-06:2014] Shunsuke Ishikuro, Toshiichi Idonuma, Shigeyuki Takano, and Yuichi Okuyama. Introduction and Implementation of Adaptive Processor. In *40th PARTHENON Technical Workshop*, pages 45–52, Japan, September 2014. PARTHENON Technical Society.

in Japanese

- [okuyama-07:2014] Shunsuke Ishikuro, Toshiichi Idonuma, Shigeyuki Takano, and Yuichi Okuyama. Introduction and Implementation of Adaptive Processor. In *40th PARTHENON Technical Workshop*, pages 45–52, Japan, September 2014. PARTHENON Technical Society.

in Japanese

- [okuyama-08:2014] Kazuki Kobayashi and Yuichi Okuyama. Evaluation of Performance for Digital Signal Processing with Matrix Processing Circuit. In *40th PARTHENON Technical Workshop*, pages 53–60, Japan, September 2014. PARTHENON Technical Society.

in Japanese

## Summary of Achievement

- [okuyama-09:2014] Takaaki Ouchi and Yuichi Okuyama. Memory Arrangement for 2DCDP Hardware in NSL. In *40th PARTHENON Technical Workshop*, pages 61–66, Japan, September 2014. PARTHENON Technical Society. in Japanese

## Grants

- [benab-10:2014] Takako Yasuta Abderazek Ben Abdallah Kim Rockel Debopriyo Roy, John Brine. 3D Printing in Creative Factory Contexts for English Language Learning, 2015.
- [benab-11:2014] A. Ben Abdallah. Photonic 3D-Network-on-Chip for High-throughput Many-core Systems, Fukushima Competitive Research Funding, 2015.
- [okuyama-10:2014] Yuichi Okuyama. Subsidy of Fukushima Prefectural Foundation, 2014.

## Academic Activities

- [benab-12:2014] A. Ben Abdallah, 2015.  
Member of IEEE
- [benab-13:2014] A. Ben Abdallah, 2015.  
Steering Committee Chair of the IEEE MCSoc-15 Symposium
- [benab-14:2014] A. Ben Abdallah, 2015.  
Member of the ACM
- [benab-15:2014] A. Ben Abdallah, 2015.  
Member
- [okuyama-11:2014] Yuichi Okuyama, April 2014.  
executive member
- [okuyama-12:2014] Yuichi Okuyama, April 2014.  
Regular member

[okuyama-13:2014] Yuichi Okuyama, April 2013.  
regular member

[okuyama-14:2014] Yuichi Okuyama, April 2014.  
Regular member

### **Patents**

[benab-16:2014] A. Ben Abdallah. Si-Photonic Router for Network-on-Chip, 2015.

### **Ph.D and Others Theses**

[benab-17:2014] A. Ben Abdallah Akram Ben Ahmed. Phd thesis, Graduate School of Computer Science and Engineering, 2015.

[benab-18:2014] A. Ben Abdallah Mitsunari Ishii. Gt, CSE, 2015.

[benab-19:2014] Yuuki Tanaka. Gt, CSE, 2015.

### **Others**

[benab-20:2014] A. Ben Abdallah. Heterogeneous Systems for Future Computing. Invited Speaker, AUST International Conference of Technology, Oct. 12-13, 2015, 2015.

Invited Speaker

[benab-21:2014] A. Ben Abdallah. -Associate Editor, Journal of Embedded Systems (2015)(<http://www.inderscience.com/jhome.php?jcode=IJES>) - Reviewer: IEEE Transactions on Computer Aided Design of Integrated Circuits and Systems (2015) -Reviewer: 2015 IEEE Symposium on Low-Power and High-Speed Chips (COOLChips), -Reviewer: Journal of Parallel and Distributed Systems (2015), 2015.

[benab-22:2014] A. Ben Abdallah. Member of the Center for Language Research Faculty Search Committee, University of Aizu Chairperson of the Qualification Examination Committee for acquisition of Tenure for Division

## Summary of Achievement

of computer Engineering, University of Aizu Chairperson of the Computer Engineering Division Faculty Search Committee, University of Aizu, Member of the Evaluation Committee for the Project, University of Aizu Member of Invention Deliberation Invention Council, University of Aizu.