Rassul Bairamkulov

brainkz.github.io | LinkedIn | GitHub

Experience

Postdoctoral scholar August 2022 – Present
EPFL *Lausanne, Vaud, Switzerland*

- Developing electronic design automation tools for emerging computing technologies

Design Automation Intern May 2020 – August 2020
Qualcomm Inc. *Remote – Rochester, New York, USA*

- Automated PCB-level power delivery network layout synthesis in low-power high-performance integrated circuits
- The developed tool enables fast PCB prototype generation, enabling a comprehensive early design exploration

Design Automation Intern May 2018 – August 2018
Qualcomm Inc. *San Diego, California, USA*

- Developed a tool to optimize power delivery network parameters based on target specifications
- Efficient design space exploration for power delivery in high-performance integrated circuits
- Power loss and area of the power delivery network are reduced under the performance constraint

Research Assistant June 2017 – June 2022
University of Rochester *Rochester, New York, USA*

- Developed EDA methodologies and software tools for VLSI power delivery network design, early system-level exploration, and layout synthesis (funded by Qualcomm)
- Developed a tool for clock distribution network synthesis for Superconductive Rapid Single Flux Quantum integrated circuits (funded by Synopsys)
- Developed Infinity Mirror Technique for fast and accurate analysis of voltage drop within large grids (funded by National Science Foundation)

Teaching Assistant Fall 2017 – Fall 2022
University of Rochester *Rochester, New York, USA*

- Assisted in conducting graduate-level course `ECE461 "Introduction to VLSI"`
- Developed, distributed, and graded the homework, laboratory, and examination assignments

Undergraduate Research Assistant November 2014 – May 2016
Nazarbayev University *Astana, Kazakhstan*

- Developed a software tool for minimizing the Total Harmonic Distortion (THD) in multilevel voltage converters

Education

University of Rochester Rochester, New York, USA
Ph.D. in Electrical and Computer Engineering *June 2017 – June 2022*

- Thesis title: *Graph Algorithms for VLSI Power and Clock Networks*

University of Rochester Rochester, New York, USA
M.S. in Electrical and Computer Engineering *August 2016 – June 2017*

Nazarbayev University Astana, Kazakhstan
B.Eng. in Electrical and Electronic Engineering *August 2012 – May 2016*

- Capstone project title: *Analysis of Natural Voltage Balancing in Single-Phase Multilevel Power Converters*

Technical Skills

Programming		Python, C++, Matlab/Octave, Mathematica, bash
Tools	:	VS Code, Git, SPICE, Spectre, Cadence Virtuoso, Ansys SIWave, Keysight ADS, Verilog HDL, Simulink
Miscellaneous		Software development, academic research, teaching, LaTeX typesetting
Languages	:	English – fluent, Russian – native, Kazakh – fluent, French – basic

Publications

Authored Book

Bairamkulov, R. and Friedman, E. G. *Graphs in VLSI*. Springer Nature, Cham, Switzerland, 2023.

Journal Articles

Zhuldassov, N., and **Bairamkulov, R.** and Friedman, E. G. "Thermal Optimization of Hybrid Cryogenic Computing Systems". *IEEE Transactions on Very Large Scale Integration Systems* (in press).

Bairamkulov, R. and Jabbari, T. and Friedman, E. G. "QuCTS -— Single-Flux Quantum Clock Tree Synthesis". *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* 41.10 (2021), 3346–3358.

Bairamkulov, R. and Roy, A. and Nagarajan, M. and Srinivas, V. and Friedman, E. G. "SPROUT—Smart Power Routing Tool for Board-Level Exploration and Prototyping". *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* 41.7 (2021), 2263–2275.

Bairamkulov, R. and Friedman, E. G. "Effective Resistance of Finite Two-Dimensional Grids Based on Infinity Mirror Technique". *IEEE Transactions on Circuits and Systems I: Regular Papers* 67.9 (2020), 3224–3233.

Bairamkulov, R. and Friedman, E. G. "Effective Resistance of Two-Dimensional Truncated Infinite Mesh Structures". *IEEE Transactions on Circuits and Systems I: Regular Papers* 66.11 (2019), 4368–4376.

Bairamkulov, R. and Xu, K. and Popovich, M. and Ochoa, J. S. and Srinivas, V. and Friedman, E. G. "Power Delivery Exploration Methodology Based on Constrained Optimization". *IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems* 39.9 (2019), 1916–1924.

Bairamkulov, R. "The Model of Metal-Oxide-Metal Memristor Based on Device Physical Parameters". *Advances in Memristor Circuits and Bioinspired Systems* 1.1 (2015), 67–72.

Conference Proceedings

Bairamkulov, R. and Friedman, E. G. and Roy, A. and Nagarajan, M. and Srinivas, V. "Graph-Based Power Network Routing for Board-Level High Performance Systems". *Proceedings of the IEEE International Symposium on Circuits and Systems*. 2020, 1–5.

Bairamkulov, R. and Xu, K. and Friedman, E. G. and Popovich, M. and Ochoa, J. and Srinivas, V. "Versatile Framework for Power Delivery Exploration". *Proceedings of the IEEE International Symposium on Circuits and Systems*. 2018, 1–5.

Bairamkulov, R. and Ruderman, A. and Familiant, Y. L. "Time Domain Optimization of Voltage and Current THD for a Three-Phase Cascaded H-Bridge Inverter". *Proceedings of the IEEE International Power Electronics and Motion Control Conference*. 2016, 227–232.

Doctoral Dissertation

Bairamkulov, R. "Graph Algorithms for VLSI Power and Clock Networks". PhD thesis. University of Rochester, 2022.