

PROMOTION RECOMMENDATION  
The University of Michigan  
College of Engineering

Igor L. Markov, associate professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering, is recommended for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

Academic Degrees:

Ph.D.	2001	University of California, Computer Science, Los Angeles, CA
M.A.	1994	University of California, Mathematics, Los Angeles, CA
M.A.	1994	Kiev University, (also covers undergraduate studies), Ukraine

Professional Record:

2006 – present	Associate Professor (with tenure), Department of Electrical Engineering and Computer Science, University of Michigan
2000 – 2006	Assistant Professor, Department of Electrical Engineering and Computer Science, University of Michigan

Summary of Evaluation:

Teaching: Professor Markov has been a very effective teacher in the classroom, inspiring quite a few students to get involved in research, even as undergraduates. One Michigan undergraduate (now a Ph.D. student in mathematics at Princeton) carried out research with Professor Markov which led to ten conference and journal publications, one of which received the *IEEE Transactions* on CAD Best Paper of the Year award.

At the graduate level, Professor Markov has served as the advisor of 12 Ph.D. students, nine of whom have graduated. A testimony to his advising excellence is that the research of his Ph.D. advisees has been recognized by an extraordinary number of awards, including no less than four Best Thesis awards from ACM SIGDA (Special Interest Group on Design Automation) and EDAA (the European Design Automation Association). It is also noteworthy that Professor Markov has also supervised several students from under-represented groups: two of his nine Ph.D. graduates were female and one was a student from under-represented groups.

Research: Professor Markov's primary research is in the area of electronic design automation, particularly layout synthesis and optimization of very large scale integrated (VLSI) circuits. He is considered to be one of the leading experts in VLSI physical design which includes partitioning, floorplanning, placement, routing, and clock-network synthesis. His research group translates many of his ideas into useful software tools that are quickly adopted by other researchers or are incorporated into commercial software flows. His collaborations have led to key innovations receiving wide exposure by being published in top journals in physics and quantum computing. For example, his work on physical synthesis shows how to restructure digital logic circuits to optimize interconnect to improve circuit performance. His publication record is very strong, with more than 100 papers in top-ranked journals and highly-selective conferences. He is a frequent invited speaker at major conferences, high-tech companies, and universities. His professional reputation is that of a brilliant, mathematically-sophisticated computer science and engineering researcher who has had significant theoretical and practical impact on a number of important research areas.

### Recent and Significant Publications:

- D.-J. Lee and I. L. Markov, "Obstacle-aware Clock-tree Shaping during Placement," to appear in *IEEE Transactions On Computer-Aided Design*, 2011.
- I. L. Markov and Y. Shi, "Constant-Degree Graph Expansions that Preserve Treewidth," *Algorithmica*, vol. 59, no. 4, pp. 461-470, 2011.
- D.-J. Lee and I. L. Markov, "Contango: Integrated Optimizations for SoC Clock Networks," *VLSI Design*, vol. 2011, no. 407507, 12 pp., 2011.
- D. A. Papa, C. Sze, N. Viswanathan, Z. Li, G. Nam, C. J. Alpert, and I. L. Markov, "Physical Synthesis with Clock-network Optimization for Large SoCs," *IEEE Micro*, 2011.
- D. A. Papa, M. D. Moffitt, C. J. Alpert, and I. L. Markov, "Speeding up Physical Synthesis with Transactional Timing Analysis," *IEEE Design & Test of Computers*, vol. 27, no. 5, pp. 14-25, 2010.
- J. A. Roy, F. Koushanfar, and I. L. Markov, "Ending Piracy of Integrated Circuits," *IEEE Computer*, pp. 30-38, October 2010.
- S. Yamashita and I. L. Markov, "Fast Equivalence-checking for Quantum Circuits," *Quantum Information and Computation*, vol. 9, no. 9, 10, pp. 721-734, 2010.
- K.-H. Chang, V. Bertacco, I. L. Markov, and A. Mishchenko, "Logic Synthesis and Circuit Customization Using Extensive External Don't-Cares," *ACM Transactions on Design Automation of Electronic Systems*, 15 (3), May 2010.
- V. V. Shende and I. L. Markov, "On the CNOT-cost of TOFFOLI Gates," *Quantum Information and Computation*, vol. 9, no. 5-6, pp. 461-486, May 2009.
- S. Krishnaswamy, S. Plaza, I. L. Markov, and J. P. Hayes, "Signature-based SER Analysis and Design of Logic Circuits," *IEEE Transactions on Computer-Aided Design*, vol.28, no.1, pp. 74-86, January 2009.

Service: Professor Markov has a very strong record of internal and external service since his last promotion in 2006. It is clear from the external letters that Professor Markov's service to the national and international research community in computer science and engineering is a great credit to his department, the College, and the University. There is strong evidence that his dynamism, leadership, and expertise are highly valued by his peers. Within the University, his department and the College of Engineering have relied on Professor Markov for several important assignments such as the Computer Engineering Program Committee (chair, 2006-2011), College Research Strategy Committee (2007), CS/LSA Review Committee (2011), and his division Internal Review Committee (2011-2012). Outside the University, Professor Markov has distinguished himself through his participation on the editorial boards and technical program committees of the most prestigious journals and conferences of the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronic Engineers (IEEE).

### External Reviewers:

Reviewer A: "But I should mention that talking to my colleagues in computer science and engineering, my understanding is that Prof. Markov is acclaimed as being one of the world's most brilliant researchers in the field of physical design and circuit layout in EDA."

Reviewer B: "I consider Igor, a star. His record of very numerous publications, production of PhD students over the years, recognition in terms of best papers etc., and his service and leadership in the EDA community are all outstanding and unsurpassed for his [generation]."

Reviewer C: "Igor is not only a dedicated researcher, but also an energetic participant on technical committees or volunteer for various professional societies."

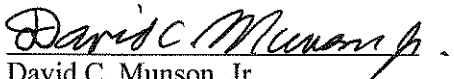
Reviewer D: “There are several dimensions such as scholarship, teaching, service, innovation, recognition and impact, along which a faculty member’s success can be measured. In this aspect, I believe Igor’s record puts him among [the] top 5% of his peers in each of these dimensions.”

Reviewer E: “I am enormously impressed with Igor’s creativity, his ability to balance mathematical elegance with practicality, and his continuous impact on this field.”

Reviewer F: “His list of awards is very impressive, and likely to grow in the future, and is an indicator of why many people regard him as one of the top researchers of his generation in the area of design automation.”

Reviewer G: “Professor Markov is clearly in the top tier of faculty in the design automation space, and compares extremely favorably with other full professors in the field.”

Summary of Recommendation: Professor Markov is recognized internationally as one of the top researchers in electronic design automation. His research portfolio includes numerous award papers in the most prestigious venues in his field of specialization. His teaching record is excellent at both the undergraduate and graduate level. His internal and external service contributions have been noted as being high quality. It is with the support of the College of Engineering Executive Committee that I recommend Igor L. Markov for promotion to professor of electrical engineering and computer science, with tenure, Department of Electrical Engineering and Computer Science, College of Engineering.

  
David C. Munson, Jr.  
Robert J. Vlasic Dean of Engineering  
College of Engineering

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