Title: How Computational Intelligence is Shaping the Art of Analog Layout Synthesis?

Abstract: On today's semiconductor industry, the integration of complex systems-on-a-chip with analog/radio-frequency (RF) components, multimillion transistor digital processors and dense memory blocks is a widespread practice, and, is only possible due to the continuous advances on electronic design automation (EDA) tools. Still, the degree of analog design automation lags behind its digital counterpart and is expected to reach 50% only by 2020, reflecting negatively in the development costs of analog/RF blocks. While some commercial EDA solutions finally begin to establish on some steps of the analog IC design flow, the process of constructing layouts has stubbornly defied all attempts of automation, even after almost 30 years of research efforts. Therefore, designers continue to use traditional editing environments to manually lay out every device and shape, in an iterative, error-prone and hardly reusable process. This talk, after introducing the "art" of analog layout, digs into the complexity of automating it, the curse of aesthetics, and, revisits previous efforts proposed by the research community. To bypass the failures of the past, the most recent solutions – empowered by modern computational intelligent techniques – promote a gigantic all-inclusive optimization loop, promising to finally close the gap between electrical and physical design steps. However, as analog EDA is starting to move slowly below the 65-nanometer integration technologies new challenges arise, and, existent tools must be prepared for them. Finally, by looking forward, the role of deep learning on speeding-up design cycles in a near future is discussed.

Ricardo Martins received the B.Sc., M.Sc. and Ph.D. degrees in Electrical and Computer Engineering from *Instituto Superior Técnico* – University of Lisbon (IST-UL), Portugal, in 2011, 2012 and 2015, respectively. He is with *Instituto de Telecomunicações* since 2011 developing tools for electronic design automation, where he now holds a postdoctoral research position. He is also an invited Assistant Professor in the Department of Electrical and Computer Engineering, where he was distinguished with two "IST Outstanding Teaching Awards". From a list of 45 international scientific publications in the last 5 years, he authored 2 books and papers in the *IEEE Transactions on Computer-Aided Design* and *Expert Systems with Application* journals, and also, in the *Design Automation and Test in Europe* conference. In 2015 he won the "Best EDA Tool" award of the *Int. Conf. on* SMACD. He was the Publication Co-Chair of SMACD's 2016 and 2017 editions, Publication Co-Chair of the *Int. Conf. on* PRIME in 2016, and also, Competition Chair of the 1st NGCAS *Conf.* in 2017, all co-sponsored by IEEE, IEEE CEDA and IEEE CAS. His current research interests include: electronic design automation tools for analog, mixed-signal and radio-frequency integrated circuits, deep nanometer integration technologies, soft computing, machine learning and deep learning.