Reconfigurable Analog Photonic Networks

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***Abstract*—Spurred by advances in scalable photonic system in-**

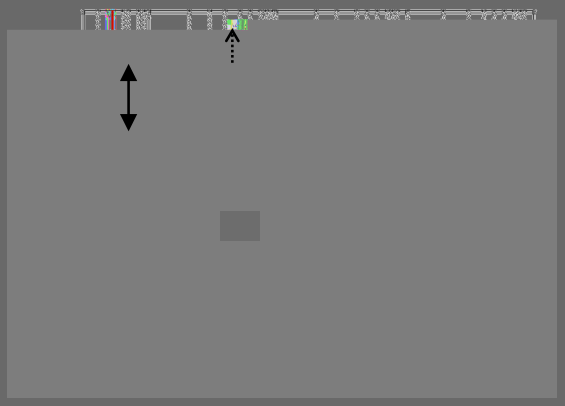

Fig. 1. a) Concept of a broadcast-and-weight network [6]. b) Regime of application for multivariate RF photonics [14]. c) Silicon waveguide implementation of a thermally reconfigurable broadcast-and-weight network; detectors and laser sources are off-chip. d) Bifurcation results of a recurrent 2-node photonic neural network [8]. e) MRR weight banks with increased tolerance to thermal cross-talk [12]. f) First principal component analysis with a MRR weight bank, before convergence (middle) and after (bottom).

would no longer trade off with number of antennas.

Multivarite RF photonics refers to the application of statistical analysis to photonic implementations of multi-channel RF signal processing. A MRR weight bank implementation of principal component analysis at 1GHz was shown in [13]. The performance limits of MRR weight banks defines the applicability regime of multivariate RF photonics, which can be compared to their electronic counterparts. Ref. [14] outlined a regime of bandwidth and number of channels where multivariate RF photonics would outperform state-of-the-art electronics.

Silicon photonic manufacturing introduces unprecedented opportunities for large-scale, analog photonic systems with wide reconfigurability. By applying neural abstractions for programming and learning interconnects, these systems could find application in new regimes of information processing where speed, adaptibility, and complexity are paramount. Further study is required to determine the specific applications where the combination of these capabilities will have greatest impact.

REFERENCES

[1] G. Indiveri