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Enabling Ultra-low Power Machine Learning at the Edge

March 27, 2023

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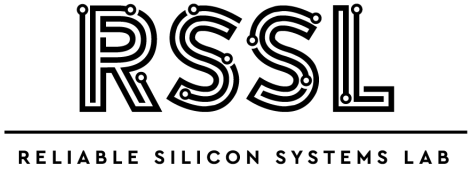

SSS3D: Fast Neural Architecture Search For Efficient Three-Dimensional Semantic Segmentation

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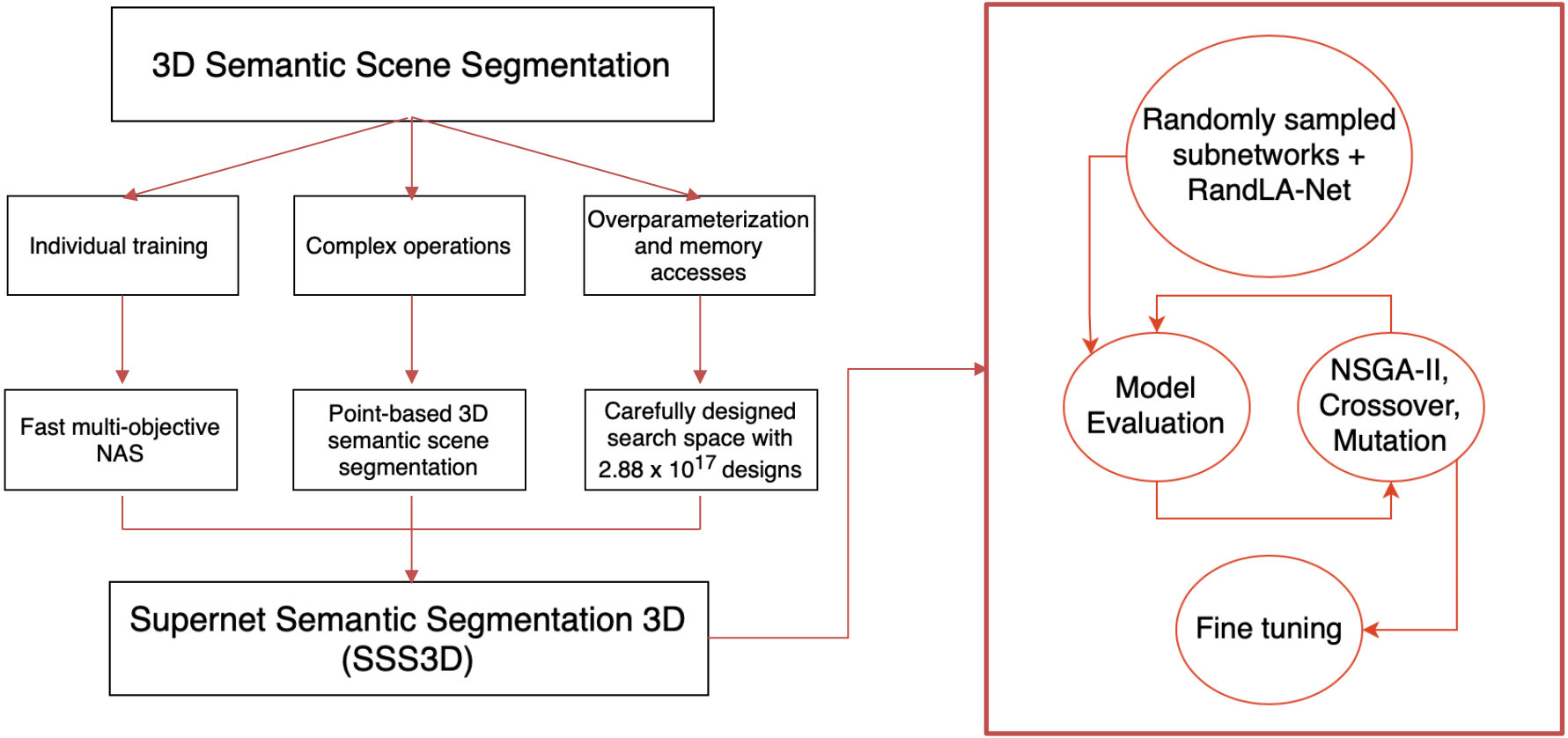
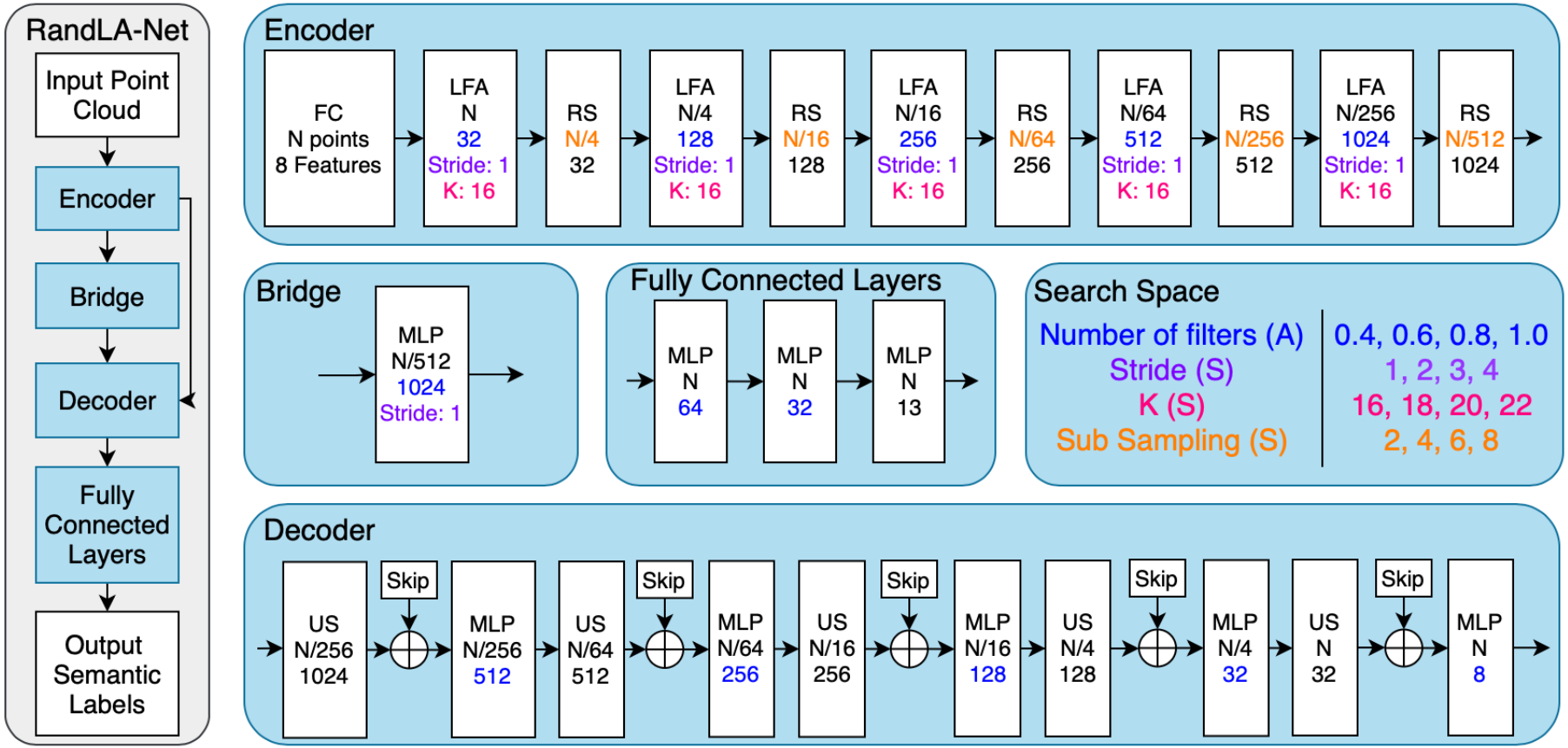
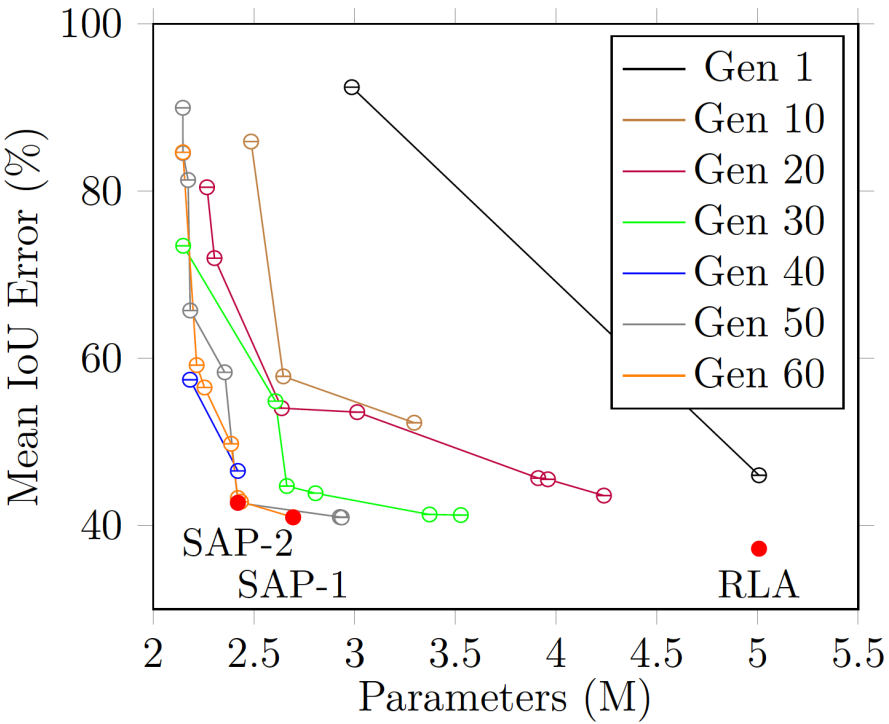
Problem Formulation

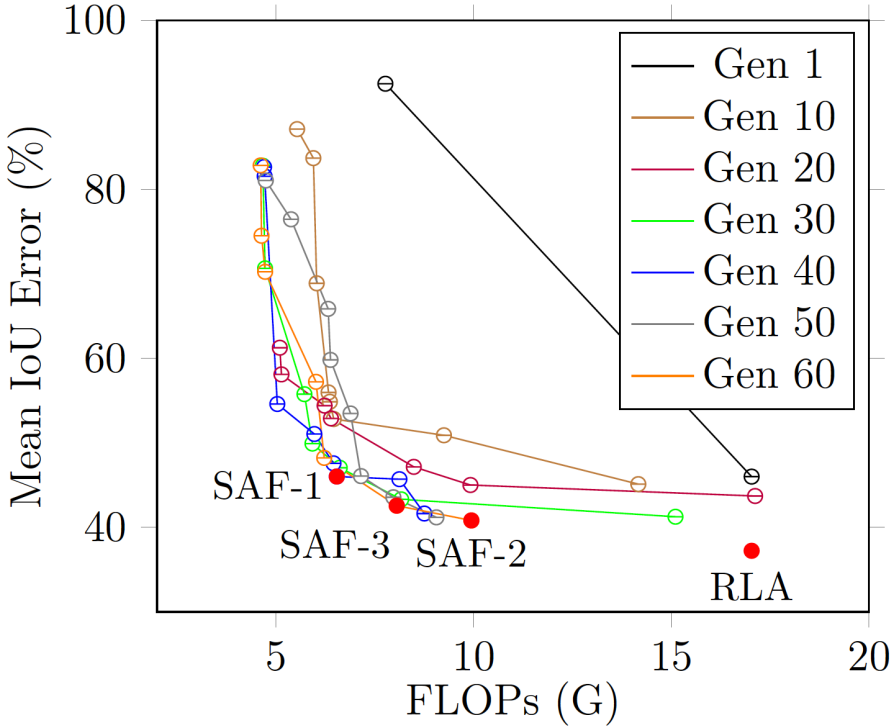


RandLA-Net and SSS3D's Search Space

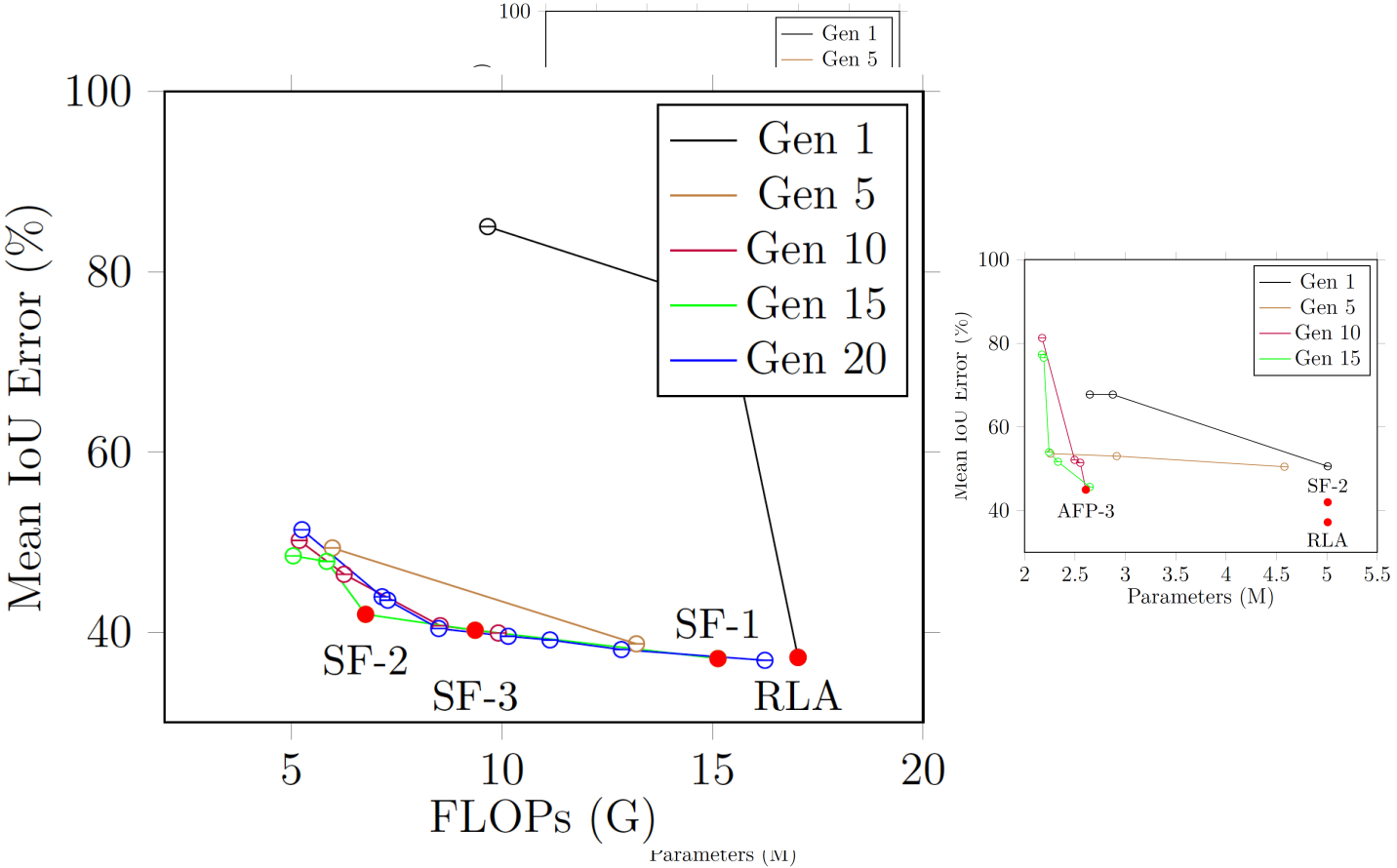


Single-Stage Search





Two-Stage Search



Subnetworks Produced

- Reduces search time by 99.67% for single-stage search
- Two-stage search is 46% faster than single-stage search
- RandLA-Net has 5M parameters, 17G FLOPs and 62.78% mIoU

Name	Filter Ratio	Stride	K	Sub Sampling
RLA	1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0, 1.0	1, 1, 1, 1, 1, 1	16, 16, 16, 16, 16	4, 4, 4, 4, 2
SAP-1	0.8, 0.8, 0.8, 1.0, 0.4, 0.4, 0.4, 0.8, 0.8, 1.0, 1.0, 0.8, 0.8	1, 1, 1, 1, 3, 1	16, 20, 16, 16, 22	4, 4, 6, 4, 2
SAP-2	0.8, 0.8, 0.8, 0.6, 0.4, 0.4, 0.4, 0.8, 0.8, 1.0, 1.0, 0.8, 0.8	1, 1, 1, 1, 4, 3	16, 18, 16, 16, 20	4, 4, 8, 8, 2
AFP-3	0.8, 0.8, 1.0, 0.8, 0.4, 0.4, 0.4, 0.8, 0.8, 1.0, 1.0, 0.6, 0.8	1, 1, 1, 1, 1, 3	16, 16, 16, 16, 16	8, 4, 8, 8, 2

- mIoU increased by 0.27 %
- Lowest parameters with 52% less than RLA for 61.51% mIoU
- Discovered in 1.04 GPU days. Lowest FLOPs with 62% less than RLA for 59.28% mIoU

Thank you !
Any questions ?

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