Active Geometric Graph Representaion Learning with Inductive Topological Graph Neural Networks I have no idea what we should title it

Roy G. Biv, Ed Grimley, *Member, IEEE*, and Martha Stewart

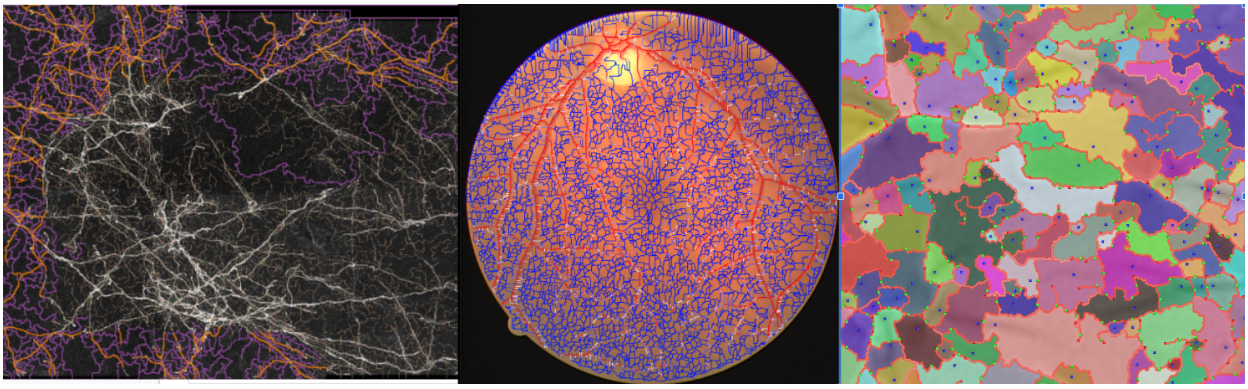

Fig. 1. Space Filler Teaser for now, **Left:** Neuron projection onto 2D with MSC segmentation of axons, **Middle:** Optic image with segmentation of blood vessels with 2 saddle geometric MSC, **Right:** Example of training topological graph neural net on dual graph of MSC defined by adjacent faces.

Abstract—Broadly: Compute an a priori segmentation of potential feature objects - distinct objects arranged in neighborhoods. Examples, are line segments, regions, surface patches, etc. Semantic features for an application are formed by groups (subsets) of the feature objects. The feature objects are the nodes of a graph, and their connections to neighbors are the edges. Can we use ML to categorize objects as a semantic feature or as background? Example: Compute a topological segmentation, the morse smale complex, extract the 2-saddle arcs as geometric lines, partition them into non-overlapping polylines, connected at nodes. Each polyline (object–¿node) has a set of attributes, and is connected to each other polyline at its endpoints (edges). Given a partial classification of this graph, can we use something like a graph neural network, currently graphsage, to learn subgraph topologies of interest, and thus classify each node as feature or background.

Index Terms—Topological segmentation, Morse Smale Complex, graph neural network, inductive graph learning, active learning, geometric graphs, neighborhood aggregation encoder, graph representation learning, graph embedding

1 Introduction

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- *Roy G. Biv is with Starbucks Research. E-mail: roy.g.biv@aol.com.*
- *Ed Grimley is with Grimley Widgets, Inc.. E-mail: ed.grimley@aol.com.*
- *Martha Stewart is with Martha Stewart Enterprises at Microsoft Research. E-mail: martha.stewart@marthastewart.com.*

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4 Example Section

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5 Exposition

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$$\sum_{j=1}^{z} j = \frac{z(z+1)}{2} \tag{1}$$

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Table 1. VIS/VisWeek accepted/presented papers: 1990–2016.

year	Vis/SciVis	SciVis conf	InfoVis	VAST	VAST conf	TVCG @ VIS	CG&A @ VIS	VIS/VisWeek incl. TVCG/CG&A	VIS/VisWeek w/o TVCG/CG&A
2016	30		37	33	15	23	10	148	115
2015	33	9	38	33	14	17	15	159	127
2014	34		45	33	21	20		153	133
2013	31		38	32		20		121	101
2012	42		44	30		23		139	116
2011	49		44	26		20		139	119
2010	48		35	26				109	109
2009	54		37	26				117	117
2008	50		28	21				99	99
2007	56		27	24				107	107
2006	63		24	26				113	113
2005	88		31					119	119
2004	70		27					97	97
2003	74		29					103	103
2002	78		23					101	101
2001	74		22					96	96
2000	73		20					93	93
1999	69		19					88	88
1998	72		18					90	90
1997	72		16					88	88
1996	65		12					77	77
1995	56		18					74	74
1994	53							53	53
1993	55							55	55
1992	53							53	53
1991	50							50	50
1990	53							53	53
sum	**1545**	**9**	**632**	**310**	**50**	**123**	**25**	**2694**	**2546**

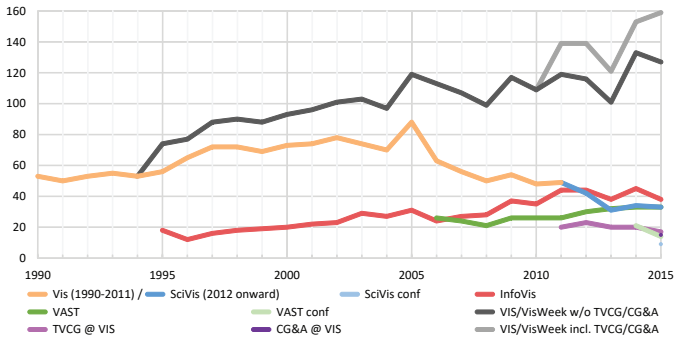

Fig. 2. A visualization of the 1990–2015 data from Table 1. The image is from [**?**] and is in the public domain.

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[1] The algorithm behind Marching Cubes [**?**] had already been described by Wyvill et al. [**?**] a year earlier.

[2] Footnotes appear at the bottom of the column.

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6 Conclusion

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Acknowledgments

The authors wish to thank A, B, and C. This work was supported in part by a grant from XYZ (# 12345-67890).

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