7a.029.TUT - Very Fast Nearest Neighbor Retrieval in High-Dimensional Domains

Project - Team

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Project - Summary

This project investigates variants of approximate nearest neighbor (ANN) search algorithms based on random projection trees.

The objectives are to develop and evaluate: i) scalable algorithms for ultrahigh-dimensional data by exploiting sparsity; ii) incremental algorithms for dynamic (streaming) data; iii) robust (fault-tolerant) parallelization techniques on GPU, cluster and cloud platforms.

Applications involve text, audio, image and other signal data.

Project - Novelty of Approach

- We use multiple random projection trees, which allows for a trade-off between the computational cost and the probability of retrieving the closest neighbor or neighbors

Project - Details of Progress/Achievement

We have applied MRPT (multiple random projection trees) method to a large-scale text classification task. MRPT made nearest-neighbor based classification possible as the exact search was computationally infeasible. However, nearest-neighbor classifier itself was outperformed by other methods in this setting.

We have made progress in research regarding the fault-tolerant parallelization techniques and in the automatic tuning of the parameters of the method.

Project - Deliverables

	Deliverable
1.	An open-source package for parallelized ANN.
2.	Concrete applications of ANN in large-scale document classification, clustering, etc.
3.	Theoretical framework for the study of parallel ANN and other machine learning procedures.
4.	Optional deliverable: Incremental algorithms for dynamic (streaming) data.

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CVDI Calendar

Project - Benefits to IAB

- Nearest neighbor search is a very standard operation ini information retrieval, clustering and visualization. Being able to scale up the methods opens up new possiblities. The actual business cases with interested IAB members will be planned later.

Project - Presentation Video (Spring 2018)

Video Link (8:47 minutes)

Project - Documents

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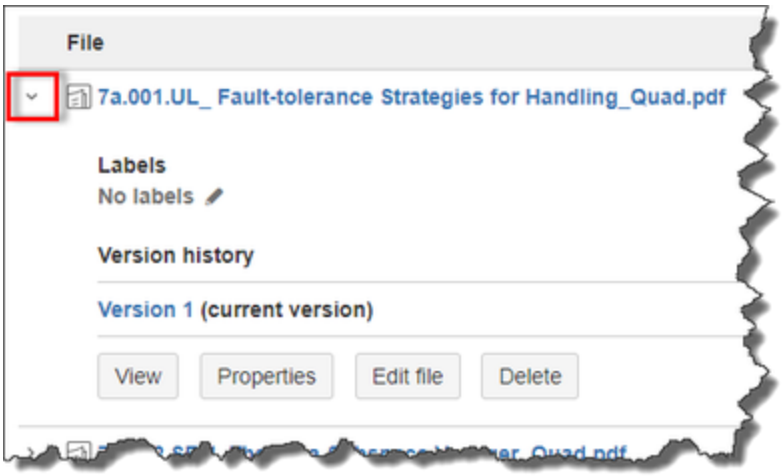

File	Modified
7a.029.TUT_Very Fast Nearest Neighbor_Retrieval_Quad_2017 Fall Meeting.pdf	Jan 05, 2018 by Sally Johnson
7a.029.TUT Executive Summary.pdf	Feb 22, 2018 by petri.myllymaki@helsinki.fi
7a.029.TUT-Very-Fast-NN-Presentation-with-audio.ppsx	Feb 22, 2018 by Moncef Gabbouj
7a.029.TUT-Very-Fast-NN-Presentation-with-audio.mp4	Feb 22, 2018 by Moncef Gabbouj
7a.029.TUT_Quad Chart_2018 Spring Meeting.pdf	Mar 15, 2018 by Sally Johnson
7a.029.TUT_2018 Fall Meeting Poster.pptx	Nov 09, 2018 by Sally Johnson
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Project - Comments