Autocorrelation in Sparse Distributed Memory

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***Abstract*—The abstract goes here.**

***Index Terms*—IEEE, IEEEtran, journal, LATEX, paper, template.**

I. Introduction

THIS demo file is intended to serve as a "starter file" for IEEE journal papers produced under LATEX using IEEEtran.cls version 1.8b and later. I wish you the best of success. Kanerva writes:

!TEX root = ../partial-sdm.tex

II. A deviation from the equator distance?

[width=0.8]./images02/calculated-table-72.png

Fig. 1. Kanerva's original Figure 7.3 generated using the equations from brogliato2014sparse.

Kanerva writes:

You have done an incredibly thorough analysis of SDM. I like the puzzle in your message and believe that your simulations are correct and to be learned from. So what to make of the difference compared to my Figure 7.3 (and your Figure 1)? I think the difference comes from my not having accounted fully for the effect of the other 9,999 vectors that are stored in the memory. You say in it

I think that is correct. It also brings to mind a comment Louis Jaeckel made when we worked at NASA Ames. He pointed out that autoassociative storage (each vector is stored with itself as the address) introduces autocorrelation that my formula for Figure 7.2 did not take into account. When we read from memory, each stored vector exerts a pull toward itself, which also means that each bit of a retrieved vector is slightly biased toward the same bit of the read address, regardless of the read address. We never worked out the math.

This is an important observation. A hard location is activated because it shares many dimensions with the items read from or written onto it. Imagine the 'counter's eye view': each individual counter 'likes' to write on its own corresponding bit-address value more than it likes the opposite; as each hard-location has a say in its own area — and nowhere else.

Let x and y be random bitstrings and n be the number of dimensions in the memory; let x_i and y_i be the i-th bit of x and y, respectively; and $d(x, y)$ be the Hamming distance. Whilst the probability of a shared bit-value between same dimension-bits in two random addresses is $1/2$, an address only activates hard-locations close to it. Let us call these shared bitvalues a *bitmatch in dimension* i.

So, what is the probability of bitmatches given that we know the access radius r between the address and a hard-location?

A. Subsection Heading Here

Subsection text here.

1) Subsubsection Heading Here: Subsubsection text here.

III. Conclusion

The conclusion goes here.

Appendix A
Proof of the First Zonklar Equation

Appendix one text goes here.

Appendix B

Appendix two text goes here.

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References

[1] H. Kopka and P. W. Daly, *A Guide to LATEX*, 3rd ed. Harlow, England: Addison-Wesley, 1999.

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Michael Shell Biography text here.

John Doe Biography text here.

Jane Doe Biography text here.

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