CLAIMS

1. A computer-implemented method executed on a processor for performing matrix sketching ~~by employing an analog crossbar architecture~~, the method comprising:

placing a first matrix and a second matrix in an analog crossbar architecture;

low rank updating ~~a~~ the first matrix for a first period of time;

copying the first matrix into a dynamic correction computing device;

switching to ~~a~~ the second matrix to low rank update the second matrix for a second period of time;

as the second matrix is low rank updated, feeding the first matrix with first stochastic pulses to reset the first matrix back to a first matrix symmetry point;

copying the second matrix into the dynamic correction computing device;

switching back to the first matrix to low rank update the first matrix for a third period of time; and

as the first matrix is low rank updated, feeding the second matrix with second stochastic pulses to reset the second matrix back to a second matrix symmetry point.

~~2. The method of claim 1, wherein the first and second matrices are placed in the analog crossbar architecture.~~

~~3~~2. The method of claim 1, wherein the first and second matrices include streaming data.

~~4~~3. The method of claim ~~3~~2, wherein the streaming data is normalized to prevent asymmetry effects.

~~5~~4. The method of claim ~~4~~3, wherein the low rank updating of the first and second matrices is scaled to adjust a final sketching matrix to between (-0.1, 0.1) for a full range of (-1, 1) to operate near the first and second matrix asymmetry points.

~~6~~5. The method of claim ~~5~~4, wherein once the matrix sketching is applied to an entire input, a final sketching matrix is moved to a digital computer to perform a regression analysis.

~~7~~6. The method of claim 1, wherein the dynamic correction computing device concurrently corrects the first and second matrices.

~~8~~7. A non-transitory computer-readable storage medium comprising a computer-readable program executed on a processor in a data processing system for performing matrix sketching ~~by employing an analog crossbar architecture~~, wherein the computer-readable program when executed on the processor causes a computer to perform the steps of:

placing a first matrix and a second matrix in an analog crossbar architecture;

low rank updating ~~a~~ the first matrix for a first period of time;

copying the first matrix into a dynamic correction computing device;

switching to ~~a~~ the second matrix to low rank update the second matrix for a second period of time;

as the second matrix is low rank updated, feeding the first matrix with first stochastic pulses to reset the first matrix back to a first matrix symmetry point;

copying the second matrix into the dynamic correction computing device;

switching back to the first matrix to low rank update the first matrix for a third period of time; and

as the first matrix is low rank updated, feeding the second matrix with second stochastic pulses to reset the second matrix back to a second matrix symmetry point.

~~9. The non-transitory computer-readable storage medium of claim 8, wherein the first and second matrices are placed in the analog crossbar architecture.~~

~~10~~8. The non-transitory computer-readable storage medium of claim ~~8~~7, wherein the first and second matrices include streaming data.

~~11~~9. The non-transitory computer-readable storage medium of claim ~~10~~8, wherein the streaming data is normalized to prevent asymmetry effects.

~~12~~10. The non-transitory computer-readable storage medium of claim ~~11~~9, wherein the low rank updating of the first and second matrices is scaled to adjust a final sketching matrix to between (-0.1, 0.1) for a full range of (-1, 1) to operate near the first and second matrix asymmetry points.

~~13~~11. The non-transitory computer-readable storage medium of claim ~~12~~10, wherein once the matrix sketching is applied to an entire input, a final sketching matrix is moved to a digital computer to perform a regression analysis.

~~14~~12. The non-transitory computer-readable storage medium of claim ~~8~~7, wherein the dynamic correction computing device concurrently corrects the first and second matrices.

~~15~~13. A system for performing matrix sketching ~~by employing an analog crossbar architecture~~, the system comprising:

a memory; and

one or more processors in communication with the memory configured to:

place a first matrix and a second matrix in an analog crossbar architecture;

low rank update ~~a~~ the first matrix for a first period of time;

copy the first matrix into a dynamic correction computing device;

switch to ~~a~~ the second matrix to low rank update the second matrix for a second period of time;

as the second matrix is low rank updated, feed the first matrix with first stochastic pulses to reset the first matrix back to a first matrix symmetry point;

copy the second matrix into the dynamic correction computing device;

switch back to the first matrix to low rank update the first matrix for a third period of time; and

as the first matrix is low rank updated, feed the second matrix with second stochastic pulses to reset the second matrix back to a second matrix symmetry point.

~~16. The system of claim 15, wherein the first and second matrices are placed in the analog crossbar architecture.~~

~~17~~14. The system of claim ~~15~~13, wherein the first and second matrices include streaming data.

~~18~~15. The system of claim ~~17~~14, wherein the streaming data is normalized to prevent asymmetry effects.

~~19~~16. The system of claim ~~18~~15, wherein the low rank updating of the first and second matrices is scaled to adjust a final sketching matrix to between (-0.1, 0.1) for a full range of (-1, 1) to operate near the first and second matrix asymmetry points.

17~~20~~. The system of claim ~~19~~16, wherein once the matrix sketching is applied to an entire input, the final sketching matrix is moved to a digital computer to perform a regression analysis.

~~21~~18. The system of claim ~~15~~13, wherein the dynamic correction computing device concurrently corrects the first and second matrices.

~~22~~19. A computer-implemented method executed on a processor for performing matrix sketching ~~by employing an analog crossbar architecture~~, the method comprising:

applying dimensionality reduction to streaming data using outer product low rank updates; ~~and~~

once the dimensionality reduction is applied to an entire input, moving a sketched matrix to a digital computer to perform regression analysis~~.~~

~~23. The method of claim 22~~, wherein the sketched matrix is derived from a first matrix and a second matrix used in parallel in a toggling manner, the first and second matrices placed in an analog crossbar architecture;~~.~~

~~24. The method of claim 23, further comprising:~~

low rank updating the first matrix for a first period of time;

copying the first matrix into a dynamic correction computing device; and

switching to the second matrix to low rank update the second matrix for a second period of time~~;~~ .

20. The method of claim 19, further comprising:

as the second matrix is low rank updated, feeding the first matrix with first stochastic pulses to reset the first matrix back to a first matrix symmetry point;

copying the second matrix into the dynamic correction computing device;

switching back to the first matrix to low rank update the first matrix for a third period of time; and

as the first matrix is low rank updated, feeding the second matrix with second stochastic pulses to reset the second matrix back to a second matrix symmetry point.

~~25~~21. A system for performing matrix sketching ~~by employing an analog crossbar architecture~~, the system comprising:

a memory; and

one or more processors in communication with the memory configured to:

apply dimensionality reduction to streaming data using outer product low rank updates; ~~and~~

once the dimensionality reduction is applied to an entire input, move a sketched matrix to a digital computer to perform regression analysis, wherein the sketched matrix is derived from a first matrix and a second matrix used in parallel in a toggling manner, the first and second matrices placed in an analog crossbar architecture;

low rank update the first matrix for a first period of time;

copy the first matrix into a dynamic correction computing device; and

switch to the second matrix to low rank update the second matrix for a second period of time.