CLAIMS

1. A system for transforming sparse elements into a dense matrix, the system comprising:

a sparse-dense transform unit configured to output a target dense matrix for further processing by a processing unit, the sparse-dense transform unit comprising multiple sparse element access units, each sparse element access unit being configured to:

receive a request for sparse elements;

identify a processor from among a plurality of processors included in the sparse element access unit, the identified processor being configured to process the request for the sparse elements;

fetch, using the identified processor, sparse elements for generating a dense matrix, wherein the fetched sparse elements are stored in one or more data shards of the system; and

generate an output dense matrix using the fetched sparse elements, the output dense matrix being used by the sparse-dense transform unit to generate the target dense matrix output by the sparse-dense transform unit.

2. The system of claim 1, wherein:

i) each of the multiple sparse element access units is configured to fetch, using at least the identified processor, sparse elements that form a two-dimensional matrix; and

ii) the sparse-dense transform unit generates the target dense matrix using the sparse elements that form the two-dimensional matrix.

3. The system of claim 1, wherein each sparse element access unit is configured to:

determine whether the sparse element access unit is assigned to access the sparse elements indicated by the request for sparse elements; and

provide control signals to cause at least the identified processor to fetch the sparse elements for processing the request.

9. A method for transforming sparse elements into a dense matrix, the method comprising:

receiving, by a sparse-dense transform unit and from an external source, an instruction for accessing sparse elements to generate a target dense matrix;

receiving, by a sparse element access unit and based on the instruction, a request for sparse elements, the sparse element access unit being one of multiple sparse element access units included in the sparse-dense transform unit;

identifying, by the sparse element access unit and based on the request, a processor from among a plurality of processors included in the sparse element access unit;

fetching, by the sparse element access unit and based on the request, sparse elements for generating a dense matrix, wherein the fetched sparse elements are stored in one or more data shards of the system; and

generating, by the sparse element access unit, an output dense matrix using the fetched sparse elements, the output dense matrix being used by the sparse-dense transform unit to generate the target dense matrix for further processing by a processing unit.

10. The method of claim 9, further comprising:

processing, using the identified processor, the request to fetch the sparse elements using the identified processor.

11. The method of claim 10, wherein:

each of the multiple sparse element access units is configured to fetch, using at least a respective identified processor, sparse elements that form a two-dimensional matrix; and

the sparse-dense transform unit generates the target dense matrix using the sparse elements that form the two-dimensional matrix.

12. The method of claim 10, further comprising:

determining, by the sparse element access unit, whether the sparse element access unit is assigned to access the sparse elements indicated by the request for sparse elements; and

generating, at the sparse element access unit, the dense matrix based on the compressed concatenated elements; and

providing the dense matrix to a multi-dimensional node network.

18. One or more non-transitory machine-readable storage devices for storing instructions that are executable by one or more processing devices to cause performance of operations comprising:

receiving, by a sparse-dense transform unit and from an external source, an instruction for accessing sparse elements to generate a target dense matrix;

receiving, by a sparse element access unit and based on the instruction, a request for sparse elements, the sparse element access unit being one of multiple sparse element access units included in the sparse-dense transform unit;

identifying, by the sparse element access unit and based on the request, a processor from among a plurality of processors included in the sparse element access unit;

fetching, by the sparse element access unit and based on the request, sparse elements for generating a dense matrix, wherein the fetched sparse elements are stored in one or more data shards of the system; and

generating, by the sparse element access unit, an output dense matrix using the fetched sparse elements, the output dense matrix being used by the sparse-dense transform unit to generate the target dense matrix for further processing by a processing unit.

19. The machine-readable storage devices of claim 18, wherein the operations further comprise:

processing, using the identified processor, the request to fetch the sparse elements using the identified processor.

20. The machine-readable storage devices of claim 18, wherein the operations further comprise:

generating, at the sparse element access unit, concatenated elements using sparse reduced elements formed from the fetched sparse elements;

compressing, at the sparse element access unit, the concatenated elements generated using the sparse reduced elements;