

## SYNOPSIS

```
use FileIO::FingerprintsTextFileIO qw(:all);
```

## DESCRIPTION

new, GetDataColLabels, GetDataLineWords, GetFingerprints, GetFingerprintsString, IsFingerprintsDataValid, IsFingerprintsFileDataValid, IsFingerprintsTextFile, Next, Read, SetBitStringFormat, SetBitsOrder, SetColMode, SetDataColLabels, SetDataLineWords, SetDetailLevel, SetFingerprints, SetFingerprintsString, SetFingerprintsStringMode, SetInDelim, SetOutDelim, SetVectorStringFormat, WriteFingerprints, WriteFingerprintsString

The following methods can also be used as functions:

IsFingerprintsTextFile

FingerprintsTextFileIO class is derived from *FileIO* class and uses its methods to support generic file related functionality.

The fingerprints CSV/TSV text file format with .csv or .tsv file extensions supports two types of fingerprints string data: fingerprints bit-vectors and fingerprints vector strings. The fingerprints string data is treated as column value in a text file.

Example of text file format containing fingerprints string data:

```
"CompoundID", "PathLengthFingerprints"
"Cmpdl", "FingerprintsBitVector;PathLengthBits:AtomicInvariantsAtomTypes
:MinLength1:MaxLength8;1024;HexadecimalString;Ascending;9c8460989ec8a4
9913991a6603130b0a19e8051c89184414953800cc2151082844a20104280013086030
8e8204d402800831048940e44281c00060449a5000ac80c894114e006321264401..."
... ..
... ..
... ..
```

The current release of MayaChemTools supports the following types of fingerprint bit-vector and vector strings:

```
FingerprintsVector;AtomNeighborhoods:AtomicInvariantsAtomTypes:MinRadi
us0:MaxRadius2;41;AlphaNumericalValues;ValuesString;NR0-C.X1.BO1.H3-AT
C1:NR1-C.X3.BO3.H1-ATC1:NR2-C.X1.BO1.H3-ATC1:NR2-C.X3.BO4-ATC1 NR0-C.X
1.BO1.H3-ATC1:NR1-C.X3.BO3.H1-ATC1:NR2-C.X1.BO1.H3-ATC1:NR2-C.X3.BO4-A
TC1 NR0-C.X2.BO2.H2-ATC1:NR1-C.X2.BO2.H2-ATC1:NR1-C.X3.BO3.H1-ATC1:NR2
-C.X2.BO2.H2-ATC1:NR2-N.X3.BO3-ATC1:NR2-O.X1.BO1.H1-ATC1 NR0-C.X2.B...
```

```
FingerprintsVector:AtomTypesCount:AtomicInvariantsAtomTypes:ArbitraryS
size:10;NumericalValues:IDsAndValuesString:C.X1.B01.H3 C.X2.B02.H2 C.X2
.B03.H1 C.X3.B03.H1 C.X3.B04 F.X1.B01 N.X2.B02.H1 N.X3.B03 O.X1.B01.H1
O.X1.B02;2 4 14 3 10 1 1 1 3 2
```

```
FingerprintsVector:AtomTypesCount:SLogPAtomTypes:ArbitrarySize:16;Nume
ricalValues;IDsAndValuesString;C1 C10 C11 C14 C18 C20 C21 C22 C5 CS F
N11 N4 O10 O2 O9;5 1 1 1 14 4 2 1 2 2 1 1 1 1 3 1
```

[illegible]



```
0 0 0 0 0 0 0 1 0 0 3 0 0 0 0 4 0 0 2 0 0 0 0 0 0 0 2 0 0 2 0 0 0 0
0 0 0 0 1 1 8 0 0 0 1 0 0 1 0 1 0 1 0 3 1 3 1 0 0 0 1 2 0 11 1 0 0 0
5 0 0 1 2 0 1 1 0 0 0 0 0 1 1 0 1 1 1 1 0 4 0 0 1 1 0 4 6 1 1 1 2 1 1
3 5 2 2 0 5 3 5 1 1 2 5 1 2 1 2 4 8 3 5 5 2 2 0 3 5 4 1
```

```
FingerprintsVector;MACCSKeyCount;322;OrderedNumericalValues;ValuesStri
ng;14 8 2 0 2 0 4 4 2 1 4 0 0 2 5 10 5 2 1 0 0 2 0 5 13 3 28 5 5 3 0 0
0 4 2 1 1 0 1 1 0 0 2 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 22 5 3 0 0 0 1 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 11 0 2 0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 ...
```

```
FingerprintsBitVector;PathLengthBits:AtomicInvariantsAtomTypes:MinLeng
th1:MaxLength8;1024;BinaryString;Ascending;001000010011010101011000110
0100010101011000101001011100110001000010001001101000001001001001000
0010110100000111001001000001001010100100100000000011000000101001011100
0010000001000101010100000100111100110111011011011000000010110111001101
01011000110000000100010000110000101000111011000010000100010000000...
```

```
FingerprintsVector;PathLengthCount:AtomicInvariantsAtomTypes:MinLength
1:MaxLength8;432;NumericalValues;IDsAndValuesPairsString;C.X1.BO1.H3 2
C.X2.BO2.H2 4 C.X2.BO3.H1 14 C.X3.BO3.H1 3 C.X3.BO4 10 F.X1.BO1 1 N.X
2.BO2.H1 1 N.X3.BO3 1 O.X1.BO1.H1 3 O.X1.BO2 2 C.X1.BO1.H3C.X3.BO3.H1
2 C.X2.BO2.H2C.X2.BO2.H2 1 C.X2.BO2.H2C.X3.BO3.H1 4 C.X2.BO2.H2C.X3.BO
4 1 C.X2.BO2.H2N.X3.BO3 1 C.X2.BO3.H1:C.X2.BO3.H1 10 C.X2.BO3.H1:C....
```

```
FingerprintsVector;PathLengthCount:MMFF94AtomTypes:MinLength1:MaxLengt
h8;463;NumericalValues;IDsAndValuesPairsString;C5A 2 C5B 2 C=ON 1 CB 1
8 COO 1 CR 9 F 1 N5 1 NC=O 1 O=CN 1 O=CO 1 OC=O 1 OR 2 C5A:C5B 2 C5A:N
5 2 C5ACB 1 C5ACR 1 C5B:C5B 1 C5BC=ON 1 C5BCB 1 C=ON=O=CN 1 C=ONNC=O 1
CB:CB 18 CBF 1 CBNC=O 1 COO=O=CO 1 COOCR 1 COOOC=O 1 CRCR 7 CRN5 1 CR
OR 2 C5A:C5B:C5B 2 C5A:C5BC=ON 1 C5A:C5BCB 1 C5A:N5:C5A 1 C5A:N5CR ...
```

```
FingerprintsVector;TopologicalAtomPairs:AtomicInvariantsAtomTypes:MinD
istance1:MaxDistance10;223;NumericalValues;IDsAndValuesString;C.X1.BO1
.H3-D1-C.X3.BO3.H1 C.X2.BO2.H2-D1-C.X2.BO2.H2 C.X2.BO2.H2-D1-C.X3.BO3.
H1 C.X2.BO2.H2-D1-C.X3.BO4 C.X2.BO2.H2-D1-N.X3.BO3 C.X2.BO3.H1-D1-...;
2 1 4 1 1 10 8 1 2 6 1 2 2 1 2 1 2 2 1 2 1 5 1 10 12 2 2 1 2 1 9 1 3 1
1 1 2 2 1 3 6 1 6 14 2 2 2 3 1 3 1 8 2 2 1 3 2 6 1 2 2 5 1 3 1 23 1...
```

```
FingerprintsVector;TopologicalAtomPairs:FunctionalClassAtomTypes:MinDi
stance1:MaxDistance10;144;NumericalValues;IDsAndValuesString;Ar-D1-Ar
Ar-D1-Ar.HBA Ar-D1-HBD Ar-D1-Hal Ar-D1-None Ar.HBA-D1-None HBA-D1-NI H
BA-D1-None HBA.HBD-D1-NI HBA.HBD-D1-None HBD-D1-None NI-D1-None No...;
23 2 1 1 2 1 1 1 1 2 1 1 7 28 3 1 3 2 8 2 1 1 1 5 1 5 24 3 3 4 2 13 4
1 1 4 1 5 22 4 4 3 1 19 1 1 1 1 1 2 2 3 1 1 8 25 4 5 2 3 1 26 1 4 1 ...
```

```
FingerprintsVector;TopologicalAtomTorsions:AtomicInvariantsAtomTypes;3
3;NumericalValues;IDsAndValuesString;C.X1.BO1.H3-C.X3.BO3.H1-C.X3.BO4-
C.X3.BO4 C.X1.BO1.H3-C.X3.BO3.H1-C.X3.BO4-N.X3.BO3 C.X2.BO2.H2-C.X2.BO
2.H2-C.X3.BO3.H1-C.X2.BO2.H2 C.X2.BO2.H2-C.X2.BO2.H2-C.X3.BO3.H1-O...;
2 2 1 1 2 2 1 1 3 4 4 8 4 2 2 6 2 2 1 2 1 1 2 1 1 2 6 2 4 2 1 3 1
```

```
FingerprintsVector;TopologicalAtomTorsions:EStateAtomTypes;36;Numerica
lValues;IDsAndValuesString;aaCH-aaCH-aaCH-aaCH aaCH-aaCH-aaCH-aasC aaC
H-aaCH-aasC-aaCH aaCH-aaCH-aasC-aasC aaCH-aaCH-aasC-sF aaCH-aaCH-aasC-
ssNH aaCH-aasC-aasC-aasC aaCH-aasC-aasC-aasN aaCH-aasC-ssNH-dssC a...;
4 4 8 4 2 2 6 2 2 2 4 3 2 1 3 3 2 2 2 1 2 1 1 1 2 1 1 1 1 1 1 2 1 1 2
```

```
FingerprintsVector;TopologicalAtomTriplets:AtomicInvariantsAtomTypes:M
```

```
inDistance1:MaxDistance10;3096;NumericalValues;IDsAndValuesString;C.X1
.B01.H3-D1-C.X1.B01.H3-D1-C.X3.B03.H1-D2 C.X1.B01.H3-D1-C.X2.B02.H2-D1
0-C.X3.B04-D9 C.X1.B01.H3-D1-C.X2.B02.H2-D3-N.X3.B03-D4 C.X1.B01.H3-D1
-C.X2.B02.H2-D4-C.X2.B02.H2-D5 C.X1.B01.H3-D1-C.X2.B02.H2-D6-C.X3...;
1 2 2 2 2 2 2 8 8 4 8 4 4 2 2 2 2 4 2 2 2 2 2 1 2 2 4 4 4 2 2
2 4 4 4 8 4 4 2 4 4 4 2 4 4 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 8...
```

```
FingerprintsVector;TopologicalAtomTriplets:SYBYLAtomTypes:MinDistance1
:MaxDistance10;2332;NumericalValues;IDsAndValuesString;C.2-D1-C.2-D9-C
.3-D10 C.2-D1-C.2-D9-C.ar-D10 C.2-D1-C.3-D1-C.3-D2 C.2-D1-C.3-D10-C.3-
D9 C.2-D1-C.3-D2-C.3-D3 C.2-D1-C.3-D2-C.ar-D3 C.2-D1-C.3-D3-C.3-D4 C.2
-D1-C.3-D3-N.ar-D4 C.2-D1-C.3-D3-O.3-D2 C.2-D1-C.3-D4-C.3-D5 C.2-D1-C.
3-D5-C.3-D6 C.2-D1-C.3-D5-O.3-D4 C.2-D1-C.3-D6-C.3-D7 C.2-D1-C.3-D7...
```

```
FingerprintsVector;TopologicalPharmacophoreAtomPairs:ArbitrarySize:Min
Distance1:MaxDistance10;54;NumericalValues;IDsAndValuesString;H-D1-H H
-D1-NI HBA-D1-NI HBD-D1-NI H-D2-H H-D2-HBA H-D2-HBD HBA-D2-HBA HBA-D2-
HBD H-D3-H H-D3-HBA H-D3-HBD H-D3-NI HBA-D3-NI HBD-D3-NI H-D4-H H-D4-H
BA H-D4-HBD HBA-D4-HBA HBA-D4-HBD HBD-D4-HBD H-D5-H H-D5-HBA H-D5-...;
18 1 2 1 22 12 8 1 2 18 6 3 1 1 22 13 6 5 7 2 28 9 5 1 1 1 36 16 10
3 4 1 37 10 8 1 35 10 9 3 3 1 28 7 7 4 18 16 12 5 1 2 1
```

```
FingerprintsVector;TopologicalPharmacophoreAtomPairs:FixedSize:MinDist
ance1:MaxDistance10;150;OrderedNumericalValues;ValuesString;18 0 0 1 0
0 0 2 0 0 1 0 0 0 0 22 12 8 0 0 1 2 0 0 0 0 0 0 0 0 18 6 3 1 0 0 0 1
0 0 1 0 0 0 0 22 13 6 0 0 5 7 0 0 2 0 0 0 0 0 28 9 5 1 0 0 0 1 0 0 1 0
0 0 0 36 16 10 0 0 3 4 0 0 1 0 0 0 0 0 37 10 8 0 0 0 0 1 0 0 0 0 0 0
0 35 10 9 0 0 3 3 0 0 1 0 0 0 0 0 28 7 7 4 0 0 0 0 0 0 0 0 0 0 0 18...
```

```
FingerprintsVector;TopologicalPharmacophoreAtomTriplets:ArbitrarySize:
MinDistance1:MaxDistance10;696;NumericalValues;IDsAndValuesString;Ar1-
Ar1-Ar1 Ar1-Ar1-H1 Ar1-Ar1-HBA1 Ar1-Ar1-HBD1 Ar1-H1-H1 Ar1-H1-HBA1 Ar1
-H1-HBD1 Ar1-HBA1-HBD1 H1-H1-H1 H1-H1-HBA1 H1-H1-HBD1 H1-HBA1-HBA1 H1-
HBA1-HBD1 H1-HBA1-NI1 H1-HBD1-NI1 HBA1-HBA1-NI1 HBA1-HBD1-NI1 Ar1-...;
46 106 8 3 83 11 4 1 21 5 3 1 2 2 1 1 1 100 101 18 11 145 132 26 14 23
28 3 3 5 4 61 45 10 4 16 20 7 5 1 3 4 5 3 1 1 1 5 4 2 1 2 2 2 1 1 1
119 123 24 15 185 202 41 25 22 17 3 5 85 95 18 11 23 17 3 1 1 6 4 ...
```

```
FingerprintsVector;TopologicalPharmacophoreAtomTriplets:FixedSize:MinD
istance1:MaxDistance10;2692;OrderedNumericalValues;ValuesString;46 106
8 3 0 0 83 11 4 0 0 0 1 0 0 0 0 0 0 0 0 21 5 3 0 0 1 2 2 0 0 1 0 0 0
0 0 0 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 100 101 18 11 0 0 145 132 26
14 0 0 23 28 3 3 0 0 5 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 61 45 10 4 0
0 16 20 7 5 1 0 3 4 5 3 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 0 0 5 ...
```

## METHODS

new

```
$NewFingerprintsTextFileIO = new FileIO::FingerprintsTextFileIO(%IOParameters);
```

Using specified *IOParameters* names and values hash, new method creates a new object and returns a reference to a newly created FingerprintsTextFileIO object. By default, the following properties are initialized during *Read* mode:

```
Name = '';
Mode = 'Read';
Status = 0;
FingerprintsStringMode = 'AutoDetect';
FingerprintsCol = 'AutoDetect';
ColMode = 'ColNum';
CompoundIDCol = 'AutoDetect';
CompoundIDPrefix = 'Cmpd';
```

```
InDelim = 'Comma';
ValidateData = 1;
DetailLevel = 1;
```

During *Write* mode, the following properties get initialize by default:

```
FingerprintsStringMode = undef;

BitStringFormat = HexadecimalString;
BitsOrder = Ascending;

VectorStringFormat = NumericalValuesString or ValuesString;
OutDelim = 'Comma';
OutQuote = 1;
```

Examples:

```
$NewFingerprintsTextFileIO = new FileIO::FingerprintsTextFileIO(
    'Name' => 'Sample.csv',
    'Mode' => 'Read');

$NewFingerprintsTextFileIO = new FileIO::FingerprintsTextFileIO(
    'Name' => 'Sample.csv',
    'Mode' => 'Read',;
    'FingerprintsStringMode' =>
        'AutoDetect',
    'ColMode' => 'ColLabel',
    'FingerprintsCol' => 'Fingerprints',
    'CompoundIDCol' => 'CompoundID',
    'InDelim' => 'Comma');

$NewFingerprintsTextFileIO = new FileIO::FingerprintsTextFileIO(
    'Name' => 'Sample.csv',
    'Mode' => 'Write',
    'FingerprintsStringMode' =>
        'FingerprintsBitVectorString',
    'Overwrite' => 1,
    'BitStringFormat' => 'HexadecimalString',
    'BitsOrder' => 'Ascending');

$NewFingerprintsTextFileIO = new FileIO::FingerprintsTextFileIO(
    'Name' => 'Sample.tsv',
    'Mode' => 'Write',
    'FingerprintsStringMode' =>
        'FingerprintsVectorString',
    'Overwrite' => 1,
    'VectorStringFormat' => 'IDsAndValuesString',
    'OutDelim' => 'Tab',
    'OutQuote' => 0);
```

#### GetDataColLabels

```
@ColLabels = $FingerprintsTextFileIO->GetDataColLabels();
$NumOfColLabels = $FingerprintsTextFileIO->GetDataColLabels();
```

Returns an array of ColLabels from first line in text file. In scalar context, it returns number of column labels.

#### GetDataLineWords

```
@DataWords = $FingerprintsTextFileIO->GetDataLineWords();
$NumOfDataWords = $FingerprintsTextFileIO->GetDataLineWords();
```

Returns an array of DataWords in current data line. In scalar context, it returns number of data words.

#### GetFingerprints

```
$FingerprintsObject = $FingerprintsTextFileIO->GetFingerprints();
```

Returns FingerprintsObject generated for current data line using fingerprints bit-vector or vector string data. The fingerprints object corresponds to any of the supported fingerprints such as PathLengthFingerprints, ExtendedConnectivity, and so on.

#### GetFingerprintsString

```
$FingerprintsString = $FingerprintsTextFileIO->GetFingerprintsString();
```

Returns FingerprintsString for current data line.

#### IsFingerprintsDataValid

```
$Status = $FingerprintsTextFileIO->IsFingerprintsDataValid();
```

Returns 1 or 0 based on whether FingerprintsObject is valid.

#### IsFingerprintsFileDataValid

```
$Status = $FingerprintsTextFileIO->IsFingerprintsFileDataValid();
```

Returns 1 or 0 based on whether text file contains valid fingerprints data.

#### IsFingerprintsTextFile

```
$Status = $FingerprintsTextFileIO->IsFingerprintsTextFile($FileName);  
$Status = FileIO::FingerprintsTextFileIO::IsFingerprintsTextFile($FileName);
```

Returns 1 or 0 based on whether *FileName* is a fingerprints text file.

#### Next or Read

```
$FingerprintsTextFileIO = $FingerprintsTextFileIO->Next();  
$FingerprintsTextFileIO = $FingerprintsTextFileIO->Read();
```

Reads next available fingerprints line in text file, processes the data, generates appropriate fingerprints object, and returns FingerprintsTextFileIO. The generated fingerprints object is available using method GetFingerprints.

#### SetBitStringFormat

```
$FingerprintsTextFileIO->SetBitStringFormat($Format);
```

Sets bit string *Format* for fingerprints bit-vector string data in a text file and returns FingerprintsTextFileIO. Possible values for BitStringFormat: *BinaryString* or *HexadecimalString*.

#### SetBitsOrder

```
$FingerprintsTextFileIO->SetBitsOrder($BitsOrder);
```

Sets *BitsOrder* for fingerprints bit-vector string data in a text file and returns FingerprintsTextFileIO. Possible values for BitsOrder: *Ascending* or *Descending*.

#### SetColMode

```
$FingerprintsTextFileIO->SetColMode($ColMode);
```

Sets *ColMode* for a text file and returns FingerprintsTextFileIO. Possible values for ColMode: *ColNum* or *ColLabel*.

#### SetDataColLabels

```
$FingerprintsTextFileIO->SetDataColLabels(@ColLabels);  
$FingerprintsTextFileIO->SetDataColLabels(\@ColLabels);
```

Sets *ColLabels* for a text file using an array or a reference to an array containing column labels and returns FingerprintsTextFileIO.

#### SetDataLineWords

```
$FingerprintsTextFileIO->SetDataLineWords(@LineWords);
```

```
$FingerprintsTextFileIO->SetDataLineWords(\@LineWords);
```

Sets *DataLineWords* for a text file using an array or a reference to an array containing data words and returns FingerprintsTextFileIO.

#### SetDetailLevel

```
$FingerprintsTextFileIO->SetDetailLevel($Level);
```

Sets details *Level* for generating diagnostics messages during text file processing and returns FingerprintsTextFileIO. Possible values: *Positive integers*.

#### SetFingerprints

```
$FingerprintsTextFileIO->SetFingerprints($FingerprintsObject);
```

Sets *FingerprintsObject* for current data line and returns FingerprintsTextFileIO.

#### SetFingerprintsString

```
$FingerprintsTextFileIO->SetFingerprintsString($FingerprintsString);
```

Sets *FingerprintsString* for current data line and returns FingerprintsTextFileIO.

#### SetFingerprintsStringMode

```
$FingerprintsTextFileIO->SetFingerprintsStringMode($Mode);
```

Sets *FingerprintsStringMode* for text file and returns FingerprintsTextFileIO. Possible values: *AutoDetect*, *FingerprintsBitVectorString*, or *FingerprintsVectorString*

#### SetInDelim

```
$FingerprintsTextFileIO->SetInDelim($InDelim);
```

Sets *InDelim* for text file and returns FingerprintsTextFileIO. Possible values: *comma*, *semicolon*, *tab*.

#### SetOutDelim

```
$FingerprintsTextFileIO->SetOutDelim($OutDelim);
```

Sets *OutDelim* for text file and returns FingerprintsTextFileIO. Possible values: *comma*, *semicolon*, *tab*.

#### SetVectorStringFormat

```
$FingerprintsTextFileIO->SetVectorStringFormat($Format);
```

Sets *VectorStringFormat* for text file and returns FingerprintsTextFileIO. Possible values: *IDsAndValuesString*, *IDsAndValuesPairsString*, *ValuesAndIDsString*, *ValuesAndIDsPairsString*.

#### WriteFingerprints

```
$FingerprintsTextFileIO->WriteFingerprints($FingerprintsObject,  
                                           @DataColValues);
```

Writes fingerprints string generated from *FingerprintsObject* object and other data including *DataColValues* to text file and returns FingerprintsTextFileIO.

#### WriteFingerprintsString

```
$FingerprintsSDFFileIO->WriteFingerprints($FingerprintsString,  
                                           @DataColValues);
```

Writes *FingerprintsString* and other data including *DataColValues* to text file and returns FingerprintsTextFileIO.

#### Caveats:

- o FingerprintsStringMode, BitStringFormat, BitsOrder, VectorStringFormat values are ignored during writing of fingerprints and it's written to the file as it is.

#### AUTHOR

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#### SEE ALSO

FingerprintsSDFFileIO.pm, FingerprintsFPFileIO.pm

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