#### NAME

FingerprintsTextFileIO

### **SYNOPSIS**

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

### DESCRIPTION

FingerprintsTextFileIO class provides the following methods:

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

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"

"Cmpd1", "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:MinRadius0:MaxRadius2;41;AlphaNumericalValues;ValuesString;NR0-C.X1.BO1.H3-ATC1:NR1-C.X3.BO3.H1-ATC1:NR2-C.X1.BO1.H3-ATC1:NR2-C.X3.BO4-ATC1 NR0-C.X1.BO1.H3-ATC1:NR2-C.X3.BO3.H1-ATC1:NR2-C.X3.BO4-ATC1 NR0-C.X3.BO3.H1-ATC1:NR2-C.X3.BO4-ATC1 NR0-C.X2.BO2.H2-ATC1:NR1-C.X3.BO3.H1-ATC1:NR2-C.X3.BO4-ATC1 NR1-C.X3.BO3.H1-ATC1:NR2-

FingerprintsVector;AtomTypesCount:AtomicInvariantsAtomTypes:ArbitrarySize;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;NumericalValues;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

FingerprintsVector; EStateIndicies: ArbitrarySize; 11; NumericalValues; IDs AndValuesString; SaaCH SaasC SaasN SdO SdssC SsCH3 SsF SsOH SssCH2 SssN H SsssCH; 24.778 4.387 1.993 25.023 -1.435 3.975 14.006 29.759 -0.073 3 .024 -2.270

FingerprintsVector; ExtendedConnectivity: AtomicInvariantsAtomTypes: Radius2;60; AlphaNumericalValues; ValuesString; 73555770 333564680 352413391 666191900 1001270906 1371674323 1481469939 1977749791 2006158649 21414 08799 49532520 64643108 79385615 96062769 273726379 564565671 85514103 5 906706094 988546669 1018231313 1032696425 1197507444 1331250018 1338 532734 1455473691 1607485225 1609687129 1631614296 1670251330 17303...

FingerprintsVector; ExtendedConnectivity: FunctionalClassAtomTypes: Radiu s2;57; AlphaNumericalValues; ValuesString; 24769214 508787397 850393286 8 62102353 981185303 1231636850 1649386610 1941540674 263599683 32920567 1 571109041 639579325 683993318 723853089 810600886 885767127 90326012 7 958841485 981022393 1126908698 1152248391 1317567065 1421489994 1455 632544 1557272891 1826413669 1983319256 2015750777 2029559552 20404...

FingerprintsVector; ExtendedConnectivity: EStateAtomTypes: Radius2;62;Alp haNumericalValues; ValuesString; 25189973 528584866 662581668 671034184 926543080 1347067490 1738510057 1759600920 2034425745 2097234755 21450 44754 96779665 180364292 341712110 345278822 386540408 387387308 50430 1706 617094135 771528807 957666640 997798220 1158349170 1291258082 134 1138533 1395329837 1420277211 1479584608 1486476397 1487556246 1566...

 FingerprintsVector; PathLengthCount: AtomicInvariantsAtomTypes: MinLength 1: MaxLength8; 432; NumericalValues; IDsAndValuesPairsString; C.X1.B01.H3 2 C.X2.B02.H2 4 C.X2.B03.H1 14 C.X3.B03.H1 3 C.X3.B04 10 F.X1.B01 1 N.X 2.B02.H1 1 N.X3.B03 1 O.X1.B01.H1 3 O.X1.B02 2 C.X1.B01.H3C.X3.B03.H1 2 C.X2.B02.H2C.X2.B02.H2 1 C.X2.B02.H2C.X3.B03.H1 4 C.X2.B02.H2C.X3.B0 4 1 C.X2.B02.H2N.X3.B03 1 C.X2.B03.H1:C.X2.B03.H1 10 C.X2.B03.H1:C.X2.B03.H1

FingerprintsVector; PathLengthCount: MMFF94AtomTypes: MinLength1: MaxLength8; 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=CO 1 COOCR 1 COOCC=O 1 CRCR 7 CRN5 1 CR OR 2 C5A: C5B: C5B 2 C5A: C5BC=ON 1 C5A: N5: C5A 1 C5A: N5: C5A: N

FingerprintsVector; TopologicalAtomPairs: AtomicInvariantsAtomTypes: MinD istance1: MaxDistance10; 223; NumericalValues; IDsAndValuesString; C.X1.B01.H3-D1-C.X3.B03.H1 C.X2.B02.H2-D1-C.X2.B02.H2 C.X2.B02.H2-D1-C.X3.B03.H1 C.X2.B02.H2-D1-C.X3.B03.E3.B03.H1 C.X2.B02.H2-D1-C.X3.B04 C.X2.B02.H2-D1-N.X3.B03 C.X2.B03.H1-D1-...; 2 1 4 1 1 10 8 1 2 6 1 2 2 1 2 1 2 1 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:MinDistancel:MaxDistancel0;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 HBA-D1-None HBA-D1-None HBA-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.B01.H3-C.X3.B03.H1-C.X3.B04-C.X3.B04 C.X1.B01.H3-C.X3.B03.H1-C.X3.B04-N.X3.B03 C.X2.B02.H2-C.X2.B02
2.H2-C.X3.B03.H1-C.X2.B02.H2 C.X2.B02.H2-C.X2.B02.H2-C.X3.B03.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; TopologicalAtomTriplets: AtomicInvariantsAtomTypes: M

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 HBD-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 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; 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-HBA1-HBD1 H1-HBA1-HBA1 H1-HBA1-HBD1 H1-HBA1-NII H1-HBA1-NII HBA1-HBD1-NII HBA1-HBD1-NII 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 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 ...

### **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 Coll abel

# 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 FingerprintsTextFileI O. 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

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

### WriteFingerprintsString

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**

 $Finger prints SDFile IO.pm,\ Finger prints FPFile IO.pm$ 

# COPYRIGHT

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