

# M-Zoom: Fast Dense-Block Detection in Tensors with Quality Guarantees

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## 1 General Information

- Version: 1.0
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## 2 Introduction

**M-Zoom (Multidimensional Zoom)** is an algorithm for detecting dense blocks in tensors.

**M-Zoom** has the following properties:

- *scalable*: scales almost linearly with all input factors
- *provably accurate*: provides high accuracy in real data as well as theoretical guarantees
- *flexible*: supports high-order tensors, various density measures, multi-block detection, and size bounds

Detailed information about the method is explained in the following paper

- Kijung Shin, Bryan Hooi, and Christos Faloutsos. “*M-Zoom: Fast Dense Block Detection in Tensors with Quality Guarantees*”

## 3 Installation

- This package requires that java 1.7 or greater be installed in the system and set in PATH.
- For compilation (optional), type `./compile.sh`
- For packaging (optional), type `./package.sh`
- For demo (optional), type `make`

## 4 Input File Format

The input file lists all tuples in a relation. Each line corresponds to a tuple and consists of dimension attributes values and a measure attribute value, which are separated by a comma. Additionally, we assume the followings:

- Measure attribute values are in the last column of each row
- Measure attribute values are integers

*example\_data.txt* is an example of the input file.

## 5 Output Files Format

For each found block, two files are created. For example, for the *n*-th found block, the following two files are created:

- *block\_n.tuples*: this file lists tuples included in the *n*-th block. This file has the same format with the input file.
- *block\_n.attributes*: this file lists attribute values included in the *n*-th block. Each line consists of the order of an attribute and a value of the attribute.

*output* directory contains the examples of the output files. Statistics, including the volumes, masses, and densities of found blocks, are printed in the console.

## 6 Running M-Zoom

### 6.1 How to Run

```
./run.sh input_path output_path dimension density_measure num_of_blocks lower_bound  
upper_bound
```

### 6.2 Parameters

- *input\_path*: path of the input file. See 4 for the detailed format of the input file
- *output\_path*: path of the directory for output files. See 5 for the detailed format of the output files
- *dimension*: number of dimension attributes
- *density\_measure*: density measure to use. This parameter should be one among [ari, geo, susp]
- *num\_of\_blocks*: number of blocks to find
- *lower\_bound* (optional): minimum size of blocks to find
- *upper\_bound* (optional): maximum size of blocks to find